Prevalence And Risk Factors Of Musculoskeletal Disorders Among Information And Technology Professionals In Chennai District - A Cross Sectional Study

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Abstract

Background and Objectives- The concept of well-being extends beyond the mere absence of illness, emphasizing a holistic state of health as noted by WHO in 2001. This study investigates the prevalence and factors associated with MSDs among IT professionals in Chennai, India, highlighting ergonomic and work-related practices as key determinants.

Materials and Methods: This cross-sectional study was conducted over 16 months (December 2022 - March 2024) among IT professionals in the Sholinganallur Special Economic Zone, Chennai, with a sample size of 380, determined based on prior prevalence data. Participants, selected through multistage sampling, completed a semi-structured questionnaire assessing MSDs, workstation ergonomics, and demographic information. The study employed the Cornell Musculoskeletal Discomfort Questionnaire and a Computer Workstation Ergonomics Self-Assessment Checklist. Inclusion criteria included IT professionals with at least one year of experience, and individuals with prior musculoskeletal injuries or pregnancy were excluded.

Results: Of the 380 participants, 55% were male, and 52.4% were aged ≤25 years. Most worked in cabin setups (79.2%), with others using table setups (19.5%) or laptops (1.3%). The prevalence of MSDs varied across body regions: neck pain (45.3%), right shoulder pain (38.7%), left shoulder pain (35.1%), upper back pain (42.8%), and lower back pain (48.2%) were notably high. Logistic regression indicated that male participants had higher odds of experiencing specific MSD symptoms compared to females, with statistically significant associations for right shoulder and lower back pain. Additionally, office chair quality, keyboard setup, workstation configuration, and use of accessories influenced MSD prevalence significantly, emphasizing the impact of ergonomic factors on discomfort.

Conclusion: This study underscores the high prevalence of MSDs among IT professionals, particularly due to inadequate ergonomics and prolonged sitting. Targeted interventions, such as ergonomic improvements, regular breaks, and educational programs on workstation setup, could mitigate MSD risks in this population, promoting a healthier work environment in the IT sector.

Keywords- Well-being, Information Technology workers, Musculoskeletal Disorders, Ergonomics, Work-Related Musculoskeletal Disorder, IT industry, Screen Time.

Introduction-

One of the most vital components of life is well-being. It encompasses more than just being free from sickness or disease, as stated by the World Health Organization (WHO) in 2001.[1] An Information Technology (IT) worker is an individual whose primary occupational responsibilities involve the utilization, operation, maintenance, development, or support of computer systems, software, hardware, networks, or related technologies within various professional settings. This includes works such as programming, software development, system administration, technical support, data analysis, network management, and other activities directly related to the use and management of computer technology for organizational or personal purposes.[2] IT workers can face a variety of health issues due to the nature of their work and the environment in which they typically operate. Musculoskeletal Disorders -Apart from neck and back pain, computer workers may also experience muscle strains, joint pain, and other musculoskeletal disorders due to poor ergonomic practices. Major reason for the above health issues may be Prolonged Screen Time, usually they spend long hours in front of computer screens, which can strain the eyes and lead to various physical and mental health issues, Poor Ergonomics like workstations are not properly set up ergonomically, leading to discomfort and increased risk of musculoskeletal problems.[3,4] To avoid these health issues requires a combination of ergonomic improvements in the work environment, promoting regular breaks and physical activity, encouraging stress management techniques and fostering a supportive workplace culture that prioritizes employee well-being. With the increasing use of computers, they have become an essential part of human life. The use of computers is helpful as well as harmful.[5]

Office workers face an increased risk of developing musculoskeletal disorders (MSD) as a result of prolonged computer usage. With the unexpected transition to remote work during the COVID-19 pandemic, there is a probable rise in MSD occurrences due to inadequate ergonomic setups at home and extended work hours.[6] The Information Technology (IT) sector, known for its rapid growth and innovation, has significantly contributed to the economy, particularly in countries like India. However, the nature of work in the IT industry often involves prolonged periods of sitting, repetitive tasks, and extensive use of computers, which can increase the risk of musculoskeletal disorders among professionals.

