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# Appeal

I am delighted to introduce this issue of *International Journal of Science and Humanities* (IJSH) to the students and research community on behalf of Islamiah College (Autonomous), Vaniyambadi, a century old institution serving for the cause of education to socially, economically and educationally weaker sections of the society. The IJSH, is a peer reviewed research journal of interdisciplinary nature that cater the needs of the teaching and research society. The aim of the journal is not only to provide a space for leading research work but also provide a platform for the budding researchers to publish their maiden attempt in the field of science and humanities. The objective of IJSH is to publish up-to-date, high-quality and original research papers alongside relevant and insightful reviews.

This journal was started by Mr. L.M Muneer Ahmed, the Former Secretary of the College with an aspiration to keep the research vibrant in this campus. Now, the torch is handed over to me from June 2016 onwards to run this journal on non-profitable basis without compromising its aims and objectives. At this juncture, I appeal to all teaching and research communities to concentrate on both teaching and research relevant to society, which are symbolically related as the two faces of the same coin. I also appeal to all reviewers and editors not to compromise with the quality of the input and promote this journal to the next level with excellent output. Finally, I pray Almighty to provide guidance for development and success of this journal. Best wishes and thanks for your contribution to the IJSH.

Dr. ANWARULLAH HAJEE
Secretary & Correspondent
Islamiah College (Autonomous)
Vaniyambadi 635 752
India

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# Some Operators on Intuitionistic L-Fuzzy sets of Second Type

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**Abstract**

In this paper, we define the new operators namely necessity and possibility on Intuitionistic L-Fuzzy Sets of second type and study some of their properties.

**AMS Subject Classification:** 03E72

**Keywords:** Intuitionistic Fuzzy Sets, necessity, possibility.

## 1. Introduction

Fuzzy sets were introduced by Lotfi.A. Zadeh in 1965 as a generalisation of classical(crisp)sets. Further the fuzzy sets are generalised by Krassimir.T. Atanassov in which he has taken non-membership values also into consideration and introduced Intuitionistic Fuzzy sets[IFS] and their extensions like Intuitionistic Fuzzy sets of second type, Intuitionistic L-Fuzzy sets and Temporal Intuitionistic Fuzzy sets. In section 2, we give some basic definitions and in section 3, we introduce the new operators $necessity(\Box)$ and $possibility(\Diamond)$ on ILFSST in the universal set $E$. Also we establish some of their properties. The paper is concluded in section 4 .

## 2. Preliminaries

In this section, we give some basic definitions.

**Definition 2.1** [7] *A Fuzzy set [FS] $A$ in a universal set $E$ is defined by,*

$$A = \{\langle x, \mu_A(x)\rangle \mid x \in E\}$$

*where $\mu_A : E \to [0, 1]$ is the membership function representing the membership degree of element $x$ in the FS $A$ such that $0 \leq \mu_A(x) \leq 1$*

**Definition 2.2** [7] *The support of a Fuzzy Set $A$ in a universal set $E$ is denoted by Supp(A) and is defined as,*

$$Supp\,(A) = \{x : \mu_A(x) > 0, x \in E\}$$

**Example.** Let $X = \{1, 2, 3\}$ and $A = \{\langle 1, 0.2\rangle, \langle 2, 0\rangle, \langle 3, 0.4\rangle\}$ then, $Supp\,(A) = \{1, 3\}$

**Definition 2.3** [1] *An Intuitionistic Fuzzy set[IFS] $A$ in a universal set $E$ is defined as an object of the form,*

$$A = \{\langle x, \mu_A(x), \nu_A(x)\rangle \mid x \in E\},$$

*where $\mu_A : E \to [0, 1]$ and $\nu_A : E \to [0, 1]$ denote the degree of membership and the degree of non-membership of the element $x \in E$ respectively, satisfying $0 \leq \mu_A(x) + \nu_A(x) \leq 1$*

The value $\pi_A(x) = 1 - \mu_A(x) - \nu_A(x)$ is the degree of uncertainty of the element $x \in E$ to the IFS $A$

**Definition 2.4** [1] *The support of an Intuitionistic Fuzzy Set $A$ in a universal set $E$ is denoted by Supp(A) and is defined as,*

$$Supp\,(A) = \{x : \mu_A(x) > 0, \nu_A(x) > 0, x \in E\}$$

**Example.** Let $X = \{1, 2, 3\}$ and $A = \{\langle 1, 0.2, 0.8\rangle, \langle 2, 0.1, 0.7\rangle, \langle 3, 0, 0\rangle\}$ then, $Supp\,(A) = \{1, 2\}$

**Definition 2.5** [1] *An Intuitionistic Fuzzy sets of second type [IFSST] $A$ in a universal set $E$ is defined as an object of the form,*

$$A = \{\langle x, \mu_A(x), \nu_A(x)\rangle \mid x \in E\},$$

*where $\mu_A : E \to [0, 1]$ and $\nu_A : E \to [0, 1]$ denote the degree of membership and the degree of non-membership of the element $x \in E$ respectively, satisfying $0 \leq \mu_A(x)^2 + \nu_A(x)^2 \leq 1$.*

The value $\pi_A(x) = \sqrt{1 - \mu_A(x)^2 - \nu_A(x)^2}$ is the degree of uncertainty of the element $x \in E$ to the IFSST $A$.

**Definition 2.6** [1] *The support of an Intuitionistic Fuzzy Sets of second type $A$ is denoted by Supp(A) and defined as,*

$$Supp\,(A) = \{x : \mu_A(x)^2 > 0, \nu_A(x)^2 > 0, x \in E\}$$

**Example.** Let $X = \{1, 2, 3\}$ and $A = \{\langle 1, 0, 0\rangle, \langle 2, 0.1, 0.7\rangle, \langle 3, 0.6, 0.2\rangle\}$ then, $Supp\,(A) = \{2, 3\}$

**Definition 2.7** [1] *An Intuitionistic L-Fuzzy set[ILFS] $A$ in a universal set $E$ is defined as an object of the form*

$$A = \{\langle x, \mu_A(x), \nu_A(x)\rangle \mid x \in E\},$$

*where $\mu_A : E \to L$ and $\nu_A : E \to L$ denote the degree of membership and the degree of non-membership of the element $x \in E$ respectively, satisfying $\mu_A(x) \leq N(\nu_A(x))$, $N : L \to L$ is an unary involute order reversing operation and $E$ be fixed.*

The value $\pi_A(x) = N(\sup(\mu_A(x), \nu_A(x)))$ is the degree of uncertainty of the element $x \in E$ to the ILFS $A$.

**Definition 2.8** [1] *The support of an Intuitionistic L-Fuzzy Set $A$, is denoted by Supp(A) and defined as,*

$$Supp\,(A) = \{x : \mu_A(x) > 0, N(\nu_A(x)) > 0, x \in E\}$$

**Example.** Let $X = \{1, 2, 3, 4\}$ and $A = \{\langle 1, 0.4, 0.3\rangle, \langle 2, 0, 0\rangle, \langle 3, 0, 0\rangle, \langle 4, 0.1, 0.7\rangle\}$ then, $Supp\,(A) = \{1, 4\}$

**Definition 2.9** [3] *An Intuitionistic L-Fuzzy sets of second type[ILFSST] $A$ in a universal set $E$ is defined as an object of the form*

$$A = \{\langle x, \mu_A(x), \nu_A(x)\rangle \mid x \in E\},$$

*where $\mu_A : E \to L$ and $\nu_A : E \to L$ denote the degree of membership and the degree of non-membership of the element $x \in E$ respectively, satisfying $\mu_A(x)^2 \leq N(\nu_A(x))^2$, $N : L \to L$ is an unary involute order reversing operation and $E$ be fixed.*

The value $\pi_A(x) = \sqrt{N(\sup(\mu_A(x)^2, \nu_A(x)^2))}$ is the degree of uncertainty of the element $x \in E$ to the ILFSST $A$.

**Definition 2.10** [3] *The support of an Intuitionistic L-Fuzzy Sets of second type $A$ is denoted by Supp(A) and defined as,*

$$Supp\,(A) = \{x : \mu_A(x)^2 > 0, N(\nu_A(x))^2 > 0, x \in E\}$$

**Example.** Let $X = \{1, 2, 3, 4\}$ and $A = \{\langle 1, 0, 0\rangle, \langle 2, 0, 0\rangle, \langle 3, 0.6, 0.3\rangle, \langle 4, 0.1, 0.7\rangle\}$ then, $Supp\,(A) = \{3, 4\}$

## 3. Operators on Intuitionistic L-Fuzzy sets of second type

In this section, we define the new operators $necessity(\Box)$ and $possibility(\Diamond)$ on *ILFSST* in the universal set $E$.

**Definition 3.1** *The $necessity$ operator is*

$$\Box A = \{\langle x, \mu_A(x), \sqrt{N(\mu_A(x))^2}\rangle / x \in E\}$$

**Definition 3.2** *The $possibility$ operator is*

$$\Diamond A = \{\langle x, \sqrt{N(\nu_A(x))^2}, \nu_A(x)\rangle / x \in E\}$$

**Theorem 3.1** *For any ILFSST $A$, we have*

(a) $\overline{\Box\overline{A}} = \Diamond A$ (b) $\overline{\Diamond\overline{A}} = \Box A$

(c) $\Box\Box A = \Box A$ (d) $\Diamond\Diamond A = \Diamond A$

**Proof.**

(a)
$$\begin{aligned}\overline{\Box\overline{A}} &= \overline{\Box\{\langle x, \nu_A(x), \mu_A(x)\rangle / x \in E\}} \\ &= \overline{\{\langle x, \nu_A(x), \sqrt{N(\nu_A(x))^2}\rangle / x \in E\}} \\ &= \{\langle x, \sqrt{N(\nu_A(x))^2}, \nu_A(x)\rangle / x \in E\} \\ &= \Diamond A\end{aligned}$$

(b)
$$\begin{aligned}\overline{\Diamond\overline{A}} &= \overline{\Diamond\{\langle x, \nu_A(x), \mu_A(x)\rangle / x \in E\}} \\ &= \overline{\{\langle x, \sqrt{N(\mu_A(x))^2}, \mu_A(x)\rangle / x \in E\}} \\ &= \{\langle x, \mu_A(x), \sqrt{N(\mu_A(x))^2}\rangle / x \in E\} \\ &= \Box A\end{aligned}$$

(c)
$$\begin{aligned}\Box\Box A &= \Box\{\langle x, \mu_A(x), \sqrt{N(\mu_A(x))^2}\rangle / x \in E\} \\ &= \{\langle x, \mu_A(x), \sqrt{N(\mu_A(x))^2}\rangle / x \in E\} \\ &= \Box A\end{aligned}$$

(d)
$$\begin{aligned}\Diamond\Diamond A &= \Diamond\{\langle x, \sqrt{N(\nu_A(x))^2}, \nu_A(x)\rangle / x \in E\} \\ &= \{\langle x, \sqrt{N(\nu_A(x))^2}, \nu_A(x)\rangle / x \in E\} \\ &= \Diamond A\end{aligned}$$

■

**Theorem 3.2** *For every two ILFSSTs $A$ and $B$, we have*

(a) $\Box(A \cup B) = \Box A \cup \Box B$ (b) $\Box(A \cap B) = \Box A \cap \Box B$

(c) $\Diamond(A \cup B) = \Diamond A \cup \Diamond B$ (d) $\Diamond(A \cap B) = \Diamond A \cap \Diamond B$

**Proof.**
(a)

$$\begin{aligned}
\Box(A \cup B) &= \Box\{\langle x, \sup(\mu_A(x), \mu_B(x)), \inf(\nu_A(x), \nu_B(x))\rangle / x \in E\} \\
&= \{\langle x, \sup(\mu_A(x), \mu_B(x)), \sqrt{N((\sup(\mu_A(x), \mu_B(x)))^2)}\rangle / x \in E\} \\
&= \{\langle x, \sup(\mu_A(x), \mu_B(x)), \inf(\sqrt{N(\mu_A(x)^2)}, \sqrt{N(\mu_B(x)^2)})\rangle / x \in E\} \\
&= \{\langle x, \mu_A(x), \sqrt{N(\mu_A(x)^2)}\rangle / x \in E\} \cup \{\langle x, \mu_B(x), \sqrt{N(\mu_B(x)^2)}\rangle / x \in E\} \\
&= \Box A \cup \Box B
\end{aligned}$$

(b)

$$\begin{aligned}
\Box(A \cap B) &= \Box\{\langle x, \inf(\mu_A(x), \mu_B(x)), \sup(\nu_A(x), \nu_B(x))\rangle / x \in E\} \\
&= \{\langle x, \inf(\mu_A(x), \mu_B(x)), \sqrt{N((\inf(\mu_A(x), \mu_B(x)))^2)}\rangle / x \in E\} \\
&= \{\langle x, \inf(\mu_A(x), \mu_B(x)), \sup(\sqrt{N(\mu_A(x)^2)}, \sqrt{N(\mu_B(x)^2)})\rangle / x \in E\} \\
&= \{\langle x, \mu_A(x), \sqrt{N(\mu_A(x)^2)}\rangle / x \in E\} \cap \{\langle x, \mu_B(x), \sqrt{N(\mu_B(x)^2)}\rangle / x \in E\} \\
&= \Box A \cap \Box B
\end{aligned}$$

(c)

$$\begin{aligned}
\Diamond(A \cup B) &= \Diamond\{\langle x, \sup(\mu_A(x), \mu_B(x)), \inf(\nu_A(x), \nu_B(x))\rangle / x \in E\} \\
&= \{\langle x, \sqrt{N((\inf(\nu_A(x), \nu_B(x)))^2)}, \inf(\nu_A(x), \nu_B(x))\rangle / x \in E\} \\
&= \{\langle x, \inf(\sqrt{N(\nu_A(x)^2)}, \sqrt{N(\nu_B(x)^2)}), \sup(\nu_A(x), \nu_B(x))\rangle / x \in E\} \\
&= \{\langle x, \sqrt{N(\nu_A(x)^2)}, \nu_A(x)\rangle / x \in E\} \cup \{\langle x, \sqrt{N(\nu_B(x)^2)}, \nu_B(x)\rangle / x \in E\} \\
&= \Diamond A \cup \Diamond B
\end{aligned}$$

(d)

$$\begin{aligned}
\diamondsuit(A \cap B) &= \diamondsuit\{\langle x, \inf(\mu_A(x), \mu_B(x)), \sup(\nu_A(x), \nu_B(x))\rangle / x \in E\} \\
&= \{\langle x, \sqrt{N((\sup(\nu_A(x), \nu_B(x)))^2)}, \sup(\nu_A(x), \nu_B(x))\rangle / x \in E\} \\
&= \{\langle x, \sup(\sqrt{N(\nu_A(x)^2)}, \sqrt{N(\nu_B(x)^2)}), \inf(\nu_A(x), \nu_B(x))\rangle / x \in E\} \\
&= \{\langle x, \sqrt{N(\nu_A(x)^2)}, \nu_A(x)\rangle / x \in E\} \cap \{\langle x, \sqrt{N(\nu_B(x)^2)}, \nu_B(x)\rangle / x \in E\} \\
&= = \diamondsuit A \cap \diamondsuit B
\end{aligned}$$

■

## 4. Conclusion

In this paper, we have introduced the new operators necessity and possibility on Intuitionistic L-Fuzzy sets of second type [ILFSST] and studied some of their properties. In future we will study some more properties and applications of ILFSST.

## References


1. ATANASSOV K.T., Intuitionistic Fuzzy sets-Theory and Applications, (1999), Springer Verlag,New York.
2. PARVATHI R and PALANIAPPAN N, Some Operations on IFSs of second Type, Notes on Intuitionistic Fuzzy sets, (2004), 10(2), pp.1-19.
3. SHEIK DHAVUDH S and SRINIVASAN R, Properties of Intuitionistic L-Fuzzy Sets of Second Type, International Journal of Mathematics and Its Applications, vol 4, Issue 2 - B, (2016), 65-68 ISSN: 2347-1557.
4. SRINIVASAN R and PALANIAPPAN N, Some Operations on Intuitionistic Fuzzy sets of Root type, Notes on IFS, (2006), 12(3),pp.20-29.
5. SRINIVASAN R and PALANIAPPAN N, Some Properties of Intuitionistic Fuzzy sets of Root type, International Journal of Computational and Applied Mathematics, (2009), 4(3), pp.383-390.
6. SRINIVASAN R and SYED SIDDIQUA BEGUM, Some Properties of Intuitionistic Fuzzy sets of Third type, International Journal of Science and Humanities, ISSN 2394 9236, (2015), 1(1), pp.53-58.
7. ZADEH L.A, Fuzzy sets Inform and Control, (1965), pp.338-353.

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# Anti-oxidative Effect of Silver Nano EGCG particles in Cigarette Smoke induced Alveolar Damage in Male Wistar Rats

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**Abstract**

Cigarette smoking (CS) is the cause of morbidity and mortality from several diseases including lung cancer, chronic obstructive pulmonary disease (COPD), and cardiovascular disease (CVD). Free radicals mediated oxidative stress has been implicated in the pathogenesis of smoking-related lung diseases and antioxidant nutrients are reported to prevent these lung damages. EGCG inhibits chemical-induced lung fibrosis and lung cancer. However, minimal bioavailability of EGCG considerably reduced EGCG mediated biological effects invivo. Therefore, the present study was intended to evaluate the pulmonary protective role of EGCG coated silver Nano particles (EGCG-AgNPs) against chronic CS induced oxidative damage in rat lungs. Adult male albino rats were exposed to side stream CS for a period of 12 weeks and simultaneously administered with EGCG-AgNPs (2mg/kg B.W./day). Exposure to CS significantly increased the levels of oxidative stress markers such as lipid peroxidation (LPO), protein oxidation, and decreased levels of reduced glutathione, vitamin C and vitaminE. The activities of superoxide dismutase, catalase, glutathione peroxidase, glutathione-S-transferases and glutathione reductase were found to be decreased in CS exposed rat. Oral supplementation with EGCG-AgNPs showed significant decrease in the levels of LPO, protein oxidation products and improved the antioxidant status by increasing the activities of enzymic antioxidants, and non-enzymic antioxidants. Histopathological alterations of the lung tissue were prevented by EGCG-AgNPs administration. These results suggest that chronic CS exposure enhances oxidative stress, thereby disturbing the tissue defense system and EGCG-AgNPs protects the

lungs from this oxidative damage through its antioxidant potential.

**Keywords:** Cigarette smoking, EGCG, Lungs, AgNPs, Oxidative stress, pulmonary disease.

## Introduction

Cigarette smoking is the cause of morbidity and mortality from several diseases including lung cancer, chronic obstructive pulmonary disease (COPD), and cardiovascular disease (CVD) [WHO, 2008]. Lung cancer has become one of the leading causes of death in both developed and developing countries. Most of the deaths from lung cancer are due to smoking tobacco products. Worldwide in 2014, tobacco smoking contributed 80% of the lung cancer deaths in males aged 30-69 years, and 82% in males over 70 years [Ezzati and Lopez, 2003]. The number of smokers worldwide is currently estimated to be 1.8 billion and continues to increase 2 billion by 2025. According to the World Health Organization (WHO), tobacco-related disease is the single largest preventable cause of death in the world today, killing around 5.4 million people a year - an average of one person every six seconds. The WHO predicts that tobacco deaths in India may exceed 1.5 million annually by 2020 [Rani et al., 2003]. Among the tobacco users, beedi smokers constitute 40%, cigarette smokers 20% and those using smokeless constitute 40% [Vijayan and Kumar, 2005].CS has been shown to induce prominent pulmonary vascular changes characterized by endothelial dysfunction and vascular remodeling, which lead to pulmonary hypertension. Lung tissue, exposed to near-atmospheric oxygen tension and inhaled, endogenous and circulating oxidants, is an organ routinely under oxidative stress and therefore at high risk for oxidative damage.CS is a complex mixture of over 4800 identified constituents [Pryor and Stone, 1993] and this array free radical was shown to induce functional and structural damage to lungs. CS induced oxidative damage, and cigarette smoke exerts its oxidative effects on the rest of entire organs eventually.Naturally occurring antioxidant substances such as polyphenols and flavonoids that are derived from herbs, fruits, vegetable and medicinal plants provides a new insight in prevention and therapy of lung cancer. The mechanisms of action of several dietary chemopreventive agents have gained considerable attention in cancer research. Green tea is currently considered as a source of dietary constituents endowed with biological and pharmacological activities relevant to human health. As per human epidemiological and new animal data, it can be suggested that the pharmacological benefits of tea drinking may help to protect from lung cancer. The major catechins of green tea are (-)-epicatechin (EC), (-)-epicatechin-3-gallate (ECG), (-)-epigallocatechin (EGC) and (-)-epigallocatechin-3-gallate (EGCG) [Babu and Liu, 2008].The bioavailability of green tea catechins in humans is an important variable for evaluation their biological activity within the target tissues. In humans, the plasma catechin concentration was notably increased 2 to 4 hours following

the consumption of green tea [Babu and Liu, 2008]. However, the bioavailability of catechins is relatively lower, with reportedly plasma catechin (EGCG and EGC) concentrations accounting for only 0.2 % to 2% of the ingested amount in healthy people. Such low bioavailability of tea catechin limits its bioactivity invivo. In recent decades, particular attention has been paid to the improvement of the bioavailability of tea components in the human body, which mainly includes synthesizing biodegradable nano EGCG. This prompted us to evaluate the possible effect of EGCG-AgNPs on lung oxidative anomalies and histopathological alterations associated CS induced lung injury with a notion to identify a successful therapy.

## Materials and Methods

### Chemicals

All fine chemicals including butylatedhydroxytoluene (BHT), thiobarbituric acid (TBA), tetraethoxypropane (TEP), 2,4 dinitrophenylhydrazine (DNPH), 5,5'-dithiobis (2-nitro benzoic acid) (DTNB), tris (hydroxymethy1) amino methane (TRIS), sodium dodecyl sulfate (SDS), acrylamide, bis-acrylamide, tetramethylethylenediamine (TEMED), and Coomassie blue, (-) - epigallocatechingallate (EGCG) and silver nitrate were purchased from Sigma chemical co., USA. All other chemicals used were of good quality and analytical grade.

### Synthesis of Silver Nanoparticles

In the typical synthesis of silver nanoparticles, 10mL of 1mM EGCG was treated with 2mL of 1M silver nitrate solution and kept in room temperature. Subsequently the synthesis of silver nanoparticles was initially identified by brown colour formation and further monitored by measuring UV-vis spectra of the reaction mixture.

### Characterization of Synthesized Silver Nanoparticles

Synthesis of silver nanoparticles was initially characterized by position of SPR band by measuring Single beam UV-vis spectroscopy at different wavelengths from 360 to 700 nm (Tomos USA model UV-1800 PC).

### Animal model

Male albino rats of Wistar strain (14010 g) procured from Tamilnadu University for Veterinary and Animal Sciences, Chennai, India were used for the study. Animals were fed with commercially available standard rat pelleted feed (M/s Pranav Agro Industries Ltd., India) under the trade name Amrut rat/mice feed and water was provided ad libitum. The rats were housed under conditions of controlled temperature (252C) and acclimatized to 12-h light:12-h dark cycle. Animal experiments were conducted

according to the guidelines of institutional animal ethical committee.

**Experimental design**

Rats were divided into four groups, each consisting of six animals.

Group I - served as the vehicle treated normal saline control.

Group II - rats were exposed with cigarette smoke for 21 days.

Group III - rats exposed to cigarette smoke condensate for a period of 21 days and simultaneously administered of Nano EGCG (2 mg/kg BW for 21 days) orally [Hsieh et al., 2011].

In Group IV - animals received Nano EGCG (2 mg/kg BW orally) dissolved in n water for 21 days.

Group II and Group III rats were exposed to CS for a period of 12 weeks as described [Gokulakrishnan et al., 2011]. Briefly, the rats were placed in a whole body smoke exposure chamber, which contains two holes of about 3 cm in diameter. Smoke from a lighted cigarette was introduced through one hole and air through the other. The cigarette was fixed away from the chamber and smoke was drawn in by slow suction with the help of a tube and an aerator, so that there was no temperature change within the chamber. The animals were exposed to side stream CS twice daily, the duration of each exposure was 3h with an interval of 10 min between each cigarette, using eight to 10 cigarettes per day. The same brand of locally available cigarette was used throughout the experiment (Scissors Standard). Control animals were subjected to the same handling and time in the smoke exposure chamber with air replacing smoke/air mixture. The concentrations of nicotine, carbon monoxide and total particulate matter were measured in the cigarette and CS in the study chamber (data not shown).

**Collection of samples for biochemical analysis**

After the experimental period, the rats were fasted overnight, anaesthetized with intraperitoneal injection of phenobarbital sodium (30 mg/kg body weight) and blood collected from jugular vein for serum isolation and sacrificed by cervical decapitation.

**Serum separation**

The blood samples collected in plain centrifuge tubes were kept in inclined position to allow complete clotting of blood and then centrifuged at 2500 rpm for 10 min. The resultant clear supernatant was pipetted out and preserved in small vials in the freezer for the purpose of biochemical investigations.

**Histological examination**

A portion of the lungs tissue was fixed in 10% neutral buffered formalin and embedded in paraffin wax for histological evaluation. Sections with thickness 5m were stained with hamatoxylin and eosin (H & E), examined under high power light microscope.

### Biochemical assays

The activities of serum enzymic antioxidants such as superoxide dismutase SOD [Misra andFridovich,1972], catalase CAT [Takaharaet al., 1960], glutathione peroxidase GPx[Rotruck, 1973], glutathione reductase GR [Staalet al., 1969], glutathione-S-transferase GST [Habiget al., 1974] were assayed. Lipid peroxidation level was determined by measuring thiobarbituric acid reactive substances (TBARS) according to the method of [Ohkawaet al., 1979].

Sodium Dodecyl Sulphate-Polyacrylamide Gel Electrophoresis (SDS-PAGE) Protein damage was analyzed by SDS-PAGE by the method of Laemmli, (1970).

Activity staining of SOD and CAT by native gel electrophoresis The levels of protein were estimated by [Lowry et al., 1954], and were separated by native gel electrophoresis in the presence of Tris (50 mM), glycine (300 mM) and EDTA (1.8 mM) at constant current (50 mA) for 4-5 hrs. After electrophoresis, the 12% native gel was incubated in staining solution containing riboflavin (0.028 mM), nitrobluetetrazolium (0.25 mM), EDTA (1 mM) and TEMED (28 mM), in 50 mM phosphate buffer. After 30 mins incubation in dark, the staining solution was removed and replaced with 50 mM phosphate buffer. The gel was then exposed to light for a few minutes and areas of SOD activity appeared as white bands in a blue background [Beauchamp andFridovich, 1971]. Similarly, the 8% native gel of CAT after electrophoresis was soaked in 50 mM phosphate buffer (pH 7.8) containing 0.01 M H2O2 for 20 mins at room temperature in dark with gentle rocking. The gel was then placed in 2% ferric chloride and 2% potassium ferric cyanide solution. The areas of CAT activity appeared as yellow bands against the greenish blue background [Sun et al., 1988].

### Statistical method

All the results were expressed as mean SD for six rats in each group. All the grouped data were statistically evaluated with SPSS/12.0 software. Hypothesis testing method included one-way analysis of variance (ANOVA), followed by least significant difference (LSD) test; P ¡ 0.05 was considered to indicate statistical significance.

## Results and Discussion

### Colour change during synthesis of nanoparticles

In the present study, it has been found that the EGCG atea poly phenol has the potential to reduce silver nitrate ions to silver nanoparticles. The yellowish [Fig. 1] colour of aqueous extract of green tea extract was changed to dark brown after 24 hours of incubation due to the excitation of surface plasma on vibrations in silver nanoparticles.

From this study, it has been found that the green tea extract, a traditional medicinal

plant has the potential to reduce silver nitrate ions to silver nanoparticles. The pale brown colour of aqueous EGCG was changed to dark brown after 24 hours of incubation due to the excitation of surface plasmon vibrations in silver nanoparticles.

**UV-Vis Spectroscopy**

The formation of silver nanoparticles was confirmed using UV-vis spectroscopy. The broad plasma resonance peak around 450 nm can be assigned to silver nanoparticles [Fig. 2]. The intensity of the color increased with the incubation time. Nanoparticle size can also be determined by the change in the color of the reaction solution. The smaller the size of nanoparticles greater is the color shift towards red. The synthesis of silver nanoparticles was also confirmed from the UV spectra of EGCG -AgNPs where the maximum absorbance was found 450nm after 24 hours of incubation.

**Effect of EGCG-AgNPson CS induced lung lipid peroxidation**

The changes in levels of LPO in lungs of control and experimental group of rats are depicted in Figure.3. The levels of LPO were significantly (p ¡ 0.05) increased CS exposed rats (Group II) when compared with control rats. EGCG-AgNPs treated CS administered rat (Group III) showed significant (p ¡ 0.05) decrease in the levels of LPO which was comparable with CS exposed rats. No significant difference was observed in rats treated with EGCG-AgNPs (Group IV) alone when compared to normal control rats, which indicates its non-toxic nature.

In the current study a significant increase in LPO were observed in the lung tissues of CS induced rats. This is in agreement with the reports by [Lucheseet al., 2007], elevation of lipid peroxides in CS exposed rats could be attributed to the sustained release of reactive free radicals. However supplementation of EGCG-AgNPs reduced the levels of LPO in CS exposed rats. EGCG significantly reduced LPO and attenuated oxidative stress of lungs. The possible alveolar protective mechanism of EGCG-AgNPs is due to the presence of tocopherol content and the iron chelating antioxidative activity.

**Effect of EGCG-AgNPs on CS induced protein pattern by SDS-PAGE of lung tissue homogenate**

SDS PAGE pattern of the lung tissue homogenate of control and experimental group of rats is shown in fig.4. Rats induced with CS (Group II) showed a prominent change (lane.2) in protein pattern when compared to control rats (lane.1). Oral treatment with EGCG-AgNPs to CS exposed (Group III) rats prevent the protein fragmentation (lane.3) when compared CS exposed rats. EGCG-AgNPs alone (lane.2) shows similar protein profile when compared to normal control. Protein oxidation and their accumulation have been observed with cigarette smoking and in several human diseases, including cardio vascular disease and cancer [Dalle-Donne et al., 2003]. Accordingly, various experimental studies [Unluet al., 2006] have demonstrated that

exposure to CS elevates protein damage in blood and other organs. The protein damage was attributed mainly due to the free radicals attack and oxidative stress induced by CS. EGCG supplementation reduced the level of protein fragmentation in CS exposed rats. These data corroborate with earlier study, which suggests that, EGCG reduced protein oxidation in experimental rats [Sriramet al., 2009]. Tea catechins may reduce the formation LPO induced low-molecular aldehydes that cause modifications of proteins [Skrzydlewskaet al., 2005] .Thus, EGCG- AgNPs role in preventing the oxidative damage to proteins is obvious by the restoration of protein levels. Effect of EGCG-AgNPs on CS induced enzymic antioxidant status of control and experimental group of rats

Table1 shows the changes in the activities of antioxidant enzyme of control and experimental group of rats. In CS exposed rats (Group I), the activities of these enzymes were decreased significantly (P ¡ 0.05) when compared to control rats. On treatment with EGCG-AGNPS(Group III) there was significant (P ¡ 0.05) increase in the activities of these enzymes when compared to CS induced rats. No significant difference was observed in rats treated with EGCG-AgNPs (group IV) alone when compared to normal control rats, which indicates its non-toxic nature.

**Effect of EGCG-AgNPs on CS induced antioxidant enzyme activity by Native PAGE**

Fig.5 shows the effect of EGCG-AgNPs on tissue antioxidant status of SOD and CAT activity staining by native gel electrophoresis of control and experimental rats. The level of antioxidant enzymes SOD and CAT, in lung tissue were significantly (P ¡ 0.05) decrease in CS exposed rats (Lane 2) when compared with control (Lane 1) rats. Treatment with EGCG-AGNPS to CS exposed rats, revert back activities of these antioxidant enzymes to near normal (Lane 3) when compared to CS administered rats (Lane 2). EGCG-AgNPs (group IV) alone treated group's shows the normal expression of SOD and CAT staining (Lane 2). SOD is an antioxidant enzyme involved in the scavenging of superoxide radicals. The H2O2 formed as the result of SOD activity is quenched by catalase and GPx. In this study, a significantly lower activity of the enzymes SOD and CAT was observed in lung tissues of CS exposed rats. The reduction in the activities of these enzymes might be due to their increased utilization for scavenging ROS, and their inactivation by excessive oxidants in CS. However, upon EGCG- AgNPs administration the activities of these enzymes were significantly increased in CS exposed rats. These findings are consistent with a recent report that EGCG can attenuate antioxidant enzymes [You et al.2014]. EGCG comprising the ortho-hydroxyl group in the B-ring and galloyl moiety in the C-ring could react directly with superoxide may reduce the formation of H2O2 and in addition it possess a direct scavenging effect on H2O2 and restores SOD and CAT activities [Babu & Liu, 2008].

The activities of GR, GST and GPx were declined in lungs of CS administered rats. A synchronized activity of these GSH dependent antioxidant enzymes reduces LPO,

detoxifies toxic electrophiles and maintains intracellular concentration of GSH. CS has been demonstrated to inhibit GR, GST and GPxin rat lungs [Lucheseet al 2009]. The reduced activity of these antioxidant enzymes by CS exposure may be associated with the depletion of GSH levels, and an increase of LPO oxidative stress and free radicals levels. Supplementation of EGCG- AgNPs to CS exposed rats increased the activities of these enzymes which indicate the protective nature of the EGCG- AgNPs against CS induced pulmonary injury. Enhancement of these enzymes in lung tissues by EGCG has been reported under different conditions [You et al., 2014]. Restoration of GSH level, and decrease LPO, which is responsible for the increase in the activity of GPx, GST and GR in EGCG- AgNPs, administered CS exposed rats.

**Effect of EGCG-AgNPs on CS induced non enzymic antioxidant status of control and experimental group of rats**

Figure 6 depicts the levels of non-enzymic antioxidant in control and experimental group of rats of CS exposed rats resulted in a significant (P ¡ 0.05) decrease in the levels of GSH,vitamin C and E when compared with control rats. WhenEGCG-AGNPSadministered along with CS, there was a significant (P ¡ 0.05) increase in the levels of GSH, vitamin C and E when compared to CS- induced rats. No significant difference was observed in rats treated with EGCG-AgNPs (group IV) alone when compared to normal control rats, which indicates its non-toxic nature.

GSH serves as the primary antioxidant defense against oxidative stress and the level of GSH was significantly lowered after exposure to CS. CS exposure induced depletion of GSH in rats is due to increased LPO and enhanced utilization of GSH for scavenging ROS, hydroxyl radicals and oxy radicals, aldehydes and cyanide of tobacco smoke [Moriarty et al., 2003]. Treatment with EGCG brought the GSH levelsto near normal. [Sriramet al., 2008] have demonstrated the importance of EGCG in up regulating non-enzymic antioxidants levels, thereby aiding in pulmonary protection. EGCG by direct scavenging the free radicals in CS may reduce the utilization of GSH and thereby exhibiting an increase in the GSH content in EGCG treated CS exposed rats.

Ascorbate and ?-tocopherol are non-enzymatic antioxidants that scavenge free radicals, lipid peroxides and more over they acts synergistically with one another. In our investigation lower levels of ascorbate and ?-tocopherol were observed in CS exposed rats. In accordance, CS dependent decline in ascorbic acid and ?-tocopherol has been reported lungs tissues of rats [Lucheseet al., 2007]. EGCG-AGNPS pretreatment showed a marked increase in ascorbate and ?-tocopherol levels in CS administered rats. EGCG was reported to possess antioxidant properties superior to that of ascorbic acid and tocopherol [Zhao et al., 1996] and repairs tocopheryl radicals [Skrzydlewskaet al., 2005]. Moreover, EGCG's potential to augment the ascorbic acid and GSH status would have played a vital role in sparing the tocopherol levels in the lung.

**Effect of EGCG-AgNPs on CS induced histopathological changes in lung tissues of control and experimental group of rats**

Fig 8 shows Effect of EGCG-AgNPs on CS induced histopathological changes in lung tissues of control and experimental group of rats.The histological examination of lungs from control animals showed a normal architecture of cells with small uniform nuclei [Fig. 8.A]. CS [Group II] administered Lung showed produced alveolar space enlargement, loss of architecture with distorted alveoli as seen from increased number of hyper chromatic nuclei in the cells of alveolar wall with extensive proliferation of alveolar epithelium[Fig. 8.B]. CS administered and EGCG-AGNPS treated rats [Group III] exhibited reduced alveolar damage with near normal architecture [Fig. 8.C]. EGCG-AGNPSalone treated animals showed no appreciable histopathological alteration [Fig.8.D] as that of control animals

In our histopathological study, airspace enlargement was observed after CS exposure, in agreement with Chan et al., 2009 who also found that exposure of Sprague-Dawley rats to cigarette smoke caused airspace enlargement. We also observed goblet cell hyperplasia in the epithelium of cartilaginous bronchi in CS-exposed rats, which might account for mucus hypersecretion in COPD patients. A previous report also suggested that rats exposed to cigarette smoke rapidly causes increased levels of cell proliferation in the epithelium and walls of bronchioles and in the walls of associated pulmonary arteries.The ability of EGCG-AGNPS to restore the CS induced histological changes, clearly indicates the antioxidant potential of this poly phenol compound. Green tea has a protective effect on CS-induced airspace enlargement, goblet cell hyperplasia as well asa suppressive effect on systemic and local oxidative stresses. Thus, the histological findings clearly support the biochemical data and suggest that EGCG-AGNPS may play a promising antioxidant role with respect to lung damage.

## Conclusions

The above findings show that chronic CS induces an oxidative stress on the lungs by increasing lipid peroxidation, protein oxidation and diminishing both enzymatic and non-enzymatic antioxidant status and histopathological alteration. EGCG-AgNPs ameliorates CS induced oxidative changes probably through its free radical scavenging, antioxidant activities in the pulmonary tissues. Thus, the results of our investigation suggest that EGCG-AgNPs can be a potent antioxidant in the lungs; an organ highly prone to oxidative stress against chronic CS induced toxicity and hence may have useful properties as a natural antioxidant supplement, capable of preventing lungs damage caused by CS oxidative stress. However, further studies pertaining to the precise mechanism of action of EGCG silver Nano particles are warranted.

**Conflict of interest**

The authors declare that there are no conflicts of interest.

## References

Babu PVA, Liu D. Green tea catechins and cardiovascular health: an update. Curr Med Chem.2008; 15: 1840-1850.

Beauchamp CO, Fridovich I. Superoxide dismutase: improved assays and an assay applicable to acrylamide gels. Anal Biochem 1971;44:276-87.

Dalle-Donne I, Giustarini D, Colombo R, Rossi R, Milzani A. Protein carbonylation in human diseases. Trends Mol Med.2003; 9: 169-176.

Ezzati M, Lopez AD. 2003. Estimates of global mortality attributable to smoking in 2000. Lancet 362: 847-52.

Gokulakrisnan.A, Jayachandran Dare. B, Thirunavukkarasu. C, Attenuation of the cardiac inflammatory changes and lipid anomalies by (?)-epigallocatechin-gallate in cigarette smoke-exposed rats. Mol Cell Biochem (2011) 354: 1. doi:10.1007/s11010-011-0785-6

Habig WH, Pabst MJ, Jakoby WB. Glutathione-S-transferases.The first enzymatic step in mercapturic acid formation.Journal of Biological Chemistry. 249 (22): 7130-7139, 1974.

Laemmli UK. Cleavage of structural proteins during the assembly of the head of bacteriophage T4. Nature 227: 680-685, 1970.

Lowry OH, Rosenbrough NJ, Farr AL, Randall RJ. Protein measurement with Folin-Phenol reagent. J BiolChem 1951;193:265-75.

Luchese, C., Stangherlin, E. C., Ardais, A.P., Nogueira, C.W., Santos, F.W., 2007. Diphenyldiselenide prevents oxidative damage induced by cigarette smoke exposure in lung of rat pups.Toxicology230,189-196.

Misra HP, Fridovich I.The role of superoxide anion in the auto oxidation of epinephrine and a simple assay for superoxide dismutase. J BiolChem 247: 3170-3175, 1972.

Moriarty SE, Shah JH, Lynn M, Jiang S, Openo K, Jones DP, Sternberg P. Oxidation of glutathione and cysteine in human plasma associated with smoking. Free RadicBiol Med.2003; 35: 1582-1588.

Ohkawa H, Ohishi N, Yagi K. Assay for lipid peroxidation in animal tissues by thiobarbituric acid reaction. Anal Biochem 195: 351-358, 1979.

Pryor WA, Stone K. 1993. Oxidant in cigarette smoke, radicals, hydrogen peroxide,peroxynitrate, and peroxynitrite. Ann N Y AcadSci 686: 12-27

Rani M, Bonu S, Jha P, Nguyen SN, Jamjour L. Tobacco use in India: Prevalence and predictors of smoking and chewing in a national cross sectional household survey. Tob Control 2003;12:e4.

Rotruck JT, Pope AL, Ganther HE, et al. Selenium: biochemical role as a component of glutathione peroxidase. Science 79: 588-590, 1973.

Skrzydlewska E, Augustyniak A, Michalak K, Farbiszewski R. Green tea supplementation in rats of different ages mitigates ethanol-induced changes in brain antioxidant abilities. Alcohol.2005; 37: 89-98.

Sriram N, Kalayarasan S, Sudhandiran G Enhancement of antioxidant defense system by epigallocatechin-3-gallate during bleomycin induced experimental pulmonary fibrosis. Biol Pharm Bull. 2008 Jul;31[7]:1306-11.

Staal GE, Visser J, Veeger C. Purification and properties of glutathione reductase of human erythrocytes. BiochimBiophysActa 185: 39-48, 1969.

Sun Y, Elwell JH, Oberley LW. A simultaneous visualization of the antioxidant enzymes glutathione peroxidase and catalase on polyacrylamide gels. Free Radic Res Commun 1988;5:67-75.

Takahara S, Hamilton BH, Neell JV, et al. Hypocatalasemia: a new genetic carrier state. J Clin Invest 29: 610-619,1960.

Unlu M, Fidan F, Sezer M, Tetik L, Sahin O, Esme H, Koken T, Serteser M. Effects of melatonin on the oxidant/antioxidant status and lung histopathology in rabbits exposed to cigarette smoke. Respirology.2006; 11: 422-428.

Vijayan V.K, Kumar R. 2005. Tobacco cessation in India. Indian J. Chest Dis. Allied Sci. 47: 5-8.

World Health Organization (WHO). 2008. The WHO REPORT on the global TOBACCO epidemic, The MPOWER package. Geneva, Switzerland: World Health Organization.

You H, Wei L, Sun WL, Wang L, Yang ZL, Liu Y, Zheng K, Wang Y,

Zhang WJ. The green tea extract epigallocatechin-3-gallate inhibits irradiation-induced pulmonary fibrosis in adult rats. Int J Mol Med. 2014 Jul;34[1]:92-102.

Zhao B, Li M, Shen S, Xin W. Studies on protective mechanism of four components of green tea polyphenols against lipid peroxidation in synaptosomes. BiochimBiophys Acta.1996; 1304: 210-222.

