Original Article

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Prevalence and associated risk factors of musculoskeletal disorders among information technology (IT) professionals: A systematic review

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Abstract

Musculoskeletal disorders (MSDs) are a growing concern among information technology (IT) professionals. Understanding the specific risk factors associated with MSDs among employers, occupational health practitioners, and IT professionals may reveal effective preventive measures. The aim of this study was to examine the prevalence and identify the risk factors associated with MSDs among IT professionals. A comprehensive literature search was conducted on several databases, including PubMed, Scopus, ScienceDirect, ProQuest, Online Library Wiley, Springer, Web of Science, and manual searches to identify relevant studies published between 2013 and 2023. The search strategy employed appropriate keywords related to IT professionals, musculoskeletal disorders, prevalence, and risk factors. Two reviewers independently assessed each article using PRISMA guidelines and the Joanna Briggs Institute's (JBI) Critical Appraisal Checklist for Prevalence Data. Data extraction was performed, and a narrative synthesis was conducted to summarize the findings. Our search yielded a total of 1159 records, with 13 studies finally included in this review. The selected studies were from several countries and contained a total of 4632 participants. The prevalence of MSDs was reported with a maximum rate of 89% and a minimum rate of 20%, reflecting the overall percentage of affected individuals and including data on specific body areas affected. Identified risk factors from the selected studies include work duration, experience, sex, strenuous back positions, smoking, physical inactivity, MSD history, uncomfortable workstation setting, mental stress, insufficient sleep, body posture, exercise status, alcohol consumption, prolonged sitting, workspace, job demands, overexertion, breaks during work, and excessive usage of smartphones.

Keywords: Musculoskeletal disorders, occupational health, IT professionals, ergonomics, injury prevention

Introduction

Musculoskeletal disorders (MSDs) are considered among the most significant work-related health diseases/conditions and are prevalent in numerous occupations throughout the world [1]. The prevention and control of MSDs are significant issues due to the associated disadvantages,

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such as disabilities, medical expenses, and reduced work performance [2]. The consequences of MSD prevalence are crucial, resulting in approximately 1.71 billion disabled people globally [3].

Musculoskeletal complaints among computer workers and information technology (IT) professionals are frequently reported due to their work behavior. Improper posture, unhealthy habits at work, workstation design, and psychosocial variables at work are some of the primary causes of MSDs among office workers, such as computer users and IT professionals [4]. The use of computers in the workplace is evolving all over the world, particularly with the rise of working outside of the office or remote work accelerated by the COVID-19 pandemic. This trend of working outside traditional office settings is expected to continue growing in the future [5,6]. Since the beginning of the pandemic, the prevalence of physical and psychological stress has increased, work patterns have also changed, and dependency on computer-based applications has reached its highest level [7]. Remote working has led to an increase in overall screen time, fewer opportunities for physical activities, improper ergonomic settings, uncomfortable workstations, and various psychological stresses [7,8]. While technologies, including computers, have significantly simplified our lives, they have also introduced various health risks. The prevalence of health issues related to computer use is on the rise, and the situation is becoming alarming [9]. Prolonged usage of computers, laptops, and tablets has already been shown to cause MSDs related to body pain and altered body posture [10]. Computer work often results in a static position of the neck, shoulders, and upper limbs for extended periods, increasing the risk of developing visual, musculoskeletal, and psychological problems [11–13]. This fixed position can also contribute to lower back pain due to heightened pressure on the vertebrae during prolonged sitting [14]. Various ergonomic factors play a crucial role in the occurrence of computer-related health problems, including sitting position, workstation setup, lighting conditions around the workstation, chair type, and the use of a footrest [11,15]. These problems have become a modern occupational disease epidemic, particularly affecting IT professionals. Ignoring these issues for an extended period can lead to debilitating consequences, potentially causing severe injuries that may force computer users to consider changing their professions [16].