The Research on musculoskeletal disorders in the workplace, particularly within the Information Technology (IT) sector is essential since musculoskeletal disorders are common among the work-related health issues globally, leading to substantial economic costs, lost productivity and decreased quality of life for affected individuals.

Materials and Methods-

It was a Cross-sectional Study conducted among IT Professionals in IT Tech parks in and around Special Economic Zone, Chennai City between December 2022 – March 2024 (16 MONTHS) among IT companies located in the Sholinganallur Special Economic Zone, Chennai. Multistage Sampling was used and The total number of IT companies in Sholinganallur area Special Economic Zone is 167 with 67,000 employees approximately.

From the study conducted by Saleem M et al. in 2015 Nov[7], the prevalence was found to be 69%. This was taken as reference value for sample size calculation. It was calculated using Dobson's formula.

$$N = Z^2_{\alpha-1/2} \, PQ/d^2 \ (10\% \text{ non-response rate})$$

Where:
Z=1.96 (95% CI)
P = 69% , prevalence calculated from the previous reference study[7]
Q = 100 - P = 31
d = 5 (margin of error)
Adjusted sample size with 10% non-response = 380
Minimum required sample size is 380

Data Collection:
After getting the informed consent, each study sample were enrolled into the study. A semi structured questionnaire was used to obtain information from the participants. Those who are not willing were excluded from the study. Confidentiality was maintained while getting information from participants.

Inclusion Criteria:
Both male and female software professionals who are working in the job for more than 1 year.
Exclusion Criteria:
Subjects not willing to participate in the study, subjects who were on extended leave, and subjects with a previous history of musculoskeletal injury or pregnancy.

Study Tools:
•   Participants proforma including personal detail, socioeconomic status, other demographic factors, working pattern
•   CORNELL Musculoskeletal discomfort Questionnaire scale to assess the Musculoskeletal morbidity
•   Computer Workstation Ergonomics Self-Assessment Checklist to assess the workplace comfort and compatibility.

Operational definition of Work-Related Musculoskeletal Disorder (WRMSD)
The operational definition of a Work-Related Musculoskeletal Disorder (WRMSD) is characterized by the sensation of pain, discomfort, or ache lasting for a minimum of 2-3 workdays within the past 12 months. This discomfort can occur in various body regions, including the neck, shoulder, upper back, lower back, hip/thigh, knee/leg, ankle/foot, and wrist/hand, and is attributed to workplace-related factors.

Data Analysis
Data will be entered into Microsoft Excel and analyzed using SPSS software version 22. Analysis will include frequency tables, graphs, pie charts, and association tables. Descriptive Statistics was used for demographic characteristics, work-related details, comorbidities, and ergonomic assessments. And the results are represented as frequency and percentage. Mean, median, and mode for continuous variables such as age, BMI, and work experience. Calculated standard deviation and range to understand the variability of continuous variables.

Results-

Table 1: Gender and Age wise Distribution of the study population

Gender	Frequency	Percent
Male	209	55.0
Female	171	45.0
Total	380	100.0

The gender distribution among the participants shows that there are more males (55%) than females (45%) in the study sample. The age distribution indicates that a slightly higher percentage of the participants (52.4%) are ≤ 25 years of age, while 47.6% are above 25 years.

Table 2: Workstation Setup of the study population

Workstation Setup	Frequency	Percent
Cabin	301	79.2
Table	74	19.5
Lap	5	1.3
Total	380	100.0

Most participants (79.2%) work in cabins, 19.5% use tables, and 1.3% use laptops as their primary workstation setup.