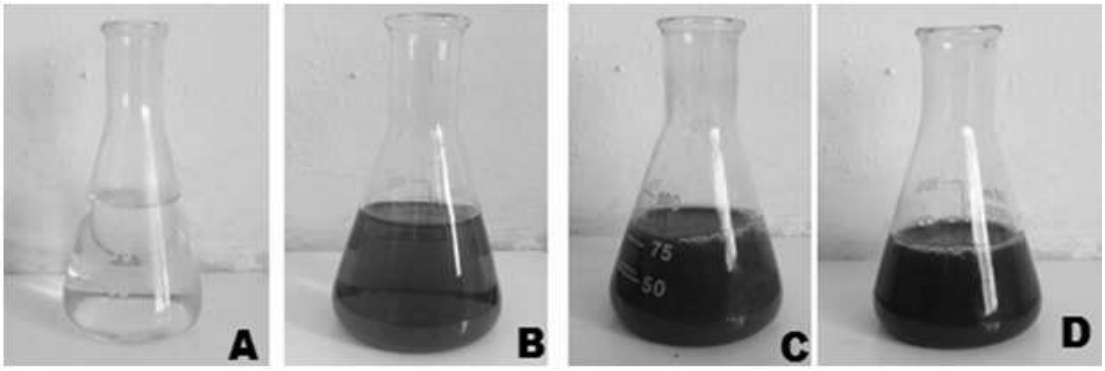


**Figure 1** - The change in colour of the EGCG extract from brown to black after the addition of 1M of $AgNO_3$

The picture is a photograph of conical flask containing (A) 1M Silver nitrate solution, (B) EGCG extract, (C) EGCG-AgNPs after 2 hours and (D) EGCG-AgNPs after 24 hourswhich was preserved for 24 hrs in a refrigerator (4°C).

| Groups | Control | Cigarette Smoke Exposed | EGCG-AgNPs + Cigarette Smoke Exposed | EGCG-AgNps alone |
|---|---|---|---|---|
| SOD | $8.36 \pm 0.72$ | $4.63 \pm 0.53^{a}$ | $8.11 \pm 0.47^{b}$ | $8.28 \pm 0.33^{NS}$ |
| CAT | $47.09 \pm 3.82$ | $23.74 \pm 2.82^{a}$ | $41.76 \pm 3.35^{b}$ | $49.47 \pm 4.35^{NS}$ |
| GPx | $5.48 \pm 0.43$ | 2.72+ $0.31^{a}$ | $5.10 \pm 0.26^{b}$ | $5.29 \pm 0.20^{NS}$ |
| GST | $102.26 \pm 17.63$ | $69.35 \pm 12.62^{a}$ | $95.62 \pm 9.86^{b}$ | $106.12 \pm 10.2^{NS}$ |
| GR | $4.12 \pm 0.26$ | $2.67 \pm 0.41^{a}$ | $3.86 \pm 0.11^{b}$ | $4.07 \pm 0.21^{NS}$ |

**Table 1.** Effect of EGCG-AgNPs on CS exposure induced activities of antioxidants enzyme levels in the lung tissue homogenate of control and experimental group of rats

Activity is expressed as

50% inhibition of epinephrine auto oxidation / min/100 mg protein for SOD; mole H2O2 consumed/min/100 mg protein for CAT; $\mu$gm of GSH consumed /min/100mg protein GPx; moles of 1chloro, 2-4 dinitrobenzene conjugated/min/100mg protein for GST; nmoles of NADH oxidized /min/100mg protein for GR.

Values are expressed as mean $\pm$ SD, for six animals in each group. Statistical significant variations are compared as follows:

$^{a}$ Cigarette Smoke Exposed Vs Control

$^{b}$ Cigarette Smoke Exposed + EGCG-AgNPs Vs Cigarette Smoke Exposed.

$^{a,b} - P < 0.05,$

$^{NS}$ - Non significant.

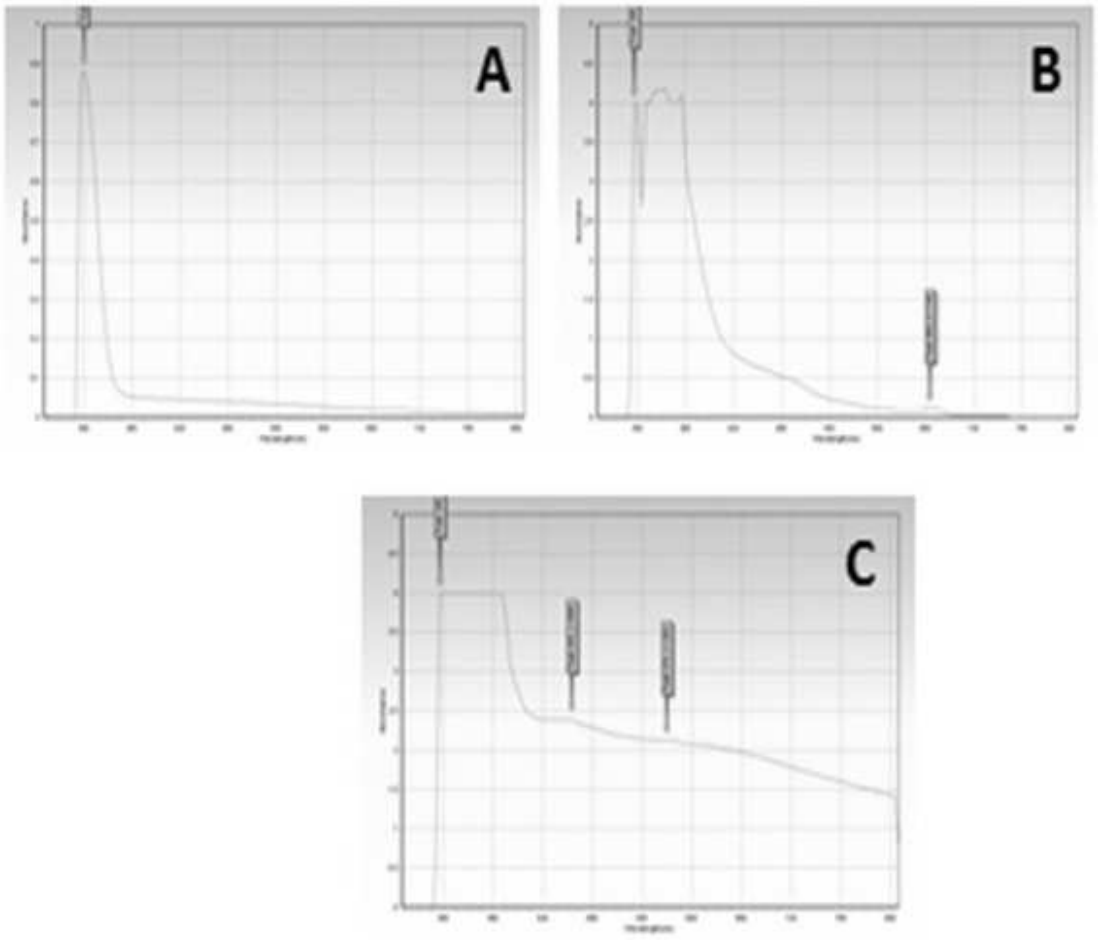


**Figure 2** - UV-Vis spectrum of (A): Silver nitrate solution (B): EGCG extract and (c) EGCG-silver nanoparticles

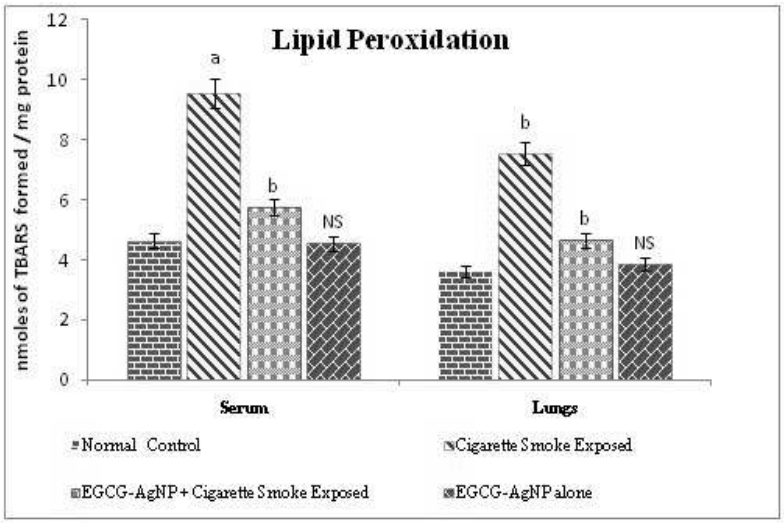


**Figure 3** - Effect of EGCG-AgNPs on CS exposure induced lipid peroxidation levels in serum and lung tissue homogenate of control and experimental group of rats

Values are expressed as mean $\pm$ SD, for six animals in each group. Statistical significant variations are compared as follows: $^{a}$Cigarette Smoke Exposed Vs Control $^{b}$Cigarette Smoke Exposed + EGCG-AgNPs Vs Cigarette Smoke Exposed. $^{a,b} - P < 0.05, ^{NS}$ - Non significant.

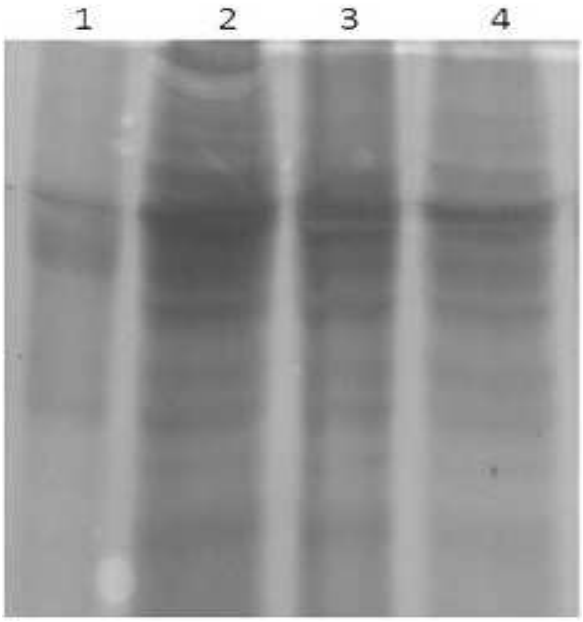


**Figure 4** - Effect of EGCG-AgNPs on CS exposure induced protein damage in lung tissue homogenate of control and experimental group of rats

Lane 1 - Control

Lane 2 - Cigarette smoke exposed

Lane 3 - Cigarette smoke exposed + EGCG-AgNPs treated

Lane 4 - EGCG-AgNPs alone

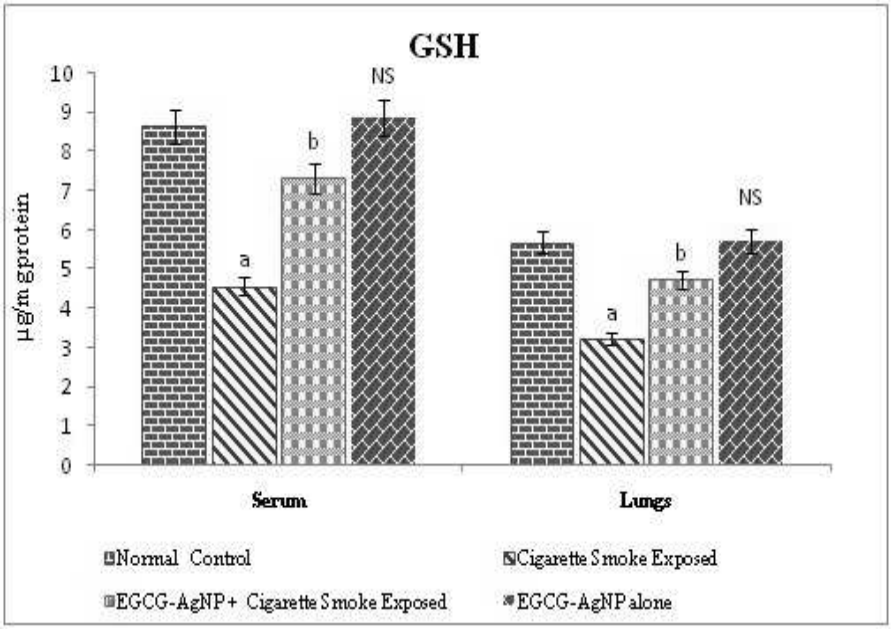


**Figure 5** - Effect of EGCG-AgNPs on CS exposure induced level of GSH serum and lung tissue homogenate of control and experimental group of rats

Values are expressed as mean $\pm$ SD, for six animals in each group. Statistical significant variations are compared as follows:

$^{a}$Cigarette Smoke Exposed Vs Control

$^{b}$Cigarette Smoke Exposed + EGCG-AgNPs Vs Cigarette Smoke Exposed.
*[3mm] $^{a,b} - P < 0.05,$

$^{NS}$ - Non significant.

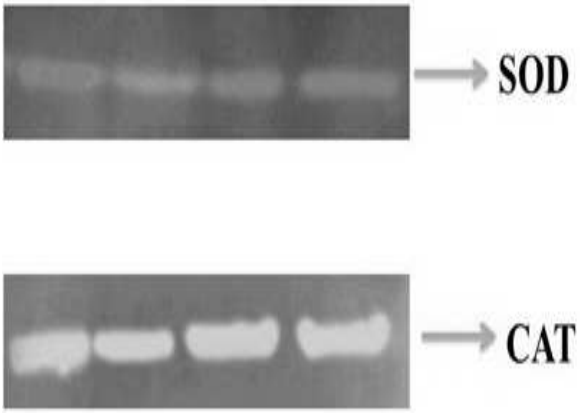


**Figure 6** - Effect of EGCG-AgNPs on the activities of SOD and CAT in the lung of control and experimental group of rats

Native-PAGE electrophoresis of SOD & CAT in lung tissue homogenate of control and experimental group of rats

Lane 1 - Control

Lane 2 - Cigarette smoke exposed

Lane 3 - Cigarette smoke exposed + EGCG-AgNPs treated

Lane 4 - EGCG-AgNPs alone

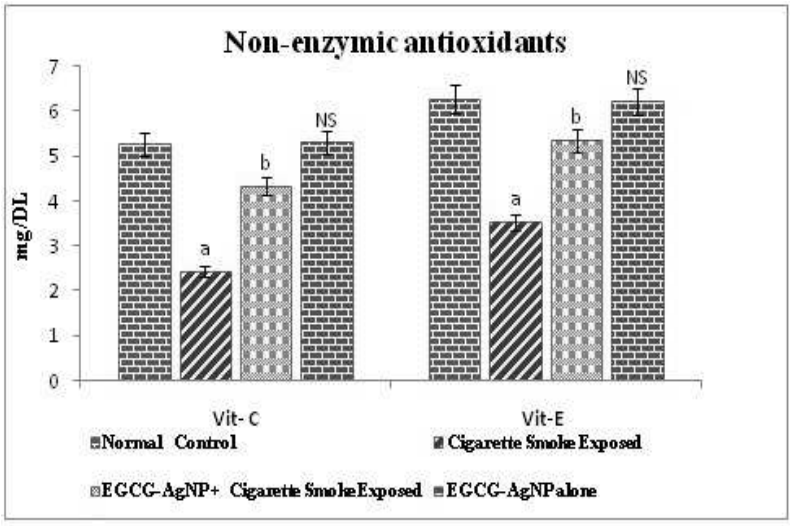


**Figure 7** - Effect of EGCG-AgNPs on CS exposure induced levels of non-enzymic antioxidants in the lung tissue homogenate of control and experimental group of rats

Values are expressed as mean $\pm$ SD, for six animals in each group. Statistical significant variations are compared as follows:

[a]Cigarette Smoke Exposed Vs Control

[b]Cigarette Smoke Exposed + EGCG-AgNPs Vs Cigarette Smoke Exposed.
*[3mm] $^{a,b} - P < 0.05,$

$^{NS}$ - Non significant.

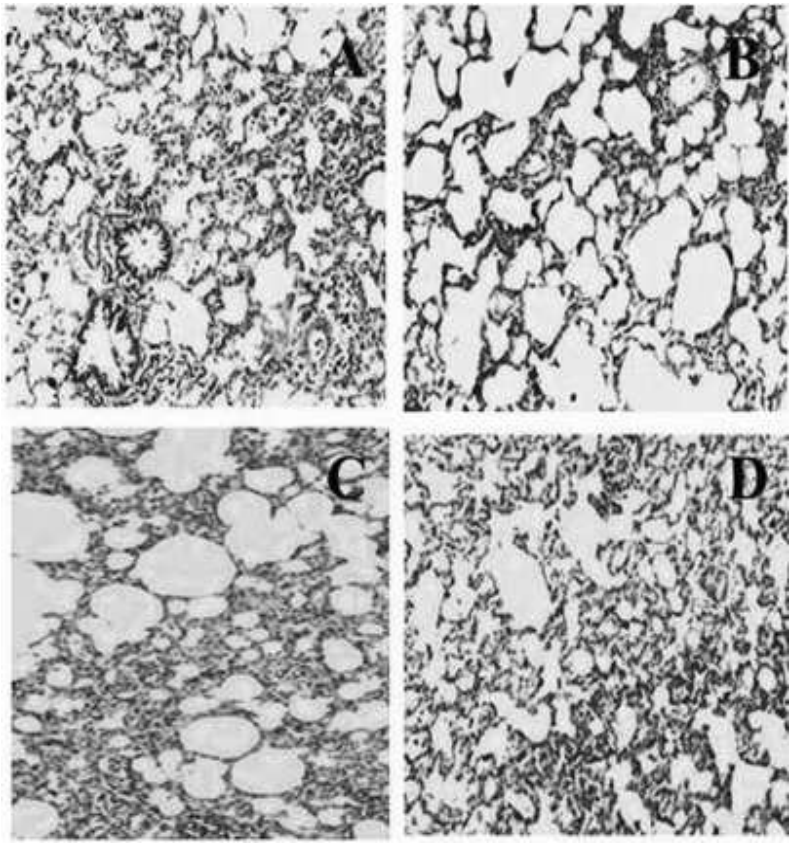


**Figure 8** - Effect of EGCG-AgNPs on CS exposure induced alveolar damage by histopathological examination of control and experimental group of rats

Histopathological observation of lung tissue viewed under light microscope. H & E staining (40X H & E) (A) Control animals showed normal architecture of the lung tissue. (B) CS administrated animals showed alveolar damage and hyperchromatic and irregular nuclei in the cells of alveolar wall. (C) EGCG-AgNPspre-treated Cs administered animals showed near normal architecture. (D) Drug control (EGCG-AgNPs alone) animals showed normal architecture as that of control animals.

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# Hepatoprotective Effect of Quercetin on Lambda - Cyhalothrin Induced Hepatotoxicity in Male Wistar Rats

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**Abstract**

Lambda-cyhalothrin is a pyrethroid insecticide. New born babies and children are often exposed to pyrethroid insecticides for long periods by wide usage. In the present study, an attempt has been made to study the toxic effect of $\lambda$-cyhalothrin on biochemical and hepatic marker enzymes and ameliorating effects of quercetin on male Wistar rats. Adult male Wistar rats were divided into four different groups. Group I served as control; group II rats were received with 7.8 mg/ kg B.W (1/10 LD 50) $\lambda$-cyhalothrin for 7 days, group III rats received with $\lambda$-cyhalothrin for a period of 7 days and simultaneously administered of quercetin (100 mg/kg BW for 7 days) orally. Group IV quercetin alone treated. $\lambda$-cyhalothrin induced hepato toxicity was assessed by the increased activities of serum hepatic marker enzymes like aspartate transaminase, alanine transaminase, alkaline phosphatase, lactate dehydrogenase, along with increased elevation of lipid peroxidation and reduction in the levels of enzymic and non-enzymic antioxidants levels. However, on treatment with quercetin normalized the levels of hepatic markers, antioxidant and non enzymic antioxidant, lipid peroxidation products. These findings highlight the efficacy of quercetin as hepato protective effects against $\lambda$-cyhalothrin induced hepato toxicity in male Wistar rats.

**Keywords:** $\lambda$-cyhalothrin, quercetin, flavonoid, oxidative stress, free radical, liver, pesticide, pyrethroids.

## Introduction

Lambda-cyhalothrin (LTC) is a pyrethroid type II insecticide used all over the world to control a wide range of insect pests in a variety of crops and it has found extensive use to control a broad range of insects and ecto-parasites, including cockroaches, flies, mosquitoes, ticks in public/ agriculture and animal health applications[1]. It is highly used in cotton farm and in vegetable production. The widespread practice of these insecticides has led to serious health problems [2, 3] including hepatotoxicity, neurotoxicity, hemato-toxicity [4, 5] on target and non-target organisms such as mammals. Annually, more than 60-80 million poisoning cases and quarter million fatalities due to pesticide poisoning have been reported [6]. Liver is the major site of pesticides metabolism. This soft tissue accumulates a greatest concentration of its metabolites.Those metabolites induced oxidative stress, free radicals that mediate toxicity in liver tissues and other internal organs of human system and animals.Pesticides are known to increase the production of reactive oxygen species(ROS), which in turn generate oxidative stress in different tissues [7] leads to the central mechanism of pyrethroid toxicity[8]. Pyrethroid insecticides are hydrophobic molecules that bind extensively to biological membranes, especially phospholipids bilayers [9], and they may damage membranes by inducing lipid-peroxidation [10]. As observed pyrethroid metabolized in liver by hepatic xenobiotic metabolizing enzymes, cytochrome P450 mono-oxygenases [11] this metabolites affects liver mitochondria and leads to alterations of liver specific marker enzymes such as aspartate transaminase, alanine transaminase, alkaline phosphatase, lactate dehydrogenase.

Flavonoids belong to a group of natural substances which have a variable phenolic structure and are found in fruits, vegetables, tea and wine. To date, more than 6000 flavonoids have been identified [12].Quercetin (3,5,7,3’,4’ pentahydroxy flavone), a flavonoid found in many plants, is widely distributed in commonly consumed foods like apples, berries, onions, teas, edible fruits and vegetables. Its daily intake with foods is estimated to be 50-500 mg. In the United States, the estimated intake of flavonoids and flavones was 20 to 25 mg/day, of which 73% to 76% was quercetin (values are for women and men) [13]. They have been recognized for having interesting clinical properties, such as anti-inflammatory, anti-allergic, antiviral, antibacterial, and anti-tumor activities [14]. Quercetin, prevents oxidant injury and cell death by several mechanisms, such as scavenging oxygen radicals [15] protecting against lipid peroxidation [16]. Quercetin is a potential antioxidant [17] commonly found in food products and is one of the most abundant natural flavonoids. Quercetin has been reported to prevent liver cirrhosis probably by inducing antioxidant enzyme system. In the present study an effort has been made to evaluate the protective role of Quercetin on liver damage.

## Materials and Methods

### Chemicals

LTC is a synthetic pyrethroid insecticide (C23H19ClF3NO3). CAS chemical name [?-cyano- 3-phenoxybenzyl-3-(2-chloro-3,3,3-trifluoro-1-propenyl)- 2,2-dimethyl cyclopropane carboxylate], CAS registry number 1581510014. A commercial formulation of LTC, named ”XYLO-5” (ATUL .Ltd Atul 396020 dist Valsad Gujarat) was used in the experiments. Quercetin was purchased from sigma chemicals Bangalore. All other chemicals and reagents used in this study were of analytical grade.

### Animal model

Male albino rats of Wistar strain (140 10 g) procured from Tamilnadu University for Veterinary and Animal Sciences, Chennai, India were used for the study. Animals were fed with commercially available standard rat pelleted feed (M/s Pranav Agro Industries Ltd., India) under the trade name Amrut rat/mice feed and water was provided ad libitum. The rats were housed under conditions of controlled temperature (252?C) and acclimatized to 12-h light, 12-h dark cycle. Animal experiments were conducted according to the guidelines of institutional animal ethical committee.

### Experimental design

Rats were divided into four groups, each consisting of six animals.

Group I served as control Group II rats were received with 7.8 mg/ kg B.W (1/10 LD 50) $\lambda$-cyhalothrin for 7 days orally Group III rats received with ?-cyhalothrin for a period of 7 days and simultaneously administered of quercetin (100 mg/kg BW for 7 days) orally. Group IV quercetin alone treated.

### Collection of samples for biochemical analysis

After the experimental period, the rats were fasted overnight, anaesthetized with intraperitoneal injection of phenobarbital sodium (30 mg/kg body weight) and blood collected from jugular vein for serum isolation and sacrificed by cervical decapitation.

### Histological examination

A portion of the liver tissue was fixed in 10% neutral buffered formalin and embedded in paraffin wax for histological evaluation. Sections with thickness 5m were stained with hamatoxylin and eosin (H & E), examined under high power light microscope.

### Biochemical assays

The activities of serum enzymic antioxidants such as superoxide dismutase SOD [18], catalase CAT [19], glutathione peroxidase GPx [20], glutathione reductase GR [21], glutathione-S- transferase GST [22] were assayed. Lipid peroxidation level was determined by measuring thiobarbituric acid reactive substances (TBARS) according to the method of [23]. The serum hepatic markers like aspartate transaminase [24], alanine transaminase [25], alkaline phosphatase [26] and lactate dehydrogenase [27] were measured respectively.

Activity staining of SOD and CAT by native gel electrophoresis The levels of protein were estimated by [28], and were separated by native gel electrophoresis in the presence of Tris (50 mM), glycine (300 mM) and EDTA (1.8 mM) at constant current (50 mA) for 4-5 hrs. After electrophoresis, the 12% native gel was incubated in staining solution containing riboflavin (0.028 mM), nitroblue tetrazolium (0.25 mM), EDTA (1 mM) and TEMED (28 mM), in 50 mM phosphate buffer. After 30 mins incubation in dark, the staining solution was removed and replaced with 50 mM phosphate buffer. The gel was then exposed to light for a few minutes and areas of SOD activity appeared as white bands in a blue background [29]. Similarly, the 8% native gel of CAT after electrophoresis was soaked in 50 mM phosphate buffer (pH 7.8) containing 0.01 M H2O2 for 20 mins at room temperature in dark with gentle rocking. The gel was then placed in 2% ferric chloride and 2% potassium ferric cyanide solution. The areas of CAT activity appeared as yellow bands against the greenish blue background [30].

### Statistical method

All the results were expressed as mean  SD for six rats in each group. All the grouped data were statistically evaluated with SPSS/12.0 software. Hypothesis testing method included one-way analysis of variance (ANOVA), followed by least significant difference (LSD) test; $P < 0.05$ was considered to indicate statistical significance.

## Results

### Effect of LTC and Quercetin on lipid peroxidation in control and experimental group of rats

Figure 1 shows the effect of LTC and Quercetin on the levels of TBARS in control and experimental group of rats. TBARS contents were significantly increased in $(p < 0.01)$ LTC induced group compared to control group of rats. The administration of quercetin (LTC + quercetin) significantly decreased the levels of TBARS contents compared to LTC induced group.

**Effect of LTC and Quercetin on Antioxidant and Non-enzymic antioxidant enzymes in control and experimental group of rats**

Antioxidant enzyme activities (SOD, CAT, GPx, GR and GST) reflect the level of oxidative stress. The changes in the activities of antioxidant enzymes in control and experimental group of rats were depicted in (Table 1). The activities of antioxidant enzymes in circulation, were significantly (p¡0.05) decreased in LTC induced rats (group II) when compared with control (group I) rats. Treatment with Quercetin to LTC-induced rats (group III), Quercetin significantly (p¡0.05) enhanced the activities of these antioxidant enzymes when compared to LTC induced rats. No significant difference was observed in rats treated with Quercetin alone treated rats. (Group IV) when compared to normal control rats.

Table 2 shows the activities of non-enzymic (GSH, vitamins C and E) antioxidant enzymes of control and experimental group of rats. A significant decrease in the levels of non-enzymic antioxidants was observed in LTC induced rats. The adverse changes in enzyme profile were restored to near normal levels in Quercetin treated group of rats. Compared to LTC induced rats. However, no significant changes were observed between control and drug control groups.

Effects of LTC and Quercetin on the activities of antioxidant enzymes were further examined by assessing the activity staining of native gel electrophoresis of SOD, CAT and the same were depicted in Figure 2. The expressions of antioxidant enzymes in the liver tissue homogenate were significantly decreased in LTC-induced rats (Lane 2) as compared to the control group (Lane 1) of rats, whereas the levels of antioxidants were significantly increased to normal level in LTC-induced and Quercetin treated group of rats (Lane 3) as compared to the LTC-induced rats. In Quercetin alone treated rats (Lane 4) shown no significant difference compared to control rats.

**Effect of LTC and Quercitin on the activities of liver marker enzymes in control and experimental group of rats**

The activities of hepatic marker enzymes in control and experimental groups were shown in Table 3. The results of biochemical parameters revealed the elevation of activities of hepatic enzymes marker levels in LTC induced group indicating that LTC induced liver damage (Table 3). A significant (p ¡ 0.001) reduction in the levels of AST, ALT, LDH and ALK in quercetin treated group compared with LTC induced group. Quercetin alone treated group showed no significant change in AST, ALT, LDH and ALK activities.

**Effect of LTC and Quercitin on histopathological examination of rat liver in control and experimental group of rats**

Histopathological alterations of rat liver of control and experimental groups of rats were depicted in Figure3.The liver of control rats (Fig. 3A) and Quercetin alone (Fig. 3D) treated rats showed a normal architecture of liver. LTC -induced (Fig. 3B) rat liver architecture as indicated by focal necrosis, vacuolization, sinusoidal dilation, inflammatory cell infiltration and giant cell formation. LTC induced with Quercetin treated rats (Fig. 3C) showed near normal hepatocytes with mild portal inflammation.

## Discussion

LPO is the marker for oxidative stress. TBARS is a major oxidation product of peroxidized polyunsaturated fatty acids, and increased TBARS contentis an important indicator of lipid peroxidation [31]. This present study shows that TBARS content significantly increased LTC induced rats. This increase in TBARS content is due to an increase in free radicals resulting from the induction of oxidative. Previous studies have demonstrated that pesticides, due to their hydrophobic nature, were largely accumulated in the biological membrane especially in the phospholipid bilayers and in lipid-rich internal tissues including body fat, skin, liver, kidney,ovaries and elements of the central and peripheral nervous system [32].

Antioxidants have been shown to inhibit free radical formation. The antioxidant properties of flavonoids are due to their ability to directly scavenge some radical species. Flavonoids, quercetin in particular, are potent antioxidants and are known to modulate the activities of peroxidative formation. The lipo-protective effect of quercetin may also be due to its ability to interact with and penetrate the lipid bilayer [33].

Antioxidant enzymes play an essential role in cellular defense against reactive free radicals. These antioxidant enzymes alleviate the toxic effects of ROS [34]. However, reduction in the activity of SOD will result in an increased level of free radicals, while a decrease in the activity of CAT will lead to accumulation of H2O2 in the cell, which leads to peroxidation of membrane lipids via Fenton-type reaction. The possible explanation for this effect could be due to the increase in the formation of lipid peroxidation, free radicals and oxidative stress in LTC induced rats acted as a signal to maintain lower levels of antioxidant enzymes (SOD, CAT, and GST) in order to enhance the triggering of the detoxification process for the pesticide poisoning.

Vitamins C and E are the main lipid soluble antioxidant vitamins, which play an important role in maintaining the integrity of the cells by preventing membrane peroxidation [35]. Decrease in the levels of GSH, vitamins C and E during LTC leads to

increased susceptibility of the tissues to free radical damage. Consistent with theabove concepts, decreased GSH level in LTC induced rats might be due to increased utilization of GSH for scavenging free radicals along with detoxification of LTC toxicity.

However treatment with Quercetin alters the enzymes levels near to normal range this may be due to its antioxidant and free radicals scavenging activity. Quercetin administration increased the level of GSH, Vitamin C and Vitamin E towards normal values probably by modulating the oxidative stress. Quercetin is potent antioxidants and is known to modulate the activities of different enzymes due to their interactions with various biomolecules [36]. The cytoprotective effect of quercetin may also be due to its ability to interact with and penetrate the lipid bilayer. The capacity of the liver to detoxify xenobiotics can possibly be influenced by high dose Quercetin, but under stress condition Quercetin can restore the level of GST thereby facilitating the detoxification mechanism as evidenced by the level of GST in the LTC plus Quercetin administered group.

Liver plays important role in metabolism to maintain energy level and structural stability of body. It is also site of biotransformation by which a toxic compound has been transformed in less harmful form to reduce toxicity. However, this will damage the liver cells and produce hepatotoxicity. In the present investigation marked increase in liver ALT, ALP, LDH and AST under stress of pesticide toxicity has been observed. The increase in transaminase activity in the liver is indicative of liver damage that occurs due to formation of reactive oxygen species and reactive intermediates after the treatment of pesticides. This increase in transaminase activity leads to cellular damage and releasing the enzyme in sinusoidal spaces to intra lobular vein [37].

Quercetin provides a physical benefit that is crucial to the liver and hepato protective effect. In general, this hepato protective effect protects the liver from the destructive activity of the ROS that could come from the cell metabolism itself or from exogenous sources. Quercetin is an excellent antioxidant agent and this is due to the high concentrations of phenolic compounds, flavonoids.

The histological features of LTC-induced rat as observed in this study exhibited congested hepatocytes, crucial necrosis, irregular parenchyma and vascular blocking, vacuolization, inflammatory cell penetration and gigantic cell formation. These histological changes could be attributed to increased oxidative stress elicited by LTC.Quercetin ameliorated the histopathological alterations in LTC induced rats due to its hepato protective effects.

## Conclusion

In conclusion, the present study demonstrates the hepato protective efficacy of quercetin on Lambda cyhalthrin induced hepatotoxicity and cellular damage in rat liver. LTC induced rats shown increase in the levels of lipid peroxidation, increased activities of serum hepatic marker enzymes like aspartate transaminase, alanine transaminase, alkaline phosphatase, lactate dehydrogenase and decrease in the activities of antioxidant and non enzymic antioxidant enzymes were observed. However, on treatment with Quercetin normalized the levels of antioxidant and non enzymic antioxidant enzymes, and all the liver specific enzymes. These findings highlight the efficacy of Quercetin as hepato protective effects against LC induced hepato toxicity. Thus it is concluded that Quercetin provides a protective option in the pesticide poisoning. However, the accurate mechanism is not yet clear. To be able to propose the potential therapeutic use of Quercetin in preventing the liver from xenobiotic-induced hepato cellular damage further studies are needed.

### Conflict of interest

The authors declare that there are no conflicts of interest.

## References

[1] Davies CR, Lanos Cuentas EA, Campos P, Monge J, Leon E, Canales J. Spray-ing houses in the Peruvian Andes with lambda-cyhalotrhin protects residentsagainst cutaneous leishmaniasis. Trans R Soc Trop Med Hyg 2000;94:631-6.

[2] Soderlund DM, Clark JM, Sheet LP, Mullin LS, Piccirillo VJ, Sargent D.Mechanisms of pyrethroid neurotoxicity: implications for cumulative risk assessment. Toxicology 2002; 171: 3-59.

[3] Ray DE, Fry JR. A reassessment of the neurotoxicity pyrethroid insecticides. Pharmacol Ther 2006; 111: 174 - 93.

[4] Fahmy AM, Abdallah EF. Cytogenetic effects by the natural pyrethrins and thesynthetic lambda cyhalothrin in mice in vivo. Cytologia 2001;66:139-49.

[5] Celik A, Mazmanci BC, Amlica Yc, Omelekoglu U, Askin A. Evaluation of cyto-genetic effects of lambda cyhalothrin on Wistar rat bone marrowby gavageadministration. Ecotoxicol Environ Saf 2005;61:128-33.

[6] Zhang X, Zhao W, Jing R, Wheeler K, Smith GA, Stallones L, et al. Work relatedpesticide poisoning among farmers in two villages of Southern China, a crosssectional survey. BMC Public Health 2011;11:429.

[7] Heikal TM, El-Sherbiny M, Hassan SA, Arafa A, Ghanem HZ. Antioxidant Effectof selenium on hepatotoxicity induced by chlorpyrifos in male rats. Int J PharmPharm Sci 2012;4:603-9.

[8] Kalender S, Uzun FG, Durak D, Demir F, Kalender Y. Malathion induce hep-atotoxicity in rats: the effects of vitamin C and E. Food Chem Toxicol2010;48:633-8.

[9] Ogutcu A, Suludere Z, Kalender Y. Dichlorvos induced hepatotoxicity in ratsand the protective effects of vitamins C and E. Environ Toxicol Pharmacol2008;26:355-61.

[10] Heikal TM, Ghanem HZ, Soliman MS. Protective effect of green tea extractsagainst dimethoate induced DNA damage and oxidant/antioxidant status inmale rats. Biohealth Sci Bull 2011;3(1):1-11.

[11] Anadn A, Martinez-Larranaga MR, Diaz MJ, Bringas P, Fernandez MC, Martinez MA, et al. Effect of flumethrin on hepatic drug metabolizing enzymes andantipyrene disposition in rats. Toxicol Appl Pharmacol 1995;132:14-8.

[12] Harborne JB, Williams CA. Advances in flavonoid research since 1992. Phytochemistry 2000;55:481-504.

[13] Sampson L, Rimm E, Hollman PC, de Vries JH, Katan MB. Flavonol and flavone intakes in US health professionals. J Am Diet Assoc 2002;102:1414- 20.

[14] Middleton E Jr. Effect of plant flavonoids on immune and inflammatory cell function. Adv Exp Med Biol 1998;439: 175-82.

[15] Bors W, Heller W, Michel C, Saran M. Flavonoids as antioxidants: determination of radical-scavenging efficiencies. Methods Enzymol 1990;186:343-55.

[16] Laughton MJ, Evans PJ, Moroney MA, Hoult JR, Halliwell B. Inhibition of mammalian 5-lipoxygenase and cyclooxygenase by flavonoids and phenolic dietary additives. Relationship toantioxidant activity and to iron ionreducing ability. Biochem Pharmacol 1991;42(9):1673-81.

[17] Terao, J. (1999). Dietary flavonoids as antioxidants in vivo: conjugated metabolites of (-)-epicatechin and quercetin participate in antioxidative defense in blood plasma. J. Med. Invest. 46: 159-168.

[18] Misra HP, Fridovich I. The role of superoxide anion in the auto oxidation of epinephrine and a simple assay for superoxide dismutase. J Biol Chem 247: 3170-3175, 1972.

[19] Takahara S, Hamilton BH, Neell JV, et al. Hypocatalasemia: a new genetic carrier state. J Clin Invest 29: 610-619,1960.

[20] Rotruck JT, Pope AL, Ganther HE, et al. Selenium: biochemical role as a component of glutathione peroxidase. Science 79: 588-590, 1973.

[21] Staal GE, Visser J, Veeger C. Purification and properties of glutathione reductase of human erythrocytes. Biochim Biophys Acta 185: 39-48, 1969.

[22] Habig WH, Pabst MJ, Jakoby WB. Glutathione-S-transferases. The first enzymatic step in mercapturic acid formation. Journal of Biological Chemistry. 249 (22): 7130-7139, 1974.

[23] Ohkawa H, Ohishi N, Yagi K. Assay for lipid peroxidation in animal tissues by thiobarbituric acid reaction. Anal Biochem 195: 351-358, 1979.

[24] Bergmeyer HU, Bernt E. Glutamate oxaloacetate transminase: UV assay manual method. In: Bergmeyer HU, editor. Methods of enzymatic analysis 2: 727-751, 1974.

[25] King J. The transferases-alanine and aspartate transaminases. In: Van D, editor. Practical clinical enzymology. London: Nostrand Company Limited, 1965:121-138.

[26] King J. The hydrolases-acid and alkaline phosphatases. In: Van D, editor. Practical Clinical Enzymology. London: Nostrand Co, 1965a: 191-208.

[27] King J. The dehydrogenases or oxidoreductases-lactacte dehydrogenase. In: Van D, editor. Practical clinical enzymology. London: Nostrand Company Limited, 1965b :83-93.

[28] Lowry OH, Rosenbrough NJ, Farr AL, Randall RJ. Protein measurement with Folin-Phenol reagent. J Biol Chem 1951;193:265-75.

[29] Beauchamp CO, Fridovich I. Superoxide dismutase: improved assays and an assay applicable to acrylamide gels. Anal Biochem 1971;44:276-87.

[30] Sun Y, Elwell JH, Oberley LW. A simultaneous visualization of the antioxidant enzymes glutathione peroxidase and catalase on polyacrylamide gels. Free Radic Res Commun 1988;5:67-75.

[31] elik, A., B. Mazmanci, Y. amlica, U. melekoglu and A. Askin (2005). Evaluation of cytogenetic effects of lambda-cyhalothrin on Wistar rat bone marrow by gavage administration. Ecotoxicol Environ Saf., 61: 128-133.

[32] Soderlund, D.M., J.M. Clark and L.P Sheets (2002). Mechanisms of pyrethroid neurotoxicity: implications for cumulative risk assessment. Toxicol., 171: 3-59.

[33] Devi Priya, S., Shyamala Devi, C.S., 1999. Protective effect of quercetin in cisplatininduced cell injury in the rat kidney. Indian J. Pharmacol. 31, 422-426.

[34] Mansour, S.A., Mossa, A.H., 2009. Lipid peroxidation and oxidative stress in raterythrocytes induced by chlorpyrifos and the protective effect of zinc. Pestic. Biochem. Phys. 93, 34-39.

[35] Parra Cid T, Conejo Garcia JR, Carballo Alvarez F, de Arriba G. Antiox-idant nutrients protect against cyclosporine A nephrotoxicity. Toxicology2003;189:99-111.

[36] Ajay, M., Achike, F.I., Mustafa, A.M., Mustafa, M.R., 2006. Effect of Quercetin on altered vascular reactivity in aortas isolated from streptozotocin-induced diabetic rats. Diabetes Res. Clin. Pract. 73, 1-7.

[37] Abdel-Rahman, A., Shetty, A.K. and Abou-Donia, M. B. Subchronic dermal application of N,N-diethyl m-toluamide (DEET) and permethrin to adult rats, alone or in combination, causes diffuse neuronal cell death and cytoskeletal abnormalities in the cerebral cortex and the hippocampus, and Purkinje neuron loss in the cerebellum. Exp. Neurol. 172: 2001, 153-171

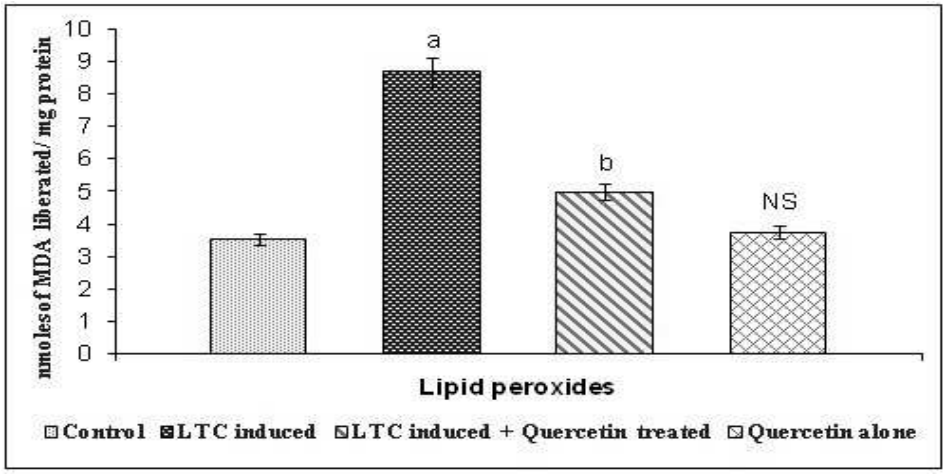


**Figure 1** - Effect of LTC and Quercetin on the levels of lipid peroxides in control and experimental group of rats

Results are expressed as mean + SD for 6 different sets of experiments. Values are considered significantly different at $p < 0.05$ with post-hoc LSD test. Statistically significant variations are compared as follows: LTC induced Vs Normal control$^{a}$, LTC induced Vs LTC induced + Quercetin treated $^{b}$ and Quercetin alone treated Vs Normal control $^{NS}$. $^{a,b}$ indicates $p < 0.05$ and NS indicates Non-significant.

