Original Research Article

A comparative study on the Liver biochemical parameters in Information Technology employees with Non Information Technology employees

K.V. Vijayakumar*

Assistant Professor, Department of Biochemistry, Government Dharmapuri Medical College, Tamil Nadu, India

*Corresponding author email: **vijayakumar.skv2011@gmail.com**

International Archives of Integrated Medicine, Vol. 6, Issue 4, April, 2019.

Available online at http://iaimjournal.com/

ISSN: 2394-0026 (P) **ISSN: 2394-0034 (O)**

Received on: 20-03-2019 **Accepted on:** 26-03-2019

Source of support: Nil **Conflict of interest:** None declared.

How to cite this article: K.V. Vijayakumar. A comparative study on the Liver biochemical parameters in Information Technology employees with Non Information Technology employees. IAIM, 2019; 6(4): 71-77.

Abstract

Background: Occupational stress is more common in Information Technology (I.T.) employees who cause alterations in biochemical parameters and diseases.

Aim: To compare the liver biochemical parameters like serum total bilirubin, Direct bilirubin, Indirect bilirubin, Total protein, Albumin, Globulin, Aspartate aminotransferase (AST), Alanine aminotransferase (ALT), Alkaline Phosphatase (ALP), in I.T employees with non I.T employees.

Materials and methods: This was a comparative study in which employees who were working in I.T. Company compared with employees not working in I.T Company. The study included totally 300 subjects of whom 150 were I.T employees and 150 were Non I.T employees. Fasting blood samples were analyzed for Total bilirubin, Direct bilirubin, Indirect bilirubin, Total protein, Albumin, Globulin, AST, ALT, ALP. The data were analyzed using SPSS software version 11.5. Results were expressed as mean ± SD.

Results: Total bilirubin, Direct bilirubin, Indirect bilirubin, Albumin and A: G ratio were significantly decreased in I.T employees than in Non I.T employees. There was no significant difference in Total protein, AST and ALT.

Conclusion: The significant reduction in Total bilirubin, Direct bilirubin, Indirect bilirubin, Albumin and A:G ratio in I.T employees may be due to their relaxation exercises in between the working hours, regular physical exercise, periodical health check-up, and life style modification which were not seen in non I.T employees.

Key words

Occupational stress, Information Technology, Bilirubin, Coping with stress.

Introduction

"Workplace stress" is the harmful physical and emotional responses that can happen when there is a conflict between job demands on the employee and the amount of control over meeting these demands. In general, the combinations of high demands in a job and a low amount of control over the situation can lead to stress [1].

Occupations particularly in Information Technology (IT) poses a host of new health challenges particularly those related to mental and social health [2]. The term information technology systems as used here includes all computer hardware, software, networks, and data used for the communication, transmission, processing, manipulation, storage, or protection of information.

Information Technology (I.T) employees have more stress than others working in other industries. Stress in Information Technology employees may be due to work timing (shift work), repetitive nature of work, tremendous workload, long working hours, minimum social interaction, night shift, job insecurity, up gradation of new technology, time bounded projects, work environment, and continuous visual focusing the monitors which leads to occupational stress. Working in irregular hours, including night work and shift work, has been found to be associated with higher levels of lipid [3].

Non I.T employees in this study were office employees who were working in show room and workshop of Motor Vehicle Company. They used to work for a fixed time, usually 8 hours per day, no shift duty or night duty, take regular and timely food. So, it was assumed that they have less or no stress at workplace. The purpose of the present study was to compare the liver biochemical parameters between I.T employees and non I.T employees.

Materials and methods

This was a comparative study between the I.T. employees and non I.T. employees. Institutional ethical committee clearance was obtained. This present study included totally 300 subjects of which both genders of 150 subjects who were working in the I.T Company with age group between 20–50 years. Age and gender matched 150 subjects who were not working in the I.T company were included for comparison. All individuals who were suffering from acute illness were excluded from this study.

After explaining the nature of the study, informed consent from the study subjects was obtained. For all subjects, a complete clinical history was taken. Fasting blood samples were taken from all the study subjects and the same were subjected for Total Bilirubin, Direct bilirubin, Indirect bilirubin, Total protein, Albumin, Globulin, Aspartate aminotransferase (AST), Alanine aminotransferase (ALT), Alkaline Phosphatase (ALP) by using fully automated analyzer.