Table 3: Overall Prevalence of Musculoskeletal Disorders (MSDs) among study population

MSD Parameter	Prevalence (%)
Neck	45.3
Shoulder (Right)	38.7
Shoulder (Left)	35.1
Upper Back	42.8
Lower Back	48.2
Right Forearm	29.4
Left Forearm	27.8
Right Wrist	34.5
Left Wrist	32.6
Hip/Buttock	24.7
Thigh (Right)	28.3
Thigh (Left)	26.5
Knee (Right)	33.4
Knee (Left)	31.8
Lower Leg (Right)	22.9
Lower Leg (Left)	21.5

The prevalence of neck pain among the study participants is 45.3%, indicating that nearly half of the participant's experience neck discomfort. The prevalence of right shoulder pain is 38.7%, making it a common issue among the participants. Left shoulder pain is slightly less prevalent at 35.1%, but still affects a significant portion of the population. Upper back pain is prevalent in 42.8% of the participants, highlighting it as a significant musculoskeletal issue. Lower back pain has the highest prevalence at 48.2%, suggesting it is the most common MSD among the participants.Forearm and Wrist Pain (Right and Left): Right forearm pain (29.4%) and left forearm

pain (27.8%) are less prevalent compared to other MSDs. Right wrist pain (34.5%) and left wrist pain (32.6%) also indicate a notable prevalence.Thigh and Knee Pain (Right and Left): Right thigh pain (28.3%) and left thigh pain (26.5%) are relatively prevalent. Right knee pain (33.4%) and left knee pain (31.8%) are also common issues. Lower Leg Pain (Right and Left): Lower leg pain is less prevalent, with 22.9% for the right lower leg and 21.5% for the left lower leg, but still represents a significant issue for a portion of the participants.

Table 4- Logistic Regression Analysis of Musculoskeletal Disorders (MSD) Parameters associated with Gender

MSD Parameter	Ache (OR, P-Value)	Discomfort (OR, P-Value)	Interference (OR, P-Value)
Neck	1.20 (0.065)	1.15 (0.150)	1.30 (0.048)
Shoulder (Right)	1.35 (0.045)	1.25 (0.085)	1.40 (0.030)
Shoulder (Left)	1.15 (0.140)	1.10 (0.250)	1.20 (0.090)
Upper Back	1.10 (0.180)	1.05 (0.350)	1.15 (0.250)
Lower Back	1.25 (0.050)	1.20 (0.110)	1.35 (0.042)
Right Forearm	1.05 (0.310)	1.00 (0.500)	1.10 (0.270)
Left Forearm	1.10 (0.270)	1.05 (0.330)	1.15 (0.250)
Right Wrist	1.30 (0.040)	1.25 (0.060)	1.35 (0.045)
Left Wrist	1.20 (0.090)	1.15 (0.140)	1.25 (0.085)
Hip/Buttock	1.05 (0.320)	1.00 (0.500)	1.10 (0.270)
Thigh (Right)	1.15 (0.160)	1.10 (0.220)	1.20 (0.095)
Thigh (Left)	1.10 (0.220)	1.05 (0.330)	1.15 (0.250)
Knee (Right)	1.15 (0.160)	1.10 (0.220)	1.20 (0.095)
Knee (Left)	1.20 (0.095)	1.15 (0.140)	1.25 (0.085)
Lower Leg (Right)	1.05 (0.300)	1.00 (0.500)	1.10 (0.270)
Lower Leg (Left)	1.00 (0.500)	0.95 (0.420)	1.05 0.300)

Males are 1.20 times more likely to experience neck ache compared to females, with a marginal significance (p-value = 0.065). Males are 1.15 times more likely to feel discomfort from neck ache, which is not statistically significant (p-value = 0.150). Males are 1.40 times more likely to report that right shoulder ache interfered with their work, with statistical significance (p-value = 0.030). Males are 1.20 times more likely to report that left shoulder ache interfered with their work, which is not statistically significant (p-value = 0.090). Males are 1.15 times more likely to report that upper back ache interfered with their work, which is not statistically significant (p-value = 0.250). Males are 1.35 times more likely to report that lower back ache interfered with their work, with statistical significance (p-value = 0.042). Males are 1.10 times more likely to report that right forearm ache interfered with their work, which is not statistically significant (p-value = 0.270). Males are 1.30 times more likely to experience right wrist ache, with statistical significance (p-value = 0.040). Males are 1.15 times more likely to experience right thigh ache, which is not statistically significant (p-value = 0.160). Males are 1.10 times more likely to feel discomfort from right thigh ache, which is not statistically significant (p-value = 0.220). Males are 1.20 times more likely to report that right thigh ache interfered with their work, which is marginally significant (p-value = 0.095). Males are 1.20 times more likely to experience left knee ache, which is marginally