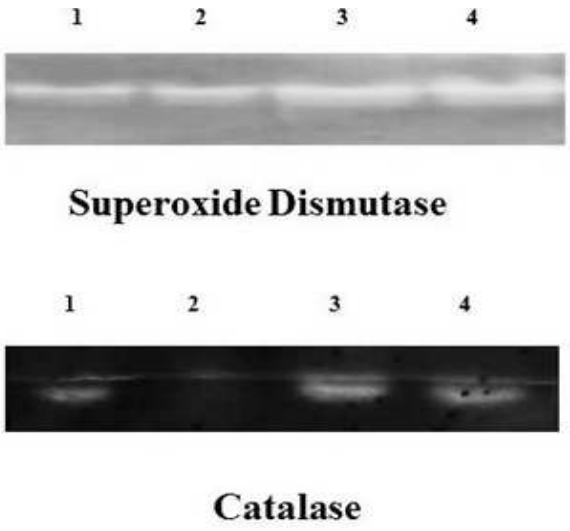


**Figure 2** - Effect of LTC and Quercetin on the Native PAGE electrophoretic pattern of SOD & CAT of control and experimental group of rats

1 - Control
2 - LTC induced
3 - LTC induced + Quercetin treated
4 - Quercetin alone

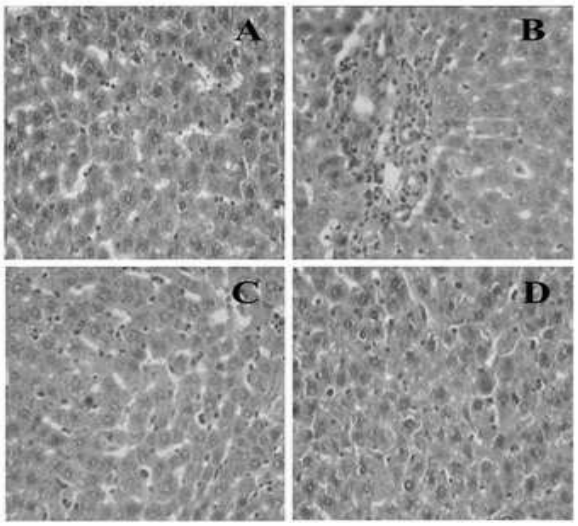


**Figure 3** - Effect of LTC and Quercetin on histopathological analysis of liver tissue of control and experimental group of rats

Effect of naringin on DLM- induced histopathological alterations in rat liver of control and experimental group of rats were depicted in Fig. 3. The liver (Hematoxylin and Eosin staining) of control rats (Fig. 3A) and Quercetin alone (Fig. 3D) treated rats showed a normal architecture of liver. LTC- induced (Fig. 3 B) rat liver architecture shown congested hepatocytes, crucial necrosis, irregular parenchyma and vascular blocking, vacuolization, inflammatory cell penetration and gigantic cell formation. LTC induction with Quercetin administration (Fig. 3C) showed near normal hepatocytes with mild portal inflammation.

| Experimental Group | SOD | CAT | GPx | GR | GST |
|---|---|---|---|---|---|
| Control | $6.48 \pm 0.40$ | $136.08 \pm 6.43$ | $2.23 \pm 0.16$ | $1.88 \pm 0.12$ | $0.78 \pm 0.024$ |
| LTC induced[a] | $2.67 \pm 0.25$ | $88.46 \pm 4.42$ | $1.09 \pm 0.09$ | $0.96 \pm 0.08$ | $0.36 \pm 0.02$ |
| LTC induced + Quercetin[b] treated | $5.76 \pm 0.44$ | $116 \pm 6.45$ | $2.12 \pm 0.16$ | $1.76 \pm 0.14$ | $0.66 \pm 0.015$ |
| Quercetin alone | $6.93 \pm 0.55$ | $142 \pm 7.34$ | $2.36 \pm 0.18$ | $1.92 \pm 0.12$ | $0.82 \pm 0.026$ |

**Table 1.** Effect of LTC and Quercetin on the activities of antioxidant enzymes in control and experimental group of rats

SOD: superoxide dismutase; CAT: catalase; GPx: glutathione peroxidase; GST: Glutathione-S-transferases; GR: glutathione reductase. Enzyme activities are expressed in serum as SOD: 50 % inhibition of epinephrine auto oxidation/min/mg protein. CAT: $\mu$ moles of $H_2O_2$ hydrolyzed/min/mg protein. GPx: $n$ moles of glutathione oxidized/min/mg protein. GST: nmoles of CDNB conjugated/min/mg protein. GR: nmoles of NADPH oxidized/min/mg protein.

Results are expressed as mean + SD for 6 different sets of experiments. Values are considered significantly different at $p < 0.05$ with post-hoc LSD test. Statistically significant variations are compared as follows: LTC induced Vs Normal control$^{a}$, LTC induced Vs LTC induced + Quercetin treated $^{b}$ and Quercetin alone treated Vs Normal control NS. $^{a,b}$ indicates $p < 0.05$ and $^{NS}$ indicates Non-significant.

| Experimental | Glutathione | Vit-C | Vit-E |
|---|---|---|---|
| Control | 4.28 0.28 | 1.88 0.10 | 1.32 0.07 |
| LTC induced | 1.66 0.16a | 0.66 0.08a | 0.58 0.06a |
| LTC induced + Quercetin treated | 3.87 0.28b | 1.56 0.14b | 1.16 0.09b |
| Quercetin alone | 4.46 0.32NS | 1.96 0.12NS | 1.38 0.08NS |

**Table 2.** Effect of LTC and Quercetin on the activities of non enzymic antioxidant in control and experimental group of rats.

GSH: Reduced glutathione; Vit-C: ascorbic acid; Vit E: $\alpha$-tocopherol. Non-enzymic antioxidant activities are expressed as $\mu$ g/mg protein in serum.

Results are expressed as mean + SD for 6 different sets of experiments. Values are considered significantly different at $p < 0.05$ with post-hoc LSD test. Statistically significant variations are compared as follows: LTC induced Vs Normal control$^{a}$, LTC induced Vs LTC induced + Quercetin treated $^{b}$ and Quercetin alone treated Vs Normal control$^{NS}$. $^{a,b}$ indicates $p < 0.05$ and $^{NS}$ indicates Non-significant.

| Experimental | AST | ALT | ALP | LDH |
|---|---|---|---|---|
| Control | $146.6 \pm 14.6$ | $42.23 \pm 3.8$ | $3.64 \pm 0.24$ | $6.86 \pm 0.48$ |
| LTC induced$^{a}$ | $288.5 \pm 20.2$ | $99.54 \pm 9.2$ | $9.24 \pm 0.78$ | $11.45 \pm 0.78$ |
| LTC induced$^{b}$ + Quercetin treated | $172.8 \pm 15.6$ | $64.64 \pm 4.8$ | $5.23 \pm 0.28$ | $7.64 \pm 0.7$ |
| Quercetin alone | $148.56 \pm 12.6$ | $45.6 \pm 5.4$ | $3.60 \pm 0.28$ | $6.68 \pm 0.6$ |

**Table 3.** Effect of LTC and Quercetin on the hepatic marker enzymes in control and experimental group of rats.

AST: Aspartate aminotransferase; ALT: alanine aminotransferase; ALP: Alkaline phosphatase; LDH: Lactate dehydrogenase. Activity is expressed as IU/L.

Results are expressed as mean + SD for 6 different sets of experiments. Values are considered significantly different at $p < 0.05$ with post-hoc LSD test. Statistically significant variations are compared as follows: LTC induced Vs Normal control[a], LTC induced Vs LTC induced + Quercetin treated[b] and Quercetin alone treated Vs Normal control$^{NS}$. $^{a,b}$ indicates $p < 0.05$ and $^{NS}$ indicates Non-significant.

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# Protective Effect of Pomegranate Peel Extract on Mosquito Coil Smoke Exposed Alveolar Damage in Male Wistar Rats

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**Abstract**

This study presents clinical findings after inhalation of mosquito coil smoke (MCS) exposure, which resulted in rapid pulmonary lung migration and parenchymal alveolar disease, noted on clinically relevant diagnostic methods. Further, the study investigated the efficacy of pomegranate peel extract (PPE) in the preventative medication of the lungs damage in male Wistar rats. Adult male Wistar rats were divided into four different groups. Group I served as control; group II rats were exposed with mosquito coil smoke 6 hrs a day, for 21 days, group III rats exposed to mosquito coil smoke for a period of 21 days and simultaneously administered of PPE (50 mg / kg BW for 21 days) orally. Group IV PPE alone. Our results showed that MCS exposure significantly $(P < 0.05)$ increased in the levels of TBARS as the marker of lipid peroxidation, and significantly $(P < 0.05)$ decreased in the levels of antioxidants enzymes such as superoxide dismutase, catalase, glutathione peroxidase, glutathione reductase, glutathione-Stransferase, non-enzymic antioxidants GSH, vitamin C, and vitamin E. MCS exposure induced pulmonary protein damage was also evidenced by SDS PAGE and antioxidatent enzyme damage by NATIVE PAGE studies. Administration of PPE significantly reduced the TBARS levels and significantly improves the antioxidant status. Results indicate that MCS exposure exerts significant harmful effects on biochemical, and alveolar pulmonary disorders and that administration of PPE reduced the detrimental effects of MCS exposure, which is also supported by histopathological examination of alvelor of lung tissue.

**Keywords:** Mosquito coil smoke, oxidative stress, free radicals, antioxidants, pomegranate peel extract, pulmonary disorders and lungs.

## Introduction

It is estimated that nearly 4050 billion mosquito coils are consumed worldwide each year by almost 2 billion people to repel mosquitos, which are a nuisance and carry diseases [Zhang L et al., 2010]. Reports have indicated that burning mosquito coils can release large amounts of fine particles, polycyclic aromatic hydrocarbons (PAHs), volatile organic compounds (VOCs), and carbonyl compounds and can have immediate and long-term health effects [Liu W et al.,2003]. Burning mosquito coils has been demonstrated to have a strong positive association with respiratory diseases, such as chronic obstructive pulmonary disease and lung cancer [Chen SC et al., 2008, Zhang J et al., 2015].

The bulk of mosquito coils consists of plant-based materials, such as wood powder, coconut shell powder, joss powder, binders, dyes, oxidants (e.g., nitrates), and other additives making controlled smoldering possible during their use of approximately 8 hours. Moreover, burning one mosquito coil releases the same amount of particulate matter (PM2.5) as burning 75-137 cigarettes. Also, the emission of formaldehyde from burning one coil can be as high as that released from burning 51 cigarettes [Liu W et al., 2003]. Mosquito coils that contain pyrethroid insecticides, particularly d- allethrin, use different concentrations of octachlorodipropyl ether (S2) as a synergist or an active ingredient [Krieger RI et al., 2003].

The lungs are involved in the blood's acid-base homeostasis by expelling carbon dioxide when breathing [Michael 2013, Hoad Robson 2016]. Several blood-borne substances, such as a few types of prostaglandins, leukotrienes, serotonin and bradykinin, are excreted through the lungs [Walter 2004]. Drugs and other substances can be absorbed, modified or excreted in the lungs [Michael 2013, Symth & Hugh 2011]. The lungs filter out small blood clots from veins and prevent them from entering arteries and causing strokes [Hoad Robson 2016]. Asthma, chronic bronchitis, bronchiectasis and chronic obstructive pulmonary disease (COPD) are all obstructive lung diseases characterized by airway obstruction. One common cause of COPD and emphysema is smoking, and common causes of bronchiectasis include severe infections and cystic fibrosis.

Natural products have proven to be an alternative source of new active molecules. In many countries, mainly in developing countries, plants have been used as the primary basic health treatment. Pomegranate peel is recognized as a potential source of antioxidants for the stabilization of food systems. Presence of substantial quantities of phenolic compounds such as ellagic tannins, ellagic acids and gallic acids has been attributed to the antioxidant potential of pomegranate peel [Yasoubi et al., 2007; Ibrahium, 2010]. Several Studies have reported that the phenolic content of pomegranate peels was 10 times higher than that found in the pulp [Li et al., 2006].

## Materials and Methods

### Chemicals

Mosquito coils were purchased from various retail outlets located within Vaniyambadi, Vellore District. The brand commercially purchased for the experiment contained pyrethroids (d- trans - allethrin) 0.2 % w/w and inert ingredient 99.8% w/w. The mosquito coil used measured 12 cm diameter, 85 cm length and 14.0 g weight. All other chemicals and reagents used in this study were of analytical grade.

### POMEGRANATE PEELS EXTRACTS (PPE)

According to Shiban et al. (2012), pomegranate peel powder (5 g) was separately blended for 2 min with 300 ml of 80% methanol. The mixture was then left, in the dark; at room temperatures for 1 h prior to filtration (Whatman No. 1) and centrifuged at 3500 rpm for 10 min. Extracts were kept at 20oC prior to analysis. The antioxidant activities of aqueous PPE are (RSA 97.214%, ABTS 89.561%, TPC 16.343 mg Gallic acid/g and TFC 6.863 mg RE/g) and acidity was 4.83% and pH 3.5.

### Animal model

Male albino rats of Wistar strain (140 $\pm$ 10 g) procured from Tamilnadu University for Veterinary and Animal Sciences, Chennai, India were used for the study. Animals were fed with commercially available standard rat pelleted feed (M/s Pranav Agro Industries Ltd., India) under the trade name Amrut rat/mice feed and water was provided ad libitum. The rats were housed under conditions of controlled temperature (25$\pm$ 2 .C) and acclimatized to 12-h light: 12-h dark cycle. Animal experiments were conducted according to the guidelines of institutional animal ethical committee.

### Experimental design

Rats were divided into four groups, each consisting of six animals.

Group I - served as the vehicle treated normal saline control.

Group II - rats were exposed with mosquito coil smoke 6 hrs a day, for 21 days.

Group III - rats exposed to mosquito coil smoke for a period of 21 days and simultaneously administration of PPE (50 mg/kg BW orally) dissolved in water for 21 days

Group IV - animals received PPE (50 mg/kg BW orally) dissolved in water for 21 days

**Collection of samples for biochemical analysis**

After the experimental period, the animals were anaesthetized by intraperitoneal injection of phenobarbital sodium (30 mg/kg body weight) and were sacrificed. Blood and lung tissue was collected in sterile tubes (CPCSEA guideline). Serum separation The blood samples collected in plain centrifuge tubes were kept in inclined position to allow complete clotting of blood and then centrifuged at 2500 rpm for 10 min. The resultant clear supernatant was pipetted out and preserved in small vials in the freezer for the purpose of biochemical investigations.

**Preparation of Tissue homogenate**

Lungs tissues were excised immediately, washed in ice-cold saline and 10% homogenates were prepared in 0.1 M Tris-HCl, (pH 7.4) and used for biochemical studies. A small part of tissues were fixed in 10% neutral buffered formalin for histological evaluation and remaining tissues were fast frozen in liquid nitrogen immediately after sacrifice and stored at -70°C.

**Histological examination**

A portion of the lung tissue was fixed in 10% neutral buffered formalin and embedded in paraffin wax for histological evaluation. Sections with thickness 5 $\mu$ m were stained with hamatoxylin and eosin (H & E), examined under high power light microscope.

**Biochemical Assays**

Protein was estimated by the method of [Lowry et al., 1951]. LPO was assayed by the method [Ohkawa et al., 1979] in which the TBARS released served as the index of LPO. Superoxide dismutase (SOD) was assayed according to the method of [Misra and Fridovich, 1972] Catalase (CAT) activity was assayed by the method of [Abi et al., 1983]. Glutathione peroxidase (GPx) was determined by the method of [Rotruck et al., 1973]. Glutathione reductase (GR) was assayed by the method of [Carlberg and mannervik, 1975]. Glutathione-S transferase (GST) was assayed by the method of [Habiget al., 1974]. Reduced glutathione (GSH) was assayed by the method of [Moron et al., 1979], vitamin E was estimated by the method of Desai [Desai et al., 1984], vitamin C was measured by the method of [Omaye et al., 1973]. SDSPAGE was performed by the method of [Laemmli, 1970]. Superoxide dismutase (SOD) and Catalase (CAT) were done by the method [Beauchamp et al. 1971] and [Sun et al. 1988], respectively.

### Statistical Analysis

All data were analyzed with SPSS/10 student software. Hypothesis testing methods included one way analysis of variance (ANOVA) followed by LSD. The values are expressed as mean + S.D. and results were considered significantly different if $P < 0.05$. Statistically significant variations are compared as follows: Group I Vs Group II, Group I Vs Group III and Group III Vs Group IV.

## Results and Discussion

In the present study the protective effect of PPE on MCS exposed oxidative damage in pulmonary lung. This work was designed to biochemically evaluate the protective effect of PPE by assessing the lipid peroxidation, Enzymic and Non-enzymic antioxidant enzymes.

### Effect of PPE on lipid peroxidation

The levels of lipid peroxidation, in experimental groups are shown in figure 1. The level of lipid peroxides increased significantly (P¡0.05) in MCS exposed in group II, when compared to control group I. Co treated with PPE decreases the levels of lipid peroxidation (P¡0.05) in group III. However, no significant difference was observed between control and PPE alone treated groups.

A Thio barbituric acid reactive substance (TBARS) is an index of lipid peroxidation. The increase in TBARS is an indication of an increased level of oxygen free radicals. The MCS exposed rats shown significant increase in the degree of lipid peroxidation this provides a direct evidence of oxidative stress, the production of reactive oxygen species (ROS) in rat [Prasanthi et al., 2005], and TBARS levels [El-Demerdash, 2007]. In the present study, MCS exposed oxidative stress, leading to the generation of free radicals and causing lipid peroxidation in pulmonary lungs.

However, treatment with PPE at 50 mg/kg significantly reduces the TBARS levels. The lipid peroxidation values have been shown to be restored as compared to control showing antilipid peroxidative effects of the components of PPE (Chidambara Murthy et al., 2002).

### Effect of PPE on Antioxidant Defence System

Enzymic antioxidants Table.1. represents the enzymic antioxidant status (SOD, CAT, GR, GPx, and GST) in the lungs of control and experimental groups. A significant decrease $(p < 0.05)$ in the activities of antioxidants was observed in MCS exposed in group II. These adverse changes in the antioxidant enzyme profile were reversed to near

normal values in PPE treated groups. There is no significant changes in antioxidant profile were observed in control and PPE alone treated groups.

**Non-enzymic antioxidants**

Table.2. represents the non-enzymic antioxidant status (GSH, Vitamin-C, Vitamin-E) in the control and experimental groups. A significant decrease $(p < 0.05)$ in the activities of these non-enzymic antioxidants was observed in the MCS exposed group of rats. PPE administered along with MCS exposed groups significantly upturned the activities of these antioxidants towards normal values.

Endogenous antioxidant enzymes are responsible for preventing and neutralizing the free radical induced oxidative damage. ROS play an important role in oxidative damage to cellular compartment which leads to cell injury and death. ROS such as the superoxide radical, the hydroxyl radical and hydrogen peroxide are produced in most cells under physiological conditions and their levels are regulated by a number of enzymes and physiological antioxidants (Ye et al., 2004).

Our results revealed that MCS exposure caused a statistically decrease in antioxidants and Non Enzymic Antioxidant enzymes. The possible explanation for this effect could be due to the increase in the formation of lipid peroxidation in MCS exposed intoxicated animals acted as a signal to maintain lower levels of antioxidant enzymes (SOD, CAT, and GST) in order to enhance the triggering of the detoxification process for the pyrethroid. However treatment with PPE alters the enzymes levels near to normal range this may be due to its antioxidant and free radicals scavenging activity. The lipid peroxidation values have been shown to be restored by 54% as compared to control showing antilipid peroxidative effects of the components of PPE [Chidambara Murthy et al., 2002].

Vitamins C and E are the main lipid soluble antioxidant vitamins, which play an important role in maintaining the integrity of the cells by preventing membrane peroxidation [Parra et al., 2003]. Decrease in the levels of GSH, vitamins C and E during MCS exposed leads to increased susceptibility of the tissues to free radical damage [Al-Khader et al., 1996]. Consistent with the above concepts, decreased GSH level in MCS exposed rats might be due to increased utilization of GSH for scavenging free radicals along with detoxification of MCS exposed. In these conditions, the PPE containing ellagic acid and gallic acid acts as a potent free radical scavenger, reducing the levels of hydrogen peroxide and superoxide anion and, consequently, lipid peroxidation and enzyme inactivation, restoring enzyme activity. This may also point toward the possible de novo synthesis of these enzymes induced by the components of PPE [Aruoma 1994, Halliwell 1990].

**SDS PAGE**

The SDS PAGE pattern of the pulmonary lung tissue of control and experimental groups is show in Figure 2. Exposure of MCS resulted in protein fragmentation when compared to control group (lane 2). Treatment with PPE (lane 3) prevent the protein fragmentation compared to MCS exposure group, PPE alone (lane 4) shows similar protein profile when compared to control group.

**NATIVE PAGE**

The NATIVE PAGE electrophoresis staining of SOD and CAT is presented in Figure 3. A marked decrease in the activity staining of SOD and CAT was observed in MCS exposure group rats (lane 2), when compared with control rats. Treatment with PPE significantly prevented these alterations and restored near normal (lane 3), when compared with MCS exposure rats. PPE alone treated group shows the normal expression of SOD and CAT staining (lane 4).

It is well known that endogenous antioxidant enzymes are responsible for preventing and neutralizing the free radical-induced oxidative damage. The antioxidant enzymes, such as CAT, SOD, GPx, GR and GST, constitute a major supportive team of defence against free radicals. In the pulmonary lung of MCS exposure rats, there was a significant increase in TBARS generation, indicating ROS generation and oxidative stress. The increased levels of superoxide and lipid peroxidation, following MCS exposure leads to decrease activity of antioxidant activity of SOD and CAT. MCS exposure decrease the level of SOD and CAT providing more evidence for the involvement of oxidative damage in MCS exposure rats. In the present study, coadministration of PPE significantly prevented the increase in the TBARS level in MCS exposure animals and provides antioxidant and free radicals scavenging property restore the levels of SOD and CAT. This might indicate the usefulness of PPE, as an excellent source of antioxidants, in modulating MCS exposure lung disease.

**Effect of PPE on MCS exposed Histopathological Alterations of Lungs**

Effect of MCS exposure and PPE on histopathological alterations in rat lungs of control and experimental group of rats were depicted in Fig. 4. The lungs (Hematoxylin and Eosin staining) of control rats (Fig. A) PPE alone (Fig. D) treated rats showed a normal architecture of lungs. MCS exposure induced (Fig. B) rat lungs damage shown by many different histologic patterns may be seen from hyperchromatic, irregular nuclei in the cells of alveolar wall, alveolar hemorrhage, edema, inflammation, remarkable recruitment of neutrophils and leukocytes into the alveolar spaces. MCS exposure and PPE administration (Fig. C) showed near normal architecture of lungs.

## Conclusion

In view of these findings, it is possible to conclude that MCS exposure rat resulted in lung damage. PPE treatment protected lungs against MCS exposed oxidative stress through decreasing ROS, hydroxyl radicals, lipid peroxidation, preventing protein fragmentation. The above results may be important mechanisms underlying the protective effects of PPE observed in MCS exposed oxidative stress. The beneficial effects of PPE observed here presumably reflect the ability of this flavonoid to protect lungs from MCS exposure damage. In conclusion, PPE appears capable of protecting cells from the toxic effects of MCS.

## References

Al- Khader A. Quinacerine attenuates cyclosporine- induced nephrotoxicity in rats. Transplantation 1996.

Aruoma Ol. Nutrition and health aspects of free radicals and antioxidants. Food chem toxicol. 1994

Chen SC, Wong RH, Shiu LJ, Chiou MC, Lee H. Exposure to mosquito coil smoke may be a risk factor for lung cancer in Taiwan. J Epidemiol. 2008;18(1):1925.

Chidambara Murthy, K. N.; Singh, R. P.; Jayaprakasha, G. K. Studies on antioxidant activity of pomegranate (Punica granatum) peel and seed extracts using in Vitro models. J. Agric. Food Chem. 2002, 50, 81-86.

El-Demerdash, F.M., Lambda- cyhalothrin- induced changes in oxidative stress biomarkers in rabbit erythrocytes and alleviation effect of some antioxidants. Toxicol. In Vitro 2007, 21: 392- 397.

Halliwell B., Gutteridge JM. The antioxidatents of human extracellular fluids. Arch biochem biophys. 1990 jul 280(1)

Hoad-Robson, Rachel; Tim Kenny. ”The Lungs and Respiratory Tract”. Patient.info. Patient UK. Archived from the original on 16 October 2012. Retrieved 11 February 2016.

Ibrahium, M.I. (2010). Efficiency of pomegranate peel extract as antimicrobial, antioxidant and protective agents, World Journal of Agricultural Sciences 6(4), pp. 338 - 344.

Krieger RI, Dinoff TM and Zhang X: Octachlorodipropyl ether (s 2) mosquito coils are inadequately studied for residential use in Asia and illegal in the United States. Environ Health Perspect 111: 1439 1442, 2003.

Laemmili UK 1970 Cleavage of structural proteins during the assembly of the head of bacteriophage T4. Nature. Aug 15;227 (5259) :680-5.

Li, Y., Guo, C., Yang, J., Wei, J., Xu, J., Cheng, S., 2006. Evaluation of antioxidant properties of pomegranate peel extract in comparison with pomegranate pulp extract. Food Chem. 96, 254260.

Liu W, Zhang J, Hashim JH, Jalaludin J, Hashim Z, Goldstein BD. Mosquito coil emissions and health implications. Environ Health Perspect 2003; 111: 1454-60

Lowry OH, Rusebrough NJ, Farr AL and Randall RJ 1951. Protein measurement with folinphenol reagent. J Biol Chem 193: 265-275.

Michael G. (2013). Pulmonary physiology (Eighth ed.). New York: McGraw-Hill Medical. p. Chapter 1. Function and Structure of the Respiratory System. ISBN 978-0071793131.

Misra, H.P., Fridovich, I., 1972 The role of superoxide anion in the auto oxidation of epinephrine and a simple assay for superoxide dismutase. Journal of Biological Chemistry 247, 31703175.

Ohkawa H, Ohishi N and Yagi K 1979. Assay for lipid peroxidation in animal tissues by thiobarbituric acid reaction. Anal. Biochem., 95 : 351-358.

Omaye ST, Tumball JD and Sauberlich HE 1979. Selected methods for the determination of ascorbic acid in animal cells, tissues and fluids. Meth. Enzymol. 62 : 1-11

Prasanthi, K., Muralidhara, R. and Rajini, P., Fenvalerate-induced oxidative damage in rat tissues and its attenuation by dietary sesame oil.Food Chemical Toxicol. 2005, 43(2): 299-306.

Rotruck, J.T., Pope, A.L., Gasther, H.E., Hafeman, D.G., 1973. Selenium: biochemical role as a component of glutathione peroxidase. Science. 179, 588-590.

S.A. Mansour, H.A.T. Mossa, Lipidperoxidation and oxidative stress in raterythrocytes induced by chlorpyrifos and theprotective effect of zinc, Pestic. Biochem.Phys. 93 (2009) 3439.

Shiban, M.S., Al Otaibi, M.M., Al-Zoreky, N.S., 2012. Antioxidant activity of pomegranate (Punica granatum L.) fruit peels. Food Nutr. Sci. 3, 991996.

Smyth, Hugh D.C. (2011). Controlled pulmonary drug delivery. New York: Springer. Chapter 2. ISBN 9781441997449.

Sun Y, Elwell JH, Oberley LW. A simultaneous visualization of the antioxidantenzymes glutathione peroxidase and catalase on polyacrylamide gels. FreeRadic Res Commun 1988;5:67 75.

Walter F., PhD. Boron (2004). Medical Physiology: A Cellular And Molecular Approach. Elsevier/Saunders. p. 605. ISBN 1-4160-2328-3.

Yasoubi, P., Barzegar, M., Sahari, M.A., and Azizi, M.H. (2007). Total phenolic content and antioxidant activity of Pomegranate (Punica granatum L.) peel extracts, Journal of Agriculture Science and Technology 9, pp. 35 - 42.

Zhang J, Qi HW, Sun YP, Xie HK, Zhou CC. Mosquito coil exposure associated with small cell lung cancer: A report of three cases. Oncology letters. 2015;9(4):166771

Zhang L, Jiang Z, Tong J, Wang Z, Han Z, Zhang J. Using charcoal as base material reduces mosquito coil emissions of toxins. Indoor Air. 2010;20(2):17684.

| Particulars | Control | MCS Exposed | MCS Exposed + PPE treated | PPE alond |
|---|---|---|---|---|
| SOD | $6.60 \pm 0.25$ | $3.40 \pm 0.17$ | $5.30 \pm 0.28$ | $6.65 \pm 0.29$ |
| CAT | $162.05 \pm 10.78$ | $96.60 \pm 8.45$ | $144.05 \pm 11.14$ | $164 \pm 10.11$ |
| GPx | $3.45 \pm 0.12$ | $1.72 \pm 0.05$ | $2.80 \pm 0.10$ | $3.55 \pm 0.14$ |
| GST | $0.79 \pm 0.03$ | $0.35 \pm 0.01$ | $0.72 \pm 0.02$ | $0.80 \pm 0.02$ |
| GR | $2.78 \pm 0.10$ | $1.27 \pm 0.04$ | $2.37 \pm 0.10$ | $2.76 \pm 0.09$ |

**Table 1.** Effect of MCS and PPE on the activities of SOD, CAT, GPx, GST and GR in control and experimental rats.

Units: SOD - 50% inhibition of epinephrine auto oxidation / min/ mg protein; CAT- mole $H_2O_2$ consumed/min/mg protein; GPx - gm of GSH consumed /min/mg protein; GST - moles of 1 chloro - 2- 4 - dinitrobenzene formed/min/mg protein and GR - gm GSSH utilized/min/mg protein

Results are expressed as mean SD for 6 different sets of experiments. Values are considered significantly different at $P < 0.05$ with post-hoc LSD test.

Statistically significant variations are compared as follows

MCS-exposed vs control.
MCS- exposed + PPE treated vs MCS-exposed.
PPE- alone vs control.

| Particulars | Control | MCS Exposed | MCS Exposed + PPE treated | PPE alone |
|---|---|---|---|---|
| GSH($\mu$ moles /mg protein) | $2.66 \pm 0.12$ | $1.2 \pm 0.07$ | $2.45 \pm 0.09$ | $2.58 \pm 0.17$ |
| VIT-C | $1.98 \pm 0.08$ | $0.76 \pm 0.02$ | $1.65 \pm 0.06$ | $1.96 \pm 0.07$ |
| VIT-E | $2.28 \pm 0.07$ | $1.56 \pm 0.03$ | $1.87 \pm 0.04$ | $2.20 \pm 0.06$ |

**Table 2.** Effect of MCS and PPE on the activities of GSH, VIT-C and VIT-E in control and experimental rats

Results are expressed as mean  SD for 6 different sets of experiments. Values are considered significantly different at $P < 0.05$ with post-hoc LSD test.

Statistically significant variations are compared as follows

MCS-exposed vs control.
MCS- exposed + PPE treated vs MCS-exposed.
PPE alone vs control.

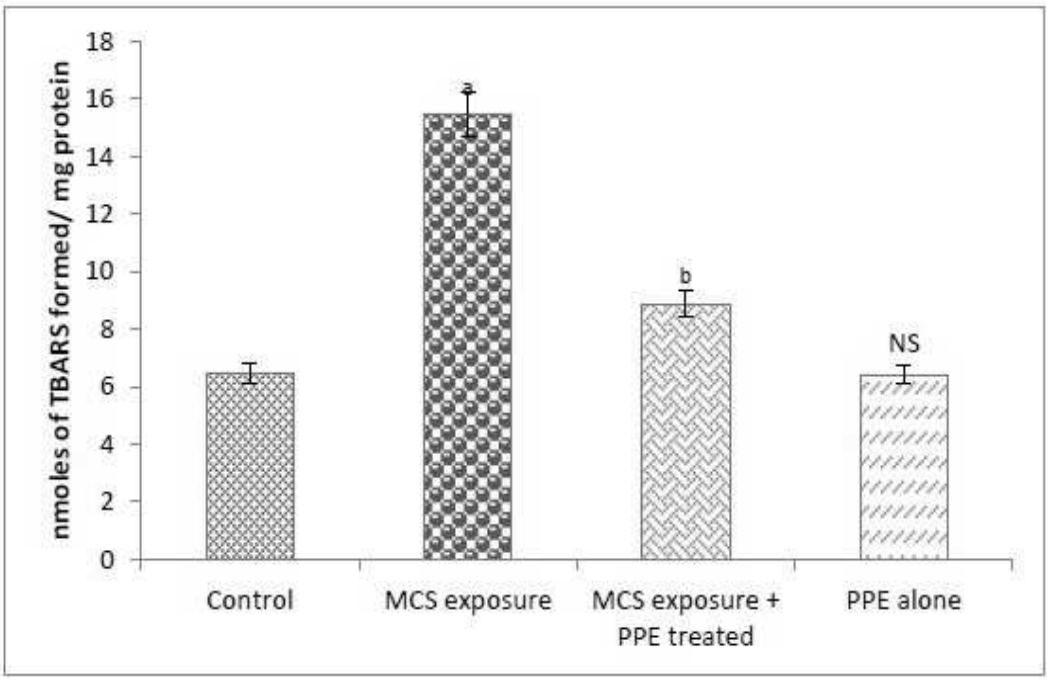


**Figure 1** Effect of MCS and PPE on the level of lipid peroxides in control and experimental group rats

Results are expressed as mean $\pm$ SD for 6 different sets of experiments. Values are considered significantly different at $P < 0.05$ with post-hoc LSD test. Statistically significant variations are compared as follows

$^{a}$ MCS-exposed vs control

$^{b}$ MCS- exposed + PPE treated vs MCS-exposed

$^{a,b}$ indicates $P < 0.05$ and

$^{NS}$ indicates non-significant.

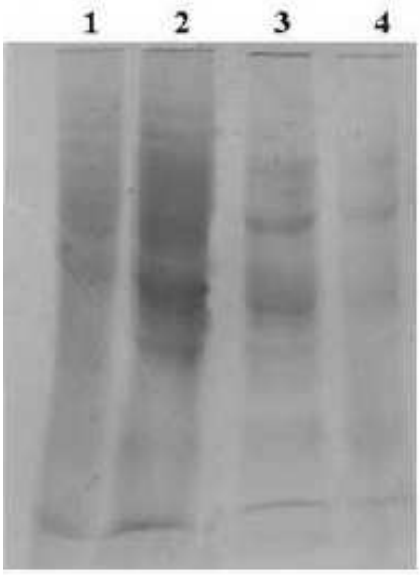


**Figure 2** Effect of MCS and PPE on the SDS PAGE pattern of the lung tissue of control and experimental groups

Protein fragmentation analysis by SDS PAGE electrophoresis in rat lung tissue homogenate.

Lane 1 : control,
Lane 2 : MCS exposed,
Lane 3 : MCS exposed + PPE treated,
Lane 4 : PPE alone.

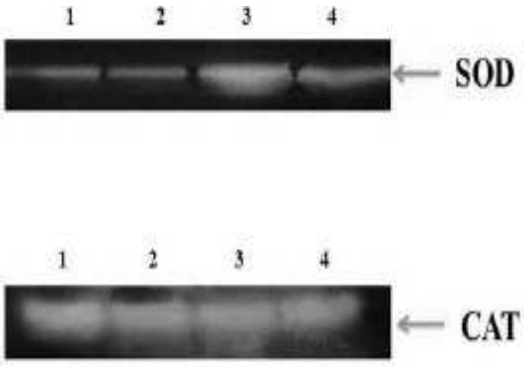


**Figure 3** Effect of MCS and PPE on the Native gel electrophoresis (SOD & CAT) pattern of the lung tissue of control and experimental groups

NATIVE PAGE electrophoretic pattern of SOD and CAT in rat lung tissue homogenate of control and experimental group of rats.

Lane 1 : control,
Lane 2 : MCS exposed,
Lane 3 : MCS exposed + PPE treated,
Lane 4 : PPE alone.

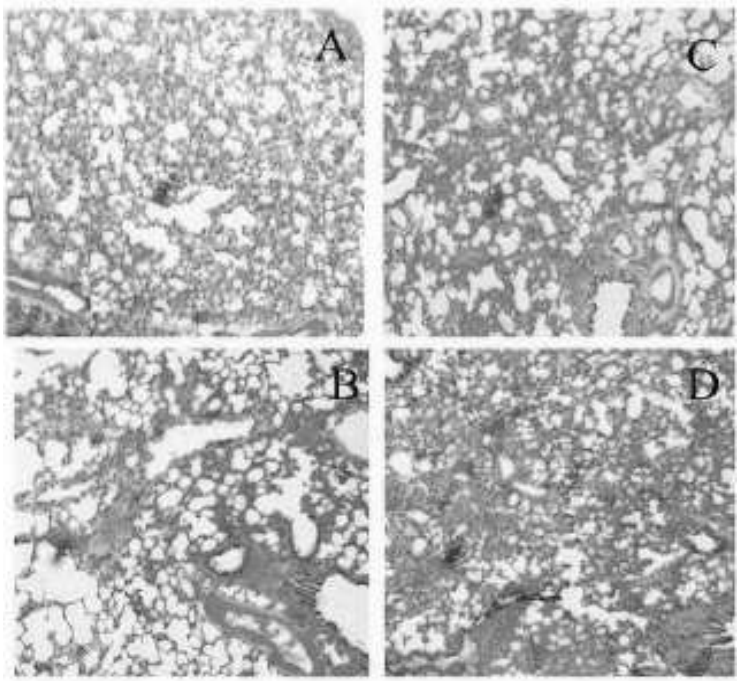


**Figure 4** Effect of MCS and PPE on the Native gel electrophoresis (SOD & CAT) pattern of the lung tissue of control and experimental groups

Effect of MCS exposure and PPE on histopathological alterations in rat lungs of control and experimental group of rats were depicted in Fig. 4. The lungs (Hematoxylin and Eosin staining) of control rats (Fig. A) PPE alone (Fig. D) treated rats showed a normal architecture of lungs. MCS exposure induced (Fig. B) rat lungs shown many different histologic patterns may be seen from hyperchromatic, irregular nuclei in the cells of alveolar wall, alveolar hemorrhage, edema, inflammation, remarkable recruitment of neutrophils and leukocytes into the alveolar spaces. MCS exposure induced with PPE administration (Fig. C) showed near normal architecture of lungs.

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# Immune Gene Expression during Larval Development of Giant Freshwater Prawn, *Macrobrachium rosenbergii* (de Man, 1879)

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**Abstract**

Ontogenesis of the immune system of giant freshwater prawn Macrobrachium rosenbergii was studied by analysing the expression of immune related and heat shock protein genes by RT-PCR using gene specific primers. The expression of prophenoloxidase (PO) gene was not detected in egg and larval stages up to V stage but was detected from stage VI onwards. The lysozyme gene was expressed in larval stage V onwards. All other immune related and heat shock protein (HSP) genes except HSP70 expressed in egg and all larval and post-larval (PL) stages of freshwater prawn. Our observation suggested possible involvements of these immune related and HSP genes during larval and post-larval development and provide preliminary information on the ontogeny of immune system during early life of giant freshwater prawn which are particularly susceptible to infectious diseases.

**Keywords:** Ontogenesis, Giant freshwater prawn, Macrobrachium rosenbergii, Post-larval, Prophenoloxidase, Heat shock protein.

## Introduction

*Macrobrachium rosenbergii* (de Man, 1879) has a high marketing demand in the aquaculture industry compared to other freshwater crustacean species. *M. rosenbergii*

is native to Southeast Asian countries and is being cultured in Thailand, Vietnam, Kampuchea, Malaysia, Myanmar, Bangladesh, India, Sri Lanka, and the Philippines. It is also produced in Israel, Japan, Taiwan, African, Latin American, and Caribbean countries (New, 1990).Disease is one of the major constraints in prawn culture system, both in hatcheries and grow-out ponds. Generally, giant freshwater prawn is a hardy animal and resistant to diseases. But the early developmental stages of *M. rosenbergii* are found to be highly susceptible to a viral disease namely white tail disease (WTD) caused by *Macrobrachium rosen bergii* nodavirus (MrNV) and extra small virus (XSV) (Sahul Hameed et al., 2004; Sudhakaran et al., 2007).The survival rate of larvae which were obtained from MrNV/XSV injected brooder gradually decreased, and 100 % mortality was observed at the post-larval stage (Sudhakaran et al., 2007). Nevertheless these viruses failed to cause mortality in adult prawn and RT-PCR analysis revealed the presence of both viruses in gill tissue, head muscle, stomach, intestine, heart, hemolymph, pleopods, ovaries and tail muscle (Sahul Hameed et al., 2004). This is possible because of better defence mechanism in adult giant freshwater prawn. The larval development of giant freshwater prawn is among the most complicated processes in crustaceans involving eleven stages followed by post-larvae. Disease is a serious problem and responsible for high mortality. Infectious diseases caused by viral and bacterial pathogens are main causes of massive mortalities during larval stages of giant freshwater prawn, when they are reared in hatcheries. Generally, the early developmental stages of animals are highly susceptible to diseases than adults (Lightner et al., 1983; Momoyama and Sano, 1989). Therefore, the susceptibility of larvae and post-larvae of giant freshwater prawn to various infectious agents could be related to their immunocompetence during these early developmental stages. In the present study, an attempt was made to study the expression of a number of immue-related and HSP genes during larval and post-larval stages of giant freshwater prawn to understand ontogenic development of immune genes. In addition, the data obtained from the present investigation would provide valuable information to increase knowledge of immune status during larval development from egg to post-larvae of giant freshwater prawn.

## Materials and Methods

### Collection of various developmental stages of M. rosenbergii

The samples such as egg, 11 larval stages and post-larvae of M. rosenbergii were obtained from giant freshwater prawn hatchery located at Mugayur near Chennai and adult prawn were obtained from the farms located near Indukurupeta, Nellore, India. At the hatchery, the prawn seeds are being produced by intensive re-circulating clear water larval rearing method (Aquacop, 1983). The stage, age, production history and selective physicochemical parameters were determined for each sampling time. The hatching rate of the eggs and the survival rate of larvae were determined according to the method of

Silas et al. (1985).

Developing eggs were obtained from brood pouch of berried female by picking with sterile forceps. After hatching of fertilized eggs, zoea was stocked in larval rearing tanks. Healthy live 11 stages of larvae and post-larvae were collected from rearing tanks after the metamorphosis of the required larval stage. The larval stages were identified from a simplified key (Uno and Kwon, 1969). The collected eggs, larvae and post-larvae were washed gently in sterile brackish water (12-13 ppt) and transferred to a sterile screw-capped bottle containing sterile brackish water. The bottles containing the samples were transported to the laboratory in ice box at 4° C within 4 h of sampling.

**Physicochemical analysis**

Dissolved oxygen, salinity, pH and temperature were measured. Salinity was determined by using a salinometer and dissolved oxygen was estimated by Winkler method (Strickland and Parson, 1968).