Statistical analysis

The results were analyzed based upon the statistical methods using computerized SPSS program version 11.5. The study subjects were divided into group 1 (I.T employees) and group 2 (Non I.T employees) for the purpose of statistical analysis. Results were expressed as mean ± S.D. The results were analyzed statistically by students un-paired't' test. The p value < 0.05 was taken as the cut-off level for significance.

Results

The group 1 (I.T. employees) contains 150 subjects and group 2 (Non I.T. employees) contains 150 subjects. All the study groups are

between the 20–50 years of age group and have more number of males than females.

Table - 1 and **Figure - 1** showed the total male subjects were slightly higher in I.T. employees than in non I.T. employees. The total female subjects were slightly higher in non I.T employees than in I.T. employees.

Table - 2 and **Figure - 2** showed age of the study subjects, range from 20 to 50 years with the mean of 28.49 ± 7.9 for I.T employees and 29.41 ± 8.00 for non I.T. employees. More number of subjects was seen in the age group of 21 – 30 years than in other age groups.

Table - 3 showed there was decrease in mean serum total bilirubin, direct bilirubin and indirect bilirubin in I.T employees than in non I.T employees. These decreased values were statistically significant (p value < 0.001).

Table - 1: Age and Sex wise distribution of study subjects in each group.

Study subjects (n= 300)	Males	Females	Age (years) MEAN±SD
Group 1: I.T. employees (n = 150)	119	31	28.49 ± 7.9
Group 2: Non I.T. employees (n =150)	122	28	29.41 ± 8.00
Total (n = 300)	231	59	28.95 ± 7.96

Figure – 1: Sex wise distributions of study subjects in each group.

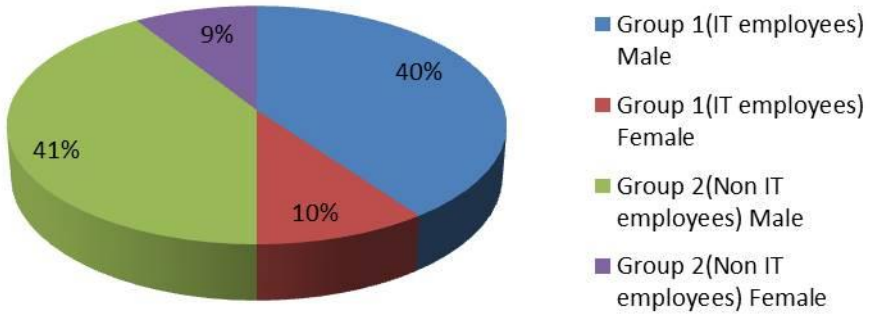

Table - 2: Age wise distribution of study subjects in each group in Numbers.

Age	20 – 30 Years	31 – 40 Years	41 -50 Years
Group 1 (I.T. employees)	98	34	18
Group 2 (Non I.T. employees)	95	35	20

Table - 4 shows there was decrease in mean serum total protein in I.T employees than in non I.T employees. This decreased value was statistically not significant (p value > 0.05). There was decrease in mean serum albumin, and albumin: globulin ratio in I.T employees than in non I.T employees. These decreased values were statistically significant (p value < 0.001). There was significant raise in serum globulin in I.T employees than in non I.T employees. These decreased values were statistically significant (p value < 0.001).

Table - 5 shows there was decrease in mean Serum Aspartate Transaminase and Alanine Transaminase in I.T employees than in non I.T

employees. This decreased value was statistically not significant (p value > 0.05). There was increase in mean Serum Alkaline Phosphatase in I.T employees than non I.T employees. This increased value was statistically significant (p value < 0.001).

Figure - 2: Age wise distribution of the subjects in each group in percentage.