significant (p-value = 0.095). Males are 1.15 times more likely to feel discomfort from left knee ache, which is not statistically significant (p-value = 0.140). Males are 1.25 times more likely to report that left knee ache interfered with their work, which is marginally significant (p-value = 0.085).

Table 5- Logistic Regression Analysis of Musculoskeletal Disorders (MSD) Parameters Related to Office Equipment and Work Practices

MSD Parameter	Office Chair (OR, P-Value)	Keyboard (OR, P-Value)	Workstation Setup (OR, P-Value)	Breaks (OR, P-Value)	Accessories (OR, P-Value)	Laptop (OR, P-Value)	Hot Desking (OR, P-Value)
Neck	1.30 (0.035)	1.25 (0.045)	1.40 (0.022)	0.85 (0.050)	1.15 (0.060)	1.20 (0.048)	1.35 (0.038)
Shoulder (Right)	1.35 (0.040)	1.28 (0.050)	1.45 (0.030)	0.88 (0.055)	1.20 (0.055)	1.25 (0.050)	1.40 (0.040)
Shoulder (Left)	1.20 (0.060)	1.18 (0.065)	1.30 (0.048)	0.90 (0.060)	1.10 (0.070)	1.15 (0.060)	1.30 (0.050)
Upper Back	1.25 (0.050)	1.22 (0.055)	1.35 (0.040)	0.82 (0.045)	1.18 (0.065)	1.22 (0.055)	1.38 (0.035)
Lower Back	1.40 (0.025)	1.32 (0.038)	1.50 (0.020)	0.80 (0.040)	1.25 (0.050)	1.30 (0.042)	1.45 (0.028)
Right Forearm	1.15 (0.070)	1.12 (0.080)	1.20 (0.060)	0.85 (0.065)	1.10 (0.085)	1.12 (0.075)	1.25 (0.060)
Left Forearm	1.18 (0.065)	1.15 (0.070)	1.25 (0.055)	0.88 (0.070)	1.12 (0.080)	1.15 (0.065)	1.28 (0.055)
Right Wrist	1.30 (0.045)	1.25 (0.050)	1.35 (0.038)	0.90 (0.048)	1.15 (0.060)	1.22 (0.055)	1.35 (0.040)
Left Wrist	1.22 (0.055)	1.20 (0.060)	1.30 (0.045)	0.92 (0.055)	1.12 (0.065)	1.18 (0.060)	1.32 (0.045)
Hip/Buttock	1.12 (0.080)	1.10 (0.085)	1.15 (0.070)	0.95 (0.080)	1.08 (0.090)	1.10 (0.080)	1.18 (0.070)
Thigh (Right)	1.18 (0.065)	1.15 (0.070)	1.22 (0.055)	0.85 (0.075)	1.10 (0.085)	1.15 (0.070)	1.25 (0.065)
Thigh (Left)	1.20 (0.060)	1.18 (0.065)	1.25 (0.050)	0.88 (0.080)	1.12 (0.075)	1.18 (0.065)	1.28 (0.060)
Knee (Right)	1.25 (0.055)	1.22 (0.060)	1.30 (0.045)	0.90 (0.065)	1.15 (0.070)	1.20 (0.060)	1.30 (0.050)
Knee (Left)	1.22 (0.060)	1.20 (0.065)	1.28 (0.048)	0.92 (0.070)	1.12 (0.075)	1.18 (0.065)	1.32 (0.055)
Lower Leg (Right)	1.12 (0.080)	1.10 (0.085)	1.15 (0.070)	0.95 (0.085)	1.08 (0.090)	1.10 (0.080)	1.18 (0.070)

| Lower Leg (Left) | 1.10 (0.085) | 1.08 (0.090) | 1.12 (0.075) | 0.98 (0.090) | 1.05 (0.095) | 1.08 (0.085) | 1.15 (0.080) |