**Extraction of Total RNA in various stages of prawn**

Egg, 11 larval stages and post-larvae were separately homogenized in a sterile homogenizer. A 10 % (w/v) suspension was made with TN buffer (20 mM Tris-HCl and 0.4 M NaCl, pH 7.4). The homogenate was centrifuged at 4,000 g for 20 min at 4° C and its supernatant was recentrifuged at 10,000 gfor 20 min at 4° C before the final supernatant was filtered through a 0.22 m pore membrane. The supernatant was collected and referred as crude larval extract. Total RNA was extracted using TRIzol reagent (Invitrogen, Carlsbad, CA, USA). Briefly, 1 ml of TRIzol reagent was added to 200 $\mu l$ of crude larval extract and mixed thoroughly. After 5 min of incubation at room temperature, 0.2 ml of chloroform was added. The sample was vigorously shaken for 2 to 3 min at room temperature then centrifuged at 12,000 g for 15 min at room temperature. RNA was precipitated from the aqueous phase with isopropanol at 12,000 g for 15 min, washed with 70 % ethanol at 2,000 g for 10 min and dissolved in 50 $\mu l$ of sterile water.

**Reverse Transcriptase PCR**

Reverse transcriptase polymerase chain reaction (RT-PCR) was carried out using total RNA extracted from the samples to find out mRNA expression level of immune and HSP genes in different developmental stages of giant freshwater prawn. The RT-PCR analysis was carried out using the Reverse-ITTM 1-step RT-PCR kit (ABgene), allowing reverse transcription (RT) and amplification to be performed in a single reaction tube. The details of primers used in the present study for amplification of immune and HSP genes are given in Table 1. Reactions were performed in 50 $\mu l$ RT-PCR buffer containing 20 p.mol of each primer and RNA template, using the following steps: RT at

55° C for 30 min; denaturation at 95° C for 2 min followed by 30 cycles of denaturation at 95° C for 40 s, annealing at 55° C for 40 s and elongation at 72° C for 1 min, ending with an additional elongation step of 10 min at 72° C.

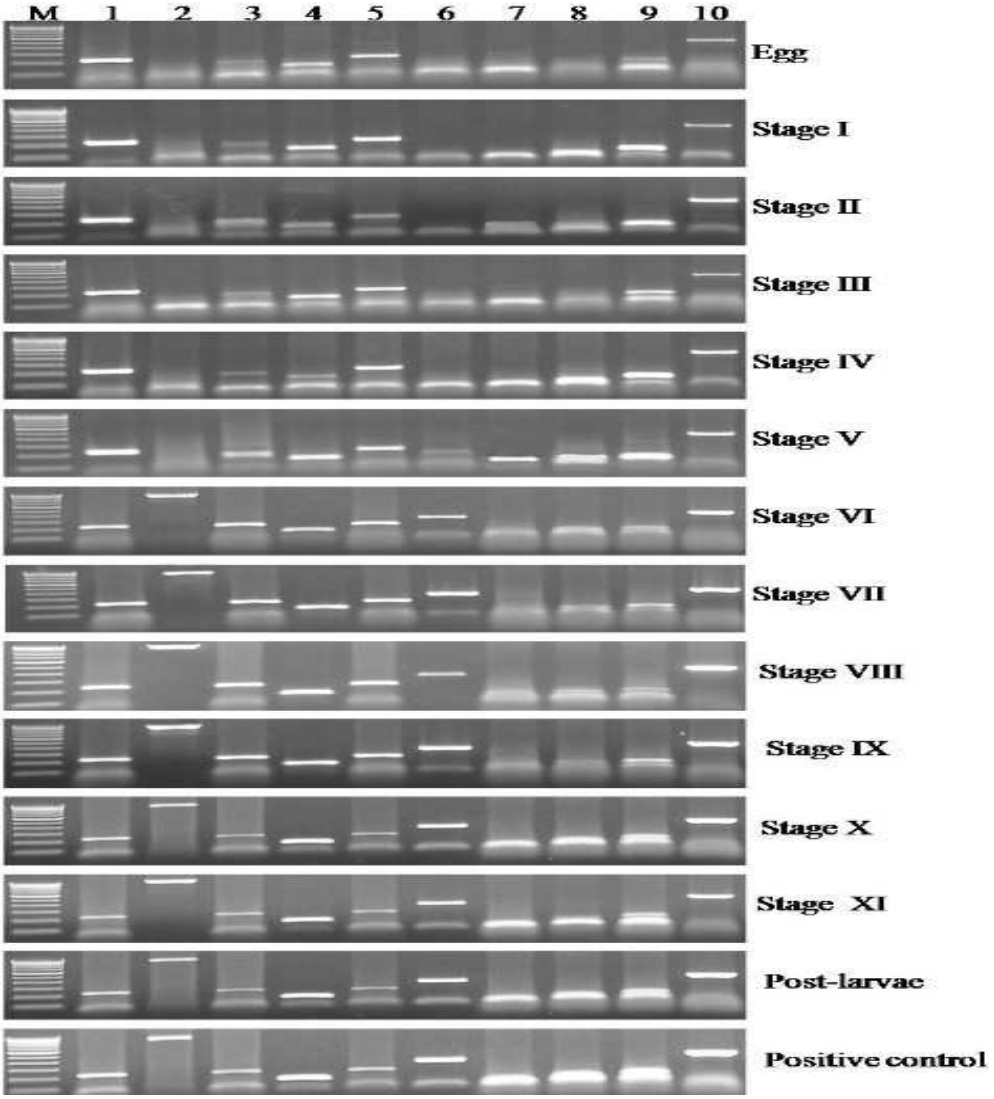


**Figure 1** - Fig.1RT-PCR analysis of immune related and heat shock protein expression in egg, various larval developmental stages and post-larvae of giant freshwater prawn. Lane 1- Superoxide dismutase (224), Lane 2- Prophenoloxidase (960), Lane 3- Crustin (229), Lane 4- Peroxinectin (138), Lane 5- Anti lipopolysaccharides (225), Lane -6 Lysozyme (334), Lane -7 Hsp21 (100), Lane 8- Hsp70 (123), Lane 9 - Hsp90 (145) and Lane 10- $\beta$ actin (461) served as a reference gene.

| Primer Name | GenBank accession No. | Primer Sequence 5' - 3' | Annealing Temp (°) | Product size (bp) |
|---|---|---|---|---|
| Superoxide dismutase F | EU077526.1 | TGAAAGGGTCAGGTTGGG | 55 | 224 |
| Superoxide dismutase R | | CCGCTCGTTTACATTAGA | | |
| Prophenoloxidase F | DQ182596 | GCCTCCAAAGAGGAAGAGTT | 55 | 960 |
| Prophenoloxidase R | | CTCCAATTGCACCAACTTCC | | |
| Crustin F | EF364558 | GCAGGTGACGGTTGAGGA | 55 | 229 |
| Crustin R | | ATGCGACTGACTGGTGGA | | |
| Peroxinectin F | JN572543 | CACTGCTGCCTTCCGTTTC | 55 | 138 |
| Peroxinectin R | | AGGGCTTGTGGATTATTCTG | | |
| Anti lipopolysaccharides F | FJ429306 | AGTTGTGGCGGCTGCTGT | 55 | 225 |
| Anti lipopolysaccharides R | | CTGACGAAGTCTTGGGTT | | |
| Lysozyme F | AY257549.2 | TGCTGGTTGGGCTTCTGG | 55 | 334 |
| Lysozyme R | | TTGTAGCGTTCGGTGTCG | | |
| Heat shock protein 21 F | JF801919 | AATTCATTGCGGAAGCGAGCCA | 55 | 100 |
| Heat shock protein 21 R | | ACTTCAGCGTGATCGACCAGGAAT | | |
| Heat shock protein 70 F | AF474375 | AGAAGTCACTCCGTGATGCCAAGA | 55 | 123 |
| Heat shock protein 70 R | | ACTCCTTGCCGTTGAAGAAGTCCT | | |
| Heat shock protein 90 F | FJ855436 | GCATGAAGGAGAACCAGAAGCACA | 55 | 145 |
| Heat shock protein 90 R | | TGAACGCAGTATTCGTCGATGGGT | | |
| $\beta$ Actin F | AY651918.1 | CCCAGAGCAAGCGAGGTA | 55 | 461 |
| $\beta$ Actin R | | GTGGTCGTGAAGGTGTAGCAG | | |

**Table 1.** Details of primer sets used in this study

## Results

The larval stages sampled, their survival rate and the results of physicochemical characteristics of larval culture tank water are presented in Table 2. The survival rate in each larval stage was determined during the period of investigation and it varied in different stages. The survival rate was the highest in stage I (90-95 %), and lowest in post-larval stage (42-45 %) (Table 2).

The expression of immune and HSP genes was analyzed by RT-PCR during larval development from egg to post-larvae including all the 11 larval stages of M. rosenbergii and the results are shown in Fig. 1 and Table 3.Based on the expression pattern during development of prawn, the immune and HSP genes are divided into two groups. Group I contains genes whose expression appeared from egg and onwards and whose expression did not change significantly in all the larval and post-larval stages (Fig. 1 and Table 3). The Group I genes were Superoxide dismutase (SOD), Crustin, Peroxinectin, anti-lipopolysaccharides (ALF) and HSP90. Other genes namely PO, lysozyme, HSP21 and HSP70 expressed during later stages (Fig. 1 and Table 3). The expression of PO was detected at larval stage VI whereas the expression of lysozyme was detected at larval stage V. The expression of HSP21 was observed at egg stage till larval stage V, disappeared at stage VI and reappeared at stage X. The HSP70 was not detected in egg but it was observed from larval stage I onwards.

## Discussion

In the present study, the expression profile of immune related and HSP genes during prawn larval development was investigated. Six immune related genes and 3 HSP genes were selected in the present study for their expression in ontogenic development of giant freshwater prawn. All the immune related genes tested in the present study were not expressed in different developmental stages of prawn. The immune genes namely SOD, crustin, peroxinectin and ALF expressed significantly in all larval and post-larval stages including egg. The expression of PO and lysozyme genes was not detected by RT-PCR in egg and larval stages up to V and IV, respectively. The results revealed that there was no PO band in egg and larval stages up to V, but the active band was gradually increased as the development progressed after larval stage V. Our result is in agreement with the result of previous works carried out in molluscs (Luna-Gonzalez et al., 2003) and *Penaeus monodon* Jiravanichpaisal et al., 2007). Luna-Gonzalez et al. (2003) reported that the PO activity was not detected in larval homogenates of some molluscs, *Crassostrea gigas, Argopecten ventricosus* and *Nodipecten subnodosus.* The expression of PO gene was not detected in naupliar stage 4 of *Penaeus monodonby* RT-PCR analysis but was detected in zoea, mysis and post-larval stage (Jiravanichpaisal et al., 2007).

| Stage | Age (days) | Prominent Characteristics | Survival rate | Temperature (° C) | Salinity (ppt) | pH | Dissolved Oxygen (mg/l) |
|---|---|---|---|---|---|---|---|
| Egg | - | - | ND | 28.7-29.5 | 5-6 | 8.0-8.2 | 6.8-7.1 |
| I | 1 | Sessile Eyes | 90-95 | 27.3-27.5 | 13 | 7.8-8.1 | 6.4-6.8 |
| II | 2 | Stalked Eyes | 84-93 | 28.8-29.2 | 13 | 8.0-8.1 | 6.8-7.0 |
| III | 3-4 | Uropods presents | 80-84 | 28.0-29.1 | 13 | 7.9-8.2 | 6.7-6.9 |
| IV | 4-6 | 2 Dorsal teeth | 80-85 | 28.1-28.4 | 12 | 7.8-7.9 | 6.5-6.7 |
| V | 5-8 | Telson narrows and elongated | 77-82 | 28.2-28.8 | 12 | 7.9-8.1 | 6.8-7.0 |
| VI | 7-10 | Pleopod buds present | 72-79 | 29.3-29.5 | 13 | 8.2-8.3 | 6.4-6.7 |
| VII | 11-17 | Pleopods biramous | 68-76 | 29.2-29.4 | 13 | 7.8-8.2 | 6.7-7.0 |
| VIII | 13-20 | Pleopods with setae | 66-72 | 28.2-28.8 | 13 | 8.0-8.2 | 6.7-6.9 |
| IX | 15-22 | Endopods of pleopods with appendices internae | 60-65 | 29.1-29.7 | 13 | 7.9-8.1 | 6.5-6.6 |
| X | 17-23 | 3-4 dorsal teeth on rostrum | 55-64 | 28.3-28.8 | 12 | 7.8-7.9 | 6.6-6.9 |
| XI | 23-35 | Teeth on half of upper dorsal margin | 53-60 | 28.0-28.3 | 13 | 8.1-8.3 | 6.6-6.8 |
| PL | 23-35 | Adult behaviour | 42-45 | 29.1-29.5 | 13 | 8.0-8.2 | 6.7-6.9 |

Values from three tanks

ND - Not done

**Table 2.** Stage, age, prominent characteristics and survival rate of Macrobrachium rosenbergii and physicochemical characteristics of tank water at the time of ontogenetic sampling.

Previous works revealed that the lack of a functional PO system during larval stages of the shrimp could be a critical factor for theeffectiveness of their defence system and this might be the reason for the susceptibility of larvae to infectious agents when compared to juveniles and adults (Couch, 1978; Lightner et al., 1983; Momoyama and Sano, 1989). The larval and post-larval stages of giant freshwater prawn are found to be highly susceptible to WTD whereas the adult prawn was found to be resistant (Sahul Hameed et al., 2004; Sudhakaran et al., 2007). Variation in mortality and disease susceptibility with age has been reported by many workers (Aquacop, 1977). The rapid propagation of larval necrosis caused by bacteria in zoea of penaeids and the young stages of M. rosenbergii showed that age is certainly an important factor in sensitivity to disease (Aquacop, 1977). A similar type of resistance against white spot syndrome virus (WSSV) has been observed in adult M. rosenbergii (Sahul Hameed et al., 2000), although the larvae can suffer mortality from WSSV (Peng et al., 1998).

Superoxide dismutases (SODs), which are important antioxidant enzymes, are present in almost all oxygen respiring animals. In decapod crustaceans, the characterization of SOD and its functions in immuno modulation have been reported (Brouwer et al., 1997, 2003; Johansson et al., 1999; Orbea et al., 2000; Cheng et al., 2006). The SOD was detected by RT-PCR analysis in all developmental stages including egg of freshwater prawn. As one of the important AMPs in crustaceans, crustins have gained the attention of many researchers. It has been proved that haemocytes are site of production and storage of crustins at very high levels (Soderhall and Cerenius 1998; Hauton et al. 2006; Supungul et al. 2007; Amparyup et al. 2008). Like SOD, the crustin gene was expressed in egg and all the larval and post-larval stages of giant freshwater prawn. Peroxinectin is a multifunctional molecule with cell adhesion activity. The expression of peroxinectin was detected in all developmental stages including egg as observed by Jiravanichpaisal et al. (2007) in P. monodon. Vazquez et al. (2002) reported the presence of peroxinectin-like gene in high amounts during early embryogenesis in Drosophila. It is reported that ALF have a specific role in reducing viral replication (Liu et al., 2006).This gene was detected in egg and all the developing stages. In the present study, the lysozyme was undetectable during egg to stage IV, but high amount of lysozyme present in V stage onwards. Heat shock proteins (HSPs) are conserved proteins induced by heat and numerous noxious stimuli, including high temperature, heavy metals, oxygen free radicals, virus, and pathologic stresses (Kiang and Tsokos, 1998; Vega et al., 2006). In this study, the constant expression was observed in HSP90 gene in all tested developmental stages, Hsp21 was observed at egg stage till larval stage V, disappeared at stage VI and reappeared at stage X.HSP70 was not detected in egg but it was observed from larval stage I onwards. In conclusion, the present study provides data on expression of immune related genes during ontogenic development of freshwater prawn. Further studies need to be carried out to manipulate the expression of these genes using immunostimulants to protect the larvae and post-larvae of freshwater prawn from viral and bacterial diseases.

| Developmental Stages | Superoxide dismutase | Prophenoloxidase | Crustin saccharides | Peroxinectin | Anti-lipopoly | Lysozyme | Hsp21 | Hsp70 | Hsp90 | $\beta$ actin |
|---|---|---|---|---|---|---|---|---|---|---|
| Egg | + | – | + | + | + | – | + | – | + | + |
| Stage I | + | – | + | + | + | – | + | + | + | + |
| Stage II | + | – | + | + | + | – | + | + | + | + |
| Stage III | + | – | + | + | + | – | + | + | + | + |
| Stage IV | + | – | + | + | + | – | + | + | + | + |
| Stage V | + | – | + | + | + | + | + | + | + | + |
| Stage VI | + | + | + | + | + | + | – | + | + | + |
| Stage VII | + | + | + | + | + | + | – | + | + | + |
| Stage VIII | + | + | + | + | + | + | – | + | + | + |
| Stage IX | + | + | + | + | + | + | – | + | + | + |
| Stage X | + | + | + | + | + | + | + | + | + | + |
| Stage XI | + | + | + | + | + | + | + | + | + | + |
| Post Larvae | + | + | + | + | + | + | + | + | + | + |
| Positive control | + | + | + | + | + | + | + | + | + | + |

+ Expressed

– Not expressed

**Table 3.** Expression of immune related and heat shock protein genes in different developmental stages of giant freshwater prawn

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## References

Amparyup, P., Kondo, H., Hirono, I., Aoki, T., Tassanakajon, A., 2008. Molecular cloning, genomic organization and recombinant expression of a crustin like antimicrobial peptide from black tiger shrimp Penaeus monodon. Molecular Immunology 45, 1085-1093.

Aquacop, 1977. Macrobrachium rosenbergii (De Man) culture in Polynesia: progress in developing a mass intensive larval rearing technique in clear water. Proceedings of the World Mariculture Society8, 311-319.

Aquacop, 1983. Intensive larval rearing in clear water of Macrobrachium rosenbergii (de Man, Anuenue Stock) at the Centre Oceanologique du Pacifique, Tahiti. In: Vey, J.P.M., Moore, J.R. (Eds.), CRC Handbook of Mariculture. Crustacean Aquaculture 1, 179-187.

Brouwer, M., Brouwer, T.H., Grater, W., Enghild, J.J., Thogersen, I.B., 1997. The paradigm that all oxygen-respiring eukaryotes have cytosolic CuZn superoxide dismutase and that Mn-superoxide dismutase is localized to the mitochondrion does not apply to a large group of marine arthopods. Biochemistry 36, 13381-13388.

Brouwer, M., Brouwer, T.H., Grater, W., Brown-Peterson, N.B., 2003. Replacement of a cytosolic cooper/zinc superoxide dismutase by a novel cytosolic manganese superoxide dismutase in crustaceans that use copper (haemocyanin) for oxygen transport. Biochemistry Journal 374, 219-228.

Cheng, W., Tung, Y.H., Liu, C.H., Chen, J.C., 2006. Molecular cloning and characterisation of cytosolic manganese superoxide dismutase (cytMn-SOD) from the giant freshwater prawn Macrobrachium rosenbergii. Fish and Shellfish Immunology20, 438-449.

Couch, J.A., 1978. Diseases, parasites and toxic responses of commercial penaeid shrimps of the Gulf of Mexico and South Atlantic Coasts of North America. Fishery Bulletin 76, 1-44.

Hauton, C., Brokton, V., Smith, V.J., 2006. Cloning of a crustin like single whey acidic domain, antibacterial peptide from the haemocytes of the European lobster,

Homarus gammarus, and its response to infection with bacteria. Molecular Immunology 43, 1490-1496.

Jiravanichpaisal, P., Puanglarp, N., Petkon, S., Donnuea, S., Soderhall, I., Soderhall, K., 2007. Expression of immune-related genes in larval stages of the giant tiger shrimp, Penaeus monodon. Fish and Shellfish Immunology 23, 815-824.

Johansson, M.W., Holmblad, T., Thornqvist, P.O., Cammarata, M., Parrinello, N., 1999. A cell-surface superoxide dismutase is a binding protein for peroxinectin, a cell-adhesive peroxidase in crayfish. Journal of Cell Science 112, 917-925.

Kiang, J.G., Tsokos, G.C., 1998. Heat shock protein 70 kDa: molecular biology, biochemistry, and physiology. Pharmacology and Therapeutics80, 183-201.

Lightner, D.V., Redman, R.M., Bell, T.A., 1983. Observation on the geographic distribution, pathogenesis and morphology of the baculovirus from Penaeus monodon Fabricius. Aquaculture 32, 209-233.

Liu, C.H., Yeh, S.P., Kuo, C.M., Cheng, W., Chou, C.H., 2006. The effect of sodium alginate on the immune response of tiger shrimp via dietary administration: activity and gene transcription. Fish and Shellfish Immunology 21, 442-452.

Luna-Gonzalez, A., Maeda-Martinez, A.N., Vargas-Albores, F., Ascencio-Valle, F., Robles-Mungaray, M., 2003. Phenoloxidase activity in larval and juvenile homogenates and adult plasma and haemocytes of bivalve mollusks. Fish and Shellfish Immunology 15, 275-282.

Momoyama, K., Sano, T., 1989. Developmental stages of kuruma shrimp, Penaeus japonicus Bate, susceptible to baculovirus mid-gut gland necrosis (BMN) virus. Journal of FishDiseases 12, 585-589.

New, M.B., 1990. Freshwater prawn farming: a review. Aquaculture 88, 99-143.

Orbea, A., Fahimi, D., Cajaraville, M.D., 2000. Immunolocalization of four antioxidant enzymes in digestive glands of mollusks and crustaceans and fish liver. Histochemistry and Cell Biology 114, 393-404.

Peng, S.E., Lo, C.F., Ho, C.H., Chang, C.F., Kou, G.H., 1998. Detection of white spot baculovirus (WSBV) in giant freshwater prawn, Macrobrachium rosenbergii, using polymerase chain reaction. Aquaculture164, 253-262.

Sahul Hameed, A.S., Xavier Charles, M., Anilkumar, M., 2000. Tolerance of Macrobrachium rosenbergii to white spot syndrome virus. Aquaculture 183, 207-213.

Sahul Hameed, A.S., Yoganandhan, K., Sri Widada, J., Bonami, J.R., 2004. Experimental transmission and tissue tropism of Macrobrachium rosenbergii nodavirus (MrNV) and its associated extra small virus (XSV). Disease of Aquatic Organisms 62, 191-196.

Silas, E.G., Mohamed, K.H., Muthu, M.S., Pillai, N.N., Laximinarayana, A., Pandian, S.K., Thirunavuk-karasu, A.R., Ali,

S.A., 1985. Hatchery production of penaeid prawn seed: Penaeus indicus. Transfer technology. CMFRI Special Publication 23, 41 pp.

Soderhall, K., Cerenius, L., 1998. Role of the prophenoloxidase activating system in invertebrate immunity. Current Opinion in Immunology 10, 23-28.

Strickland, J.D.H., Parson, J.D.H., 1968. A practical handbook of water analysis. Bulletin, Fisheries Research Board of Canada 167.

Sudhakaran, R., Ishaq Ahmed, V. P., Haribabu, P., Mukherjee, S.C., Sri Widada, J., Bonami, J.R., Sahul Hameed, A., S. 2007. Experimental vertical transmission of Macrobrachium rosenbergii nodavirus (MrNV) and extra small virus (XSV) from brooders to progeny in Macrobrachium rosenbergii and Artemia. Journal of Fish Diseases 30, 27-35.

Supungul, P., Tang, S., Maneeruttanarungroi, C., Timphanitchayakit, V., Hirono, I., Aoki, T., 2007. Cloning, expression and antimicrobial activity of crustinPm1, a major isoform of crustin, from the black tiger shrimp Penaeus monodon. Development and Comparative Immunology 32, 61-70

Uno, Y., Kwon, C.S., 1969. Larval development of Macrobrachium rosenbergii (De Man) reared in the laboratory.Journal of the Tokyo University of Fisheries55, 179-190.

Vázquez, M., Rodriguez, R., Zurita, M., 2002. A new peroxinectin-like gene preferentially expressed during oogenesis and early embryogenesis in Drosophila melanogaster. Development Genes and Evolution 212, 526-529.

Vega, E., Hall, M., Degnan, B., Wilson, K., 2006. Short-term hyperthermic treatment of Penaeus monodon increases expression of heat shock protein 70 (HSP70) and reduces replication of gill associated virus (GAV). Aquaculture 253, 82-90.

# Part B :

# HUMANITIES

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# A Study of Urdu and English Medium Secondary School Teachers' Morale

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**Abstract**

In the present research, an attempt has been made to find out the English and Urdu medium secondary school teachers' morale by taking a sample of 160 teachers (80 Urdu medium and 80 English medium teachers) through stratified random sampling method. For the collection of data, Teachers' Morale Scale constructed and standardized by Jamal and Raheem (2013) is used by the researcher. Percentage and t-test were employed to analyze the data. The findings of the study revealed that there is significant difference between English and Urdu medium teachers' morale. Also, there is significant difference between male and female teachers' morale. However, there is no significant difference between English medium male and English medium female teachers' morale.

**Keywords:** Urdu Medium, English Medium, Secondary School, Teachers' morale

## Introduction

The quality of school education to a large extent depends on quality of teachers. It is the quality of teachers which creates excellence in all walks of life. The teacher is the topmost academic and professional person in the educational pyramid around which all the educational programmes rotate. Teaching is the most difficult and challenging profession which demands a lot of hard work and dedication because it deals with the mind of the student having various faculties. Hence, someone who is entrusted with nurturing the mind is definitely a person of great importance. It is an established fact that qualitative improvement of school education which is the foundation of the entire education system directly depends upon the qualified, skilled and able teachers. Teachers are regarded as national builder, backbone of the society and social reformer,

because they are the architects, facilitator, mediator and interpreters for the children who are various levels of cognitive developments. Secondary education Commission (1952-53) remarks with respects to educational reconstruction. Most important factors in the contemplated educational reconstruction is teacher, his personal qualities, his educational qualifications, his professional training and the place he occupies in the community. The Education Commission (1964-66) has very aptly observed that the future of the nation is shaped in her classroom; it is the teacher who moulds the most precious material of land viz. boys and the girls in their most crucial period of development in required shapes. The National Policy on Education (1986) remarks that the status of the teacher has direct bearing on the quality of education. The teacher has a powerful and abiding influence in the formation of character of every future citizen.

The morale of an employee is considered as a prime requirement for effective organization in industry as well as in education. Teachers' morale is referred to as teaching efficiency of teachers. The morale of the teacher is indispensible for the successful implementation of educational programme. Joseph (1952) believes that there is no substitute for morale in an army, in a school and in an industrial plant. Morale has been thought of variously as a feeling, a state of mind, a mental attitude, and an emotional attitude (Mendel, 1987). Morale, as opined by Bently and Rempel (1980) is "the professional interest and enthusiasm that a person displays towards the achievement of individual and group goals in a given job situation." Evan (1997) suggests a definition of morale as "a state of mind determined by the individual's anticipation of the extent of satisfaction of those needs which he/she perceives as significantly affecting his/her work situation." According to Pestonjee (1967), Morale is "a fairness of employer's policies and behavior, adequacy of an immediate leadership, a sense of participation in the organization, and an over-all belief that the organization is worth working for." In short, this is an index of their regard for the organization which employs them.

It has been indicated that teachers' morale has a direct effect on teacher's performance and student achievement implying that where morale is high, school show an increase in students' achievement (Ellenberg, 1972). When morale is high and the faculty culture is healthy, students excel socially and academically, teachers are productive and collaborative, and the school environment is dynamic and engaging. Likewise morale can have a positive effect on pupil attitude and may create an environment that is more conducive to learning (Miller, 1981) and can have a far reaching implications for the health of the teacher (Mendel, 1987). Teachers have high morale and are more personally invested in their work when - (i) they are empowered (ii) they have a voice in what happens to them, (iii) their work has meaning and significance in contributing to a higher purpose or goal, and (iv) have positive feedback and support from the community (Stenlund, 1995; Heafford and Jennison, 1998).

Although, the teachers, since times immemorial, have high morale for teaching job but at this juncture of time, there are several factors which contribute to decline teacher morale. Expanding teacher load, declining provision of resources and working conditions and diminished status of teachers appear to be crucial factors that generate dissatisfaction, low commitment and low morale and detract from the enjoyment of teaching. In recent times, the high expectations placed on teachers are also taking their toll on morale. It seems that the paradox between the community expecting high results from teachers while affording the professional low status has a serious affect on the way teachers feel about their work (Heafferd and Jennison, 1998; Sinclair, 1990). Teachers have an insuperable amount of responsibilities and duties. Stress related to low pay, lack of administrative support, heightened discipline problems, are all factors that contribute to low teachers morale. With the current economic state, job security is another heightened concern of teachers. Low teacher morale affects many areas in education. It engagement with colleagues and students, diminishes productivity, reduces student learning, decreases quality of teaching, causes depression, encourages greater use of sick leave, forces to make efforts to leave the profession and creates a cynical and dehumanized perception of students and breeds cynicism. This ultimately leads to a vast teacher shortage (Adams, 2003).

In the field of education and psychology, there are various studies on teacher's morale. Among them the study of Rouf (2013) found that the strength of morale and job satisfaction is slightly higher in case of rural and male subject specialist as compared to urban and female subject specialist. Jan (2012) reported that no significant difference was found between male/female and rural/urban higher secondary teachers on teacher morale and adjustment. Gupta (2006) found that male and female teachers, rural and urban teachers do not differ significantly in their morale. Savadamathu (1994) revealed that the morale of female teachers and rural teacher is higher than that of men teachers and urban teachers.

Thus, it can be evolved from the above discussion that there are many factors that affect teachers' morale. The factors which influence the teachers' morale include administrative leadership, working conditions, personal, opportunity for professional development, and level of belongingness, along with several other factors. In the light of the empirical works cited above, the researcher undertake an empirical study to explore the Urdu and English medium secondary school teachers' morale, as this kind of comparison is very rare and expected to yield motivating results.

**Objectives:** The researcher started the work with the following objectives:

1. To find out the difference between Urdu and English medium teachers' morale.
2. To find out the difference between Urdu and English medium teachers' morale on the basis of their gender.

**Hypotheses:** On the basis of the objectives of the study, researcher formulated the following null hypotheses:

1. There will be no significant difference between Urdu and English medium teachers' morale.
2. There will be no significant difference between Urdu and English medium teachers' morale on the basis of their gender.

## Methodology

For the present study, the survey type descriptive research method is adopted. A sample of 160 Urdu and English medium secondary school teachers (45 Urdu medium male teachers, 35 Urdu medium female teachers, 40 English medium male teachers and 40 English medium female teachers) is selected through stratified random sampling method from the Urdu and English medium secondary schools of Hyderabad City of Tilangana State. For measuring the teachers' morale, the researcher used *Teachers' Morale Scale* constructed and standardized by Jamal and Raheem. This inventory consists of 30 items selected from five areas viz. - fairness of policies and behavior, sense of belongingness, adequacy of immediate leadership, regard and appreciation, and opportunity for professional development. After the collection of data, the scoring was done according to the scoring procedure given in manual of the scale. The percentage and t- test is used to analyze the data.

## Results and Discussion

To verify the first hypothesis the mean teachers' morale scores for the two groups are subjected to t-test and the results are presented in the Table-1.

| Groups Compared | N | M | SD | t-value | Level of Significance |
|---|---|---|---|---|---|
| Urdu Medium Teachers | 80 | 107.97 | 11.94 | | |
| English Medium Teachers | 80 | 122.76 | 11.80 | 7.88 | 0.01 |

**Table 1.** Significance of difference between mean teachers' Morale Scores of Urdu & English Medium Secondary School Teachers

As seen from the table-1, the mean of Urdu medium teachers' morale score is found to be 107.97 with an SD of 11.94, while the mean of English medium teachers' morale score is found to be 122.76 with an SD of 11.80. The calculated t-value is

7.88 which are found to be significant at 0.01 levels. Hence, the null hypothesis, 'There will be no significant difference between the English and Urdu medium teachers' morale,' is rejected. Thus, it is concluded that there is significant difference between the English and Urdu medium teachers' morale. English medium teachers are found to have significantly high level of morale than the Urdu medium teachers.

To verify the second hypothesis of the study, the mean teachers' morale scores of the various groups on the basis of their gender are subjected to t-test and the results are presented in the Table- 2.

| Groups Compared | N | Mean | SD | t-value | Level of Significance |
|---|---|---|---|---|---|
| Male Teachers | 85 | 117.76 | 10.91 | | |
| Female Teachers | 75 | 112.65 | 12.86 | 2.72 | 0.01 |
| Urdu Medium Male Teachers | 45 | 112.32 | 11.56 | | |
| Urdu Medium Female Teachers | 35 | 102.37 | 12.35 | 3.71 | 0.01 |
| English Medium Male Teachers | 40 | 123.87 | 10.33 | | |
| English Medium Female Teachers | 40 | 121.64 | 13.29 | 0.84 | NS |
| Urdu Medium Male Teachers | 45 | 112.32 | 11.56 | | |
| English Medium Male Teachers | 40 | 123.87 | 10.33 | 4.83 | 0.01 |
| Urdu Medium Female Teachers | 35 | 102.37 | 12.35 | | |
| English Medium Female Teachers | 40 | 121.64 | 13.29 | 6.47 | 0.01 |

**Table 2.** Significance of difference between mean teachers' morale scores of Urdu and English medium secondary school teachers on the basis of gender

From the results presented in table-2, it is evident that the first comparison is made between male and female teachers. It is found that the mean of male teachers' morale score is 117.76 with an SD of 10.91, while the mean of female teachers' morale score is found to be 112.65 with an SD of 12.86. The calculated t-value is 2.72 which are found to be significant at 0.01 levels. Thus, it is concluded that there is a significant difference between the male and female teachers' morale. The male teachers are found to have significantly high level of morale than the female teachers.

The second comparison is made between Urdu medium male and Urdu medium female teachers, it is found that the mean of Urdu medium male teachers' morale score is 112.32 with an SD of 11.56, while the mean of Urdu medium female teachers' morale

score is found to be 102.37 with an SD of 12.35. The calculated t-value is 3.71 which are found to be significant at 0.01 levels. Thus, it is concluded that there is a significant difference between Urdu medium male and Urdu medium female teachers' morale. Urdu medium male teachers are found to have significantly high level of morale than the Urdu medium female teachers.

The third comparison is made between English medium male teachers and English medium female teachers, it is found that the mean of English medium male teachers' morale score is 123.87 with an SD of 10.33, while the mean of English medium female teachers' morale score is found to be 121.64 with an SD of 13.29 The calculated t-value is 0.84 which is not significant at any levels. Thus, it is concluded that there is no significant difference between the English medium male and English medium female teachers' morale.

The fourth comparison is made between Urdu medium male teachers and English medium male teachers. It is found that the mean of Urdu medium male teachers' morale score is 112.32 with an SD of 11.56, while the mean of English medium male teachers' morale score is found to be 123.87 with an SD of 10.33. The calculated t-value is 4.83 which are found to be significant at 0.01 levels. Thus, it is concluded that there is a significant difference between Urdu medium male teachers and English medium male teachers' morale. English medium male teachers are found to have significantly high level of morale than the Urdu medium male teachers.

The fifth comparison is made between Urdu medium female teachers and English medium female teachers, it is found that the mean of Urdu medium female teachers' morale score is 102.37 with an SD of 12.35, while the mean of English medium female teachers' morale score is found to be 121.64 with an SD of 13.29. The calculated t-value is 6.47 which are found to be significant at 0.01 levels. Thus, it is concluded that there is significant difference between Urdu medium female teachers and English medium female teachers' morale. English medium female teachers are found to have significantly high level of morale than the Urdu medium female teachers.

Thus, from the preceding discussion, it is clear that the t-values for all the groups on the basis of gender are found to be significant except for English medium male and English medium female teachers for which it is found to be non-significant. Moreover, all the t-values are significant at 0.01 levels. Thus, the hypothesis 'There will be no significant difference between the English and Urdu medium teachers' morale on the basis of their gender' is almost rejected as four out of five comparisons are found to be differ significantly.

## Findings of the study

1. There is significant difference between the English and Urdu medium teachers' morale. English medium teachers' morale is higher than their Urdu medium counterparts.

2. There is significant difference between the male and female teachers' morale. The male teachers' morale is higher than their female counterparts.

3. There is significant difference between the Urdu medium male and Urdu medium female teachers' morale. Urdu medium male teachers' morale is higher than their Urdu medium female counterparts.

4. There is no significant difference between the English medium male and English medium female teachers' morale.

5. There is significant difference between the Urdu medium male and English medium male teachers' morale. English medium male teachers' morale is higher than their Urdu medium counterparts.

6. There is significant difference between the Urdu medium female and English medium female teachers' morale. English medium female teachers' morale is higher than their Urdu medium counterparts.

## Conclusion and Implications

Teachers' morale has a direct effect on teacher's performance and student achievement. When morale of a teacher is high and the faculty culture is healthy, students excel socially and academically. If, the teachers are productive and collaborative, the school environment will be surely dynamic and engaging. The present study suggests that there is a tremendous need to improve the morale of Urdu medium teachers in general and Urdu medium female teachers in particular. The morale of Urdu medium teachers may be raised through fairness of administrative policies on the part of government and school administration, by providing them an opportunity to professional development through various orientation and training programs, refreshers courses and workshops etc. in their respective subject areas.

Further, there is an urgent need to raise the morale of female Urdu medium teachers through providing favourable working conditions, sense of belongingness, adequacy of immediate leadership, regard and appreciation, involvement in decision making process, freedom of expression, conducive work environment, collaborative approach and healthy faculty culture and support from colleague and society. All these measures will surely raise the morale of the teachers teaching in Urdu medium schools and it

will also be helpful in increasing their productivity. By doing so, they may be able to contribute more and more in the field of teaching and learning resulting improvement in the student's achievement and lead to overall improvement in the standard of Urdu medium schools.

## References

Adams, C. (2003). Supply Teachers not a fault. Guardian, 18th Feb, 2003.

Bentley, R. and Rempel, A. (1980). Manual for the Purdue Teacher Opinionaire. West Lafayette, IN: University Book Store.

Ellenberg, F.C. (1972). Factors affecting teacher morale. National Association of Secondary School Principal Bulletin, 56(12), 76-87.

Evans, L. (1997). Understanding teacher morale and job satisfaction. Teaching and Teacher Education, 13, 831-845.

Gupta, S.L. (2006). A study of relationship between teachers morale and teacher aptitude of higher secondary school teachers in Orissa. The Primary Teacher, 28(2), 67-75.

Heafford, M. and Jennison, B. (1998). Destined to Teach: A case study of post graduate certificate of education cohort over 16 years. Journal of Education for Teaching, 24(2), 147-164.

Jamal, S. and Raheem, A. (2013). Teachers' Morale Scale (TMS). Manual. Agra: National Psychological Corporation.

Jan, F. (2012). A study of morale and adjustment of higher secondary school teachers in Kashmir, Unpublished M.A Project through IGNOU.

Joseph, T. (1952). Industrial Psychology, New York, Prentice Hall Incl.

Mendel, P. C. (1987). An investigation of factors that influence teacher morale and satisfaction with work conditions. Unpublished Dissertations, University of Oregon, Eugene.

Miller, W. C. (1981). Staff morale, school climate and education productivity. Educational Leadership, 38 (6), 483-486.

National Policy on Education (1986). Ministry of Human Resource Development, Dept. of Education, New Delhi, Govt. of India.

Pestonjee, D.M. (1967). A study of employee's morale and job satisfaction as related to organizational structure. Ph. D. Thesis, Dept. of Psychology, A.M.U. Aligarh.

Rauf, M. (2013). Relationship between morale and job satisfaction of subject specialist teaching in higher secondary school of Khyber Pakhtunkhwa Province of Pakistan, The Dialogue, 8(1), 71-83.

Savadamuthu, T. (1994). Teacher morale and student morale at secondary level in Dindigal Anna District of Tamil Nadu. Indian Educational Review, 29, 179-182.

Secondary Education Commission (1952-53). The Report of the Secondary Education Commission, New Delhi, Ministry of Education, Government of India.

Sinclair, R. (1990). UK Teachers' Perception of their Small Rural Schools. Centre for Research and Teaching in Rural Education, Charles Sturt University.

Stenlund, K.V. (1995). Teacher perception across cultures: The impact of students on teacher enthusiasm and discouragement in across-cultural context. The Alberta Journal of Educational Research, 41(2), 145-161.

The Education Commission (1964-66). Report of the Education Commission, New Delhi, Govt. of India.

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# Bapsi Sidwa's Ice-Candy-Man : A Perspective in the Background of Partition

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**Abstract**

Bapsi Sidhwa's third novel Ice-Candy-Man represents a number of female characters who survive the chaotic period of 1947 in India, which can be registered as the period of worst religious riots in the history of India. Sidhwa has given a very realistic and transparent picture of carnage during Hindu-Muslim riots in 1947. The novel mirrors men becoming adversaries on the basis of their religion and also represents the changing political scenario of the country. Emotional turmoil, individual weakness, barbarities of communal riots and the brutalities inflicted on women amidst this iconoclastic ruthlessness and communal frenzy have been very realistically projected by the novelist. The whole story has been narrated by the female protagonist Lenny who related the horrors of violence and her personal observations and reactions. The protagonist not only observes but also analyses men's lascivious and degrading attention towards women, voraciousness of male sexual desires, women's plight as they are reduced to the status of sexual objects, and relates the peculiar disadvantages, social and civil, to which they are subjected.

## Introduction

BapsiSidhwa has shown considerable accomplishment as well as promise as a novelist. Like all good novelists, BapsiSidhwa's works have aroused a variety of reactions. Her interests are vast and she cannot be easily categorized as just a comic writer or a Parsi novelist. Her novels are remarkably different from one another in both subject and treatment. One can find variety of themes in her fiction such as the partition crisis, expatriate experience, the Parsi milieu, social idiosyncrasies of the small minority community, the theme of marriage, women's problems, patterns of migration. Her treatment of such wide ranging themes is a testimony to her growth

as a powerful and dramatic novelist who is both an affectionate and shrewd observer of human society and a keen teller of stories. She is perhaps Pakistan's finest English language novelist. There is a complex sprinkling of themes in her novels which defy any simplistic interpretation. The present research work is a modest attempt to make a thematic study of the fictional works by BapsiSidhwa and a revelation of the patterns inherent therein. .Keya Majumdar rightly mentions :

> Partition literature and especially Sidwa, attempts to locate a space at this breaking point of civilizational and human existence at this part of the world, to give voice to the voids of hidden alternate texts. These are the texts that peeped helplessly out from the silent-wide-open eyes of Ayah (77).

BapsiSidhwa's third novel Ice-Candy-Man also represents a number of female characters who survive the chaotic period of 1947 in India, which can be registered as the period of worst religious riots in the history of India. Sidhwa has given a very realistic and transparent picture of carnage during Hindu-Muslim riots in 1947. The novel mirrors men becoming adversaries on the basis of their religion and also represents the changing political scenario of the country. Emotional turmoil, individual weakness, barbarities of communal riots and the brutalities inflicted on women amidst this iconoclastic ruthlessness and communal frenzy have been very realistically projected by the novelist. The whole story has been narrated by the female protagonist Lenny who related the horrors of violence and her personal observations and reactions. The protagonist not only observes but also analyses men's lascivious and degrading attention towards women, voraciousness of male sexual desires, women's plight as they are reduced to the status of sexual objects, and relates the peculiar disadvantages, social and civil, to which they are subjected.

