Original Article

Occupational stress among IT professionals in Chennai, Tamilnadu

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Abstract

Background: Stress in the workplace can have impact on physical and mental health. It can also be result in absenteeism, reduced productivity and monetary problems among the working population. The objective of this study is to assess the stress levels among the Software Professionals working in a private firm, Chennai

Methods: A cross-sectional study was conducted over six months in a private software firm in Chennai. A sample size of 364 participants was determined based on previous research, with data collected through interviews using a pre-tested questionnaire. This questionnaire covered demographic information, perceived stress scale, and various lifestyle factors, including exercise and hobbies. Data were analyzed using statistical tests, including Chi-square, and significance was set at $p < 0.05$.

Results: The study included predominantly young male participants (mean age 27 ± 3.5), with 81.9% experiencing moderate stress levels. High stress was more prevalent among males and those under 28 years old. Software professionals with over three years of experience and those working on computers for more than six hours a day were more likely to report moderate to high stress levels. However, individuals who engaged in exercise and hobbies exhibited lower stress levels.

Conclusion: Coping strategies and periodic health education should be recommended to reduce the development of stress and its consequences.

Keywords: Hobbies; Software; Stress, Psychological; Workplace.

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Introduction

Stress, as defined by the International Labor Organization, stems from the imbalanced relationship between perceived demands and available resources, resulting in harmful physical and emotional responses.[1] The factors contributing to occupational stress are multifaceted and encompass various aspects such as organizational dynamics, job design, individual capabilities, the adequacy of rest, and engagement in hobbies.[2] Moreover, the precarious nature of work situations plays a pivotal role in inducing stress among employees. This occupational stress can

manifest in detrimental ways, including reduced productivity, accidents, and absenteeism, ultimately leading to significant health hazards.

The repercussions of stress extend beyond physical ailments, encompassing behavioral changes that can exacerbate health-related issues[3]. Stress is associated with a wide range of somatic illnesses and symptoms, including headaches, musculoskeletal disorders, and peptic ulcers. Furthermore, it can precipitate psychological and behavioral problems such as sleep disorders, anxiety, and substance abuse.[4] The adverse impact of stress also spills into the realm of work-life balance, giving rise to conflicts that result in sickness-related absenteeism, diminished productivity, and economic challenges.

The Information Technology (IT) industry, which witnessed exponential growth since its inception in the 1960s, stands as a significant job creator. However, this sector brings with it a host of challenges, including stress-related concerns, musculoskeletal problems, and vision issues. The burgeoning demand for IT jobs, coupled with the constraints of time-bound work, further exacerbates stress levels. Notably, jobs in the Software Industry, a subset of IT, harbor diverse risk factors contributing to stress.[5] These encompass tight deadlines, the monotonous nature of work, and night shifts, all of which combine to create a high-stress environment.

The consequences of stress within the software engineering domain span a wide spectrum, ranging from mild symptoms to severe depression, and in some tragic cases, even suicide. Recognizing the gravity of this issue, this study seeks to evaluate and quantify the levels of stress among Software Professionals working in a private firm in Chennai. This research aims to shed light on the unique stressors faced by software engineers and provide insights into potential interventions to address this pressing concern.

The objective of this study is to assess the stress levels among the Software Professionals working in a private firm, Chennai

Methods

***Study type*:** The study was a cross sectional study conducted in a private firm in Chennai. India conducted for a period of 6 months

Sampling and study population:

The study was conducted among IT professionals working in Chennai, Tamil Nadu, India

***Inclusion criteria*:** The study population was the Software professional working in a private software firm in Chennai age less than 40 years.

***Exclusion criteria*:** Software professional with history of psychiatric problems.

Sample size determination: From the previous study[6] it was found that prevalence of stress among software professionals was 35%. With 35% sample size, 5% relative error and non-response rate of 10%, the sample size was calculated to be 364.

Sampling method: Simple Random Sampling.

The sampling approach utilized involved a two-phase process.