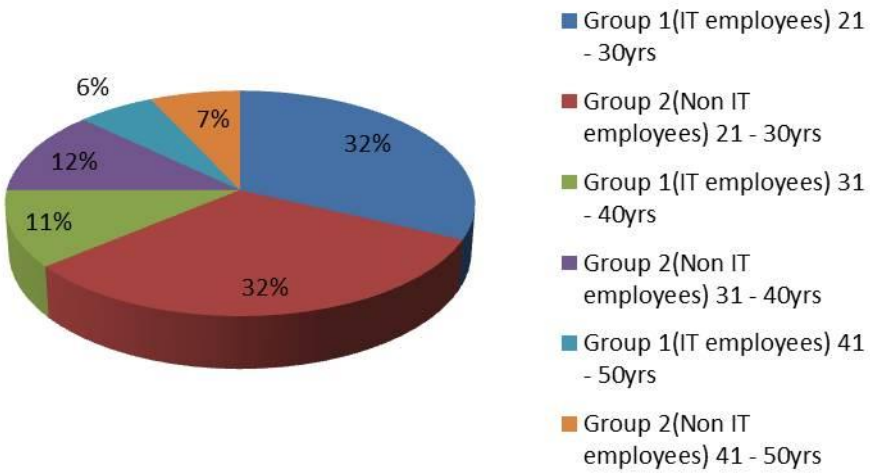

Table - 3: Bilirubin level of the study subjects in each group.

Variables	Group 1 (I.T. employees) (Mean±SD) n = 150	Group 2 (Non I.T. employees) (Mean±SD) n = 150	p value
Total bilirubin (mg/dl)	0.66 ± 0.41	0.89 ± 0.47	<0.001
Direct bilirubin (mg/dl)	0.13 ± 0.09	0.20 ± 0.10	<0.001
Indirect bilirubin (mg/dl)	0.52 ± 0.33	0.69 ± 0.42	<0.001

Table - 4: Serum proteins level of the study subjects in each group.

Variables	Group 1 (I.T. employees) (Mean±SD) n = 150	Group 2 (Non I.T. employees) (Mean±SD) n = 150	p value
Total protein (g/dl)	7.56 ± 0.62	7.60 ± 0.70	>0.05
Albumin (g/dl)	4.39 ± 0.35	4.69 ± 0.45	<0.001
Globulin (g/dl)	3.17 ± 0.45	2.91 ± 0.60	<0.001
Albumin Globulin ratio	1.41 ± 0.22	1.69 ± 0.46	<0.001

Table - 5: Liver Enzymes levels of the study subjects in each group.

Variables	Group 1 (I.T. employees) (Mean ± SD) n = 150	Group 2 (Non I.T. employees) (Mean ± SD) n = 150	p value
Aspartate transaminase (IU/L)	23.45 ± 11.18	23.58 ± 19.15	>0.05
Alanine transaminase (IU/L)	19.85 ± 13.01	19.99 ± 13.13	>0.05
Alkaline phosphatase (IU/L)	85.41 ± 27.48	63.79 ± 25.43	<0.001

Discussion

According to Geeta Kumara, et al. and many other previous studies, I.T employees are more prone for stress and stress related health disorders with altered biochemical parameters than other employees [4].

In our study, the I.T employees were more aware about their health. So, they were practicing yoga, meditation and physical exercise regularly. They were doing periodical health check-up. I.T company was also giving adequate relaxation techniques during the work at regular intervals.

So, coping with stress may be better in I.T employees than in Non I.T employees.

Several literatures found that by practicing yoga and stress relaxing exercises reduce the body weight, blood pressure, blood glucose, serum urea, total cholesterol, triglycerides, LDL, VLDL levels. Kreitzer MJ, et al. found that yoga was effective in reducing stress [5]. Vedamurthachar, et al. observed that there was a significant reduction in plasma cortisol level after yoga practice [6]. Some other study found that yoga can decrease the oxidative stress [7].

There was a significant lowering of total bilirubin, direct bilirubin, indirect bilirubin in I.T. employees than non I.T. employees (p value < 0.001). Bilirubin is a physiological anti-oxidant. Stressful working environment may cause oxidative stress. Bilirubin utilization during the coping up of stress may be the reason for decreased level of bilirubin in I.T employees.

Our study results (significant decrease of albumin and significant raise of globulin) are matched with the study results of F. Van Hunsel, et al. in which they observed that there was raise in globulin level and decreased in albumin levels in stress [8].

In our study, there was no statistically significant difference in serum aspartate transaminase (AST) and serum alanine transaminase (ALT) levels between I.T employees and Non I.T employees (p value > 0.05). Our study results do not match with the study results of Ranjit Kumar, et al. who observed that epinephrine induced stress causes increase in serum aspartate transaminase levels in mice [9]. Several studies have reported increased liver enzymes in stress which could be due to activation of hypothalamo – pituitary – adrenal axis activation, releasing glucocorticoids and catecholamines which suppress the cytokine immune activation and increase the hepatic inflammatory response [10, 11]. Nagano, et al. found that a positive correlation between psychosocial stress and liver injury, as alanine transaminase values strongly correlated with high stress scores in the cirrhosis cohort [12].