The Ice-Candy Man deals with partition of India and its aftermaths. This is the first novel by a women novelist from Pakistan in which she describes about the fact of people of Lahore. BapsiSidhwa describes the communal violence and destruction during the partition through the eyes of Lenny and eight years old young Parsi girl from Lahore. The novelist tells the story of the horror and pity hovering over the city of Lahore through Lenny's beloved Ayah-Shanta. Lenny is lame and helpless Ayah looks after her and takes care of her needs. Ayah is very beautiful and she attracts men of varied occupations and religions. Masseur and Dilnawaz (The Ice-Candy Man) have strong rivalry against each other to win the heart and favor of Ayaah. When winter comes, Ice-Candy Man turns into a birdman and he is seen in the streets of Lahore with birds. Ice-Candy Man is very talkative and he can talk on any topic. Now it is April and Lahore is going to be broken into two countries. Muslim league wants Pakistan to Muslims. Political gathering are very common raising and slogans against the British Raj for an independent homeland for the Muslims. Riots begin in Lahore and this leads to confusion among people. Hindus and Sikhs leave their houses behind

and reach Amritsar. People hear announcement of the division of the country into India and Pakistan.Subash Chandra observes:

> Bapsisidwa turns the female protagonists into the moral centre, while most of the male characters either remain apathetic or indulge in destructive violence and disintegrative actions. The analysis of Ice-Candy-Man reveals that the female characters pulsate with a will and life of their own. While these characters are unselfconscious of the biological essentialism of their sex, they cut loose the constraints imposed by the gender which has come into existence through centuries of biased, motivated and calculated orchestration of the aggressive patriarchal postulate. (Subash Chandra 119)

The character of Ayah Shanta in Ice-Candy-Man highlights female sexuality, something that is celebrated as well as exploited by men. A major part of the novel revolves around her character. Eighteen years old and a Hindu, she is entrusted with the duty of looking after Lenny. Possessing a charming and beautiful personality, she is Lenny's experienced and trusted advisor. She has a number of admirers, who include the Ice-Candy-Man, a masseur, a garderner, a restaurant owner, a zoo attendant, a knife-sharpening Pathan and several more. Irrespective of her religion, they all adore her. To win her favour they compete with one another by turns, while she gives them importance according to the degree to which they satisfy her psychosexual needs. Though her masters are gentle and considerate, her condition is that of an unprotected poor woman who has to devise a strategy to fend for herself. Lenny moves in her company and becomes aware of her sexuality. She says, " the covetous glances Ayah draws educate me. Up and down, they look at her. Stub-handed twisted beggars and dusty old beggars on crutches drop their poses and stare ate her with hard, alert eyes. Holy men, masked in piety, stove aside their pretences to ogle her with lust. Hawkers, cart-drivers, cooks, coolies and cyclists turn their heads as she passes, pushing my pram with the unconcern of the Hindu goddess she worships "(3)

The Ayah is a flame of sensuousness and female vitality around whom the male moths hover constantly and hanker for the sexual warmth she radiates. (Subash Chandra 120). Ayah knows well that she is a sex object for the male. She learns to manipulate her sexuality to obtain easy gains-cheap bosky clothes, cashew nuts, extra serving of food etc. This is her strategy of survival. She is able to keep her chastity by adopting these strategies. It is through her that Lenny learns the difference between physical desire, romantic love and animal lust. V.S. Thanwar aptly mentions,"Woman has no individual identity. She is seen as only the other of the male. Religion, social conditions and cultural traditions perceive woman as an adjunct to the male (48).

In the meanwhile, Ice-Candy Man out of sheer hatred and jealousy kills Masseur, his rival and paves his way to get Ayah. One day he waits for his sister at Lahore Railway

Station. When the train arrives from Gurdaspur, everyone on the platform is shocked to see the ghastly sight. The train is loaded with mutilated bodies of Muslim passengers. There is no woman on board. This ugly sight turns friendly Dilnawaz into a person who has a desire to kill the Hindus. After the abduction of Ayah by the Muslim mob, Lenny remains sad and dejected. She is shocked over the betrayal of Ice-Candy Man. His beloved Ayah becomes Hindu for him. Ayah is forced to offer her body to appease the sensual desire of the visitors. After a few months, Ayah is forced to embrace Islam and Ice-Candy Man marries her. Later with the help of Lenny's relatives, Ayah is rescued from the clutches of Ice-Candy Man and reaches the relief camp at Amritsar. Ice-Candy Man also follows her across the Wagah border into India. The novel deals with the bloody Partition of India through the eyes of a girl Lenny growing up in a Parsee family surviving through the female bonding and rebellion. Isabella Bruschi mentions :

> people first pinned to their religious community, then forced to conversion, further contract in unaccustomed forms and gestures; they vanish into palpable absences; they are reduced to mere bodies, corpses, disconnected limbs ( 131).

Ice-Candy Man offers a significant treatment of geocentric view of reality in which the feminine psyche and experiences are presented with a unique sight. It covers the story of women who lost her dignity because of sexual abuse and abduction. The most horrible example of female atrocity in the novel Ice-Candy Man is the abduction of Ayah by Ice-Candy Man and the Muslim mob. She was forced to prostitute her body and coerced into having sex with Ice-Candy Man. He kept in the brothel even marrying her. She was humiliated and subjected to all kinds of psychological and emotional outbursts forever. There was a description of Hamida who had been besmirched and subsequently discarded by her family. Hamida was kidnapped by the Sikhs who could not allow their women being touched by other men.

The novel presents woman as a twice oppressed category on stage: firstly, as human beings suffocated by violence and secondly, as women burdened by the bond and impositions of a patriarchal society. However, it is not the whole truth. Each woman character in the novel is a representative of a way of life. Some of them have internalized the principles of the patriarchal societies and they unknowingly work for the perpetuation of the unjust laws of this ideology. The portrayal of Mother, Muccho and Slavesister can be included in this category. However, a group of characters challenge the patriarchal repressiveness in the most unassuming manner. The transformed role of the mother as a social worker, Ayah's sexuality and the resilience of her spirit and Godmother's positive qualities represent their redemptive potential. The character of Godmother has become a symbol of womanly courage. She acts like an authority figure and inspires confidence in Lenny's evolving sensibility. The novel not only presents the subjugation of women in the patriarchal society but also exhibits a constructive approach

towards woman's predicament. It exhorts women not to remain oppressed in the face of oppression. They should challenge injustice and should not lead a contented life in the present setup of the society. They should have aims in their lives and try to achieve them. They should come out from the narrow and unjust confinement of the patriarchal system. They must inculcate courage and confidence in themselves to break through their plight and should utilize the opportunities that they get during their struggle for the goodness of their lives in the present patriarchal system.

It is appropriate to say that BapsiSidhwa has successfully created discourse to bring the turbulent past to the forefront of society. The novel encompasses the issues of independence and partition using it as a means to explore other issues which then emerge as the larger picture of the devastation, bloody births of nation and continued problems. The novelists have drawn attention to the women's experience of the holocaust through the women characters. They made visible the trauma, anguish, pain and ambivalence that marks the experience of Partition. Such writings become more intimate account of this most momentous event because it was women who suffered most. It is this intimacy of the victimization and portrayal of the female agony that makes such novels extremely powerful and readers the Partition literature so rich and multidimensional.

## References

1. Majumdar, Keya. Locating the parts in the Partition of India : A Postcolonial Study of BapsiSidwa's Ice Candy Man. "The Literary Criterion 38.3 and 4 (2003): 74-86.

2. Chandra, Subhash. "BapsiSidwa's Ice-Candy-Man : A Feminist Perspective", Feminism and Literature. Veena Noble Dass(Ed). New Delhi: Prestige Books, 1995.118-26

3. Sidwa, Bapsi. Ice-Candy-Man, Pg.no. 3

4. Tanwar, V.S.."Power Politics and Woman: BapsiSidwa's Ice Candy Man. "The Quest 24.2(Dec 2010) : 47-54

5. Bruschi, Isabella. "Shifting Identities: Partition, women and nation building in BapsiSidwa's Ice-Candy-Man".Kakatiya Journal of English Studies ( 2007-08) : 116-143

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# Genesis of National Consciousness in Tamil Nadu with Special Reference To Madras Native Association

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## Introduction

Tamilnadu has been described as *a country, almost a nation, on its own*[1]. Primarily defined in cultural terms, as the land of the Tamil speaking people. For a century and a half from the end of the eighteenth century until Indian independence in 1947- Tamil Nadu was part of the Madras presidency. A sprawling, polygot province Madras incorporated Malabar, and South Canara on the West Coast and parts of the Telugu, Kannada and Oriya Linguistic regions to the north.[2] Tamilnadu was further distinguished from its neighbours in that unlike the other linguistic regions of the Dravidian South, almost the whole of the tamil speaking area was under one administration. Tamil districts of the province constituted a relatively compact and homogeneous linguistic block, and they correspondence closely to the state of Madras (renamed Tamil Nad or Tamil Nadu in 1969).[3]

The organized movement for freedom in Tamil Nadu was started in 1920 with the establishment of the Tamil Nadu provincial congress committee. But many years before this congress activity the people of Tamil Nadu opposed the colonial rule through armed rebellions. Around 1800 a serious of feudal rebellions broke out against the imperial rule which is called the South Indian rebellion.[4]

The British army suppressed there revolts and established their hegemony all over the Tamil speaking area and Malabar. The establishment of Madras Presidency increased the amount of British imperialism with Presidency colonial systems patronized the conversion of traditional urban centres in to colonial markets which resulted in the empowerment of the traditional Tamil Society. The landlords become the

[1]O.H.K. Spate and T.A. Learmonth, India and Pakistan: A General and Regional Geography (3rd edition, London, 1967), p.737

[2]Census of India, 1921: Madras, XIII, PtI, Madras, 1922, p.39

[3]Census of India, 1931: Madras XIV, Pt.I, pp. 15, 21 and Map IV

[4]C.K. Rajjayyan, South Indian Rebellion.

mediator between the peasants and colonialism. Under the colonial rule some landlords and money lenders became prosperous after exploiting the peasants. This wealthy class was engaged in Marketing and money lending and was also interesting in Western education to promote a new generation of urban professions and the bureaucracy.[5] This paper examines the birth of national consciousness in Tamil Nadu under the work of the newly emerged aristocracy and the merchant class.

The first step towards nationalist and agitation in Tamil Nadu was taken by the Non-Brahmin merchants of Madras city. Their reaction was against the propaganda of Christians missionary with the aid of the British government with presidency. The results was the establishment of Pachiappa's college in 1842, and the launching of the newspaper crescent to defend the rights and privileges of the natives. The merchants aimed at the removal of certain grievances submitting petitions to the British government. Under the inspiration from British Indian Association of Calcutta, the merchants formed a local branch of the Association in February 1852, but in July 1852 it become an independent associations called a Madras Native Association, according to another view it was an outgrowth of the Hindu Literary Society, begun in Madras in 1830. [6]

Most members of the Madras Native Association came from an a affluent commercial background and few of them where which landlords, there were graduates in the association. The leaders were Lakshmanarasu Chetty, Srinavasa Pillai, Yagambera Mudaliar, V. Sadagopalcharlu and Ramanujachari. They were critical of the rule of East India company and criticized the revenue and Judicial policy of the company. East India company's provisionary stand was also criticized, they demanded the change in company charter revision of Taxes etc. In 1852 they submitted a petition to the British parliament pointing out the grievances of merchant class. They wanted reduction of Taxes, New roads, bridges, irrigation facilities, education opportunities etc. The petition was prepared after spending about a year to collect facts.[7] According to them the Zemindary and Ryotwary system in the Presidency were the instrument of injustice and operations they wanted the restoration of the Ancient village system which prevailed in that region, they condemned the tax on trades and occupations, salt monopoly and liquor traffic. They wanted the restoration of the old indigenous institutions of Panchayat in the place of British Judicial systems. They also criticized the Madras Presidency, for maintaining the public records and revenue records in Marathi .Language. The Madras Native Association wanted the adminstration of persons having an interest in India and knowledge obtained by residence here. They wanted an impartial enquiry in the affairs of a company by the Europeans and the natives.

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[5]David (Arnold), the Congress in Tamil Nadu 1919-1937, New Delhi, 1977: p. 13

[6]N. Rajendiran, The National movement in Tamil Nadu 1905-1914, Madras, 1954: p.10.

[7]S.R. Mehrotra, the emergence of the Indian National Congress, Delhi, 1971, pp. 65-66.

By late 1853 the Madras Native Association extended its work beyond the city of Madras it persuaded local leaders in Cuddalore, Trichirapalli, Salem and Tirunalveli to start branches in order to help the parent associations with funds and information The petitions submitted by the Madras Native Associations, received attention in Britain than the Memorandum of Bombay and Calcutta Associations. In 1853 H.D. Seymour, Chairman of the Indian Reforms Society visited Madras to study the problems. An enquiry committee was formed to study the practice of torture by government official to extract revenue in the Presidency.[8] The Madras Native Associations extended its work to the semi urban centres to collect the public opinion in favour of their petition. They held public meetings and made several representations to the so called Torture Commission, Religious Riots in Tirunalveli was also an issue under the perview of the commission. Those who opposed to the Madras Native Associations were the British educator class in the Presidency. In 1852 itself M., Venkatrayalu Naidu formed the Madras Hindu debating society, Naidu had also close links with Anglo Indian both officials and non-officials his attempt was to discuss various Judicial issues untouched by the Madras Native Associations.

The association was active for ten years it is wrong to say that it became in active with the transfer British India from the East India Company to the crown in 1858. David Arnold in his study on South Indian politics is trying to proof that this association is became in active with the redressal their grievance by the act of 1858.[9] The Madras Native Association continued to function till the coming of Madras Mahajana Sabha in 1884. The reason for the demise of the organization was the inability to undertake major issues of the society. Being a business community the association was working for the removal of the grievances of the traders. According to some scholars the merchants were not ready to continue their protest because of their dependency on European business houses in the city. They failed to mobilize the popular support or the support of the intelligentsia. The emergence of Brahmin dominated Madras Mahajana Sabha resulted in the disappearance of the Madras Native Association. Many members of the Madras Native Association joined with Mahajana Sabha in 1884.

The Madras Native Association inaugurated organized political activity in the presidency. They understood the preliminary lessons of political activities, but they worked around their commercial interest, which prevented them undertaking the social, economic and political problems of the society

[8]S.R. Mehrotra, the emergence of the Indian National Congress, Delhi, 1971, p.205

[9]David (Arnold), p. 14

## References

1. Arnold, David, The Congress in Tamil Nadu 1919-1937, New Delhi, 1977.
2. Narasimhan, V.K., Kasturi Ranga Iyengar, Delhi, 1963.
3. Rajendran, N., The National Movement in Tamil Nadu 1905-1914, Madras, 1954.
4. Seal, Anil, The Emergence of Indian Nationalism, Cambridge, 1971.
5. Srinivas, M.N., Religions and Society Among the Coorgs of South India, London, 1952.
6. Sunthara Lingam, R., Politics and National Awakening in South India, Tueson, 1974.

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# Hero-Stone Speaks: Altruism was Volksgeist in Krishnagiri Region

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## Introduction

No history can be written without the consideration of the lengthy list of heroes, those personalities who were risked and sacrificed their lives to try to save or protect the lives of others. Every society in this world has its own brave history and the erection of memorials in honour of that brave man or woman, who died in a brave or heroic action, is common phenomenon in all civilizations. These memorials took different forms in different countries and in different ages. In Tamil Nadu, the erection of memorials gets its stable foot from the megalithic culture. Sangam bards speak about the rituals for erecting hero-stones as memorials. Hero-stones were considered as a primary source to study the different aspects of common people's life and culture, their mode of warfare, dress, ornaments, hair style, weapons, animals and to a certain extent their habits, customs, beliefs and languages etc. It was usually divided into three panels, but some of them could be labelled occasionally under four or five panels depending on the event. The upper panel depicts the subject worshiping a deity, the middle panel depicts the hero, and the lower panels describe the battle scenes. They often carry inscriptions displaying the variety of adornments, including decorations and figures on carved stone. The carved inscription of hero-stones speaks about the heroic actions of warriors, the battle, the name of king and those who involved in those heroic actions. Hero-stones were erected usually for honouring the warriors and individuals who lost or sacrifice their lives for the sake of a king, country, society etc., They are usually in the form of a stone monument called as planted stones and denoting as *natukal* in Tamil and *Veerakallu* in Kannada.

Krishnagiri district is located in the Indian state of Tamil Nadu. The history of this region starts with the presence of habitats of mankind during Palaeolithic, Neolithic and Mesolithic Ages. Various rock paintings and rock carvings discovered in this region are similar to that of Indus Valley civilization[1]. and Iron Age. The excavations carried out in the places like Mallappadi, Guttur, Gollapalli and Thogarapalli in Krishnagiri district revealed the antiquity of Krishnagiri district to Old Stone Age. Later Stone Age

sites were also discovered at Pudur, Gollapalli, Togarapalli, Mullaikadai, Bannaimadulu and Dailamalai[2]. The crude clumsy implements discovered from trap dykes atBargur in Krishnagiri district unveiled its history fromtheoldest settlements of Neolithic period[3]. The 2000 year old megalithic burial site in Mallachandiram near Krishnagiri has over 200 dolmens and is considered to be the largest in the Indian state of Tamilnadu[4]. Krishnagiri region was ruled by the familiar south Indian dynasties like Kongu, Chera, Cholas, Pallavas, Gangas, Nulambas, Hoysalas, Vijaya Nagar, Bijapur, Wodeyars of Mysore and Nayaks of Madurai. It was called as *Eyil Nadu, Murasu Nadu, Kowoor Nadu, Nigarili Chola Mandlam, Vidhugadhazhagi Nallur,* and *Nulambadi* in the ancient period. Krishnagiri district was emerged as separate district from Dharmapuri on 9th February, 2004 and surrounded by Vellore and Thiruvannamalai district in the East and Karnataka State in the West, State of Andhra Pradesh in the North and Dharmapuri district in the South. The district total area is about 5143 sq. kilometres. Now it consists of seven taluks namely Krishnagiri, Hosur, Pochampalli, Uthangarai, Shoolagiri, Bargur and Denkanikottai. Through this paper an attempt is madeto carve out the immense importance of the availability of the numerous epigraphical sources to construct and reconstruct the glorious past of the Krishnagiri district along with the altruism was the volksgeist nature of the subjects in those ages.

From time immemorial the Tamil people followed the tradition of erecting hero-stones for those who sacrificed their lives for the sake of their kings in TamilNadu. Krishnagiri district is fertile in hero-stones and they recorded the heroic actions of the individuals in the battlefield, pig hunting, snake killing etc., A hero-stone of Ayyappadeva from Reddiyur in Uthangarai taluk of Krishnagiri district recorded that one Aryakutti, servant of Idusappaiyar of Venadu lost his life in pig hunting. The hero-stones found in Kundani region, which is located 22kms away from Krishnagiri, are unique in type called Navakanda sculptures. Navakandam means nine cuts, *nava* means nine and *kandam* is colloquial tamil word which means piece. A heroic soldier ritually cuts himself in nine places and dies in front of their deities for the welfare and success of the king and kingdom in a war, was a great patriotic action. The people who had sacrificed their lives for the sake of their country are honoured by the Tamils. Jeyam kondar refers self-immolation in his renowned work *Kalingathu Parani*. The sangam bard Tolkappiam speaks about *Avipali* in which *avi* is a derivation of the tamil word *aavi,* which means soul and *pali* means immolation, or self-sacrifice by warriors. Manimekalai also speaks about these human sacrifices. Maravars of TamilNadu and Nayars of Kerala practiced this as a ritual. *Vairavi*, a community in Madurai also adopted this practice where they were always ready to sacrifice their lives for any noble cause in those centuries[5]. Hero-stones also consider as a primary source material in the process of constructing and reconstructing of one's own regional native history.

Nolambas had their hegemony over Krishnagiri district from 9th century[6]. It was

characterised by the erection of many hero-stones in this region. They are the pioneers for honouring their subjects for their brave patriotic actions. From time immemorial, whe ther it is to express one's supreme love for gods, kings and lords, people have sacrificed their lives. The Ancient society was deeply bound with the Social Welfare Theory. Therefore, the self-sacrifice was considered as noblest of all sacrifices, but most martyrs sacrificed their life for a social cause they espoused or for the welfare of their benefactors. Likewise, it was also observed in Krishnagiri district also witnessed the presence of numerous hero-stones.

MahendraNolamba was succeeded by his son Ayyappadeva. A hero-stone erected during his period speaks about the battle between Gangas and Nolambas[7]. Ayyappadeva was succeeded by his son Anniga also known as BiraNolamba. A hero-stone found in the Muthanur Village of Krishnagiri district speaks about his ascendancy to the throne in the year 923 A.D.[8]. Nolambas had become subordinates of Rashtrakutas during his region. An incident of cattle raid is mentioned on a hero-stone of the fifteenth year of Bira Nolamba from Periabompatti in the Uthangarai taluk of Krishnagiri district[9]. According to the inscription on the hero-stone, Sekathur Manikkadayanar lost his life in an attempt to recapture the cattle which was raided by the enemies. Another hero-stone of the same year of Bira Nolamba at the same place speaks about the death of a hero with his servants when he recaptured the cattle which were raided by Mamandayan, the ruler of Sevathur.

Hero-stones were erected not only to the heroes who lost their lives in the battle fields of cattle raids and also for those who lost their lives in some adventurous actions. For instance, a hero-stone of Ayyappadeva's regime from Reddiyur in Uthangaraitaluk of Krishnagiri district speaks about one Arayakutti, servant of Idusappaiyar of Venadu who lost his life in pig hunting. All these events were also recorded in the annals of the history of Krishnagiri district.

During the hegemony of Cholas over Krishnagiri region witnessed the erection of numerous hero-stones. A hero-stone found at Gangavaram belonging to the 25th regnal year of RajendraChola recorded the death of Kamundan of Yelinadu during the conflict with the people of Bangalanadu for the possession of cattle. Yeilnadu refers to modern Krishnagiri region and Bangalanadu refers to modern Vellore region. This epigraphical source confirmed that these conflicts for the possession of cattle were regular in those times in these regions [10]. Hera Hodahalli inscription in Harurtaluk speaks about this conflict for cattle raids [11]. Rajadhirajan I ruled over Chola Empire for thirty six years from 1018 to 1054 A.D. six inscriptions belong to this ruler have been discovered from Krishnagiri region. From these inscriptions we came to know that he was referred as Vijayarajendiran. A damaged hero-stone belong to the period of Rajadhirajan I found at Kattadikuppam in Krishnagiri talukmentions the name of the village as *Vijayarajendira*

*Mandalathi Aeilnattunelayur* [12].

Kundani is located in Hosur taluk of Krishnagiri district. It was the capital of ViraRamanatha, the Hoysala king during the 13th century. A unique type of hero-stones was found in this region called Navakanda sculptures. Some of them are preserved in the Dharmapuri Government Museum. One of the hero-stones of Navakanda type depictsthat a hero cut the head of another soldier and fled away on a horse back. This sculpture is said to be the period of the king Chikpamithalwan, son of Mallapurvathirajan. In a sculpture at Kundani, it is depicted that a soldier cut the head of another soldier and handed over it to another soldier who kept it in a basket and fled away on a horse back. This awful scene depicted in this sculpture revealed the historic fact that Saktham13,a unique kind of female goddess 'sakthi' worship of beheading human beings to please God was prevalent in Kundani region during the 12th and 13th centuries and from another incriptions, it was established that similar practice was in vogue at Panneswarar Madam in Krishnagiri District.

Krishnagiri district is situated at the frontier provinces of Tamil Nadu, Karnataka and Andhra Pradesh. It was ruled by various rulers belong to various dynasties from time immemorial. The climate of this district in general was salubrious. The areas like Denkanikotta, Hosur, Thally, Krishnagiri etc., were very cool and pleasant. It comprises forests with pasture lands called as Mullai. Tamil sangam works says that Mullai provinces were inhabited by the Ayar whose occupation was cattle-breeding. So no doubt, the lives of the peoples in these regions centred with the cattle. Cattle-breeding was the main occupation of the people of Krishnagiri district due to the availability of its pasture (Mullai) wealth in richness in those periods. The cattle raids happened frequently in this region. So, continuous conflicts were inevitable due to cattle raids and made them brave as great warriors and patriots. Plenty of Hero Stones available in this region speaks about the selfless courage of the people in and around Krishnagiri district. The sati stones and the hero stones of individuals also illuminated the virtues and valour of the Krishnagiri people. To illuminate the past glorious of this region, an in-depth research study is the need of this hour.Altruism or selflessness is the principle or practice of concern for the welfare of others. It is a traditional virtue in krishnagiri region.

## References

1. Ancient history, a stone's throw away", Times of India, Coimbatore, June 30, 2014

2. Santhanalingam, S., VaralatrilThagadur (Tamil), Kaveripattinam: PuduEzhuthu, 2006,p.17

3. Narasimmaiya.B., Neolithic and Megalithic Cultures in Tamil Nadu, New Delhi, 1980,p.21
4. op.cit.,p.18
5. Namma Madurai: What makes a martyr?, The Hindu, Friday Review, History & Culture, February 29, 2012
6. EpigraphicaCarnatica, Vol.XII, S.I.28
7. EpigraphicaCarnatica, Vol, X,p.70, A.R.E.No.305 of 1901
8. T.N.S.D.A.No.75/1974
9. T.N.S.D.A.No.14/1972
10. Santhanalingam, S., VaralatrilThagadur (Tamil), Kaveripattinam: PuduEzhuthu, 2006, pp.93
11. Dharmapuri Inscriptions, Vol.I. No.67
12. Dharmapuri Inscriptions, Vol.II. No.97
13. Flood, Gavin D, An Introduction to Hinduism, Cambridge University Press, 1996, pp. 174-176.

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# Social and Economic Exploitation in Medieval Tamil Nadu

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## Introduction

During the medieval period in Tamil Nadu the subaltern dissents and protests were manifested in several forms as is evident from inscriptions, when feudal oppression was in full swing. According to N.Vanamamalai these protests took various forms like suicides, refusal to pay taxes and in some cases riots in the Cholas period. Agrarian economy provided the base for the emergence of rise and growth of empires and political organisations in the river valleys of Tamil Nadu, by about 3rd century B.C. Gradually, areas under cultivation increased owing to the introduction of irrigation projects and reclamation of forests and dry lands. In such an agrarian society power and wealth were concentrated in a minority consisting of Princes, Brahmins and Vellalas under a variety of land tenures in operation. Whatever maybe the tenure, peasants, sharecroppers and slaves, the real producing classes were sufferers prone to harassment and exploitation. These exploitations reached such proportions as to force the oppressed peasantry to show signs of protest taking different forms from place to place. Of the four eco-regions in Tamil Nadu, Marutham had all the potentialities for developing into cultural units. The soil there was so fertile as to make a sangam bard to observe that one veli of land was capable of producing thousand kalams of paddy[1]. Agricultural technology seems to have reached a fairly advanced level as vouched by Sangam works, K.K.Pillai cites a number of references from sangam works to activities like transplantation, crop rotation, manuring, the use of sluices and shutters[2].

The earliest form of land tenure was known as Vellanvagai, in which land was commonly held by Vellalas. Vellanvagai villages were composed of Uluvithunpor, Uluthunpor, Tenants, Vinaivalar, Ulathiar etc., while uluvithunpor controlled large areas of land and cultivated the land with the help of sharecroppers and slaves, uluthunpor were holding small pieces of land which they themselves cultivated. The lowest class known as *Kadasiyar* in the sangam works was equivalent to the slaves of medieval Europe. Kanaka sabai pillai's assessment that *Tamil Civilization of the Sangam period was superior to other culture because slavery was unknown amongst the Tamils* does not stand the scrutiny of modern scholarship[3]. Kailasapathy for instance citing Tolkappiam observes that Sangam society was highly graded and slaves, servants, errandmen etc.,

were not entitled to be portrayed as heroes in poems[4]. No wonder tenants and serfs of the Vellanvagai villages were not only at the mercy of the perungudi but also the vagaries of climate. At times of draught tenants had to eat up the seed corn as there was no income from the land. To the labouring classes the landlords denied the minimum *to keep their body and soul together*[1].

The post sangam period when the Kalabhras had their hegemony was characterised by economic stagnation. However, agriculture economy revived under the Pallavas, Pandyas and Cholas. Large scale agrarian expansion facilitated by canal and tank irrigation schemes was the characteristic feature of Tamil Nadu since the days of the Pallavas. Instances of colonisation are also there on record. It is believed that 48,000 vellalas from Tanjore were permanently settled in Tondaimandalam with Kaniyatchi rights. In 1900 villages each village provided with service communities and *mauniems* of different types were established. Vellalas were allowed to exercise *the right of buying, selling, pledging and giving in free gift of pariah and certain other caste slaves*[6]. The form of land tenure was known as Brahmadeyam in which land was commonly held by Brahmins, Ekapoga Brahmadeyam was held by Individual Brahmins and Devadananm was held by the temple authorities belongs to Siva Temple.Brahmadeya and Devadhana tenures synchronised with the revival of Hinduism in Tamil Nadu through the Bakthi Movement. Later another type of service tenure known as Jivitham began to emerge in the medieval times. Karasima produces evidences for the appearance of individual land tenures in the lower Kaveri region during the imperial Chola period consequent on the purchase of lands by soldiers of fortune with the money got as share from foreign booties[7].

The medieval agrarian system was such that every village had to come under any one of the land tenures discussed above. There was corporate ownership in vellanvagai villages. In the Brahmadeyas, Brahmins were the non-cultivating land owners where as the non-brahmin communities either as tenants or serfs engaged in agricultural operations. Devadhana lands were least in most cases to Brahmins. Here subletting was resorted to. Whenever peripheral regions were subjugated the tribals, the hitherto occupants of the lands were accommodated in the agrarian system either as peasants or serfs. The Proliteration of small peasants was due to the grant of service tenures both by the state as well as by village assemblies.

Tenancy cultivation was vogue in medieval period, tenants paid a fixed amount commonly known as Melvaram to the land owners and retained the remaining amount as their share. Known as kutikal or kutimakkal, tenants continued to exist as an exploited class. Melvaram collected from the tenants was very heavy varying from 1/3 to 2/3 of the produce as indicated by inscriptions. Tenants in Tinnevelly and Ramnad had to pay from 240 to 260 kalams per veli as Melvaram which was equivalent to 50 % of

the total produce8. Another source of trouble came to the tenants when overzealous monarchs assigned land grants to Brahmins evicting (Kutineeki) them from their lands, which they tilled for many years[9]. In some cases administrative and fiscal control were given to temples. In such cases temple authorities harassed the tenants for non-payment of arrears. For the maintenance of the existing temples and the consecration of new temples tenants were forced to pay additional amounts.

Discontentment among the peasants, displeased as they were due to harassment from landlords as well as officials resulted in protests which manifested in different forms in different areas. These protests were strong during strong governments and vice versa. Peasant protests were more visible during the later chola period. According to N.Vanamamalai these protests were in the form of suicide, refusal to pay taxes and in some cases open riots. A dancing girl by name Chathuri Manickam is stated by an inscription to have ended her life by falling from the temple tower in an attempt to establish the right of her relative to till the land assigned to her as jivitham. Another record tells that temple guards committed suicide by leaping into the flames of fire lit before the temple to establish their right over the land assigned to them as jivitham which the temple authorities grabbed from them.

An inscription from Aduthurai speaks about the illtreatment meted out by Brahmin landlords and government officials against the 98 Idangai castes. In what is regarded as a strange coming together of 98 valangai and 98 idangai castes known for their perpetual rivalry decided in a meeting not to pay any tax levied by the village Sabha in protest against a new tax imposed on them with the approval of the Muventhavelan, the government official. They refused to undertake agricultural operations demanding action to be taken against the official concerned. Edgar Thuston narrates a story of a strange protest by the village servants of Melur region against their Vellala masters. Though Melur was a Vellalanadu to begin with, Kallas emigrated to Melur and settled there permanently as servants of the Vellala landlords. They served their masters faithfully. But when Vellalas began to punish them for small offences, they rebelled against them in such a severe fashion that in due course all Vellalas evacuated Melur converting it into a Kallar Nadu.

The picture about the early medieval agrarian economy will not be complete if the life of the lowest stratum of the society is not portrayed. Servility resulted from the immutable rules of caste system. As a general rule slaves were attached with and sold along with the land. They were condemned to live in exclusive quarters designated as Cheris outside villages. The elitist view of history is that caste system ensured social harmony in the Indian society and there was no protest against caste discrimination. This is quite contrary to truth because in Tamil literature we find a lot of reference to severe condemnation of caste distinctions. Thiruvalluvar clearly stated that all are

equal by birth but they differ among themselves due to their avocations10. Thirumular advocated one Caste and one God. He had no respect for worldly Brahmins. *They* according to him, have no truth, Special Wisdom, Bhakti or Knowledge of God[11]. Kapilar Ahaval, a medieval Tamil poem on caste, finds fault with the Brahmins for creating the four fold caste system. He states that only by character man becomes high and law in caste and not by birth as Brahmins think. Tamil Siddhas were vehement critics of the caste system. Majority of them, it is believed belonged to the low castes. Sivavakkair makes a scathing attack on caste system. To him Temple worship, Idolatory, Pilgrimages, Holy bathings, the Chanting of Vedas and Rituals of the Brahmin priests are all devoid of use and meaning. PampattiSiddhar declares that we would set fire to caste discriminations. Baddiragriar yearns for the day when casteism would vanish.Dissent did not develop into protests and movements because fear of economic power, social status and political authority of the higher castes acted as effective checks.During the period of Pallavascaste fold Varnashrama system was very rigid and the Sutras were lived in a mud houses and their villages were far away from the higher caste villages they were not permitted to enter in to the villages of high castes.MeenakshiSundareswarar Temple in Madurai also has such an inscription at the northern wall of the East Rajagopuram.According to the inscription, in 1710, during the regime of Vijaya Ranga Chokkanatha Naicker, a resident of Madurai sacrificed his life opposing heavy taxation on temple lands. In another incident, a person jumped from the eastern tower to highlight poor administration of the temple authorities.

According to an inscription issued in the 43rd regional year of Kulothunga, Village servants were curtailed from moving from their villages. Vetti or compulsory labour was extracted from them. KadamaiUliyarAmanji is other terms used to describe free labour during medieval times. Slaves were coerced by the state to build and repair irrigation works in the dry season and to quarry and transport stone for palaces and temples, make roads and drag heavy palanquins of royalty priestly authorities and temple deities. Unfortunately nobody not even the slave himself was interested in his redemption for as Manu whose law governed social relations stated *Better is death in the fulfilment of one's duty for to follow another*.

## References

1. K.A.N Sastri, The Cholas, Madras 1975, p.66

2. K.K.Pillay, A Social History of the Tamils, Vol.I, Madras, 2nd Edi, 1975, p.196

3. V.Kanakasabai, The Tamils 1800 Years Ago, Asian Educational Services, New Delhi, 1979, p.114

4. K.Kailasapathy, Tamil Heroic Poetry, Oxford, 1968,p.11

5. N.Vanamamalai, Material Thought in Early Tamil Literature, Social Scientist, Nov.1973,pp.34-35

6. Bundla Ramasamy Naidoo, Memories of the Internal Revenue System of the Madras Presidency, Madras, 1908,p.18

7. N.Karasima, South Indian History and Society, OUP,Delhi,1984,pp.31-40

8. L.B.Alayev, The System of Land Rights in South India, Proceedings of 5th International Conference Seminar of Tamil Studies, Madurai, Jan,1981,pp.1-14

9. N.Vanamamalai, Consolidation of Feudalism and Anti-Feudalism during Chola Imperialist Rule, Proceedings of the 2nd International Conference Seminar of Tamil Studies, Oct, 1977, Madras, Vol 2, pp.239-243

10. Thirukkural No: 972, Athigaram: Perumai (Tamil)

11. Thirumanthiram, Padal(Poet) No: 2066, Thanthiram Number 7.

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# Disparity of Higher Education in India: An Assessment

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**Abstract**

The importance of education in the emancipation schema of Dalits can never be overemphasized. Their enslavement for more than two millennia as well as their resistance movement against it through the colonial times are largely related with education; the former for the lack of it and the latter due to its availability. With the inspiring role model of Babasaheb Ambedkar, his specific exhortations to educate, and the motivation provided by the reservations in public sector employment, Dalits have made a commendable progress in the field of education. It was catalysed creation of sizable middle class among them. Therefore, this paper assesses disparity in higher education among dalits and non-dalits in India.

**Keywords:** Higher Education, Dalits.

## 1. Introduction

Education along with health constitutes the basis factor in human life. While health represents its physicality and is common to all sentient beings, education represents its consciousness and characterizes only humans. As such, education becomes more important than even health. In the context of India's caste system, education assumes far more importance to the Dalits and the Shudra castes because it was the single biggest causal factor behind their enslavement by the upper castes for millenniums.

The importance of education was duly acknowledged in the Indian constitution. Although the Advisory Committee to the Constituent Assembly had not accepted the sub - committee's recommendation to make education the fundamental right, and

education was pushed to the Part IV. Which contained 'the directive principles of state policy', while education is not justifiable unlike the fundamental rights in Part III, it is the only thing in the entire Constitution for which the Constitution had stipulated a 10 - year time frame for implementation of free and compulsory education to all children up to the age of 14 years vide Article 45. However, the rulers did not pay any heed to it. Although Maulana Abdul Kalam Azad. India's first Minister of Education, envisaged strong central government control over education throughout the country, and with a uniform educational system but as it happened he could not prevail.

## 2. Right to Basic Education

The right to basic education stood at the core of this right because denial to access to primary education will render other peripheral rights meaningless. It implied that the proposition of Article 45 to give free compulsory and universal education up to the age of 14 years was now a part of the fundamental right. The ruling classes mulled over this development and intrigued to pass the 86th Amendment to the Constitution in December 2002. Which inter alia inserted Article 21 A after article 21 of the Constitution. As Right to Education, Aurally, it took away that right given in Article 45 from the children up to the age of six.

As against the directive of the Constitution to implement the provisions of Article 45 within ten years from the adoption of the Constitution, the new article says that the State shall provide free and compulsory education to all children of the age of six to fourteen years "in such manner as the State may, by law, determine", Further, it made guardians of a child responsible for educating his/her ward. In effect, the new Article took always the entire essence of right provided in the Constitution and deceptively called it Right to Education.

This so called Right to Education Act actually became the right of the rich to get exclusive education in the country. For them all the islands of education providing international quality education would exist. There would be infinite variety of schools in the country; at the one end of the continuum would be international schools for the ultra rich and at the other end would exist the schools without shelter, blackboard and even teachers in villages. The ruling classes deployed their pet weapon of reservation to quell possible resentment of lower classes against the Act. They provided for 25% reservation for the students belonging to the lower classes in such islands in a callous manner.

## 3. Higher Education in India

The low enrolment rate at the secondary school levels indicate that very few students survive by the time they reach the class X. Table 13 shows that the GER for the SC students in higher secondary level for the year 2013-2014 was 50.50% a drastic jump from previous years. In a recent report *Intergenerational and Regional differentials in Higher Education in India* authored by development economist, Abusalesh Shariff of the Delhi- based Centre for Research and Debates in Development Policy and Amit Sharma, research analyst of the National Council of Applied Economic Research, observed that access to education beyond higher secondary schooling is a mere 10% among the university-age population in India, which creates doubt about various figures floating around on GER in higher education. The report noted huge disparity across gender, socio-economic religious groups and geographical regions, the latter being most skewed. This news about this report was prominently flashed in January 2014 in print media. As against it, the government claimed 18.8% as GER in higher education in 1012 itself and 20.8% for the previous year, 2010-11 with that for the SCs as 14.6, 12.3 and 13.5 percent respectively for Boys, girls and Total Obviously these figures lose authenticity, Another report of the government (`www.ncsc.nic.in/files/ncsc.new3/203.pdf`) has this to say on page 119: ".. cumulative effect of all these schemes could be somewhat judged by the fact that enrolment of students from SCs for undergraduate, post graduate, technical and professional courses within a span of fifteen years had increased manifold; in the academic year 1978-79 there were only 7.08% of students enrolment in higher educational institutions but in 1995-96 it has risen to 13.30% . But thereafter, although the absolute numbers have gone up, the percentage has gone down to 11.32% in 2002-03." Such irreconcilable data from the government sources create doubt about the reliability of these figures. As the government had targeted 15% GER in higher education to be achieved in 2012 and thereafter aimed at 30% GER in 2020, at least there is no doubt that it admits that it is far below the world average of 29% and 54.6% average GER for developed countries and even 36.5%. The GER for the SCs of course would be far below than these claims.

Notwithstanding this problem, Table 1.3 tells us that GER for the SC students in higher education was as low as 5.8% in 2001-02, which increased year by year and reached 11% in 2007-2008 for which firm figures are available. It may have been up even to 15% the figure not yet claimed by any government source. The government in recent years considerable increased the assistance being given to the SC students in order to hike their GER. It does not know, many of these schemes remain confined to a minuscule population of the SCs which is able to make use of them and other benefits of affirmative action. They are largely irrelevant for the poorer majority because the amount of money promi8sed in these schemes often needs family supplement which

they are unable to mobilize.

| year | Age Group (18-23 years) | | |
|---|---|---|---|
| | Boys | Girls | Total |
| 2001-02 | 7.7 | 3.6 | 5.8 |
| 2002-03 | 8.3 | 3.7 | 6.0 |
| 2003-04 | 8.3 | 4.3 | 6.4 |
| 2004-05 | 8.1 | 5.2 | 6.7 |
| 2005-06 | 10.1 | 6.4 | 8.4 |
| 2006-07 | 11.5 | 6.9 | 9.4 |
| 2007-08 | 13.2 | 8.6 | 11.0 |
| 2008-09(P) | 12.5 | 8.3 | 10.5 |
| 2009-10 (P) | 13.0 | 9.0 | 11.1 |
| 2010-11 (P) | 14.6 | 12.3 | 13.5 |

P : Provisional

**Source:** Ministry of Human Resource Development, Government of India

**Table 1.** Gross Enrolment Ratio (GER) of Scheduled Caste Students of Higher Education in India

This assistance also would not reach in time making the problem far more difficult to handle for a poor Dalit. It may be theoretically alright to say that there are plenty of educational loan schemes etc., apart from the government assistance to deserving SC student. But practically it is mistaken insofar as it ignores their low risk profile and intensity of poverty.

**Disparity of Higher Education in India**

Instead of mere literacy, some index of inequality between the Dalits and the non-Dalits at various levels of education by way of enrolment could be more meaningful to assess their educational progress vis -a - vis others. Table 14 provides such equality c coefficients for the year 1991-92. The equality coefficient for Dalits at a particular level of education is the ratio of the enrolment divided by the population of SCs/STs to Non-SCs/STs, multiplied by 100. The coefficient of 100 denotes perfect equality and zero, the total inequality.

| SNo. | Type of Institution | Coefficient of Equality | |
|---|---|---|---|
| | | SCs | STs |
| 1 | Pre- Primary | 42.95 | 168.99 |
| 2 | Lower Primary/ Jr. Basic/ I-V | 94.06 | 94.21 |
| 3 | Higher Primary / Sr. Basic / VI-VIII | 76.29 | 58.34 |
| 4 | Secondary IX-X | 68.53 | 46.59 |
| 5 | Higher Secondary / IX-XII | 65.57 | 37.08 |
| 6 | Technical Industrial Arts and Crafts | 69.38 | 52.89 |
| 7 | Teacher Training Schools | 70.28 | 92.56 |
| 8 | Polytechnics | 48.70 | 26.58 |
| 9 | B.A. | 58.30 | 38.70 |
| 10 | B.com. | 27.51 | 12.60 |
| 11 | B.Sc. | 32.29 | 10.24 |
| 12 | B.A., B.Com., B.Sc. | 42.76 | 24.13 |
| 13 | M.A., | 60.12 | 30.53 |
| 14 | M.Com. | 35.86 | 17.07 |
| 15 | M.Sc. | 26.74 | 8.38 |
| 16 | M.A., M.Com., M.Sc. | 47.09 | 22.47 |
| 17 | B.Ed. | 44.29 | 24.08 |
| 18 | M.B.B.S | 43.88 | 26.79 |
| 19 | B.E., B.Sc. (Engg.) and B. Arch. | 26.96 | 11.09 |
| 20 | Education, Medical and Engineering | 34.28 | 17.18 |
| 21 | Ph.D., D. Sc, D. Phil | 14.18 | 7.56 |

**Source:** 1. Registrar General & Census Commissioner, Govt of India (1992): Census of India 1991; Series I, India; Paper 2 of 1992, Table 6, pp. 18-19, 44-45 and 210-11, 1961, 1971, 1981 and 1991, Population and Literacy Percentage Tables.