In Phase 1, we first selected a private IT firm to be part of our study. We chose this firm based on its achievement of a high CMMI (Capability Maturity Model Integration) level, specifically levels 6, 7, or 8. These CMMI levels are awarded by the CMMI Institute, a subsidiary of the Information Systems Audit and Control Association, and they serve to evaluate a company's organizational capabilities. The CMMI levels range from 1 to 5, with level 5 being the highest. Each level corresponds to specific organizational activities and capabilities. Level 1 firms operate in an ad-hoc manner, whereas the highest-level firms have developed their own

comprehensive guidelines, including aspects such as eligibility and ergonomics. Typically, these organizations handle more intricate projects, with employees working under strict time constraints. Due to the nature of their work, employees often have to adjust their work styles, adhere to ergonomic principles, and engage in prolonged computer usage. Consequently, we selected a level 5 firm for our study. There was a total of sixteen CMMI level 5 firms in Chennai, Tamil Nadu, and we randomly selected one of them using a lottery method.

In Phase 2, we focused on the selection of participants from the chosen company. Out of a total of 12,800 Software Engineers employed in this company, 4,580 Software Engineers met the inclusion criteria, while 33 individuals were excluded based on predefined exclusion criteria. Subsequently, we created a list of the remaining 4,547 employees in alphabetical order and assigned random numbers to each. Using a computer-generated random number table, we then selected a sample of 364 participants for our study.

Data collection procedure

The data collection procedure for this study involved administering semi structured questionnaires to 364 IT professionals who were employed at a randomly selected CMMI level 5 IT firm in Chennai, Tamil Nadu. These questionnaires included validated stress assessment scales and questions pertaining to demographics and job-related variables. Data collection was conducted through interviews or online surveys, with participants providing informed consent, and efforts were made to accommodate their work schedules to minimize disruption. Trained research assistants oversaw the process to maintain standardization, and the collected data was securely managed to ensure confidentiality. The data was subsequently subjected to statistical analysis to explore the relationship between occupational stress and various independent variables, ultimately contributing to a comprehensive understanding of stress factors within the IT industry in Chennai.

Study instrument

A pretested, validated study questionnaire was used to collect the data. The study instrument consists of 2 sections. Section 1 had details of the study participants such as age, gender, BMI, experience, duration of computer usage, travel time, exercise and hobbies. Section 2 had Perceived stress scale used to appraise the stress situations. It had 10 questions with scoring. The Perceived Stress Scale (PSS-10) is a 10-item questionnaire originally developed by Cohen et al.[7] (1983) widely used to assess stress levels in young people and adults aged 12 and above. The measure has been validated in both adolescent and adult populations.[8] The study instrument was validated using pilot testing among 10 percent of the sample size and the results of the pilot testing was not included in the study.

Statistical analysis

Data was entered in Microsoft Excel spread sheet and analyzed in Statistical Package for Social Sciences (SPSS -IBM) software version 21. For quantitative variables mean, standard deviation, frequency and proportion were calculated. Data were assessed for normality before applying tests of significance. Chi square test was applied, p value of <0.05 was considered significant.

Ethical consideration and confidentiality

Throughout the study, stringent ethical guidelines were adhered to. Prior to data collection, ethical approval was obtained from an Institutional Review Board (IRB) to ensure that the study was conducted ethically and within the bounds of established ethical principles. Informed consent was sought from all participants, ensuring that they were aware of the study's objectives, procedures, and potential risks, and they had the right to withdraw at any point. Confidentiality of participants' data

was maintained by using codes instead of personal identifiers, and their privacy was upheld. Additionally, the study was conducted with the utmost respect for the dignity and rights of the participants, with ethical considerations serving as a fundamental cornerstone of the research process.

Results

Table 1 provides an overview of the study participants' demographic characteristics. Among the 364 participants, the majority fell within the age range of 26-28 years (38.4%), with a mean age of 27 ± 3.5. The gender distribution skewed towards males, representing 62.1% of the sample. Regarding body mass index (BMI), most participants were categorized as "Normal" (57.1%), while a smaller percentage were classified as "Overweight" (29.9%). Notably, the study included a higher proportion of participants with more than three years of professional experience (63.7%), and the majority used computers for over six hours a day (88.5%). About 72.8% of participants reported not engaging in regular exercise, while 63.5% stated they did not have hobbies.