Vagus nerve stimulation with anti-stress therapy (Hypnosis, meditation, acupuncture) may actually reduce the negative effect of stress on the liver [13]. This could be the reason for mild lowering of AST and ALT levels in I.T employees in our study. Activation of the HPA axis is a central component of the stress response, resulting ultimately in the release of glucocorticoids (cortisol in man, corticosterone in rodents) from the adrenal cortex. This release of glucocorticoids during stress is known to be critical for survival [14].

There was a significant raise in serum alkaline phosphatase levels in I.T employees than in Non I.T employees (p value < 0.001) in our study. But the values are within the normal range. According to Jain A, et al. there was a decrease in ALP levels in oxidative stress. Because I.T employees are well coping with stress, their ALP levels might be raised [15].

However, in recent years glucocorticoids released during the activation of the HPA axis have been shown to be intimately involved in the control of the inflammatory response in that removal of endogenous glucocorticoid release (by adrenalectomy), inhibition of the biological effect of endogenous glucocorticoids, or intrinsic biologically defective HPA axis activity results in a significant augmentation of the inflammatory response [16].

Interestingly, elevated plasma cytokine levels have been documented in patients with chronic hepatic inflammation, and chronic exposure to these elevated circulating levels of cytokines may lead to HPA axis dysregulation [17]. This finding suggests that chronic inflammatory liver disease itself may be associated with defective stress-induced glucocorticoid release. Low levels of circulating glucocorticoid after stress may theoretically exacerbate the underlying hepatic inflammatory disease.

Once an individual is subjected to such a stressor, specific pathways within the brain lead to the activation of the hypothalamic-pituitary-

adrenal (HPA) axis as well as the central sympathetic outflow. This constitutes the stress response, releasing key peripheral mediators glucocorticoids and catecholamines [18]. For a long time, it was suggested that stress influenced hepatic blood flow by inducing vasospasm and centrilobular hypoxia, leading to liver damage [19].

Some study observed that psychosocial stress itself can influence the course of hepatic inflammation, by directly altering IL-6 and TNF-α production [20]. Liu, et al. demonstrated that survival time of mice affected by HCC is greatly reduced when subjected to social isolation stress [21].

Cristin Constantin Vere, et al. observed that stress has been identified in recent years as an important factor in the progression and outcome of several important liver pathologies [22]. For a better understanding of the relationship between stress and liver pathology, further studies on both human and animal models have to be conducted. Comprehensive clinical trials could be devised, which would test positive correlations between elevated stress scores and a number of both serological and imaging parameters assessing disease in hepatic patients.

Conclusion

The occurrence of stress related health disorders and biochemical parameter changes depend on the intensity and duration of stressors and how well the person copes up with the stress. Previous studies have shown that the relaxation training and health awareness may decrease the stress related biochemical changes.

In our study, the I.T employees were having more health awareness, regular physical exercise, adequate relaxation training during the work, periodical health check – up, good diet habits, in-campus physical fitness centre, practicing yoga and meditation and life style modifications than Non I.T employees. During coping with stress, there is decreased release of glucocorticoids which in turn may cause decreased inflammation in liver which may be the reason for significant reduction of bilirubin in I.T employees. Our study strongly recommends the implementation of adequate relaxation training, periodical health check-up camp, proper diet counseling, life style modification and in-campus physical fitness centre in all working organizations (I.T. and Non I.T.) which will be very helpful in promoting the health of the employees, their organization and ultimately the development of the nation.

Limitation

- Study with long term follow up will give more information regarding the alteration in biochemical parameters due to prolonged exposure of stressors among the employees.
- Long term study with assessment of stress level (by standard recommended questionnaire) will give more validated results.
- Inclusion of the samples from various geographical distribution and large sample size will give more information.