2. Government of India, Ministry of Human Resource Development (Education), Planning, Monitoring and Statistics Division, 1993, Selected Educational Statistics (as on 30th September 1991), New Delhi, Table V. Pp. 11-22 and table VIII, pp. 31-51.

**Table 2.** Coefficient of Equality for SCs and STs in Different Categories of Educational Institutions in 1991-92

The table presents a dismal picture of equality as the level of education rises, indicating thereby the huge dropout percentage among Dalits as they go up the scale of higher education. For the degree and higher courses, with the exception of Humanities, the equality coefficient is as low as below 30 dropping down to mere 15 in case of doctoral degrees. These data show that in terms of capability inducing education, the Dalits still could not reach even one - third of the level reached by the general population. In other words, everything remaining the same, the Dalits would take more than seven decades to come nearer the levels of education of the general mass. This is the magnitude of disparity between Dalits and non- Dalits!

Some starting facts still protrude out of this statistics. Just about 10-15 children finishing school joins a college for higher education. India has one of the lowest higher education enrolment ratios, way below the world average of 29 (2010) and over 80% in developed countries. The GER would be raised only with the neoliberal vehicle of public private partnership (PPP) including massive doses of FDI. According to the government's own Eleventh Plan estimates, an investment of Rs. 2,26,410 crores was needed to achieve the enrolment target of 12% in 2012 but it had provided only Rs. 77.933 crore, fourth of the total needed. A recent NASSCOM-McKinsey study showed that only one out of 10 India's boast of having one of the largest technical and scientific manpower reserves in the world.

A study by the National Assessment and Accreditation Council (NACC) showed that 90% of the colleges and 70% of the universities that the Council graded were of middling or poor quality. With the reckless quantitative expansion of higher education, even this quality level is being eroded with impunity. Even our hallowed institutes like IITs and IIMs suffer from endemic shortfall of faculty to the extent of 15 to 25 percent. The situation resulting from doubling their numbers and trebling their strength can only be imagined. In the fast changing world, where product life cycles have already been reduced to months or a couple of year, most India universities revise their curricula only once in five to 10 years, none of our universities including the IITs and IIMs figure in the list of first 100 in the global university rankings; the only entrants in the list being ranked beyond 2000. The impact of acute shortage of seats in institutions offering quality education coupled with increasingly fewer jobs has been mounting huge psychological pressure on students which reflects in worrisome incidence of suicides among them.

Education only makes them incapable of the physical labour. They would do casual white collar jobs if they existed, pull on for some years on parents meagre income, try their luck with entrepreneurship, commercial, political or in crime would and even tally resign to their lot or literally commit suicide. This scary trend not noticed by the academia is however an incipient rural phenomenon. The situation is no different in urban area except for the fact that there are relatively better job prospects in informal

sector for such school dropouts. Many of them became lumpen, either joining criminal gangs or political parties.

## 4. Conclusion

It could conclude from above discussion that the higher education is as heterogeneous as the school system. Privatization in higher education has been a historical paradigm since early colonial times and there existed a sizable presence of private institutions in the country as philanthropy. However, it suddenly an ideological boost from neoliberal policies, from 1980s there has been a virtual flood of private institutions, not as philanthropy but as purely commercial ventures to exploit the expanding educational market. They were mostly launched by the political bigwigs who came to earn the dubious epithet of shikshan samrat (education emperor). They offered professional education like engineering, medicine, pharmacy, etc., which had a booming demand among burgeoning middle classes. Those who afforded their hefty capitation fee could get in whatever education they willed for. The free market growth of this bazeer in higher education completely overwhelmed the public institutions, which however remained by far reliable and authentic sources of education, and so covered for admission.

The acute supply constraint of these quality institutions catalysed huge market for coaching classes which prepared students as examinees to get into such institutions by charging hefty price. These business enterprises emptied out the school system of good teachers and created a paradigm that formal schools would be reduced to a formality and real teaching would take place only in coaching classes. Obviously, for most Dalits they would be unaffordable. If some of them crossed this hurdle and got admission into a converted government college, they world face another hurdle of high fees. The neoliberal thrust of the government to institute 'cost recovery' principle in higher education led to huge rise in fees in government institutions, theoretically beyond means of most Dalits. Barring few exceptions, entire Dalits community would thus be excluded from this education bazaar.

## References

1. Anitha BK. Village, Caste and Education. Delhi: Rawat Publication; 2000.

2. Desai S, Adams CD, Dubey A. "In the Margins: Social Inequalities in Children's Educational Outcomes in India.". Paper presented at the annual meeting of the Population Association of America; Los Angeles. 2006.

3. Galanter M. "Pursuing Equality: An Assessment of India's Policy of

Compensatory Discrimination for Disadvantaged Groups." In: Kaviraj S, editor. Politics in India. New Delhi: Oxford University Press; 1997. pp. 187-99.

4. Nambissan GB, Sedwal M. "Education for All: The Situation of Dalit Children in India." In: Govinda R, editor. India Education Report. New Delhi: Oxford University Press; 2002. pp. 72-86.

5. Pong S-L. "Preferential Policies and Secondary School Attainment in Peninsular Malaysia" Sociology of Education. 1993; 66:245-61.

6. Sujatha K. "Education Among Scheduled Tribes" In: Govinda R, Editor. India Education Report. New Delhi: Oxford University Press; 2002.

7. Government of India (2008) Status of Education in India, National Report. Ministry of Human Resource Development, 2008. http://www.ibe.unesco.org/ National_Reports/ ICE_2008/india _NR08.pdf accessed on 3rd May, 2014.

8. Elementary Education in India: Progress towards UEE (2012-13). National University of Educational Planning and Administration. New Delhi.

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# A Study on Customer Satisfaction of E-Banking Services in Vaniyambadi Town

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**Abstract**

Now-a-days the fast growth of technology has made many sectors to upgrade their existing system. The banks also are in upgrading their system. Since because of the existing technical supports, customers' visiting the bank has been reduced. E-banking support services are Web linking, Account aggregation, Electronic authentication, Websites hosting, Payments and E-commerce, Bill payments and presentation, Wireless E-banking etc. Common e-banking services are Account Management, Cash management, Bill payment & presentment, New Account Opening, Consumer Wire Transfers, Commercial Wire Transfers, Small Business Loan (Applications, approvals & advances), Investment Brokerage Services, Business to business payments, Loan applications, Account aggregation and Employee benefit / Pension Administration are the common services provided by E-banking. Using the sample collected from Vaniyambadi town. Sampling size for the study is 150, which they are collected from salaried people, retired people, self-employed. The researcher applied random sampling method. The study found that, it is interesting to note that most of the respondents using E-banking service are more satisfaction.

**Keywords:** E-Banking Services, Customer Satisfaction.

## Introduction

E-banking or Electronic banking means banking by means of electronically operated devices such as computers, ATMs, etc. In addition, Internet, Telephone, Mobile handsets and other means are also used as part of e- banking.

According to Khan (2007), internet (electronic) banking includes the system that enables financial institution customers, individuals or business, access accounts, transact business, or obtain information on financial services on public or private network including internet.

A wide range of services are being offered by banks using the electronic media. E-banking (Electronic Banking) provides 24-hours access to cash through an Automatic Teller Machine (ATM) Direct Deposit of pay-cheques or savings accounts of a bank. However, in modern times, electronic banking involves different activities, i.e., purchases and sales transaction and bill payments, transfer of fund one place to another place etc.

In banking industry, E-services are revolutionizing the way business is conducted. Electronic based business models are replacing conventional banking system and almost of banks are rethinking business process designs and customer relationship management strategies. It is also known as e banking, online banking which provides various alternative e-channels to using banking services i.e. ATM, Credit card, Debit card, Internet banking, Mobile banking, Electronic fund transfer. Electronic clearing services etc. E-banking has become an important channel for delivering banking transactions and services in India.

## Significance of the Study

Now-a-days the fast growth of technology has made many sectors to upgrade their existing system. The banks also are in upgrading their system. Since because of the existing technical supports, customers' visiting the bank has been reduced. Further the importance of the study is to know the customers' expectations in enhancing the facilities in e-banking service.

## Objectives of the Study

1. To examine the customers satisfaction in e-banking service.

2. To know the factor influencing to use e-banking services.

## Research Methodology

The study was based on survey method. The theme of the study was to find the customer satisfaction towards e-banking services. The study is based on primary and secondary data.

The sampling unit rate for selecting the sampling for the study is from Vaniyambadi town. Sampling size for the study is 150 which they are collected from salaried people, retired people, self-employed. The researcher applied random sampling method.

## Review of Literature

According to Ala Eddin M. and Hassan A.(2011) in their study in which 70.40 % were male, age wise 71.60 % of the users of e-banking were 35 or below and below 45 accounts 7.8 % and educational level e-banking customers participated in the study that only 8.40 % were high school complete or less and the rest 91.6 % were above high school. The study also investigated that fees determined by Jordan banks were an important element to facilitate the using of e-banking which was reflected on the customer satisfaction.

Philip's L. B. (2013) in his study of customer satisfaction and e-banking service in some selected banks of Ethiopia found out that customer satisfaction in e-banking has significant relationship with convenience, reasonable and fair fees (charges) during transaction, efficient service of e-banking, privacy, security, reliability and responsiveness of employees to solve e-banking service failure and these variable determined 84 % customer satisfaction in e-banking.

## Analysis of Data

| Type of Account | Frequency | Percentage |
|---|---|---|
| Saving account | 79 | 53 |
| Current account | 56 | 37 |
| Loan | 15 | 10 |
| Others | – | – |
| Total | 150 | 100 |

**Table 1.** Type of Account

From the above table shows that 53 % of the respondents were users of *Saving account*, 37 % of the respondents were users of *Current account* and remaining 10 % of the respondents were users of *Loan*. The above table shows that most of the account

holder are saving account holder.

| Influence to e-banking Service | Frequency | Percentage |
|---|---|---|
| Family | 48 | 32 |
| Friends | 47 | 31.33 |
| Relatives | 23 | 15 |
| Self-knowledge | 32 | 21.33 |
| Total | 150 | 100 |

**Table 2.** Influence to E-banking Service

From the above table it is clear that 32 % of the respondents were prefer to use e-banking service through the influence of family members, 31 % and 15 % of the respondents influence through friends and relatives. 21 % of the respondent has self-knowledge.

| Prefer E-banking | Frequency | Percentage |
|---|---|---|
| Convenient | 43 | 29 |
| Save time | 53 | 35 |
| Easy to handle | 30 | 20 |
| Fast service | 24 | 16 |
| Total | 150 | 100 |

**Table 3.** Prefer E-banking

From the above table shows that 35 % of the respondents were preferred e-banking to save time. 29 % of the respondents were used for convenient purpose. 20 % of the respondents prefer it for easy handling and remaining 16 % of the respondents used it because of fast service.

| Satisfaction | Frequency | Percentage |
|---|---|---|
| Yes | 123 | 82 |
| No | 27 | 18 |
| Total | 150 | 100 |

**Table 4.** Satisfaction of E-service

From the above table it is clear that 3/4 of the respondents are satisfaction with e-banking service, 1/4 of the respondents say that they satisfied with e-banking services.

## Testing of Hypotheses

### Relationship between Occupation and Usage

| Occupation | Frequency of Usage | | | | Total |
|---|---|---|---|---|---|
| | Daily | Weekly | Monthly | Annually | |
| Student | 4 | 2 | 5 | 5 | 16 |
| Retired | 17 | 1 | 25 | 10 | 53 |
| Salaried | 11 | 3 | 34 | 16 | 64 |
| Self-employed | 2 | 1 | 8 | 6 | 17 |
| Total | 34 | 7 | 72 | 37 | 150 |

$\chi^2 = 24.09$

**Table 5.** Occupation and Usage

The chi-square test reveals that the calculated value is 24.09 is more than table value at 5 % level of significance. $(24.09 > 5.99)$ So the null hypothesis rejected. So it is concluded that there is a significant relationship between Occupation and Usage of the respondent.

### Relationship between Income and Usage

| Income | Frequency of Usage | | | | Total |
|---|---|---|---|---|---|
| | Daily | Weekly | Monthly | Annually | |
| Less than 3,00,000 | 6 | 32 | 37 | 11 | 86 |
| 3,00,000 - 6,00,000 | 7 | 17 | 24 | 3 | 51 |
| 6,00,000 - 10,00,000 | | 3 | 2 | 2 | 7 |
| Above 10,00,000 | 2 | 2 | 2 | | 6 |
| Total | 15 | 54 | 65 | 16 | 150 |

$\chi^2 = 3.24$

**Table 6.** Income and Usage

The chi-square test reveals that the calculated value 3.24 is less than table value at 5 %level of significance $(3.24 < 5.99)$ So the null hypothesis is accepted. So it is concluded that there is no relationship between Income and Usage of the respondent.

### Age and e-banking Usage

The chi-square test reveals that the calculated value is 2.68 is less than table value at 5 % level of significance $(2.68 < 5.99)$. So the null hypothesis is accepted. (i.e.) it is concluded that there is a significant relationship between Income and Usage of the respondent.

| Age | Frequency of Usage | | | | Total |
|---|---|---|---|---|---|
| | Daily | Weekly | Monthly | Annually | |
| Less than 25 | 5 | 17 | 15 | 6 | 43 |
| 25 - 35 | 8 | 27 | 34 | 5 | 74 |
| 35 - 45 | 2 | 5 | 11 | 5 | 23 |
| Above 45 | 1 | 4 | 5 | | 10 |
| Total | 16 | 53 | 65 | 16 | 150 |

$\chi^2 = 2.68$

**Table 7.** Age and E-banking Usage

**Relationship between Usage and Marital Status**

| Marital Status | Frequency of Usage | | | | Total |
|---|---|---|---|---|---|
| | Daily | Weekly | Monthly | Annually | |
| Married | 5 | 21 | 38 | 6 | 70 |
| Unmarried | 13 | 30 | 27 | 10 | 80 |
| Total | 18 | 51 | 65 | 16 | 150 |

$\chi^2 = 7.38$

**Table 8.** Usage and Marital Status

The chi-square test reveals that the calculated value is 7.38 is less than table value at 5 % level of significance $(7.38 < 7.81)$. So the null hypothesis is accepted. (i.e.) it is concluded that there is a significant relationship between Income and Usage of the respondent.

## Findings of the Study

- 53 % of the respondents were use in saving account e-banking services.
- 32 % of the respondents' e-banking service to use in family.
- It is obvious that 35 % of the respondents were preferred e-banking to save time.
- It is obvious that 43 % of the respondents were prefer to use e-banking services at monthly once in a time.
- 82 % of the respondents using it more satisfaction.

## Suggestions

The following suggestions are made on the basis of the study.

- It suggests that all the banks give improvement on various e-banking services to customer.
- Give proper awareness and improve the knowledge in e-banking services to people.
- Give a continuous and fast service to customer.
- It should be suggests to give a good security for banking transaction.
- Provide a good satisfaction to the customer by using e-banking services.

## Conclusion

Based on the results of the study it can be concluded that the majority of current E-banking users are youth between the age 25 up to 35, gender wise Female are the dominant users, occupationally salaried and self-employed are the majority users, retired people are not active participated in using the service, banks do not keep full record of their customer profile in standardized way for easy reference. The banks are currently providing e-banking service for saving account holders and current account holders.

## References

1. Banking theory law and practice by s. Gurusamy.
2. Principles of banking, Indian institute of banking and finance by macmillan.
3. E-commerce C.S.V. Murthy.
4. Banking theory law and practice by B. Santhanam
5. A. Jayakumar and N. Sathiya (2009) Marketing of banking services: An overview, Southern Economist, Volume 48.
6. B.S. Sawant, Technological Developments in Indian Banking Sector, Indian Streams Research Journal. Vol.1,Issue.
7. Ala Eddin and Hassen Aizubi. (2011).E-banking functionality and outcomes of customer satisfaction: An empirical investigation in Jordan commercial banks. International Journal of marketing studies, Vol.3, No.1.
8. Philipos Lamore Bambore (2013).Customer satisfaction and electronic banking service on some selected banks of Ethiopia. Available at www.ijrcm.org.

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# A Study on Investment Preference and Behaviour of Individual Investors in Vellore City

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**Abstract**

This study aims to encounter the behaviour of individual investors of Vellore city vis-a-vis available investment avenues in the India. The major factors behind an investment are the safety of principal amount, liquidity, income stability, and appreciation. A variety of investment avenues are available such as Savings Account, Fixed Deposit Account, Government Securities, Corporate Bonds, Insurance policies, Real estates, Commodities, Shares and Mutual Funds, Chit Funds and Gold and Silver. All the investors invest their surplus money in the above-mentioned avenues depending on their risk-taking attitude. *No pain, no gain* it is the golden principle of investment management. In the developing economy one can earn more and more money. More risks lead to more profits. Investors cannot avoid risks but they can minimize the risk by investing their money in various forms of safe investments so that they can get a moderate profit. This study has led the researcher to conclude that most of the investors of Vellore city prefer bank deposits followed by investment in gold and silver.

**Keywords:** Investment behaviour, Investor Information, Investment Avenues.

## Introduction

Every individual investor possesses different mindset when they decide about investing in a particular investment avenue such as bonds, mutual funds, gold (e-gold) and silver, shares, debentures, bank deposit, real estate, public provident fund, post office savings, life insurance policies, mutual funds, company's fixed deposits and so on. In each life cycle stage, every individual desires his hard-earned money to be invested in most secure and liquid avenue. However, the decision varies for every individual depending on his or her risk-taking ability and the purpose of investment.

The purpose of investment is related with saving objective. Each individual investor selects the investment option for certain time period looking at their personal financial goals. Investment behaviour of an individual investor reveals how he / she wants to allocate the surplus financial resources among various investment alternatives available. The investment behaviour consists of why they want to invest? How much of their disposable income they want to invest? For how many years/months they want to invest? and most importantly the timing of such investment that is when they invest?

In various empirical studies, it has been found that information being an important factor on investment decision, which influences them on choice of investment and later on how they act after investment. In every life cycle stage, saving objective by an individual always changes. Such a change occurs not only due to the age of the investors, but also due to the occupation and income level category, where they fall. The study was conducted mainly to know about the individual investors' being employed in schools, colleges and Government offices as Government employees or non-Government employees about whom enough studies have not been carried out extensively on investment behaviour aspects.

## Literature Riview

**Palanivelu V R and Chandrakumar K** (2013)[1] have said that the Investment is the employment of funds on assets with the aim of earning income or capital appreciation. Investment is the most important things today. People are earning more, but they do not know where, when and how to invest it. They said that a proper understanding of money, its value, the available avenues for investment, various financial institutions, the rate of return/risk and so on are essential to successfully manage one's finance for achieving life's goal. Through this study, an analysis was made into preferred investment avenues among salaried peoples in Namakkal Taluk, Tamilnadu, India. The results highlighted that certain factors like education level, awareness about the current financial system, age of investors and so on make significant impact while deciding the investment avenues. The study was based on personal interviews with salaried peoples, using a structured questionnaire. Actually, through this study the researchers have identified the preferred investment avenues among the individual investors using self-assessment test. The study was based on primary sources of data which were collected by distribution of a close ended questionnaire. The data were analyzed using percentage and chi-square test with the help of statistical software. There was large number of investment opportunities available. The study was primarily focussed on how the salaried peoples manage their investments ?

**Basabi Deb** (2013)[2] found that India had achieved a significant growth in the insurance sector offering the market more choice, better service, quicker settlement,

tighter regulations and greater awareness. The research has carried out a research project on the specific parameters based on the purchasing decision of the consumers, the customer-orientated accessibility and promptness of services including more returns on investment, tax savings as well as life coverage, which tends to lead a company acquiring the top rank with a huge market share. The buying behavior of customers in respect of Life insurance products in general was initiated by number of factors viz. psycho graphical, economical, social, politico legal and demographical. The list is not exhaustive but it is adequate to have the deep understanding of the factors influencing the decision. This research analyzed and rated all the life insurance companies by analyzing certain variables, the clients' perception, and purchase behavior and consumer awareness about the Life Insurance industry and to establish the factors affecting the choice of investors for choosing a life insurance policy in Guwahati.

**Subhashree Nayak** (2013)[3] is of the opinion that saving is an important macroeconomic variable to be studied under the purview of the economic arena on an individual as well as household basis. In a country like India, the income standard is almost uncertain and leads to more consumption rather than saving which has always been a central problem. If the saving is low, then the investment will also be low leading to low capital formation. This study analyzed the determinants and patterns of saving behaviour in rural household of western Odisha. The determinants and patterns of saving differ from rural to urban region. In rural areas, the marginal propensity to consume is more rather than the marginal propensity to save. The study is conducted through primary survey with 300 households drawing a sample from rural villages of Sundergarh district of Odisha. These 300 households from Sundergarh district are selected and a cross-sectional primary data is collected by personal interview method. The determinants of saving are analyzed empirically by a linear regression method. The income, level of expenditure, consumption pattern and saving behaviour is taken as the criteria for drawing the samples. The present study reveals that the APC and MPC of the rural households varies in terms of the distribution of income and occupation, that is, the lowest income groups (the agricultural labours and the non-agricultural labours) have the highest marginal propensity to consume which leads to lowest marginal propensity to save as compared to the other occupational groups. The study finds that most of the rural households have low educational status which is resulting in less awareness of the people towards the benefits of saving. They are even careless towards their health standard as the consumption of local liquor is very prominent in these households which in a way or the other deteriorating the health as well as the financial condition of these households.

## Statement of the Problem

The development of any economy depends on healthy savings and proper allocation of capital for the developmental activities of any country. The reduction

of disposable income or increase in per-capita income will contribute to savings. The avenues of investment and the investors' opinion based on their preferences vary from person to person. Liquidity and safety play a major role in the investment decision; tax exemption and other factors are also taken into consideration. Apart from the above factors, there are demographic factors which influence the decision on investment. This article discusses the factors which affect the investment behavior of individuals in the city of Vellore.

## Objective

To study and analyse the preference of the individual investors' investment behaviour in Vellore City.

## Methodology

### Type of Data

The data required for the study are primary in nature. The primary data have been collected by making use of a structured questionnaire.

### Area of Study

The present study is confined to the investors of Vellore city.

### Sample Design

By adopting convenient sampling, 107 customers have been selected.

### Framework of Analysis

The collected data have been analysed by making use of Friedman test, Garratt ranking and Factor analysis.

### Analysis and Interpretation

From Table 1 it is inferred that

- Most of them reside at the urban area
- Majority of the investors reside at their own house
- Most of the investors have two earning members
- The age of most of the investors ranges between 26 and 30 years

- Majority of the investors are married
- Majority of investors are professionally qualified
- Majority of the investors belong to middle class
- Majority of the investors are from nuclear families

| Variables | Particulars | Frequency | Percentage |
|---|---|---|---|
| Gender | Male | 54 | 50.5 |
| | Female | 53 | 49.5 |
| Domicile | Rural | 36 | 33.6 |
| | Urban | 43 | 40.2 |
| | Semi-urban | 28 | 26.2 |
| Type of Residence | Own | 63 | 58.9 |
| | Rented | 44 | 41.1 |
| Education | Upto Schooling | 15 | 14.0 |
| | UG | 30 | 28.0 |
| | PG | 30 | 28.0 |
| Earning Members | One | 19 | 17.8 |
| | Two | 49 | 45.8 |
| | More than Two | 39 | 36.4 |
| Age | Below 25 | 25 | 23.4 |
| | 26 - 30 | 33 | 30.8 |
| | 31 - 35 | 29 | 27.1 |
| | 36 - 40 | 8 | 7.5 |
| | 41 and above | 12 | 11.2 |
| Marital Status | Married | 57 | 53.34 |
| | Unmarried | 50 | 46.70 |
| Family size | Two | 10 | 9.3 |
| | Three | 26 | 24.3 |
| | Four | 36 | 33.6 |
| | More than Four | 35 | 32.7 |
| Occupation | Agriculture | 16 | 15.0 |
| | Business | 20 | 18.7 |
| | Professional | 39 | 36.4 |
| | Employment - Govt | 14 | 13.1 |
| | Employment - Pvt | 18 | 16.8 |
| Family Type | Joint | 33 | 30.8 |
| | Nuclear | 74 | 69.2 |

**Table 1.** Demographic Profile

**Friedman Test**

To find out the important sources of information considered by an investor before investments, Friedman rank test is employed.

| Sources of Information | Mean Rank | Rank |
|---|---|---|
| Print Media - News papers | 3.32 | 5 |
| Electronic Media - TV | 3.95 | 2 |
| Internet | 4.59 | 1 |
| Financial Advisors | 3.54 | 4 |
| Friends & Peer Investors | 3.76 | 3 |
| Own Analysis | 1.84 | 6 |

**Table 2.** Friedman Test

The result of Friedman rank test discloses that the majority of investors make use of Internet for mobilizing investment related information followed by watching television, consulting with friends and peer investors, etc.

The research of Garrett ranking reveals that respondents prefer to invest in savings account followed by our traditional investment Gold and Silver, Fixed deposit account and the like.

**Factor Analysis**

To ascertain the investors' attitude before investment, at the time of investment, and post investment, Factor analysis is employed.

All factor loadings are 0.5 and above, showing good convergent validity. The constructs are, therefore, uni-dimensional and factorials distinct, and all items used to operationalize a construct lead on to a single factor which has been grouped into three sets of factors. The result of factor analysis discloses that investors, before making investment, search for various investment options followed by seeking intermediaries' advice and prefer to invest based on transaction cost and the like. At the time of investment, the investors ascertain the performance of investments, undertakes the responsibility for their investments, prefers to diversify their investments, etc. Similarly, during the post investment scenario, investors are of the opinion that they will retain their investments till a need arises, wish to make more investments in the same avenue if they receive the expected return from their investments, and agree that they may switch over to other investment sources, when a need arises.

| SNo | Factors | Rank | | | | | | | | | | No of Respondents | Total Scores | Mean Scores | Rank Rank |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | | | | |
| 1 | Savings A/c in Banks | 43 | 43 | 21 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 107 | 7923 | 74.05 | I |
| 2 | FD A/c in Banks | 22 | 21 | 43 | 0 | 0 | 21 | 0 | 0 | 0 | 0 | 107 | 7055 | 65.93 | III |
| 3 | Govt. Securities | 0 | 0 | 22 | 43 | 21 | 0 | 21 | 0 | 0 | 0 | 107 | 5918 | 55.31 | IV |
| 4 | Corporate Bonds | 0 | 0 | 0 | 0 | 22 | 43 | 21 | 0 | 21 | 0 | 107 | 4763 | 44.51 | VII |
| 5 | Insurance | 0 | 21 | 0 | 0 | 22 | 21 | 22 | 21 | 0 | 0 | 107 | 5388 | 50.36 | VI |
| 6 | Real Estates | 0 | 21 | 0 | 0 | 21 | 22 | 43 | 0 | 0 | 0 | 107 | 5509 | 51.49 | V |
| 7 | Commodities | 0 | 0 | 0 | 0 | 21 | 0 | 0 | 21 | 22 | 43 | 107 | 3367 | 31.74 | IX |
| 8 | Shares and Mutual Funds | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 62 | 21 | 0 | 107 | 42.53 | 39.75 | VIII |
| 9 | Chit Funds | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 43 | 64 | 107 | 2506 | 23.42 | X |
| 10 | Gold & Silver | 42 | 22 | 21 | 22 | 0 | 0 | 0 | 0 | 0 | 0 | 107 | 7626 | 71.27 | II |

**Table 3.** Garrett Tanking

| | | | |
|---|---|---|---|
| I search for investment options | 0.855 | | |
| I rely on intermediaries for making investments | 0.851 | | |
| I prefer investment based on low transaction cost | 0.829 | | |
| I discuss with my friends, colleagues, family members before I decided on my investments | 0.746 | | |
| My investments are always tenure based | 0.588 | | |
| I watch the performance of investment | | 0.783 | |
| I take responsibility for the investments made | | 0.689 | |
| My choice of investments are be of various avenues | | 0.688 | |
| My investments are diversified | | 0.671 | |
| My investments will be in equal ratio for all avenues | | 0.543 | |
| My investment will be the last resort during contingency | | | 0.801 |
| I make more investments in the same avenue if my objectives are fulfilled | | | 0.799 |
| I analyse my investments and switch to other(s) when I find it appropriate | | | 0.735 |
| I consider using investments for social aspect needs | | | 0.727 |
| I don't consider switching when my investment objectives are met | | | 0.668 |

**Table 4.** Factor Analysis

## Suggestion

The findings of the study present some suggestions. The study has a direct bearing on the market for financial products such as Savings account in banks, Fixed Deposit account in banks, Government Securities, Corporate Bonds, Insurance policies, Real estates, Commodities, Shares & Mutual Funds, Chit Funds and Gold & Silver. Therefore, it may be of superior interest to policy makers and regulatory authorities concerned with financial market. The regulatory bodies can protect the interests of the new investors on the basis of the pattern of their investing. The following suggestions may be worth considering in this respect:

1. It is suggested to the investors that, instead of keeping a long-term investment, their time horizon should depend on their objectives and types of Investment Avenue.

2. Instead of making wrong decisions concerning investment, it is advisable that the investors should take help from the financial planners.

3. Insurance is assurance and not investment. So, it is suggested to the investors that, instead of buying high premium charging policies, they should invest in

pure protection plans as the premium is less and the surplus can be capitalized elsewhere and the return can be earned.

4. It has also been suggested that investors are making their investments as the last resort and many a time they are found to have made erroneous investments. So, instead of making the last-minute rush, investors must plan for their investments from the beginning stage of the financial year.

5. Now-a-days the return on various investments are based on market situation; so, it is advisable that the investors should keep on upgrading themselves with new guidelines and changes in terms and conditions.

6. It is not just enough to know the investment avenues where the investors have invested, but be aware of the overall investment avenues also. This way the investors can make necessary changes for keeping their portfolio profitable.

7. SEBI has made changes in the rules for portfolio management service providers and users, as the minimum amount required for Portfolio Management Service is high and fees are also quite higher, as compared to the previous rules. Therefore, it is suggested to the authorities to reframe the rules regarding Portfolio Management Service so that more investors can opt for the service.

8. It is suggested to the investors that at-least the equity portion of their portfolio must be reviewed regularly so that if stock is not performing, then necessary changes can be made.

## Conclusion

This research paper shows that education of investors is immensely important for the present-day investors in Vellore. Investors, before making investments, need to collect investment related information from the internet and consult with friends, peers and investment experts before making investments. The majority of the investors prefer to invest in savings account followed by Gold and Silver, Fixed deposit account and the like. The outcome of the research shows that most of the investors prefer bank deposits followed by investment in gold & silver investment in the study area.

## References

1. Palanivelu V R and Chandrakumar K (2013), A Study on Preferred Investment Avenues among Salaried People with Reference to Namakkal Taluk, Tamil Nadu, India, International Conference on Business, Economics, and Accounting, The 2013 IBEA Proceedings, pp. 1 - 12.

2. Basabi Deb (2013), Consumer Preference in Life Insurance - A Case Study of Guwahati, *Indian Journals of Applied Research*, Volume 3, Issue 2, pp 1 - 5.

3. SubhashreeNayak (2013), Determinants and Pattern of Saving Behaviour in Rural Households of Western Odisha, Report of Major Research Project, Department of Humanities and Social Sciences, National Institute of Technology, Rourkela, pp 14 - 19.

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# A Study on Consumer Behaviour towards Home Appliances with Reference to Vellore District

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**Abstract**

In the present study, the researcher deals with the consumer behaviour. In today's scenario, there are many manufacturers enter into consumer durable market. This makes the consumer to change their behaviour. It may change according to types of brand, price, income level, family size etc. This makes this study more important. The consumers are getting into problem while selecting a product and take decisions. The Vellore city is famous for fort. The Vellore city situated in the midst of Vellore District. The purchasing power is also considerably high. They are capable of spending more money on basic requirements as well as luxurious goods. The researcher is a native of Vellore and as such she has a very good opportunity to know most of the customers who are using home appliances like washing machine and Refrigerators. The study is based on primary data and secondary data, Questionnaire used in this study. The questions were based on the objectives of the study and were finalized after making preliminary discussion with the concerned people. A schedule for consumers was prepared. The growing middle class population is largely emphasizing on consumer electronic products that are more convenient to use and more efficient. Today there are number of brands available in the market and they differ in price, quality, capacity, type etc. In the present technological era, it can be easily said that all middle class people are also using washing machine and refrigerator to replacing the human resources. By considering this situation consumer durable producers have come up with different names. But consumers prefer to purchase their brands due to various

reasons. It is obvious that the quality, price, advertisement brand name, dealers network and after sales service together decide the purchase. So the manufacturers shall pay special attention to the above factors and to the problems revealed by the customers. If these things have been seriously considered by manufacturer of washing machine and refrigerator, their business will grow up and they can enjoy with good amount of good will. To rightly say, yesterday's luxuries are today's necessities. Hence in this digital world, washing machine and refrigerators is no longer a luxury item.

**Keywords:** Consumer Behaviour; Home Appliances; Refrigerator, Washing Machine.

## Introduction

The burgeoning consumer electronics market in India presents an attractive opportunity to manufacturers. Most of the global corporations are looking at India as regional hub for manufacturing and sales to cater to not only Indian market, but SAARC and Middle East & African markets as well. Government of India's recent *Make In India* initiative has provided fresh impetus to this sector. In this report, we seek to provide an insight into India's consumer electronics (TV, Air Conditioners, refrigerators, washing machines) market. The domestic consumer electronics and durable sector has witnessed a substantial growth over the last few years.

Though for decades together marketers have regarded *customer* as the king and evolved all the activities to satisfy him or her, the concept is gaining more momentum and importance today The primary work of the business in the olden days was to concentrate only in the production areas. But the trend today is totally different as the importance goes on with marketing production. In the competitive world of business, without paying importance on marketing, the business will never be successful.

This can be largely attributed to the prevailing market situation. Not only has competition become intense but over and above with the market being flooded with many products, the challenge before the marketer is to understand the diversity of consumer behaviour and offer goods/services accordingly. Today the company image is built and known by its customers.

In the majority of markets, however, buyers differ enormously in terms of their buying dynamics. The task faced by the marketing strategist in coming to terms with these differences is complex. In consumer markets, for example, not only do buyers typically differ in terms of their age, income, educational levels and geographical

location, but more fundamentally in terms of their personality, their lifestyles and their expectations.

## Concept of Consumer Behaviour

One *Official* definition of consumer behaviour is *The study of individuals, groups or organizations and the processes they use to select, secure, use and dispose of products, services, experiences or ideas to satisfy needs and the impacts that these processes have on the consumer and society*.

Consumer behaviour is defined variedly the Dictionary of marketing and advertising defines consumer behaviour as *observable activities chosen to maximize satisfaction through the attainment of retail outlet, preference for particular brands and so on*.

Consumer buying behaviour refers to the buying behaviours of final consumer - individual and households who buy goods and services for personal consumption. All of these final consumers combined makes up the consumer market.

Consumers made many buying decisions every day. Most large companies research consumer-buying decisions in great detail to answer questions about.

- Who buys products or services?
- How do they buy products or services?
- Where do they buy them?
- How often do they buy them?
- When do they buy them?
- Why do they buy them and how often do they use them?

These questions will help in understanding better what factors influence the decisions making process of the consumers. The decision making process identifies the number of people who believed in this process and ascribed a role to them - like the user, decider, influencer and buyer.

A number of reasons make the study of consumer behaviour relevant for effective marketing management as mentioned below.

1. Consumers do not always act or react as the theory would suggest
2. Consumer preferences are changing and become highly diversified.

3. Consumer research has vividly pointed out that customers dislike using identical products and prefers differentiated products.
4. Meeting of special needs of customers requirement market segmentation
5. Rapid introduction of new products with technological advancement has made the job of studying consumer behaviour more imperative.
6. Consumer behaviour can be used to sell products that might not sell easily.

Marketing of consumer durables faces the following challenges.

1. Consumer durables are priced rather high in relation to disposal income.
2. In case of FMCG's it is easer to create product differentiation. Which is not so easy to achieve with durables
3. Setting up a distribution network in areas with population of less than one lakh is challenging, as the volumes are unviable.
4. Creating an after sale service support structure is very expensive and pushes up the price of the product.
5. The diversity of language and culture developing communication strategies that appeal to the whole rural India is rather difficult.

Everybody in this world is a consumer. Consumers are buying and consuming incredible variety of goods and services. Customer is a person in whom a critical awareness of his role as a shopper, user and citizen needs to be aroused. He may be an individual, or an institution belonging to higher, medium or lower income group.

Likewise he may a ruralite, urbanite or is a member of labour force, service, and administrative or business class. The problems of consumers differ from country to country, state-to-state, etc.

Now it is recognized all over the world that the consumer is sovereign, he is the king, he is always right. The seller's market is giving place to the consumers besides running his business in a more profitable and efficient manner.

Attitude is an important variable in human behaviour. It refers to the feelings, beliefs, action, and tendencies towards certain objects. It is associated in the minds of human beings and as a result attitude becomes multidimensional and complex. The most important source of acquiring attitudes is direct experience with the object, association, family background, neighbour-hood, economic, social status and mass communication.

The consumer is always interested to know the product, price, place and promotion. The buyer behaviour is psychological. Social and physical behaviour of potential customer, as they evaluate purchase, consume and tell others about the product utility, durability and services.

Alfred Marshall suggests an economic model to the consumer behaviour, according to him the factors such as personal income, size of the family, source of other income, savings, liquidity and credit are affecting the buyers behaviour.

## An Overview of Market

### Refrigerator Market

The refrigerator market in India has been growing at a level of 11.75 % over the last four year. The Refrigerator market size is estimated to be 2.4 million units (2000 - 2001) of this, whereas the frost free refrigerator segment has de-grown by 6.9 percent, the direct cool refrigerator segment has de-grown by 3.4 percent over the previous year. At 0.34 millions units, frost-free refrigerators accounted for 14.5 percent of total refrigerator sales in the year 2000-2001. Major players in the Indian refrigerator market are Whirlpool, Kelvinator, Godrej, Videocon, BPL, LG and Samsung.

Real value of refrigeration for food preservation is not much of a felt need of Indian people who eat freshly cooked food at every meal, and that too without any packed inputs what so ever. In that sense market's evolution remains tied to Indian eating habits. In the US, when frozen foods occupy huge amounts of space, frost-free refrigerators are quite popular. But in India, things are different.

Companies today are trying to make products affordable to practically every household whatever the income level. Companies in the refrigerator segment are trying to play the price point game. Price is an important criterion in rural markets and companies such as Godrej - GE is trying to boost sales through consumer financing schemes in conjunction with countrywide finance.

As on 2013. india's Refrigerator market estimated at Rs. 2750 Cr. is catered mainly by 10 brands. The annual capacity is estimated at around 4.15 million units is running head of demand of 1.5 millions. The market shares of the major players are as follows:

| | |
|---|---|
| Godrej | 30% |
| Videocon | 13% |
| Kelvinator | 12% |
| Allwyn | 10% |

| | |
|---|---|
| Voltas | 5% |
| Whirlpool | 27% |
| Daewoo | 1% |
| L.G | 1% |
| Others | 1% |

**Washing Machine Market**

Washing market in India is estimated to be around one million units in year 2000-2001. Major players in the washing machine market are Videocon, Whirlpool, LG, BPL, Godrej, Electrolux and IFB. The India washing market increased with a CAGR of 22.24 % from 2009-14 and it is expected to grow more in upcoming years.

Some of the major players in the category of washing machine market are LG, Samsung, whirlpool, Videocon, IFB, and Onida. LG, Videocon and Samsung continue to dominate the overall washing machine market. With regards to zone, the northern part of India has largest share of the market, followed by the southern region. North India prefers semi automatic machines whereas in South India the fully automatic ones are more preferred.

An in-house research survey by Godrej revealed that after refrigerators the two most important big-ticket household appliances in India are washing machines and cooking systems. Now companies are successfully moving towards mini-metros and small towns in selling the concept of washing machine companies such as videocon who were selling their product in metros, mini-metros and A-class cities felt the need of washing machines in small towns. At present, BPL is the largest player in consumer electronics and home appliances in India. Now companies have to match the global efficiency standards and have to be innovative to satisfy consumers.

## Statement of the Problem

In the present study, the researcher deals with the consumer behaviour. In today's scenario, there are many manufacturers enter into consumer durable market. This makes the consumer to change their behaviour. It may change according to types of brand, price, income level, family size etc. This makes this study more important. The consumers are getting into problem while selecting a product and take decisions.

## Objectives of the Study

The following are the broad objectives of the study.

1. To find out the preferred brands of washing machine and refrigerator.

2. To study the level of satisfaction among the users.

3. To identify the factors influencing the purchase of home appliances.

4. To determine the decision maker of home appliances.

## Scope of the Study

Now-a-days consumer durable markets have increased because the necessities of the people have increased. To reduce the physical strain, to maintain status, non-availability of reliable servant, makes the consumers to buy the home appliances like washing machine, refrigerators, etc. Besides that there is a substantial demand in the country and also has a greater demand in foreign countries.

For the present study, the researcher has covered the Vellore city only. Vellore is the place where many home appliance shops are prevailing. The researcher has investigated the consumer attitude towards the use of home appliances.

## Significance of the Study

The Vellore city is famous for fort. The Vellore city situated in the midst of Vellore District. The purchasing power is also considerably high. They are capable of spending more money on basic requirements as well as luxurious goods. The researcher is a native of Vellore and as such she has a very good opportunity to know most of the customers who are using home appliances like washing machine and Refrigerators.

## Hypotheses

The analysis of the study has been made with the following hypotheses.

1. There is no relation between the literacy level and the influencing factors for the purchase of Home Appliances.

2. Elders in the family strongly influence in decision making process of Home Appliances.

3. Majority of the Educated Customers go for the Cash Purchase System.

4. There is a relationship between the age of the consumers and their satisfactory level.

## Research Design & Methodology

The following methodology is adopted for the purpose of the study.

## Sample Design

The main study centers on the consumers. Having considered the indefinite universe on the time at the disposal of the researcher, it was decided to adopt the convenient sampling technique. The sample selected was 90 in case of consumers.

## Research Instrument

The study is based on primary data and secondary data, Questionnaire used in this study. The questions were based on the objectives of the study and were finalized after making preliminary discussion with the concerned people. A schedule for consumers was prepared.

## Collection of Data

The researcher had a stimulating experience in collecting data. Most of the consumers do not come out openly. The researcher had to use all tactics to get information from the consumers, most of the consumers had some reservation in their mind and they did not come out openly. However within these limitations the researcher tried her best to collect maximum information.

## Analysis of Data

The data collected were arranged in a proper sequence and then these were tabulated. The primary Data collected through schedule were analyzed to highlight all aspects of the study.

The researcher has applied the following statistical tools for analysis. They are

1. Tables.
2. Diagrams
3. Percentage analysis
4. Chi-square test.

## Review of Literature

P. Janaki1 and P. Santhi (2013) studied *Marketing Stimuli in Purchase of Home Appliances from Customer Perspectives* The finding of the study included that education and income of the respondents are the two socio-economic variables which have significant association in all the stages which the buyers undergo while purchasing home appliances.

Shiau Pei Shih, Szuchiang Yu, and Hui Chin Tseng,(2015) *The Study of Consumers' Buying Behavior and Consumer Satisfaction in Beverages Industry in Tainan, Taiwan*. The result of the analysis reveals a positive correlation between product attribute and consumer purchase decision.