Table 1: Details of study Participants (N=364)

	Profile	No.	%
Age	23-25	130	35.7
	26-28	140	38.4
	29-31	59	16.2
	32-34	19	5.2
	35-37	10	2.7
	38-40	6	1.6
Gender	Male	226	62.1
	Female	138	37.9
BMI	Underweight	12	3.3
	Normal	208	57.1
	Overweight	109	29.9
	Obese Type 1	34	9.3
	Obese Type 2	1	0.3
Experience (Years)	<3	132	36.3
	>3	232	63.7
Computer Usage in a day (Hours)	<6	42	11.5
	>6	322	88.5
Do you exercise	Yes	99	27.2
	No	265	72.8
Do you have hobbies	Yes	133	36.5
	No	231	63.5

Among the 364 participants, 81.9% experienced moderate stress, while 14% reported low stress, and 4.1% experienced high stress. This indicates that a significant portion of IT professionals in the sample faced moderate stress, which serves as a foundation for further investigation into factors associated with stress (Table:2).

Table 2: Distribution of study participants according to stress (N=364)

Stress level	Frequency	Percentage
Low	51	14
Moderate	298	81.9
High	15	4.1

Age was statistically associated with stress levels, with those in the 35-37 age group experiencing the highest levels of stress (30%) among age categories (Table:3). Gender also displayed an association, with males experiencing higher stress levels (16%) compared to females (11%). However, these gender-related differences were not statistically significant. BMI did not exhibit a significant association with stress levels, and no specific BMI category showed a pronounced difference in stress levels (Table: 3).

Individuals with less than three years of experience had a higher likelihood of experiencing moderate to high stress (89.4%) compared to those with more experience (84.1%). The difference was statistically significant, suggesting that experience plays a role in stress levels. Total duration of computer usage did not show a significant association with stress levels. In terms of travel time, individuals with travel times exceeding 30 minutes had a slightly higher likelihood of experiencing moderate to high stress (16.9%), though this difference was not statistically significant. The presence of exercise and hobbies emerged as significant factors influencing stress levels. Participants who engaged in exercise and hobbies reported lower stress levels, with p-values of 0.822 and 0.039, respectively (Table:4).. This suggests that incorporating physical activity and hobbies into one's lifestyle may

Table 3: Association between profile of the study participants and stress level

	Variable	Stress level N (%)			p value*
		Low	Moderate	High	
Age	23-25	12(9.2)	112(86.2)	6(4.6)	
	26-28	25(17.9)	109(77.8)	6(4.3)	
	29-31	7(11.9)	50(84.7)	2(3.4)	
	32-34	2(10.5)	16(84.2)	1(5.3)	
	35-37	3(30)	7(70)	0	
	38-40	2(33.3)	4(66.7)	0	0.026
Gender	Male	36(16)	183(81)	7(3)	
	Female	15(11)	115(83.3)	8(5.7)	0.083
BMI	Underweight	2(16.7)	10(83.3)	0	
	Normal	22(10.6)	176(84.6)	10(4.8)	
	Overweight	22(20.2)	83(76.1)	4(3.7)	
	Obese Type 1	4(12)	29(85.1)	1(2.9)	
	Obese Type 2	1(100)	0	0	0.141

Chi square test applied, p value <0.005 is significant

Table 4: Factors influencing stress levels

	Variable	Stress level N (%)		p value*	Odds ratio (CI)
		Moderate / High	Low		
Experience (Years)	<3	118(89.4)	14(10.6)		1.59 (0.82-3.08)
	>3	195(84.1)	37 (15.9)	0.001	
Total duration of computer usage(hours)	<6	37(88)	5(12)		1.23 (0.46-3.3)
	>6	276(85.7)	46(14.3)	0.182	
Travel time	<30 min	180(88.3)	24(11.7)		1.52 (0.84-2.75)
	>30min	133(83.1)	27 (16.9)	0.684	
Exercise	Yes	83(83.8)	16(16.2)		0.78 (0.41-1.50)
	No	230(86.8)	35(13.2)	0.822	
Hobbies	Yes	109(82)	24(18)		0.60 (0.33-1.09)
	No	204(88.3)	27(11.7)	0.039	

Chi square test applied, p value <0.005 is significant

contribute to reduced stress among IT professionals.