References

1. Jakkula V. Rao, K. Chandraiah. Occupational stress, mental health and coping among information technology professionals. Indian Journal of Occupational and Environmental Medicine, 2011; 15(2): 22-26.
2. P. Bhuyar, A. Banerjee, P. Padmanaban, A. Patil, S. Duggirala, S. Rajan, S. Chaudhury. Mental, Physical and Social health problems of Call Centre Workers. Industrial Psychiatry Journal, 2008; 17(1): 21 – 25.
3. Bøggild H, Knutsson A. shift work, risk factors and cardiovascular disease. Scand J Work Environ Health, 1999; 25: 85-99.
4. Geeta Kumari, K.M.Pandey, S.S. Khanaka. Studies on Health Problems of Software People: A Case Study of Faculty of GCE and GIMT Gurgaon, India. International Journal of

Innovation, Management and Technology, 2010; 1(4): 388.

5. Kreitzer MJ, Gross CR, Ye X, Russas V, Treesak C. Longitudinal impact of mindfulness meditation on illness burden in solid-organ transplant recipients. Prog Transplant., 2005; 15: 166–72.
6. Vedamurthachar. Biological Effects of Sudarshana Kriya on Alcoholics Science of Holistic Living and Its Global Application. Arogyadham, MGIMS, Sevagram. Cmb., 6: 72 – 78
7. Sinha S, Singh SN, Monga YP, Ray US. Improvement of glutathione and total antioxidant status with yoga. J Altern Complement Med., 2007; 13(10): 1085–90.
8. F. Van Hunsel, A. Van Gastel, H. Neels, A. Wauters, P. Demedts, K. Bruyland, I. Demeester, S. Scharpé, A. Janca, C. Song And M. Maes. The influence of psychological stress on total serum protein and patterns obtained in serum protein electrophoresis. Medicine, 1998; 28(02): 301-09.
9. Ranjit Kumar, Shivshanker Kumar, Mohd Ali, Arun Kumar, A. Nath, Kapil Lawrence, J.K. Singh. Impact Of Stress On Histology And Biochemical Parameters Of Liver And Kidney Of Mice. Innovative Journal of Medical and Health Science, 2012; 2(4): 63 – 66.
10. Hirose S, Hirayama C, Ikemi Y. The influence of emotional stress on the liver blood flow. Kyushu J Med Sci., 1961; 12: 319-23.
11. Chrousos GP. The hypothalamic-pituitary-adrenal axis and immune-mediated inflammation. N Engl J Med., 1995; 332: 1351-62.
12. Nagano J, Nagase S, Sudo N, Kubo C. Psychosocial stress, personality, and the severity of chronic hepatitis C. Psychosomatics, 2004; 45: 100-06.
13. Liz Highleyman, Alan Franciscus. Stress and the Liver. HCSP FACT SHEET, HCSP 2012; version 4.
14. Swain, Mark G. Stress and the Gastrointestinal Tract. I. Stress and hepatic inflammation. Am J Physiol Gastrointest Liver Physiol., 2000; 279: G1135–G1138.
15. Jain A, Jaddhav A A, Varma M. Reaction of oxidative stress, zinc and alkaline phosphatase in protein energy malnutrition. Arch Physiol. Biochem., 2013; 119(1): 15 – 21.
16. Sternberg EM, Chrousos GP, Wilder RL, Gold PW. The stress response and the regulation of inflammatory disease. Ann Intern Med., 1992; 117: 854-66.
17. Turnbull AV, Rivier CL. Regulation of the hypothalamic pituitary - adrenal axis by cytokines: actions and mechanisms of action. Physiol Rev., 1999; 70: 1–71.
18. Swain MG. Stress and hepatic inflammation. Am J Physiol Gastrointest Liver Physiol., 2000; 279: G1135-G1138.
19. Hirose S, Hirayama C, Ikemi Y. The influence of emotional stress on the liver blood flow. Kyushu J Med Sci., 1961; 12: 319-23.
20. Tjandra K, Sharkey KA, Swain MG. Progressive development of a Th1-type hepatic cytokine profile in rats with experimental cholangitis. Hepatology, 2000; 31: 280-90.
21. Liu H, Wang Z. Effects of social isolation stress on immune response and survival time of mouse with liver cancer. World J Gastroenterol., 2005; 11: 5902-04.
22. Cristin Constantin Vere, Costin Teodor Streba, Letitia Maria Streba, Alin Gabriel Ionescu, Felix Sima. Psychosocial stress and liver disease status. World J Gastroenterol., 2009; 15(24): 2980-86.