A. Abdul Brosekhan and C. Muthu Velayutham, made an Empirical Study on Consumers Buying Behaviour towards Selected Home Appliance Products in Ramanathapuram. The study revealed that lifestyle characteristics have a great impact on the consumer buying behavior of the clusters. In a consumption environment, a person chooses a product or a brand, which seems to possess a maximum possibility of the definition or elaboration of his life style identity.

Dr Neha Sharm, made a Empirical Study of Consumer Buying Behaviour Regarding Home Appliances With Special Reference To Jaipur City, Understanding the consumer psychology, thus, becomes the key factor that can decide the success or failure of a marketing strategy. it is revealed from the study that consumer behaviour depends on a no. of variables such as demographic variables, personality, needs and buying motives , family life cycle stage, family buying roles and the factors included in the choice criteria (e.g. technology, brand image, price, style and after sales services).

## Profiles of Companies under Study

### LG Electronics

LG group had entered the Indian market in April 1997, with three products, namely Colour Televisions, Refrigerators and Washing Machines, South Korean white goods giant LG electronics have begun exports from its Indian manufacturing base.

LG Electronics caused a stir in the domestic premium home appliance market with the release of its front - loading washing machine, the TROMM. The TROMM followed LG Electronics to seize the leading position in the domestic washing machine market.

By using linear compressors, LG Electronics produces world-class refrigerators that

are both powerful and quiet. LG electronics is marketing various types of refrigerators specially designed for unique national cultures.

In 2002 the company sold 69000 washing machines. The company reports to have grown by 192 % in terms of turnover during the first four months of the year the best performance Indicator was that the company's growth in collection terms was 211 % market share had also gone up from 5.4 % to 12.25 %, in semi automatic washing machine segment, up from 3.6 % to 4.3 % in the fully automatic washing machine segment.

LG sells in 1800 towns and cities with a population of 1 - lakh persons and above. It also intends to reach as many as 50000 plus towns. The company has 40 distributors and 2000 dealers and plans to increase the number to 100 distributors and 3000 dealers. LG also does not allow much credit to the dealers, and also incentives to the dealers to make intelligent demand projections and move the products fast of the shelves.

The $73 - BILLION LG group of South Korea has decided to invest Rs 1025 crores in India in two phases over the next two years. So far it has invested $50 million in its operation in India. The company will invest Rs.525 crore in the second phase as part of its expansion project by 2000.

**Whirlpool**

Whirlpool is an US based company formed in India in 1993.

Whirlpool is the single largest consumer durable brand in the world has a unique story. Whirlpool Corporation celebrates its 90th anniversary this year. Here is a brief sketch of the major forces that have shaped the company's maturation from a pioneering producer of electric motor driver washing machines in the early 20th century to its current position of leadership in the major home appliance global industry.

The whirlpool brand went from no brand awareness to claim a 85 % awareness today and a market share of 25 %. In less than three years, the whirlpool brand had become a household name and has today emerged as a leader in the domestic refrigerator market. The brand has the distinction of being the most preferred brand in the washing machine category with market leadership in the segment it pioneered worldwide - the automatic washing machine.

In the year 1996-97, it invested Rs.220 crore on two hi-tech plants- A washing machine plant at Shirwal (3,00,000 units per annum capacity) and third refrigerator facility at Mohili (5,00,000 units per annum capacity).

In September 1998, they proposed new sales and marketing structure. Now it has same sales for both refrigerator and washing machine. In whirlpool the sales function is looked after by two V.Ps who directly report to the M.D. This leaves the marketing department free to concentrate on the long term strategic planning.

Whirlpool has a framework of 6000 direct dealers and 6000 distributors spanning across 2500 cities and towns.

It has taken up the consumer financing in conjunction with country wide finance and 46 % of its 2002-03 sales came through the finance schemes in Urban levels and is expected to be more in coming years.

They have decided to address different consumer categories on the basis of need, price, and features. Simultaneously, they are making sure that the brand remains, to emphasize the quality that is related with reliability and durability.

**Samsung**

The Samsung Company manufactures domestic products like washing machines, Microwave ovens, refrigerators and other home appliances.

It currently has manufacturing facilities at Noida, U.P and it has potential to manufacture 1,00,000 different types of washing machines in a year.

The company sells through both regular dealer and company owned dealer points. The company plans to expand its distribution network and increase the retain points to 2400 from 1500. The thrust is likely to be in the grade B and C cities and the company hopes to use the distribution claim as a vehicle to piggy-ride the frost - free models.

**Videocon**

Videocon was the first company in India to introduce washing machines in the year 1987. Videocon company started producing refrigerators in the year 1991 in India.

The Indian promoters holding 156499971 shares and it represent 70.82 % of the whole value. Over the years, it has remained market leader, with an overall market share of 35 % by adopting flexible strategies.

## Analysis and Interpretation

### Age Wise Classification

In order to study the consumer attitude towards the use of refrigerator and washing machine, the researcher has classified the buyers according to the age group. The buyers age group is classified and tabulated has under.

| S No. | Age Class | No. of Respondents | Percentage |
|---|---|---|---|
| 1 | 21 to 30 | 18 | 20 |
| 2 | 31 to 40 | 33 | 37 |
| 3 | 41 and above | 39 | 43 |
| Total | | 90 | 100 |

**Table 1.** Age-wise Classification

From the above table it is clear that 20 % of the buyers are falling in the age group of 21 -30 years , 37 % of the buyers are in between 31 and 40 years, 43 % of the buyers are coming under age group of above 41 years.

It is inferred that the majority of the home appliance users are in the age group of above 40 years.

### Educational Qualification

Education is very important one. Education is very useful to know about the product, design, style, durability colour, etc. The researcher has investigated the educational qualification of the buyers and is shown in the following table.

| S No. | Particulars | No. of Respondents | Percentage |
|---|---|---|---|
| 1 | Elementary | 16 | 18 |
| 2 | Higher Secondary | 36 | 40 |
| 3 | Graduate | 12 | 13 |
| 4 | Post graduate | 17 | 19 |
| 5 | Others (professional graduation) | 9 | 10 |
| Total | | 90 | 100 |

**Table 2.** Educational Qualification

It is apparent from the table that 18 % of the respondents have obtained elementary education. 40 % of the respondents have studied upto high school, 13 % of the respondents are graduates, 19 % of the respondents are post graduates, and the remaining 10 % of the respondents are professionally qualified.

**Occupation**

The following table shows the occupation of home appliance users.

| S No. | Occupation | No. of Respondents | Percentage |
|---|---|---|---|
| 1 | Government employees | 15 | 17 |
| 2 | Business people | 9 | 10 |
| 3 | Private employees | 22 | 24 |
| 4 | House wife | 30 | 33 |
| 5 | Others (Professionals) | 14 | 16 |
| Total | | 90 | 100 |

**Table 3.** Occupation

From the above table it is understood that 33 % of the respondents are housewives, 24 % of the respondents are private employees, 16 % of the respondents are government employees, 10 % of the respondents are business people and 16 % of the respondents are professionally qualified persons, coming under other category.

**Monthly Income**

Income is the important factor deciding the buyer behaviour. The buying behaviour is also differing from person to person based on their income. When the income is increased automatically it produce some changes. The researcher has evaluated the fact and it is shown in the following table.

| S No. | Income Level (in Rs.) | No. of Respondents | Percentage |
|---|---|---|---|
| 1 | Below 5.000 | – | – |
| 2 | 5,001 to 10,000 | 5 | 5 |
| 3 | 10,001 to 15,000 | 33 | 37 |
| 4 | 15,001 to 20,000 | 26 | 29 |
| 5 | Above 20,000 | 26 | 29 |
| Total | | 90 | 100 |

**Table 4.** Monthly Income

The above table clearly shows that 37 % of the respondents fall in the income group from Rs.10001, 15,000. 29 % of the respondents are in the income group of Rs. 15001 to Rs.20.000. 29 % of the respondents are falling in the income group of above Rs. 20,000.

It is evident from the fact that most (37 %) of the respondents are having the income of Rs.10,001 to 15,000 per month. It is also represented through chart.

**Brand Preference**

The brand refers to the symbol or a trademark for a product. In home appliances, there are certain familiar brands like LG, Videocon, Samsung, Whirlpool, Panasonic, etc. The consumers prefers according to their taste, design, colour etc. Therefore the researcher has investigated the brand preference of the home appliances like refrigerator and washing machine.

| S No. | Income Level (in Rs.) | No. of Respondents | Percentage |
|---|---|---|---|
| 1 | LG | 18 | 20 |
| 2 | Videocon | 16 | 18 |
| 3 | Samsung | 11 | 12 |
| 4 | Whirlpool | 27 | 30 |
| 5 | Others | 18 | 20 |
| Total | | 90 | 100 |

**Table 5.** Brand Preference of Refrigerator

It is made clear from the above table that 30 % of the respondents are preferring Whirlpool refrigerator 20 % of the respondents are preferring LG, 18 % of the respondents are preferring Videocon brand. Rest of the 20 % respondents, preferring other brands like Panasonic, IFB.

| S No. | Income Level (in Rs.) | No. of Respondents | Percentage |
|---|---|---|---|
| 1 | LG | 9 | 10 |
| 2 | Videocon | 21 | 23 |
| 3 | Samsung | 10 | 11 |
| 4 | Whirlpool | 42 | 47 |
| 5 | Others | 8 | 9 |
| Total | | 90 | 100 |

**Table 6.** Brand Preference of Washing Machine

From the above table, it is clear that 46.7 % of the respondents preferring Whirlpool washing machine. 23 % of the respondents preferring Videocon Wahsing Machines, 10 % of the respondent preferring LG products, 11 % of the respondents are preferring Samsung washing machine.

**Factors Influencing Purchase of Home Appliances**

The researcher has also investigated the factors influenced to buy the home appliances.

| S No. | Income Level (in Rs.) | No. of Respondents | Percentage |
|---|---|---|---|
| 1 | Brand | 27 | 30 |
| 2 | Quality | 23 | 26 |
| 3 | Price | 16 | 18 |
| 4 | Features | 13 | 14 |
| 5 | After sales services | 11 | 12 |
| Total | | 90 | 100 |

**Table 7.** Factors influencing Purchase of Home Appliances

From the above table, it is clear that 30 % of the respondent purchase their home appliances because of brand name, 25.6 % of the respondent, purchase the home appliances of the basis of quality of the home appliances. 17.8 % of the respondent, purchase their appliances on the basis of price of the durables. 14.4 % of the respondents purchase their product on the basis of feature of the product.

It is inferred that most of the respondents (30 %) purchase their on the basis of brand name. So the main factor influence to buy the home appliance is brand name, next quality of the product.

In order to test the effectiveness of the influencing factor, the researcher has formed a hypothesis that *There is no relation between the literacy level and the influencing factors for the purchase of home appliances*. To test the hypothesis the researcher made use chi-square test.

| S No. | Particulars | Below Higher Secondary | Above Higher Secondary | Total |
|---|---|---|---|---|
| 1 | Brand | 19 | 8 | 27 |
| 2 | Quality | 10 | 13 | 23 |
| 3 | Price | 9 | 7 | 16 |
| 4 | Features | 6 | 7 | 13 |
| 5 | After sales service | 8 | 3 | 11 |
| Total | | 52 | 38 | 90 |

Source: Primary Data

**Table 8.** Factors (Chi-square Table)

Significance level of chi-square = 0.05
Calculated value = 0.246

Calculated value of chi-square is more than the significance level. Therefore the hypothesis is rejected. Hence it is concluded that there is relationship between the literacy level and the influencing factors for the purchase of the home appliances.

**Source of the Product Awareness**

The researcher has also investigated the consumer's awareness about the home appliances such as washing machine and refrigerator, that is knowledge about the latest fashion, design, variety etc. The following table clearly reveals the awareness of the consumers about the home appliances.

| S No. | Particulars | No. of Respondents | Percentage |
|---|---|---|---|
| 1 | Friends | 12 | 12.9 |
| 2 | Relatives | 9 | 10.3 |
| 3 | Advertisement | 67 | 74.4 |
| 4 | Others | 2 | 2.2 |
| Total | | 90 | 100 |

**Table 9.** Sources of Product Awareness

It is understood from the above table that 74.4 % of the respondents are getting awareness about the home appliances through advertisement, 10.3 % of the respondents are getting awareness through their relatives. 12.9 % of the respondents are getting awareness through friends.

**Purchase Decision**

Generally, the consumer's purchase decision will be to buy the most preferred brand, but the two factors can come between the purchase intension and the purchase the decision. The first factor is the attitude of other. The second factor is unexpected situational factors. The consumer may form a purchase intention based on factor such as expected income, expected price and other things. However the expected income may change the purchase intention. The researcher has investigated the purchase decision of the consumers.

| S No. | Particulars | No. of Respondents | Percentage |
|---|---|---|---|
| 1 | Husband | 19 | 21 |
| 2 | Wife | 1 | 1 |
| 3 | Both | 43 | 48 |
| 4 | Elders in the Family | 27 | 30 |
| Total | | 90 | 100 |

**Table 10.** Purchase Decision

It is known from the analysis that 48 % of the respondents said that both husband and wife make decision for the purchase of home appliances. 30 % of the respondents said that elders in the family take decision for the purchase of the home appliances.

It is evident from the table that elders in the family for the purchase of the home appliances influence most of the respondents.

**Mode of Purchase**

The sellers may sell their products both on cash and credit. But the consumer purchases their appliances according to their convenient. Some consumers may prefer credit purchase. Some may prefer cash purchase. It will depend according to the income level and their loan repaying capacity. So the researcher also investigated customer's mode of purchase of home appliances. The following table shows the mode of purchase of the consumers.

| S No. | Particulars | No. of Respondents | Percentage |
|---|---|---|---|
| 1 | Cash | 60 | 66.7 |
| 2 | Instalement | 30 | 33.3 |
| Total | | 90 | 100 |

**Table 11.** Mode of Purchase

From the above table, it is clear that 66.7 % of the respondent purchase their appliances by cash purchase method. 33.3 % of the respondents purchase their home appliances by instalment.

It is evident from the above analysis that most of the respondents (66.7 %) prefer cash purchase only.

In order to test the mode of purchase of the home appliances, the researcher has framed the hypothesis as *majority of the educated customers go for the cash purchase system*.

| S No. | Particulars | Below Higher Secondary | Above Higher Secondary | Total |
|---|---|---|---|---|
| 1 | Cash | 28 | 32 | 60 |
| 2 | Instalment | 24 | 6 | 30 |
| Total | | 52 | 38 | 90 |

Source: Primary Data

**Table 12.** Factors (Chi-square Table)

Significance level of chi-square = 0.05
Calculated value = 0.003

The calculated value of chi-square is less than the significance level (0.05). Therefore hypothesis is proved. Hence most of the educated customers use to go for the cash purchase system.

**Level of Satisfaction**

The researcher has also extended her investigation to understand the level of satisfaction. The customer's satisfaction is relation to home appliances is summarized below.

| S No. | Particulars | No. of Respondents | Percentage |
|---|---|---|---|
| 1 | Satisfied | 74 | 82 |
| 2 | Dissatisfied | 2 | 2 |
| 3 | No Comment | 14 | 16 |
| Total | | 90 | 100 |

**Table 13.** Level of Satisfaction

It is understood from the above table that 82 % of the respondent are satisfied with their home appliances. 2 % of the respondent are dissatisfied about their product, 16 % of the respondents are not ready to give any comment about their satisfactory level.

It is evident from the fact that most (82.2 %) of the respondent are satisfied with their home appliances.

The researchers have made an attempt to study the hypothesis namely *There is a relationship between the age of the consumers and their satisfactory level*.

| S No. | Particulars | Below 40 | Above 40 | Total |
|---|---|---|---|---|
| 1 | Satisfied | 42 | 32 | 74 |
| 2 | Dissatisfied | 1 | 1 | 2 |
| 3 | No comment | 8 | 6 | 14 |
| Total | | 51 | 39 | 90 |

**Table 14.** Satisfactory Level (Chi-square Table)

Significance level of chi-square = 0.05
Calculated value = 0.003

**Recommending the Home Appliances to Others**

A satisfied customer is a valuable asset to any organization. The modern marketing management is mainly aimed at achieving customer's satisfaction. The researcher makes an attempt to know the after effect of purchasing and using the home appliances.

A word of mouth influence can play magic in expanding the market for any product. The result is presented in the following table.

| S No. | Particulars | No. of Respondents | Percentage |
|---|---|---|---|
| 1 | Yes | 68 | 76 |
| 2 | No | 4 | 4 |
| 3 | No comment | 18 | 20 |
| | Total | 90 | 100 |

**Table 15.** Recommending the Home Appliances to others

It is clear from the above table that 76 % of the respondents are ready to recommend the home appliances to others. Only 4 % of the respondents are not prepared to recommend the home appliances to others. 20 % of the respondents are not ready to give any comment about the recommendation.

It is inferred that the performance of the home appliances is upto the expectation of the majority of the sample design.

## Conclusion

The growing middle class population is largely emphasizing on consumer electronic products that are more convenient to use and more efficient. Today there are number of brands available in the market and they differ in price, quality, capacity, type etc. In the present technological era, it can be easily said that all middle class people are also using washing machine and refrigerator to replacing the human resources. By considering this situation consumer durable producers have come up with different names. But consumers prefer to purchase their brands due to various reasons. It is obvious that the quality, price, advertisement brand name, dealers network and after sales service together decide the purchase.

So the manufacturers shall pay special attention to the above factors and to the problems revealed by the customers. If these things have been seriously considered by manufacturer of washing machine and refrigerator, their business will grow up and they can enjoy with good amount of good will.

To rightly say, yesterday's luxuries are today's necessities. Hence in this digital world, washing machine and refrigerators is no longer a luxury item.

## References

1. Suja R. Nair, *Consumer behaviour in Indian perspective*, Himalaya publishing House, Bombay

2. Gupta C.B and Rajan Nair N, *Marketing Management*, Seventh edition 2002, Sultan Chand & Suns. Educational publishers. New Delhi.

3. Jerome Mccarthy E, William D. Perreault Jr. *Basic Marketing* Ninth edition, Universal Book Stall, New Delhi.

4. Philip Kotler, *Marketing Management*, Ninth edition, Prentice-Hall of India private Ltd, New Delhi, 1997.

5. Gupta S. L and Sumitra Pal, *Consumer Behaviour, an Indian perspective Text & Cases*, Edition 2002, Sultan Chand and Sons, New Delhi.

6. Aswattappa K, *Organizational Behaviour*, Himalaya publishing House, Bombay, 1998.

7. Sheetal Kapoor, *Understanding Buying Behaviour of Indian families*, New Century publications, New Delhi.

8. Mallikarjuna Reddy K, Marketing Strategy Linkages with Consumers Behaviour, *Indian Journal of marketing*, Vol. XXXII, March-April 2002.

9. Venkatrama Raju D, Saravanan S, A study on consumer behaviour in the marketing of a household appliance in Chennai city of Tamil Nadu State, *Indian Journal of Marketing*, Vol - XXXV, March 2005.

10. Sivakumar and Komathi S, Consumer Behaviour Towards Home Appliances an Exploratory Study with Reference to Pondichery Region, *Indian Journal of Marketing*, Vol.XXXIV, May 2004.

11. Selvaraj A and Mahendran A, Brand preference of washing machine. Role of factors and problems, *Indian Journal of Marketing*, Vol.XXXIII, October 2003.

12. Sivakumar N and Raghunatha Reddy D, Growth and Evaluation of washing machine industry in India, *Indian Journal of Marketing*, Vol.XXXV, March.

13. P. Janaki and P. Santhi, ”Marketing Stimuli in Purchase of Home Appliances from Customer Perspectives, *International Journal of Sales & Marketing Management Research and Development*, ISSN 2249-6939, Vol. 3, Issue 2, Jun 2013, 23-30.

14. Shiau Pei Shih, Szuchiang Yu and Hui Chin Tseng, *Journal of Economics, Business and Management*, Vol. 3, No. 3, March 2015.

15. A. Abdul Brosekhan and C. Muthu Velayutham, (2015), An Emprical Study on Consumers Buying Behaviour towards Selected Home Appliance Products in Ramanathapuram, *IOSR Journal of Business and Management*, e-ISSN : 2278-487X, p-ISSN : 2319-7668, PP 13-21 www.iosrjournals.org

16. Neha Sharm, A, Empirical Study Of Consumer Buying Behaviour Regarding Home Appliances With Special Reference To Jaipur City, *International Journal of Combined Research & Development*, eISSN:2321-225X; pISSN:2321-2241 Volume: 1; Issue: 4; August -2013.

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# Family-Work Conflict and Job Satisfaction

# - A Study with Reference to Information Technology Professionals

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**Abstract**

There are so many types of stress and among them one is known as *Family-Work Conflict* which is mostly neglected for the basic reason that this is personal in nature and not easily identifiable. Information Technology Professionals being advanced in all respect and moreover always busy in their virtual world do not find time to realize that they are facing such a conflict which will soon put them in difficulties not only in their work place but also inside the family, which will slowly reduce the satisfaction one possesses both by being in the job and in the family. Therefore, a humble attempt has been made by the researchers to find the relationship exist between family-work conflict and job satisfaction among the IT professionals working in Chennai and Bengaluru. For this, the researchers developed a tool to gather primary data from 300 respondents working in six major IT companies situated in both the said cities. Quota-cum-accidental sampling method was adopted. Pilot study was also conducted to finalise the tool. For the purpose of analysis, Frequencies, Chi-Square Test, Correlation, Students t-test and Factor Analysis are adopted. The suitable suggestions have been made for the management of family-work conflict and to increase job satisfaction among IT professionals.

**Keywords:** Work-family Conflict, stress, Job Satisfaction, IT professionals.

## Introduction

The present day world, which is said to be a world of revolution, is also a world of conflict. One finds stress everywhere, whether it be within the family, business organisation or enterprise or any other social and economic activity. Right from the time of birth till the last breath, an individual is invariably exposed to various conflicts. Thus, it is not surprising that interest in the issue has been rising with the advancement of the present century which has been called the *Age of Anxiety, Conflict and Stress*.

The researchers have observed that the conflict is identified in every one's life irrespective of age, sex, marital status, education level and designation. It is a common myth that conflicts come from one's profession or occupation or work-place only. The researchers have perceived that the roots of conflict is emanating from family and work place when the employee is not in a position to give due importance to both or fails to balance expectations of family and the expectations in the work place and more particilarly when the family related problems starts intervening in the work to which technically known as family-work interface. The family-work conflict brings its impact on Job Satisfaction of the employees.

## Need for the Present Study

It is perceived that the job with less conflict normally results in good amount of Job Satisfaction wherein interference of family related stresses into the work is either absent or comparatively lesser. But, all the occupations are not alike. Therefore, occupation is an important factor to be considered. In the same way it is also believed that the quantum of conflict is directly dependent on the type of family and the number of members in the family. It is a fact that the quantum of conflicts faced by the employees of Information Technology Industry is much more than the others connected to any other profession and occupation.

Therefore, the researchers had observed that Indian IT Professionals, in contrast to similar professionals in other parts of the world (where the single parent family or the nuclear-family system is a more common way of life) must be facing and confronting lot more pressures and conflicts in their attempts to meet the varying and contrasting demands of family and work roles. The pressures are likely to be high, primarily because of the Indian socio-cultural context, where the joint-family-structure and the extended family system, with its emotionally loaded familial bonds and close-knit character, is the dominant way of life. Hence, the researchers have found that the IT Professionals in India, about whom not enough data and information is generated and available, as interesting source materials for exploring and furnishing new insights into the problems of family-work-integration. Indian IT Professionals were considered an interesting

study material for one other reason also. It is a commonly known fact that the socio-cultural ethos in the sub-continent is quite different because of its strong social and family support system. In the face of industrialisation, modernisation, urbanisation, globalisation and growth in the standards of education and economy levels, rapid transformation is taking place in the social fabric and social structure of the nation. The typical joint-family structure, especially in urban areas and amongst the educated lot, is rapidly getting destroyed and substituted by nuclear and close single families.

In such a situation, how do IT Professionals in India, within this kind of family structure and social-context, respond to and cope with family-work-interface? Does this family-work conflict have a say in the level of Job Satisfaction? These are some very pertinent questions that triggered the interest and attention of the researchers to carry out such a study which will be helpful to IT Professionals, Employers, IT Industry and the society as a whole.

Hence, the researchers wish to explore the relationship of Family-Work Conflict with the Job Satisfaction of IT Professionals.

## Research Problem

The Information Technology Profession seems to be much attractive; one cannot deny the level of conflict experienced by its Professionals, particularly the Indian Information Technology Professionals. Their experience of conflict does not restrict to their profession alone but also affecting comparatively a lot in their personal lives also. Often they experience family-work conflict for the basic reason that though they seem to be comparatively wealthier most of the time they do not find time to think towards family or its members. It is within this experimental, theoretical and research based background framework that the researchers thought of examining the nature of interference of family related issues in the work environment of IT Professionals and its relationship with their job satisfaction - a strong and predictive factor of burnout.

Though many researches carried out earlier to study the stress among IT Professionals, many of them just attempted to prove only work role related stress in them. Few studies were done to measure the social as well as family stressors and many researches proved the interference of stress factors in the work as well as family. One study by the same researchers were enlightened about the interference of work related issues in the familiar environment. But none of the study took place so far by correlating family based stress factors' interference in to the work life and relating them with the Job Satisfaction levels of the respondents being IT Professionals. In short, the present study intends to explore the relationship of Family-Work Conflict with the job satisfaction of IT Professionals. This Research Problem has raised the following questions.

1. What are the levels of Family-Work Conflict and Job Satisfaction?

2. What is the relationship of demographic factors with family-work conflict and job satisfaction?

3. What is the relationship of Family-Work Conflict with the Job Satisfaction of IT Professionals?

## Important Concepts

### Family-Work Conflict

Family-Work Conflict is experienced when simultaneous pressures from family and work role are mutually incompatible. Family-Work Conflict refers to those problems arising out of interference of family demands in the work or professional life (Tripti Singh, Avantika Singh and Prabha Singh, 2007).[1]

### Family-work conflict vs. work-family conflict

Family-Work Conflict refers to those problems arising out of interference of family demands in to work life, whereas, Work-Family Conflict refers to those problems arising out of interference of work demands in to the family life (Yu-Ying Lu).[2]

### Job Satisfaction

Job satisfaction is an attitudinal concept central to work psychology (Bass and Barnett, 1972).[3] Bullock (1952)[4] defined job satisfaction as an attitude, which results from a balancing and summation of many likes and dislikes experienced in connection with one's job. Locke (1969)[5] defined job satisfaction as *a pleasurable or positive emotional state resulting from the appraisal of one's job values or job experience*. According to Wexley and Yukl (1977)[6] job satisfaction is the way an employee feels about his job. Ilies and Judge (2004)[7] have defined job satisfaction as a latent evaluative tendency of one's job that accounts for the co-variation between work stimuli and responses is manifested through discrete evaluative states during the working day.

Seybolt (1976)[8] supported the idea that job satisfaction is a function of the person-environment interaction. Although a number of factors (such as wages, opportunity for achievement and advancement, security, company, management, social aspects of job, communication and benefits) are related to the job satisfaction, it is the interaction among these factors rather than any one of them in isolation that accounts for job satisfaction.

In simple terms, Job Satisfaction is the way how people feel about their job and its various aspects. It has to do with the extent to which people like or dislike their job. That is why job satisfaction and job dissatisfaction can appear in any given work situation.

## Objectives of the Study

The main objective of the research study is to determine the relationship between the Family-Work Conflict and Job Satisfaction of IT Professionals. For this, the researchers have framed the following objectives.

1. To study the level of Family-Work Conflict and Job Satisfaction of IT Professionals.
2. To study the relationship of demographic factors with that of Family-Work Conflict and Job Satisfaction.
3. To identify the relationship of Family-Work Conflict with that of Job Satisfaction IT Professionals.

## Hypotheses

Based on the above objectives, the following hypotheses were framed.

1. There is no significant relationship between Demographic Factors and Family-Work Conflict and Job Satisfaction.
2. There is no significant relationship between Family-Work Conflict with that of Job Satisfaction.

## Review of Literature

As the researchers have tried for the first time to do a study exclusively on the interference of family related issues in to the work life, similar studies are not available. However, many researches had been done on the work-family conflict. Hence, a brief discussion on few of them as as follows.

Thushel Jayaweera A (2005)[9] has examined the impact of Work Family Conflict and Job Satisfaction and Individual's Passionate Desire to Develop through Management Development Opportunities. Survey was carried out among 132 managers in ten classified hotels in Sri Lanka. Findings of the study revealed that Work Family Conflict is negatively related with Individual's Passionate Desire to Develop through Management Development Opportunities. Work Family Conflict was found to have

a negative relationship with Job Satisfaction but Job Satisfaction was found to have a positive relationship with Individual's Passionate Desire to Develop through Management Development Opportunities.

Katherine J.C. Sang, Stephen G. Ison and Andrew R. J. Dainty (2009)[10] evidenced that those working within the construction industry are exposed to a number of stressors which potentially negatively impact the well-being, namely; long working hours, high workload, poor work-life balance, low sense of professional worth and lack of job security. Additionally there is some evidence architects may also be vulnerable to an erosion of professional status, low pay and limited scope to use their creative skills. The researchers explored the job satisfaction of architects who were employed during the study period within the UK. A questionnaire was used to elicit data from 110 practicing architects on their occupational well-being and work-life balance. The results of the study revealed that between 20 and 40 percent of respondents were dissatisfied with their rate of pay, practice management, promotion prospects, working hours and opportunity to use their abilities. Additionally the majority of respondents report some work-life balance difficulties and approximately one-third were considering leaving their current employer. The causes of poor well-being are associated with organisational factors rather than factors intrinsic to the work of an architect. Further analysis demonstrated that those who were self employed may experienced better occupational well-being.

Noryati Ngah, Aminah Ahmad and Maznah Baba (2009)[11] have tested a mediation model consisting of job satisfaction as the dependent variable, locus of control as the independent variable and work-family conflict as the mediator. Data were gathered from 159 single mother employees, aged 45 and below and having at least one child, using self-administered questionnaires. The data were analysed using correlation and multiple regression analyses. Results of correlation analysis revealed that locus of control was related to work-family conflict and job satisfaction and work-family conflict was related to job satisfaction. Results of a series of multiple regression analyses indicated that work-family conflict partially mediates the relationship between locus of control and job satisfaction. They suggested that during the screening process of potential recruits, employers should take into consideration locus of control as one of the important dispositional characteristics of candidates. Employers should look into the possibility of designing training programmes to assist employees in taking more control of events in their work situations. They concluded the study as *Single mother employees who believe that they are in control of the events that happen in their lives seem to be more satisfied with their jobs and seem to experience less work-family conflict*.

Xinyuan Zhao and Hailin Qu (2009)[12] investigated the effects of work-family conflict (WFC) on job and life satisfaction among hotel sales managers in China. Data were collected by a field survey on 121 sales managers in 26 hotels at the Pearl River

Delta in China. A hierarchical regression analysis by GLM - Multivariate was conducted to test the hypotheses. The results indicated that in contract to the study hypotheses, hotel sales managers' WIF (work interfering with family) had negative effects on job satisfaction but not life satisfaction, whereas FIW (family interfering with work) had negative effects on life satisfaction rather than job satisfaction. The results suggested the strategic role of family-friendly HR polices in hotel business and also remind potential limitations to the audience when implying the results in other hotels.

## Research Methodology

### Population

The researchers have targeted six major firms in the information technolology sector, namely,

1. Tata Consultancy Services (TCS)
2. Cognizant Technology Solutions (CTS)
3. Infosys
4. Wipro
5. HCL and
6. Microsoft Corporation India (Pvt.) Ltd.,

having offices both at two major cities (to have uniformity) namely Bengaluru (Karnataka) and Chennai (Tamilnadu) as the former is considered as the IT Hub of India and the later is equivalently having major IT firms. All categories of IT Company employees are included in the population.

## Sampling Design

### Sample

The researchers by adopting Quota Sampling method have selected twenty five employees from each of the six companies mentioned above in two cities constituting 300 respondents. The researchers have not differentiated respondents based on their designation. The researchers have personally visited the above mentioned IT Companies and the required data was collected from the IT Professionals who voluntarily came forward to respond to the questionnaire. Hence, the sampling technique adopted for this study is 'Quota Cum Accidental Sampling'.

**Pilot study**

A pilot study was carried out in all the six firms of both the cities. Three respondents in each firm were selected and the tool was administered to them. All the 36 respondents were promptly responded. Based on the pilot study, the researchers confirmed that no change is required in the questionnaire.

**Questionnaire**

The researchers have designed a questionnaire with the following three parts.

Part I - Personal Information;

Part II - Family-Work Conflict Scale
(Netemeyer, Boles and McMurrian)[13]; and

Part III - Job Satisfaction Questionnaire (Shailendra Singh)[14]

**Part I - Personal information**

This part of the questionnaire consists of questions relating to Demographic Factors and few other personal factors relevant for the study.

**Part - II Family-work conflict scale (FWC Scale)**

This part is to know the extent to which family demands interfere into work related obligations. For this purpose, the researchers have used the scale called Work-Family Conflict Scale developed and standardised by Netemeyer, Boles and McMurrian in 1996. Originally, this scale consists of 10 statements, five for work-family conflict and the rest for family-work conflict. The researchers have taken the last five statements concerning family-work conflict. The original tool has five point likert scale to represent the agreement of the respondents with the statements, namely, Strongly Disagree, Disagree, Neither Agree nor Disagree, Agree and Strongly Agree. But the researchers have eliminated *Neither Agree nor Disagree* scale so as not to avoid response to any statement by the respondents. Hence, four point likert scale is adopted to represent the agreement with the statements as Strongly Agree, Agree, Disagree and Strongly Disagree. Though all the five statements were adopted negative statements were converted into positive statements to remove the respondents' hesitation while answering the questions.

**Part - III Job satisfaction questionnaire (JSQ)**

This is the last part of the questionnaire. This part is to measure the Job Satisfaction level of the respondents. For this, the researchers have used the questionnaire called the Job Satisfaction Questionnaire consisting of 20 statements developed and standardised

by Shailendra Singh. The original questionnaire has five points namely 1, 2, 3, 4 and 5 to represent the agreement with respect to satisfaction about the statements as Very Dissatisfied, Dissatisfied, Neutral, Satisfied and Very Satisfied respectively. But the researchers have made a small change with respect to the scaling though they have adopted all the statements as it is. Four point *Likert scale* is adopted to measure the responses as Very Much Satisfied, Satisfied, Dissatisfied and Very Much Dissatisfied. There is no scale to represent *Neutral* so as to obtain compulsorily the responses for all the statements.

### Reliability Test

In order to test the reliability of the questionnaire *Cronbach alohpa* test was carried out and the value came to 0.863. Hence it can be concluded that the tool designed and used for this study is reliable.

### Analysis of data

The researchers have applied the appropriate statistical tools like Frequencies, Chi-Square Test, Correlation, Student's t-test and Factor Analysis so as to draw the results and findings of the study.

## Limitations of the Study

1. The companies from which samples were drawn are only MNCs.
2. Employees of Call Centres both domestic and international were not included in the study.
3. Employees of Off-Shore Projects are also excluded.
4. No mention of Transgenders.
5. Solo Living and Living Relationship Concepts are ignored.
6. This study is restricted to Chennai and Bangaluru Cities only due to resource and time constraints.

## Analysis and Interpretation

### Level of Family-Work Conflict and Job Satisfaction

The following table shows the level of family-work conflict and job satisfaction of IT Professionals.

| Levels | Family-Work Conflict (FWC) | | Job Satisfaction (JS) | |
|---|---|---|---|---|
| | Frequency | Percentage | Frequency | Percentage |
| High | 72 | 24 | 258 | 86 |
| Moderate | 228 | 76 | 36 | 12 |
| Low | - | - | 06 | 02 |
| Total | 300 | 100 | 300 | 100 |

**Table 1.** Level of Family-Work Conflict and Job Satisfaction of IT Professionals

**Family-Work Conflict (FWC) Level**

It is observed from the above table that more than 3/4th of the respondents are experiencing moderate level of family-work conflict and only less than 1/4th i.e., 24 % of the respondents were found to be experiencing high level of family-work conflict. Again, here, it is to be noted that no one is experiencing low level of family-work conflict.

**Job Satisfaction (JS) Level**

The above table indicates that more than 4/5th of the respondents are highly satisfied and only 12 % of the respondents come under the category of moderately satisfied with their job. Though not considerable, 2 % of respondents were experiencing low level of job satisfaction.

## Testing of Hypotheses

To study the relationship of demographic factors with that of Family-Work Conflict and Job Satisfaction, the following hypothesis is formulated.

> There is no significant relationship between Demographic Factors and Family-Work Conflict and Job Satisfaction.

The above mentioned hypothesis is tested using the chi-square test in the following discussions.

**Demographic Factors and Family-Work Conflict (FWC)**

In order to test the relationship between demographic factors including few other important personal factors and family-work conflict (FWC), various hypotheses were formulated which are discussed below.

| S.No. | Factors Compared | Chi-Square Value | d.f. | Significance |
|---|---|---|---|---|
| 1 | Age & FWC | 24.740 | 3 | 0.000 |
| 2 | Gender & FWC | 0.038 | 1 | 0.846 |
| 3 | Marital Status & FWC | 21.979 | 3 | 0.000 |
| 4 | Family Type & FWC | 4.185 | 1 | 0.041 |
| 5 | Family Size & FWC | 15.578 | 2 | 0.000 |
| 6 | Educational Qualification & FWC | 14.704 | 5 | 0.012 |
| 7 | Designation & FWC | 26.012 | 4 | 0.000 |
| 8 | Experience & FWC | 5.253 | 4 | 0.262 |
| 9 | Remuneration & FWC | 7.685 | 4 | 0.104 |
| 10 | Working Hours & FWC | 7.843 | 2 | 0.020 |
| 11 | Working Shift & FWC | 4.942 | 4 | 0.293 |
| 12 | Spouse Working Status & FWC | 2.594 | 1 | 0.107 |
| 13 | Nature of Spouse Work & FWC | 8.862 | 3 | 0.031 |

**Table 2.** Demographic Factors and Family-Work Conflict (FWC)

The chi-square analysis revealed that there exist a significant relationship of age, marital status, family type, family size, educational qualification, designation, working hours and nature of spouse work with Family-Work Conflict of IT Professionals. But there exist no significant relationship of gender, experience, remuneration, working shift and spouse working status with Work-Family Conflict of IT Professionals.

**Demographic Factors and Job Satisfaction**

| S.No. | Factors Compared | Chi-Square Value | d.f. | Significance |
|---|---|---|---|---|
| 1 | Age & JS | 49.512 | 6 | 0.000 |
| 2 | Gender & JS | 7.022 | 2 | 0.030 |
| 3 | Marital Status& JS | 9.831 | 6 | 0.133 |
| 4 | Family Type & JS | 7.089 | 1 | 0.029 |
| 5 | Family Size & JS | 25.129 | 4 | 0.000 |
| 6 | Educational Qualification & JS | 44.149 | 10 | 0.000 |
| 7 | Designation & JS | 39.171 | 8 | 0.000 |
| 8 | Experience & JS | 11.742 | 8 | 0.163 |
| 9 | Remuneration & JS | 14.959 | 8 | 0.060 |
| 10 | Working Hours & JS | 10.185 | 4 | 0.037 |
| 11 | Working Shift & JS | 12.373 | 8 | 0.135 |
| 12 | Spouse Working Status & JS | 7.311 | 2 | 0.026 |
| 13 | Nature of Spouse Work & JS | 15.578 | 3 | 0.001 |

**Table 3.** Demographic Factors and Job Satisfaction

In order to test the relationship between demographic factors including few other important personal factors and job satisfaction, various hypotheses were formulated and the following table gives us the chi-square analysis results.

The chi-square analysis showed that there exist a significant relationship of age, gender, family type, family size, educational qualification, designation, working hours, and nature of spouse work with Job Satisfaction of IT Professionals. But there exist no significant relationship of marital status, experience, remuneration, working shift and spouse working status with Job Satisfaction of IT Professionals.

**Relationship between Family-Work Conflict (FWC) and Job Satisfaction (JS)**

The objectives of the study include identifying the relationship between family-work conflict (FWC) and job satisfaction (JS) of IT professionals. For this purpose the following hypothesis was formulated.

> There is no significant relationship between family-work conflict and job satisfaction.

For testing this hypothesis, correlation analysis and paired sample t-test was applied. The following two tables show the summary of correlation and t-test.

| S.No | Variables | Mean | SD | r | | t (df 299) | |
|---|---|---|---|---|---|---|---|
| | | | | r value | Sig. Level | t value | Sig. Level |
| 1 | Family Work Conflict | 12.63 | 1.77 | $-0.042$ | $-0.465$ | $-72.306$ | $-0.000$ |
| 2 | Job Satisfaction | 67036 | 12.05 | | | | |

**Table 4.** Relationship between FWC and Job Satisfaction

Since the level of significance in case of t-test is less than 0.05 Ho is rejected. Therefore it can be concluded that there is a difference in the mean value between Family-Work Conflict (FWC) and Job Satisfaction (JS).

As far as correlation between Family-Work Conflict (FWC) and Job Satisfaction (JS) is concerned there exist no correlation (sig = 0.465) at 0.05 significance level.

**Factor Analysis**

In order to analyse the data further, factor analysis was carried out to know the inter correlations between factors studied and to analyse among the factors which of the factors contribute to the maximum.

Factor Analysis was carried out for Job Satisfaction consisting of 20 factors. Factor Analysis was not used for Work Family Conflict (WFC) as the statements are only five in the scale.

**Factor Analysis for Job Satisfaction (JS)**

The following table shows the result of factor analysis for Job Satisfaction.

**Total Variance Explained**

| | Initial Eigenvalues | | | traction Sums of Square Loadings | | | on Sums of Squared Loa | | |
|---|---|---|---|---|---|---|---|---|---|
| Compon | Total | % of Variance | umulati e % | Total | % of Variance | umulati e % | Total | % of Variance | umulati e % |
| 1 | 11.781 | 58.907 | 58.907 | 11.781 | 58.907 | 58.907 | 7.706 | 38.529 | 38.529 |
| 2 | 1.126 | 5.628 | 64.535 | 1.126 | 5.628 | 64.535 | 5.201 | 26.006 | 64.535 |
| 3 | .908 | 4.540 | 69.075 | | | | | | |
| 4 | .839 | 4.193 | 73.268 | | | | | | |
| 5 | .671 | 3.355 | 76.623 | | | | | | |
| 6 | .597 | 2.986 | 79.609 | | | | | | |
| 7 | .523 | 2.614 | 82.222 | | | | | | |
| 8 | .477 | 2.383 | 84.606 | | | | | | |
| 9 | .434 | 2.171 | 86.776 | | | | | | |
| 10 | .411 | 2.056 | 88.832 | | | | | | |
| 11 | .378 | 1.891 | 90.723 | | | | | | |
| 12 | .344 | 1.721 | 92.444 | | | | | | |
| 13 | .282 | 1.409 | 93.853 | | | | | | |
| 14 | .266 | 1.330 | 95.184 | | | | | | |
| 15 | .236 | 1.181 | 96.364 | | | | | | |
| 16 | .214 | 1.072 | 97.436 | | | | | | |
| 17 | .163 | .815 | 98.251 | | | | | | |
| 18 | .128 | .639 | 98.890 | | | | | | |
| 19 | .120 | .602 | 99.492 | | | | | | |
| 20 | .102 | .508 | 00.000 | | | | | | |

Extraction Method: Principal Component Analysis.