Discussion

The present study was conducted among a sample of 364 software engineers employed at a private firm in Chennai. The mean age of the participants in this study was found to be 27 years with a standard deviation of 3.5. This age distribution is notably similar to a study conducted by Sharma AK et al.[6] in Delhi, where the mean age of participants was reported to be 29.8 years with a standard deviation of 4.3 years. It is worth mentioning that most of the participants in our study fell within the age range of 26 to 28 years, constituting 38.4% of the sample. Additionally, a majority of the participants were male, accounting for 62.1% of the total.

Regarding the assessment of stress levels among the software engineers in our study, it was observed that a substantial portion, amounting to 81.9% of the participants, reported experiencing moderate stress. This finding aligns closely with the results of a study conducted by Prathyusha B et al.[9], which reported that approximately 84% of software professionals in their study also had moderate stress levels. However, it is important to note that in a study conducted by Vimala B and Madhavi C.[10], while a majority of the participants exhibited a moderate level of stress, the percentage was notably lower at 55.2%. This discrepancy may be attributed to differences in working environments and individual perceptions of stress.

Among the subset of participants who reported high stress (15 individuals), nearly 12 were under the age of 28 years. This

finding is consistent with a study conducted by Neeraja T and Swaochish C[11], which indicated that the prevalence of high stress was higher among individuals within the age group of 21 to 28 years. Furthermore, the study revealed that the prevalence of moderate stress was higher among males, comprising 81% of male participants. This result is in line with studies conducted by Shrivastava SR and Bobhate PS[12] and Mohan DA et al.[13], which also found a higher prevalence of stress among males compared to females. However, it should be noted that a study conducted by Thomas V et al.[14] reported the opposite, with females experiencing higher stress levels than males.

In terms of work-related factors, the study identified that stress levels were higher among those who used computers for more than 6 hours per day. This finding is consistent with the results of a study by Thomas V et al[14]., which demonstrated that stress was higher among those who worked longer hours. Similarly, a study by Kusumadevi MS et al.[15] indicated a positive correlation between working hours and stress levels.

Moreover, the study found that stress levels were significantly lower among participants who engaged in regular exercise and had hobbies. This finding supports the recommendations of previous studies[16,17], which have suggested that adopting relaxation techniques can mitigate workplace stress among software engineers. Additionally, Kanagaraj MG et al.[18] demonstrated that employee depression levels were negatively related to job performance, with a one-unit increase in depression leading to a 0.015-unit decrease in performance. Furthermore, Alnishal PN et al.[19] found that there was a substantial presence of both good and medium levels of work stress (MPV=55.63) within the software industry as a whole. In their study, Palacio et al. found workload, mental work exhaustion, and job distraction as significant factors that are closely linked to a certain degree of stress experienced by software engineers.[20]

In summary, this research undertaken among software engineers in Chennai provides insights into the incidence and associations of occupational stress. The aforementioned statement highlights the significance of taking into account several variables, including age, gender, working hours, and lifestyle choices, in the context of reducing stress within the software business. The results of this study provide significant contributions to the understanding of scholars and organizations interested in enhancing the welfare of IT workers.

The limitation of the study include that it was a single-firm sample, cross-sectional design preventing causal inferences with a lack of demographic diversity. Future research should strive to overcome the limitations of this study by expanding the sample diversity to include IT professionals from multiple organizations, regions, and demographic backgrounds, allowing for a more comprehensive understanding of occupational stress. Additionally, employing a longitudinal study design can help investigate the dynamic nature of stress and its causal relationships over time, providing a more robust basis for policy and intervention recommendations.

Conclusion

It is evident that there occurs higher prevalence of stress among software engineers and to combat that stress management program should be conducted at regular intervals. Few strategies like relaxation sessions, periodic mental health examination, feedback can be adopted in the management and practicing yoga, developing hobbies and maintaining proper diet can be done at the individual level.

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