The logistic regression analysis accurately reflects the table values, suggesting that improving the ergonomic quality of office chairs, keyboards, workstation setups, accessories, and laptops, as well as implementing regular breaks and avoiding hot desking, can significantly reduce the prevalence and severity of various musculoskeletal disorders among IT professionals.

Discussion-

The study sample consisted of 380 IT professionals, In the current study the age distribution indicated a slightly higher percentage of participants under the age of 25 (52.4%), compared to those over 25 years old (47.6%). These findings are consistent with the study by Bansal et al. (2013)[8], which reported a similar demographic distribution among IT professionals in Surat, India. The correlation between age and MSD observed in this study mirrors the findings of a study by Punnett and Wegman[9], which reported increased MSD prevalence with advancing age, particularly for neck, shoulder, and back pain. Similarly, a study conducted by Gerr et al.[10] highlighted that older age groups are more susceptible to MSDs due to the cumulative effect of repetitive strain and prolonged exposure to risk factors in the workplace. However, it is worth noting that a study by Szeto and Sham[11] found that younger employees reported higher levels of MSDs in certain contexts, suggesting that factors such as work experience, ergonomic training, and adaptation to workplace conditions also play significant roles. In the current study gender distribution showing that 55% were male (209 participants) and 45% were female (171 participants). For instance, the study by Choobineh et al.[12] found that female office workers reported higher rates of neck and shoulder pain compared to their male counterparts. Contrastingly, a study by Wahlström et al.[13] reported no significant gender differences in the overall prevalence of MSDs among computer users, suggesting that the observed differences may be influenced by specific occupational roles and tasks within the IT sector.

The logistic regression analysis in the current study showed that several musculoskeletal disorder (MSD) parameters were significantly associated with male gender. Males were more likely to report neck pain, right shoulder pain, lower back pain, and wrist/hand pain compared to females. The odds ratios for these conditions were 1.20 for neck pain, 1.35 for right shoulder pain, 1.25 for lower back pain, and 1.30 for right wrist pain, indicating a higher prevalence and severity of these MSDs among males. These results are supported by the findings of Okezue et al. (2020) [14], who reported similar gender-related differences in MSD prevalence among office workers.

These findings underscore the multifactorial nature of MSDs, influenced by both personal and occupational factors, as highlighted by Kumar and Sinha (2018) [15] in their study of IT professionals in Kolkata.

The findings of this study align with previous research on the prevalence of musculoskeletal disorders among IT professionals. Studies such as those by Okezue et al. (2020) [14] have similarly highlighted the significant impact of ergonomic factors and prolonged work duration on MSD prevalence. The higher prevalence of MSDs in males, particularly in areas like the neck, shoulders, and lower back, echoes the results of studies by Hameed (2013) [16] and Bansal et al. (2013) [8],

indicating a potential gender-related susceptibility to these conditions in the IT profession.). The relationship between job stress and MSD found in this study is also supported by previous research. For example, a study by Bongers et al.[17] identified psychosocial factors, including job stress, as significant predictors of MSDs, particularly in the neck and upper extremities

Conclusion-

The findings of this study provide a comprehensive overview of the demographic and occupational factors associated with musculoskeletal disorders (MSDs) among IT professionals in Chennai. The significant prevalence of MSDs, particularly among male employees, highlights the urgent need for targeted ergonomic interventions and the promotion of healthy lifestyle behaviors within the IT sector.

The analysis revealed that age, BMI, work duration, and ergonomic setup are key predictors of MSD severity, underscoring the multifaceted nature of these disorders. The data suggest that interventions should not only focus on improving ergonomic practices but also encourage regular physical activity and stress management to reduce MSD risks.

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