**Table 5.** Factor Analysis (Initial Eigen Value) - (Job Satisfaction)

The above table shows that the extraction of 'Initial Eigen Value' by adopting Principal Axis Factoring Method. It is clear from the above table that among the 20 variables, only two factors whose Eigen values are more than one is selected. The factors are JSQ-2 (Freedom in Work) and JSQ-14 (Variety of Task in the Job).

Factor matrix called 'Rotated Component Matrix' was used to know that among the two variables, which variable correlates very much and thus considered as contributing factors for the job satisfaction of IT Professionals on hierarchy basis.

**Rotated Component Matrix** [a]

| | Component | |
|---|---|---|
| | 1 | 2 |
| JOB SATISFACTION QUESTION (JSQ) - 18 | .812 | .270 |
| JOB SATISFACTION QUESTION (JSQ) - 17 | .782 | .299 |
| JOB SATISFACTION QUESTION (JSQ) - 15 | .765 | .244 |
| JOB SATISFACTION QUESTION (JSQ) - 12 | .750 | .290 |
| JOB SATISFACTION QUESTION (JSQ) - 19 | .738 | .385 |
| JOB SATISFACTION QUESTION (JSQ) - 20 | .701 | .283 |
| JOB SATISFACTION QUESTION (JSQ) - 10 | .700 | .406 |
| JOB SATISFACTION QUESTION (JSQ) - 11 | .699 | .338 |
| JOB SATISFACTION QUESTION (JSQ) - 14 | .674 | .468 |
| JOB SATISFACTION QUESTION (JSQ) - 13 | .661 | .351 |
| JOB SATISFACTION QUESTION (JSQ) - 16 | .646 | .454 |
| JOB SATISFACTION QUESTION (JSQ) - 8 | .611 | .520 |
| JOB SATISFACTION QUESTION (JSQ) - 7 | .590 | .555 |
| JOB SATISFACTION QUESTION (JSQ) - 1 | 6.560E-02 | .787 |
| JOB SATISFACTION QUESTION (JSQ) - 4 | .426 | .711 |
| JOB SATISFACTION QUESTION (JSQ) - 2 | .501 | .710 |
| JOB SATISFACTION QUESTION (JSQ) - 5 | .359 | .708 |
| JOB SATISFACTION QUESTION (JSQ) - 3 | .479 | .681 |
| JOB SATISFACTION QUESTION (JSQ) - 6 | .471 | .652 |
| JOB SATISFACTION QUESTION (JSQ) - 9 | .480 | .494 |

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 3 iterations.

**Table 6.** Factor Matrix (Rotated Component Matrix) (Job Satisfaction)

The above table shows 2 different levels consisted of group of factors which contribute to the Job Satisfaction of IT Professionals. The following table explains in detail these group of factors classified in 2 levels which are named based on some common feature exist among the factors come under each group.

The above table showing the factor matrix analysis reveals that at the first level *Job Content, Freedom and Opportunities* and at the second level, *Industrial Relations, Working Conditions and Recognition* are contributing to Job Satisfaction of IT Professionals.

| **Level 1 - [Job Content, Freedom and Opportunities]** | | |
|---|---|---|
| Contributing Factor | Value | Factor Explanation |
| JSQ -18 | .812 | Power and prestige in the job. |
| JSQ -17 | .782 | Chances to learn new things. |
| JSQ -15 | .765 | Job security. |
| JSQ -12 | .750 | Attention paid to employees suggestions. |
| JSQ -19 | .738 | Opportunities to make decisions. |
| JSQ -20 | .701 | Opportunities to achieve something worthwhile. |
| JSQ -10 | .700 | Chances of promotion. |
| JSQ -11 | .699 | Management style. |
| JSQ -14 | .674 | The amount of variety in the job. |
| JSQ -13 | .661 | Working Hours |
| JSQ -16 | .646 | Opportunity to help others with personal problems at work. |
| JSQ -8 | .611 | Relationship between Management and Employees. |
| JSQ -7 | .590 | Opportunities to use abilities. |
| JSQ -2 | .501 | Freedom in choosing working method. |
| **Level 2 - [Industrial Relations, Working Conditions and Recognition]** | | |
| Contributing Factor | Value | Factor Explanation |
| JSQ - 8 | .520 | Relationship between Management and Employees. |
| JSQ -7 | .555 | Opportunities to use abilities. |
| JSQ -1 | .787 | The physical work conditions. |
| JSQ -4 | .711 | Recognition for good work. |
| JSQ -2 | .710 | Freedom in choosing Working Method. |
| JSQ -5 | .708 | Satisfaction with Immediate Boss. |
| JSQ -3 | .681 | Satisfaction with Colleagues. |
| JSQ -6 | .652 | Amount of given responsibility. |

**Table 7.** Factor Matrix for Job Satisfaction - 2 Levels Explained

## Suggestions for tackling Work-Ramily Conflict

It is a well known fact that very few IT companies have done anything substantial to tackle the problems of conflict at the workplace, family environment and society in general. Over emphasizing the achievement oriented work cultures and simply linking employee motivation with material incentives may not always increases job satisfaction among employees. The conflict factor is intangible and cannot be quantified so easily, and thus neglected. It is a great hidden cost for the companies. In recent times, many

companies are waking up and are taking conflict management as a serious concern for their employees. The organisations are suggested to concentrate on the following to tackle family-work conflict.

- stress management workshops
- training programmes
- medical examination
- time-management techniques
- work-life and family-life integration programmes
- providing opportunities for social interaction
- providing moral education
- holding family day
- counseling through psychiatrists
- yoga, gym and spa sessions
- movie ticket bookings, travel plans, gift deliveries
- marriage leave, parental leave, maternity leave, paternity leave and bereavement leave
- child care arrangements (vacation child care programmes, child care referral services, child care network, work-based child care for nursing mothers, family room and telephone access)
- providing elder care
- in-house store/services
- arranging vacation trips
- conducting stress audit
- hypnosis by expert

It is suggested that the IT Companies at their level should try to diagnose the root cause of conflict and then try to rectify the problem from its origin. Unrealistic targets, communication gap, and negative motivation which are some of the root causes, should be avoided. It is advised not to stick with one or two techniques known to them or practiced in their firm rather it is suggested to try other alternatives mentioned above

depending on the basic nature and root of conflict. It will work out and as an organisation it can manage the said conflict. However, all the factors that cause conflict among employees may not be controllable for the organisation like recession, social demands or other employees' personal lives. Moreover, the causes and effects of conflict are often different for different employees. So, along with the organisational level programmes, it is important for the organisations to build awareness and encourage employees to adopt conflict management techniques at their own individual levels. It is also quite evident that any organisational level intervention technique is not without limitations in terms of ensuring a long term healthy conflict-free work environment for its employees. Infact, the role of organisations in conflict management is more of a facilitator than anything else. Therefore, managing conflict should be an equal responsibility of the individuals as well.

An individual cannot change the world, but he can change his reactions to situations by changing himself/herself. Understanding the individual conflict level is the first step towards successful conflict management. It involves recognising the stressors or the factors that causes conflict and affects health. Employees have to identify certain conflict symptoms and relate it with the conflict situation they are going through. Difficulty in sleeping, frequent burst of anger and depression are common conflict symptoms related to various conflict situations. Recognising the conflict symptoms can help people to keep conflict from snowballing to chronic from an acute stage. It may also prompt them to adopt life styles techniques of conflict management and seek medical help when it becomes necessary. So, once the conflict level is understood, next step is to select a suitable conflict management technique. There are several techniques that help in conflict management today which includes anything from yoga to aromatherapy. Yoga includes postures (asana), breating (pranayama), and meditation (dhyana). It helps to increase the body awareness, releases muscular tension and increases coordination between mind and body. Another technique getting popular is the 'laughter therapy'. No one can deny that 'laughing is the best medicine'. In this 21st century life has become too fast, too mechanical and somewhat over materialistic, people often forget to laugh. We must adopt humor as a part of our life to reduce stress. Simply, inculcating a general habit of being organised and managing time by prioritising tasks according to their importance takes a lot of pressure out of our daily lives. Besides, every individual has to understand his own strengths and limitations and should not strive beyond his capacity. Adopting a healthy lifestyle means proper diet, routine sleep, regular exercises, and taking some time out for ourselves for the things that we like. But on the other hand, taking to smoking or drinking may temporarily help one to cope with stressful situations but at the same time they do serious damage to our health in the long run.

Use of simple stress busters like listening to music, deep breathing, drinking sufficient water, indulging in leisurely activities and hobbies, stop worrying and remain

positive, taking breaks, talking with closed ones, playing simple games on computer or cell phones, reading and sharing jokes with colleagues and friends, taking a shower, if possible, body massage and meditation (Mantra/Prayer/Recitation of Holy Books, Recitation of Sacred Books) provides quick relief in stressful situations. It is recommended that the IT Professionals as individuals can adopt any one or more of the above mentioned techniques to reduce the stress level. It is a fact that the above mentioned techniques are though simple stress management techniques and are very helpful and effective at most of the times, still it is recommended and advisable to seek medical and specialist's intervention in severe cases of chronic stress.

## Directions for further Research

1. Study can be made for the employees of Domestic Call Centres and International Call Centres. A Comparative Study can also be done between them.

2. The relationship between family-work conflict and job satisfaction can be seen for IT employees working at Off-shore projects.

3. The study can also be done at other geographical areas and then comparative study can be made so as to find any differences in findings due to geographical change.

4. Similar kind of study can be made for the employees working in other sectors.

5. Comparative study can be done with respect to public sector and private sector in various industries.

6. A comparative study can be made with special reference to gender.

## Conclusion

The main reason behind the development of family-work conflict is not always the family itself as perceived by most of the employers. In most cases the root cause for this is emanating from work place in the form of its policies, procedures, rules and regulations. These work-place factors does not allow the employee to discharge his family responsibilities to the required level which gave birth to a slow poison called family-work conflict which not only destroys the family environment but also damages the work environment. Therefore, the organizations have to understand that their success largely depends on motivated and satisfied employees and their motivation and satisfaction surely depends on balancing of their family-life and work-life. Therefore, the organizations should design their policies, procedures, rules and regulations in such a manner that it does not swallow the happiness of employees' families. Otherwise, the unhappiness of the employees' families will slowly venture into

the employers' families through the channel called Organisation. Hence, the concept in the IT sector called *Work-From-Home* should be insisted only if it is most urgent and important because in most of the cases, this work-from-home becomes the first step for the development of Family-Work Conflict. Every IT company should form a panel with representation from employees at all levels, employers, administrators, human resource department, organizational psychologists, health experts and if possible family-members of the employees to evaluate their policies, procedures, rules and regulations with this balancing perspective and redesign wherever there is a necessity. This will definitely help the employees to manage majority of family-work conflict and pave a way to get job satisfaction from them which will in turn help the fulfillment of organizational goals.

## References

1. Tripti Singh, Avantika Singh and Prabha Singh (2007), Relationship of Stress and Job Satisfaction: A Comparative Study of Male and Female of Dual Career Teacher Couples of India', Indian Institute of Management, Bangalore, Working Paper No. 263.

2. Yu-Ying Lu (2007), The Impact of Work Family Conflict on Working Women in Taiwan - the Effects of Organisational Support, Ph. D Dissertation, Queensland University of Technology.

3. Bass, B.M., and Barnett, G.V.(1972). Man, Work, and Organisations. New York: Allyn and Bacon.

4. Bullock, R.P. (1952). Social Factors Related to Job Satisfaction. Research Monograph, No. 70, Ohio State University, Beauro of Business Research, Columbus.

5. Locke, E.A. (1969), What is Job Satisfaction? Organisational Behavior and Human performance, 4, 309-336.

6. Wexley, K. N. and Yukl, G. A. (1977). Organisational Behavior and Personnel Psychology. Irvin: Homewood, Illinois

7. Ilies, R. and Judge, T.A. (2004), An Experience-Sampling Measure of Job Satisfaction and its Relationships with Affectivity, Mood at Work, Job Beliefs, and General Job Satisfaction. European Journal of Work and Organisational Psychology, 13(3), 367-389.

8. Seybolt, J.W. (1976). Work Satisfaction as a Function of the Person-Environment Interaction. Organizational Behavior and Human Performance, 17, 66-75.

9. Thushel Jayaweera A (2005), ”Management Development: A Model of Linkages Between Work Family Conflict, Job Satisfaction and Individual’s Passionate Desire to Develop through Management Development Opportunities”, SAARC Journal of Human Resource Management, pp108-117.

10. Katherine J.C. Sang, Stephen G. Ison and Andrew R. J. Dainty (2009), ”The Job Satisfaction of UK Architects and Relationships with Work-Life Balance and Turnover Intentions”, Engineering, Construction and Architectural Management, Vol. 16 (3), pp288-300.

11. Noryati Ngah, Aminah Ahmad and Maznah Baba (2009), ”The Mediating Effect of Work-Family Conflict on the Relationship between Locus of Control and Job Satisfaction”, Journal of Social Sciences, Vol. 5 (4), pp348-354.

12. Xinyuan Zhao and Hailin Qu (2009), ”A Study on the Impacts of Work-Family Conflict and Job and Life Satisfaction among Hotel Sales Managers in China”, Hospitality and Tourism Management, 2009, Pp. 1-7. (Available Online at: Scholar Works @ U Mass Amherst - http : // scholarworks . umass .edu / refereed/Sessions/Saturday/2).

13. Netemeyer, R.G., Boles, J.S., and Mc Murrian, R. (1996). Development and validation of work family and family work conflict scales, Journal of Applied Psychology, Vol. 81, No. 4, pp. 400-410.

14. Shailendra Singh (1997) Job Satisfaction Questionnaire, Third Book of Psychological and Social Instruments, Pestonjee D M, Vol. 2, Concept Publishing Company, New Delhi, p. 302.

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# Management Students' Awareness on Stock Market Efficiency - A Bird's Eye View

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**Abstract**

Market efficiency refers to the degree to which stock prices and other securities prices reflect all available relevant information. Market efficiency was developed in 1970 by economist Eugene Fama, whose theory of efficient market hypothesis (EMH) stated it is not possible for an investor to outperform the market because all available information is already built into all stock prices. Investors who agree with this statement tend to buy index funds that track overall market performance and are proponents of passive portfolio management.

**Keywords:** EMH, IT, NSE, BSE and SENSEX.

## Introduction

When money is put into the stock market, the goal is to generate a return on the capital invested. Many investors try not only to make a profitable return, but also to outperform, or beat, the market. However, market efficiency - championed in the efficient market hypothesis (EMH) formulated by Eugene Fama in 1970, suggests that at any given time, prices fully reflect all available information on a particular stock and/or market. Fama was awarded the Nobel Memorial Prize in Economic Sciences jointly with Robert Shiller and Lars Peter Hansen in 2013. According to the EMH, no investor has an advantage in predicting a return on a stock price because no one has access to information not already available to everyone else.

The nature of information does not have to be limited to financial news and research alone; indeed, information about political, economic and social events, combined with how investors perceive such information, whether true or rumored, will be reflected in the stock price. According to the EMH, as prices respond only to information available in the market, and because all market participants are privy to the same information, no

one will have the ability to out-profit anyone else.

In efficient markets, prices become not predictable but random, so no investment pattern can be discerned. A planned approach to investment, therefore, cannot be successful. This *random walk* of prices, commonly spoken about in the EMH school of thought, results in the failure of any investment strategy that aims to beat the market consistently. In fact, the EMH suggests that given the transaction costs involved in portfolio management, it would be more profitable for an investor to put his or her money into an index fund. Three identified EMH classifications aim to reflect the degree to which it can be applied to markets:

- **Strong efficiency** - This is the strongest version, which states that all information in a market, whether public or private, is accounted for in a stock price. Not even insider information could give an investor an advantage.
- **Semi-strong efficiency** - This form of EMH implies that all public information is calculated into a stock's current share price. Neither fundamental nor technical analysis can be used to achieve superior gains.
- **Weak efficiency** - This type of EMH claims that all past prices of a stock are reflected in today's stock price. Therefore, technical analysis cannot be used to predict and beat a market.

In the real world, markets cannot be absolutely efficient or wholly inefficient. It might be reasonable to see markets as essentially a mixture of both, wherein daily decisions and events cannot always be reflected immediately into a market. If all participants were to believe that the market is efficient, no one would seek extraordinary profits, which is the force that keeps the wheels of the market running.

In the age of information technology (IT), however, markets all over the world are gaining greater efficiency. IT allows for a more effective, faster means to disseminate information, and electronic trading allows for prices to adjust more quickly to news entering the market. However, while the pace at which we receive information and make transactions quickens, IT also restricts the time it takes to verify the information used to make a trade. Thus, IT may inadvertently result in less efficiency if the quality of the information we use no longer allows us to make profit-generating decisions.

## Statement of the Problem

Despite having many awareness programmes by Indian Stock Exchanges, investors associations and SEBI, there is a serious lack of awareness in the public and hence awareness to the information has remained a big challenge to the efficiency of the

Indian Stock Exchanges and to the investors themselves. However the access to these programmes among students is very low due to either existence of attendance fees or timing or being selectively to some classes of audience especially to investors only. Many researches had been made in market efficiency in India by testing on either weak form of Efficient Market Hypothesis (EMH) or random walk hypothesis of stock prices and returns. The researchers used daily closing data for the indices such as S & P NIFTY (NSE) and BSE SENSEX in a specific period of time. This study seeks to address this gap.

## Significance of the study

The need for the study is to examine the extent of awareness among management students towards efficiency of the stock market as far as they are daily exposed to various business concepts not only from college curriculum but also from social learning and education programmes run by various capital market participants.

## Objectives of the Study

1. To examine the understanding of various concepts on stock market investments.
2. To evaluate the significance of information technology facilities on dissemination of stock market news.

## Methodology

The data used for this study is accompanied by primary and secondary data. Primary data was obtained from management students from the selected sample list of educational institutions. Whereas Secondary data was elicited through journals, SEBI, BSE, NSE annual reports, News Papers, Brokerage Firms Reports, and Reports from World Federation of Exchanges.

Besides, the sample size for the study is 100. The respondents were selected using stratified sampling, simple random sampling. The sample size of 100 is divided equally to four colleges.

## Review of Literature

Market Capitalisation is perhaps the most important criterion in assessing the size of a capital Market. Market Capitalisation equals to value of listed shares divided by nominal GDP. The ratio has been widely adopted in the literature as a stable measure

of stock market efficiency for various reasons. First; it is a proxy of the sized of the stock market which is positively correlated with the ability mobilise capital and diversify risk. Secondly, it is presumed to include firms past retained profits and future growth prospects so that a higher ratio to GDP signified growth prospects and stock market development (Levine and Zervos, 1998, Bekaert et al. 2001).

The key weakness of this ratio is that a high ratio solely driven by appreciated value of few firms with little or no change in the amount of funds raised, and no change in the breadth of the stock market may be interpreted as Stock Market Efficiency. Growth in the market capitalisation as a share of GDP is associated with an increase in the number of listed firms (Adelegan, 2008).

## Results and Discussion

Chi-Square test was applied to find the significant association between two variables by cross tabulating.

| | | | Age of the Respondents | | | | Total |
|---|---|---|---|---|---|---|---|
| | | | 18 - 21 | 22 - 25 | 26 - 29 | 30 and above | |
| Financial Instrument Traded | Yes | Count | 26 | 43 | 2 | 0 | 71 |
| | | % within respondent's College/University | 81.3% | 72.9% | 100% | 0% | 76.3% |
| | No | Count | 6 | 16 | 0 | 0 | 22 |
| | | % within respondent's College/University | 18.8% | 27.1% | 0% | 0% | 23.7% |
| Total | | Count | 32 | 59 | 2 | 0 | 93 |
| | | % within respondent's College/University | 100% | 100% | 100% | 0% | 100% |

Source: Primary Data

**Table 1.** Relationship of age and financial instruments traded in stock market Cross Tabulation

| Chi-Square Data | | | |
|---|---|---|---|
| | Value | df | Asymp Syg (2-sided) |
| Pearson Chi-Square | 1.438 | 2 | 0.487 |

**$H_0$:** There is no association between age and awareness of instruments traded

**$H_1$:** There is association between age and awareness of financial instruments traded.

**Interpretation:** The above table indicates that the value of Chi-Square is 1.438; degree of freedom is 2 with P-Value 0.487 at 5 % significance level. Since the P-Value is greater than 0.05, the Null Hypothesis is accepted. Hence, there is no significant association between age and awareness of financial instruments traded in stock market.

| | | | Gender | | |
|---|---|---|---|---|---|
| | | | Male | Female | Total |
| Stock Market is easy way to mobilise funds | Yes | Count | 34 | 39 | 71 |
| | | % within gender | 75.6% | 92.9% | 83.9% |
| | No | Count | 11 | 3 | 14 |
| | | % within gender | 24.4% | 7.1% | 16.1% |
| Total | | Count | 45 | 42 | 87 |
| | | % within gender | 100% | 100% | 100% |

Source: Primary Data

**Table 2.** Relationship between gender and stock market as easy way to mobilise funds Cross Tabulation

| Chi-Square Data | | | |
|---|---|---|---|
| | Value | df | Asymp Syg (2-sided) |
| Pearson Chi-Square | 4.816 | 1 | 0.028 |

**$H_0$:** There is no association between gender and awareness of stock market as easy way to mobilise funds.

**$H_1$:** There is association between gender and awareness of stock market as easy way to mobilise funds.

The above table indicates that the value of Chi-Square is 4.816; degree of freedom is 1 with P-Value 0.028 at 5 % significance level. Since the P-Value is less than 0.05, the Null Hypothesis is rejected. Hence, there is association between gender and awareness of stock market as easy way to mobilise funds.

| | | | Year of Study in MBA | | |
|---|---|---|---|---|---|
| | | | $I^{st}$ year | $II^{st}$ year | Total |
| Follow Stock Market News on Internet | Yes | Count | 40 | 13 | 53 |
| | | % within year of Study | 51.9% | 72.2% | 55.8% |
| | No | Count | 37 | 5 | 42 |
| | | % within year of Study | 48.1% | 27.8% | 44.2% |
| Total | | Count | 77 | 18 | 95 |
| | | % within year of Study | 100% | 100% | 100% |

Source: Primary Data

**Table 3.** Relationship between year of the study and stock market news via internet services Cross Tabulation

| Chi-Square Data | | | |
|---|---|---|---|
| | Value | df | Asymp Syg (2-sided) |
| Pearson Chi-Square | 2.431 | 1 | 0.119 |

**$H_0$:** There is no association between year of the study and awareness of stock market news via internet service.

**$H_1$:** There is association between year of the study and awareness of stock market news via internet service.

**Interpretation:** The above table indicates that the value of Chi-Square is 2.431; degree of freedom is 1 with P-Value 0.119 at 5 % significance level. Since the P-Value is greater than 0.05, the Null Hypothesis is accepted. Hence, there is no association between year of the study and awareness of stock market news via internet service.

## Mann-Whitney U-Test

The Mann-Whitney U-test is a non-parametric test that allows two groups or conditions or treatments to be compared without making the assumption that values are normally distributed. It measures distribution of two groups of independent variable across dependent variable.

| Ranks | | | | |
|---|---|---|---|---|
| | Gender | N | Mean Rank | Sum of Ranks |
| Level of Awareness | Male | 49 | 43.09 | 2111.50 |
| | Female | 47 | 54.14 | 2544.50 |
| | Total | 96 | | |

Source: Primary Data

**Table 4.** Distribution of level of awareness across gender

**$H_0$:** There is no difference between levels of awareness across categories of gender.

**$H_1$:** There is difference between levels of awareness across categories of gender.

| Test Statistic | |
|---|---|
| | Level of Awareness |
| Mann-Whitney | 886.500 |
| Asymp. Sig. (2-tailed) | 0.051 |

**Interpretation:** The above table indicates that the value of Mann-Whitney U Test is 886.500 with P-Value 0.051 at 5 % significance level. Since the P-value is greater than 0.05, the Null hypothesis is accepted. This means that the distribution of level of awareness is the same across categories of gender.

| Ranks | | | | |
|---|---|---|---|---|
| Follow Stock Market News on TV | | N | Mean Rank | Sum of Ranks |
| Level of Awareness | Yes | 42 | 53.90 | 2264 |
| | No | 54 | 44.30 | 2392 |
| | Total | 96 | | |

Source: Primary Data

**Table 4.** Distribution of level of awareness across gender

**$H_0$:** There is no difference between levels of awareness and attitude to follow stock market news on TV.

**$H_1$:** There is difference between levels of awareness and attitude to follow stock market news on TV.

| Test Statistic | |
|---|---|
| | Level of Awareness |
| Mann-Whitney | 907.000 |
| Asymp. Sig. (2-tailed) | 0.093 |

**Interpretation:** The above table indicates that the value of Mann-Whitney U Test is 907.000 with P-Value 0.093 at 5 % significance level. Since the P-value is greater than 0.05, the Null hypothesis is accepted. This means that the distribution of level of awareness is the same with those who follow stock market news on TV.

## Suggestions and Conclusion

So far as there is no significant association between variables such as age, gender and years of the study of the respondents against knowledge and awareness on the ways to use to follow stock market news, knowledge of the common financial instruments traded, return on investment in the market in this study. Hence the study suggests that all Indian stock exchanges and SEBI as they have taken upon a mandate to promote financial literacy to use various methods and approaches of disseminating information in order to bring more people into the folds of the financial market.

In reality, investors do not receive all information freely; they have to decide whether and which information to Gather prior trading and investors end up staying afloat in a sea of uncertainty which in turn affects their level of awareness. This study reveals that majority of management students are more selective on ways to follow stock market news as they prefer newspapers and the use of internet services rather than financial news on TV. Also it has been revealed that they are aware of financial instruments traded, returns on the investment in the market and they realise that stock market is one way among easy way to mobilise funds for companies to operate although they are facing trouble to follow stock market news due to unaffordable expenses.

On the other hand the overall level of awareness is high though it has been contributed specifically by years of the study of the respondents, gender and respondent's college or University meanwhile age was not significant determinant on it. Therefore, the study reveals that management students are aware on the stock market efficiency concept. This is the best indicator that Indian stock markets will continue to grow and more important to be efficient.

## References

1. Levine and Zervos (1998), stock markets, banks and Economic Growth, The American Economic Review Journal, Vol.88,
2. Adelegan (2008); What determines Bonds Market Development in Sub Saharan Africa for the CAPM, review of finance 8, 445-480
3. SEBI Annual Reports 2015.
4. www.bseindian.com
5. www.nseindia.com

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# User Awareness About The Seminars / Workshops Conducted By Department of Library and Information Science, Islamiah College (Autonomous), Vaniyambadi, Vellore District: A Study

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**Abstract**

This study describes the user awareness about the Library and Information Science Seminars/Workshops conducted by the Department of Library and Information Science, Islamiah College (Autonomous), Vaniyambadi. This paper highlights the response from the different types of participants from different regions and the topic which is highly responded by the Participants. It also focuses on the funds mobilized from the various sources for the programmes. Responses from the faculty of different subject disciplines, Library Science professionals, research scholars and students are also highlighted.

## Introduction

Libraries play a central role in every academic institution. To keep pace with the rapidly growing and changing technology, the academic institutions are also adopting the latest trends in the educational field. They need to offer uplifting, inspiring and mind-expanding activities/opportunities to the student community in order not to be left behind in the competitive world. One can witness a sea of change in teaching and learning methods. Some of the technologies that have revolutionized libraries include telephone, IVRS, internet, email, mobile SMS, e-learning sources like

CMS, digital library services, social net working tools like blog, facebook, twitter, RSS Flicker, Cloud technology, automated library vending machines, mobile library applications, lending e-books, online tutorial, webinar etc. The duty of the librarian is to provide user education, orientation and create awareness about the latest developments among the library users so that they can make use of the library more effectively and efficiently. The advancements that are being made in all walks of life particularly in the academic/research related sciences ultimately have to reach the end user through programmes like conferences, seminars, webinars and workshops.

In order to erase illiteracy, make India a literate country, the Government/Private organizations provide various educational facilities like INFLIBNET (INFormation LIBrary NETwork, Ahamadabad), DELNET (DEveloping Library NETwork, New Delhi) and online resources from National Digital Library initiated by the University Grants Commission established at IIT, Kharagpur. But call it irony of fate, that there is not enough awareness among the educational institutions, academicians, research scholars, students and the library users about this knowledge treasure which is available at their finger tips. To inform and transform them, we need to conduct Seminars/Conferences/Workshops.

Department of Library and Information Sciences, Islamiah College has taken a lead and arranged the following programmes in the previous years on topics related to the academicia and research scholars.

## Digital Resources and Publications

This was an UGC-Autonomous funded one day state-level workshop conducted on 24th October 2013 at Seminar Hall. There were three technical sessions and each session was handled by an eminent scholar. The first session was chaired by Dr. T. K. Thiruvengada Mani, Deputy Librarian, University of Madras. The Second Session was conducted by Dr. P. K. Mohamed Imran, Associate Professor, Islamiah College and Mrs. Nallini Olivannan, Head - Legal operations, Books and Publishers Association, Chennai chaired the Third Session respectively. The central theme of the First Session was ICT & LIBRARY, Second was on Journal Publications and the third one was on Book publishing and Distribution. The following table highlights the statistical data of the participants.

| S No | Type of Participants | Total |
|---|---|---|
| 1 | Research Scholars Local | 40 |
| 2 | Research Scholars Outside | 6 |
| 3 | Faculty Local | 72 |
| 4 | Faculty Outside | 16 |
| 5 | Librarian | 7 |
| 6 | Students | 4 |
| 7 | Others | 1 |
| Total | | 132 |

**Table 1.**

## WEBINAR (Video Conferencing Seminar)

This was a Special Programme organized in the Multimedia Hall, Islamiah College entitled N-LIST INFLIBNET-Springer Webinar (Video conferencing Seminar) on 12th December 2013. Discussions were held on two topics - first one on *N-List Journals* followed by the second talk on *Shodhganga* - Reservoir of Indian Theses. The following table shows the active participation from the various segments of the academicia.

| S No | Type of Participants | Total |
|---|---|---|
| 1 | Research Scholar M.Phil. Local | 40 |
| 2 | Research Scholar Ph.D. Local | 1 |
| 3 | Research Scholar Outside | 0 |
| 4 | Faculty Local | 40 |
| 5 | Faculty Outside | 0 |
| 6 | Students | 2 |
| 7 | Librarians | 1 |
| 8 | Others | 5 |
| Total | | 66 |

**Table 2.**

## e- Resources for Education and Research

This was also an UGC Autonomous-Funded one day State-level Seminar organized on 9th March 2014 at Seminar Hall. There were two lecture sessions. One was on *N-List, IndCat & Vidwan* (Expert data base in India) delivered by Dr. T. K. Thiruvengadamani, Deputy Librarian, University of Madras. The Second session was addressed by Prof. B. Jeyapragash , Department of Library and Information Science, Bharathidasan University on the topic *e-Resources with special reference to*

*Shodhganga & OJAS*. Table 3 lists out the number of participants from the various segments.

| S No | Type of Participants | Total |
|---|---|---|
| 1 | Librarians | 20 |
| 2 | Research Scholars Ph.D. | 18 |
| 3 | Research Scholars M.Phil. | 46 |
| 4 | M.L.I.S. | 10 |
| 5 | Students | 16 |
| 6 | Others | 1 |
| 7 | Faculty Local | 14 |
| 8 | Faculty Outside | 16 |
| Total | | 131 |

**Table 3.**

## Management of Cyber Information

This programme is also an UGC-Autonomous Funded State level workshop held on 19th February 2015. There were three Resource Persons who presented the lectures. First session was by Dr. Joyson Soundararajan, Senior Librarian, CMC, Vellore on the topic ZOTERO Reference Manager followed by the Second talk by Dr. T. K. Thiruvengadamani, Deputy Librarian, University of Madras on the topic SOUL Library Automation Software and the third was by Dr.Sarangapani, University Librarian, Bharathiar University, Coimbatore who spoke on the topic Role of INFLIBNET in the Digital Era. The following Table shows the number of category wise participants in the seminar.

| S No | Type of Participants | Total |
|---|---|---|
| 1 | Librarian | 6 |
| 2 | Research Scholars Ph.D. | 7 |
| 3 | Research Scholars M.Phil. | 89 |
| 4 | M.L.I.S. | 1 |
| 5 | Students | 0 |
| 6 | Others | 5 |
| 7 | Faculty Local | 21 |
| 8 | Faculty Outside | 10 |
| Total | | 132 |

**Table 4.**

## Virtual Libraries and Research Tools and Techniques

This is an UGC Sponsored one day National level Seminar in collaboration with Taramani Campus Library, University of Madras, Chennai organized on 22nd March 2015. There were Four lecture sessions in the seminar. First Session was by Dr. S. Humayoon Kabir, Associate Professor, DLIS, University of Kerala, Trivandrum who enlightened the audience on Virtual Libraries & Digitalization of documents. Second Session speech was delivered by Dr. B. Jeyapragash, Department of Library Information Science, Bharathidasan University, Trichy on the topic Reference Management Tools while the Third session which was a Paper Presentation Session was chaired by Dr.T.K.Thiruvengada Mani, Deputy Librarian, University of Madras. In the Fourth Session Dr. R. Sevugan, Department of Library Information Science , Pondicherry University, Pondicherry shed light on the topic Open Access Resources and writing of Theses & Article. The following table lists out the number of participants in each category.

| S No | Type of Participants | Total |
|---|---|---|
| 1 | Librarian | 34 |
| 2 | Research Scholars Ph.D. | 18 |
| 3 | Research Scholars M.Phil. | 59 |
| 4 | Students - UG | 1 |
| 5 | Others | 11 |
| 6 | Faculty Local | 67 |
| 7 | Faculty Outside | 16 |
| Total | | 194 |

**Table 5.**

## Harvesting Web Resources and Academic Publishing

| S No | Type of Participants | Total |
|---|---|---|
| 1 | Librarian | 35 |
| 2 | Research Scholars Ph.D. | 20 |
| 3 | Research Scholars M.Phil. | 63 |
| 4 | PG Students | 10 |
| 5 | Faculty Local | 37 |
| 6 | Faculty Outside | 35 |
| Total | | 181 |

**Table 6.**

This is again an UGC-Autonomous funded one day National Seminar conducted in collaboration with CHRISTIAN MEDICAL COLLEGE, VELLORE held on 26 December 2015. There were three Sessions - First session was on Harvesting Web Resources by Dr. B. Jeyapragash, Department of Library & Information Science, Bharathidasan University, Trichy. The Second Session speech was delivered by Dr. R.Sevugan, Department of Library & Information Science, Pondicherry University on the topic *Academic Publishing*.

| S No | Year | Title of the Programme | Geographical Coverage | Financial Assistance | Total No. of Participants |
|---|---|---|---|---|---|
| 1 | 2013 | Digital Resources & Publications | State Level Workshop | UGC Autonomous Fund | 132 |
| 2 | 2013 | NList INFLIBNET -Springer Webinar | Intra College Level | UGC Autonomous Fund | 66 |
| 3 | 2014 | E-Resources for Education & Research | State Level Seminar | UGC Autonomous Fund | 131 |
| 4 | 2015 | Management of Cyber Information | State Level Workshop | UGC Autonomous Fund | 132 |
| 5 | 2015 | Virtual Libraries and Research Tools & Techniques | National Level Seminar | UGC Autonomous Fund | 194 |
| 6 | 2015 | Harvesting Web Resources & Academic Publishing | National Level Seminar | UGC Fund | 181 |

**Table 7.**

| S No | Type of Participants | Total |
|---|---|---|
| Research Scholars | 371 | 44 % |
| Librarians | 98 | 12 % |
| Faculty | 300 | 36 % |
| Students | 46 | 8 % |

**Table 8.**

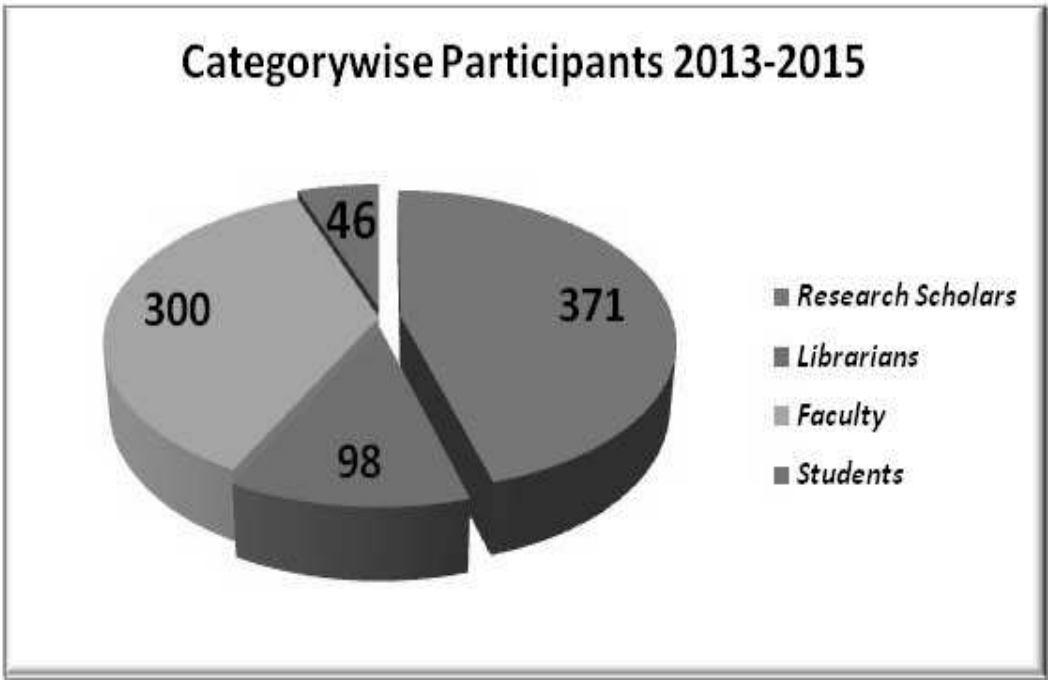


**Figure 1** Year wise Response : 2013 - 2015

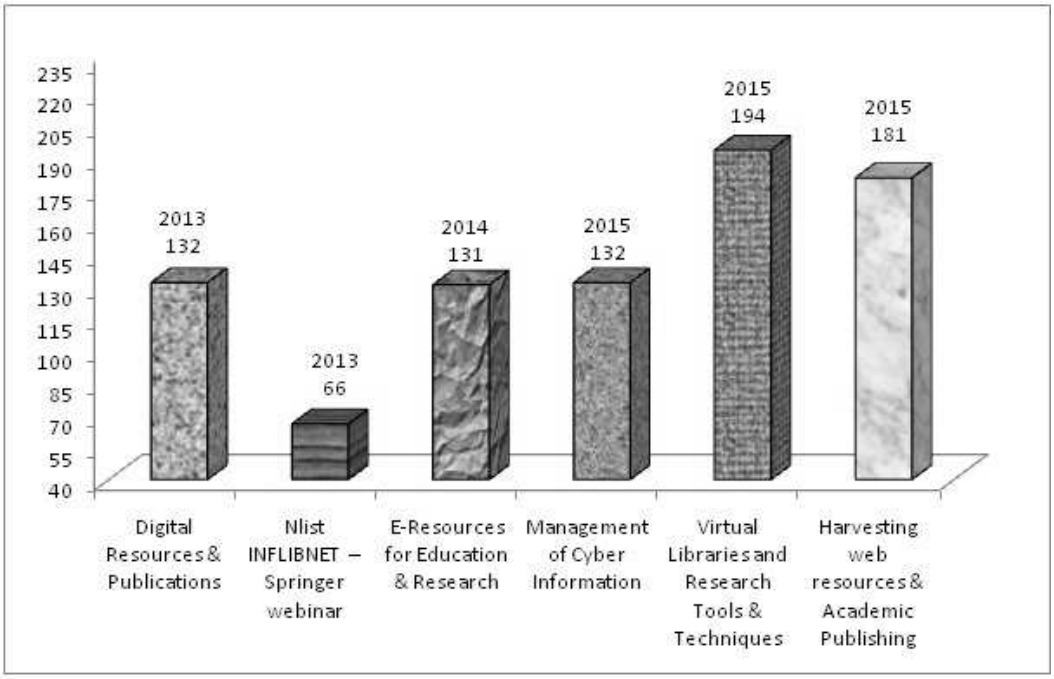


**Figure 2** Year wise Response : 2013 - 2015

The table 7 summarizes year wise various programmes, the central themes, source of funds, Geographical coverage and the total number of delegates present in each programme. The most popular programme was the national level UGC sponsored programme on Virtual Libraries and Research Tools and Techniques held in 2015. It attracted a total number of 194 participants.

Table 8 Shows the facts in figures:

- According to the Cumulative data from the year 2013-2015 highest response is from Research Scholars which is 44%.
- Second highest response has come from the Faculty at 36%.
- Librarians occupy third place in the cumulative data with 12%.
- Students response is the lowest i.e. only 8

| SNo | Month & Year | Research Scholars | | Faculty | | Librarians | | Students | Total |
|---|---|---|---|---|---|---|---|---|---|
| | | Local | Out Station | Local | Out Station | Local | station Station | | |
| 1 | Oct 2013 | 38 | 5 | 72 | 9 | 3 | - | 5 | 132 |
| 2 | Dec 2013 | 18 | - | 40 | - | 1 | - | 7 | 66 |
| 3 | Mar 2014 | 64 | - | 10 | 10 | 5 | 15 | 17 | 131 |
| 4 | Feb 2015 | 94 | - | 19 | 7 | 3 | 3 | 0 | 132 |
| 5 | Mar 2015 | 67 | 2 | 67 | 12 | 4 | 30 | 12 | 194 |
| 6 | Dec 2015 | 80 | 3 | 35 | 19 | 5 | 29 | 10 | 181 |
| | Total | 361 | 10 | 243 | 57 | 21 | 77 | 67 | 836 |
| **Grand Total** | | **371** | | **300** | | **98** | | **67** | **836** |

**Table 9.**

The table No.9 highlights the Cumulative data and Category wise Participants during the years 2013-2015. Total No of participants 836. Amongst this, the Local Research Scholars were 366 while Outstation research scholars counted only 10 and the local faculty participants numbered 243 and outstation faculty figured 57, Librarians local were 21 and from other districts 77 and the students participation was only 67.

## Findings and Conclusion

Libraries are the heart of every academic Institution. They play a vital role in the higher education and research arena. In this paper we have tried to analyse the

various programmes conducted by Islamiah College Library under different heads viz. geographical data, subjects dealt and the type of participants. Based on the analysis, it is evident that research scholars and faculty members have given positive response for each programme. This study also reveals that every academic institution should conduct the National/State level Library programmes to enhance the knowledge of the faculty, research scholars, Librarians, and update the students knowledge. We need to elucidate the current status and levels of LIS education, as well as the research programmes being offered by various universities in India. We should emphasis on the need to maintain uniformity and standard in LIS education and incorporate professional education that provides training to future librarians to manage the libraries and information centres effectively. It is the need of the hour that the academic Institutions - be it Government or Aided or Self finance, should support the Libraries/Librarians to conduct programmes like this. If this be done then definitely Higher Education and Research will get a boost in India.

## References

National level Conference (2014), Proceedings of the Emerging technologies and Innovations in Disseminating Information Among library users in the College Libraries, Sacred Heart College, Tirupattur, TamilNadu.

Lalitha, R (2016), Need for Re-Designing the LIS Education in India, Proceedings of the International conference on *Re- engineering of library resources and services: Challenges and Opportunities*, Annamalai University, Chidambaram.

Kumaraswamy, R and Raj Kumar,J (2016): The status of LIS education, Research & Training in Andhrapradesh & Telangana: An overview, Proceedings of the International conference on *Re- engineering of library resources and services: Challenges and Opportunities*, Annamalai University, Chidambaram. p.192-197

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