Studying contributing risk factors of MSDs is important for reducing their global prevalence, enabling the identification of vulnerable groups, changing the work environment, developing preventive strategies and policies, enabling early detection of MSDs, providing necessary interventions, and promoting health safety. A study in India found that the prevalence rate of MSDs can be as high as 89% [17]. Another study showed around 72% MSDs prevalence in China, along with several correlated factors among IT Workers [18]. While numerous studies explore individual or specific risk factors within a limited work environment, there is a shortage of synthesis reviews that offer a comprehensive overview of existing knowledge and evidence. This scarcity is particularly noticeable when compared to other industries like healthcare, infrastructure, manufacturing, office work, construction, or agriculture [19]. This review focuses on the burden of musculoskeletal disorders among information technology (IT) professionals. The aim of this study was to investigate the existing prevalence and related factors of MSDs among IT professionals based on the published literature. In addition, risk factors associated with MSDs prevalence among IT professionals were discussed.

Methods

Information sources and search strategy

This study was performed according to the preferred reporting items for systematic reviews and meta-analyses (PRISMA) guidelines [20]. The findings of this study are based on the research articles published in peer-reviewed international journals. This systematic review was registered at PROSPERO (CRD42023413617). The search for relevant articles was performed in reputable international databases, such as Web of Sciences, Scopus, PubMed, ScienceDirect, Springer, Online Library Wiley, and ProQuest. Additionally, a manual search was conducted by reviewing the reference lists of key articles and relevant journals using specific keywords to identify further studies. Article searching was done using relevant keywords and standard MeSH terms such as: “musculoskeletal,” “disorder,” “prevalence,” “incidence,” “epidemiology,” “symptom,” “disease,” “discomfort,” “complaint,” “trauma disorder,” “workplace or occupational injury,” "musculoskeletal injury," and all prospective keyword combinations using Boolean operators (AND, OR, and NOT) in different databases (**Table 1**). Moreover, a manual and citation search was performed to find more relevant articles through the evaluation of the identified articles' reference list (**Figure 1**). The last search was completed on September 1, 2023, to identify relevant studies published between 2013 and 2023.

Eligibility criteria

The main criterion for including a research article in this study was the estimation of MSD prevalence in different body parts among IT professionals, such as software programmers, IT technicians, data analysts, or other positions that heavily relied on computers to perform their jobs. MSDs are defined as conditions affecting the muscles, nerves, tendons, joints, cartilage, and spinal discs, typically diagnosed through patient-reported outcomes, clinical assessments, and imaging techniques. This review considered studies that utilized a variety of screening tools and instruments, such as the Nordic Musculoskeletal Questionnaire (NMQ), Chinese Musculoskeletal Disorders Questionnaire, the Core Occupational Stress Scale (COSS), the Maastricht Upper Extremity Questionnaire (MUEQ), Disabilities of the Arm, Shoulder, and Hand (DASH) questionnaire, and self-administrable structured questionnaires featuring NMQ or other questionnaire for musculoskeletal symptoms, visual symptoms, and work-related variables. Articles were selected based on their adherence to these diagnostic criteria and the application of these validated screening tools. The records were included or excluded based on the criteria outlined in **Table 2.**

Study selection for this study

For a record to be included in this review study, it had to meet the eligibility criteria (**Table 2**). Two evaluators independently carried out a blinded, standardized eligibility evaluation. The study selection processes, including database outputs, duplicate checks, and screening, were managed using Microsoft Excel. The title and abstract were the only parts of the first phase of selection that were subject to the selection criteria. The complete texts of all potentially qualifying research articles were then obtained. The full-text articles served as the basis for selection in the second step. The article was excluded from the literature review process if any of the selection criteria were not met. Discrepancies between evaluators were resolved through discussions, and if disagreements persisted, a third reviewer made the final decision.

Data extraction

Data was extracted from each included study based on the following: author, year of publication, country, population, study design, sample size, ergonomic risk, exposure definition, assessment method, important findings, authors' conclusions, and study limitations. The Microsoft Excel program was used to manage and organize the data.

Quality appraisal

Two reviewers independently assessed the methodological quality of each included article based on PRISMA guidelines. We also used Joanna Briggs Institute's (JBI) Critical Appraisal Checklist for Studies Reporting Prevalence Data. This instrument contains nine items (https://jbi.global/ accessed on 26 October 2023) with three response options; i.e., yes, no, unclear, and not applicable. The instrument aims to evaluate the methodological quality of articles and identify errors in studies, designs, and data analyses. Overall, 13 studies were included in this study.

Data analysis

A narrative synthesis was conducted to present the results of each included study. A meta-analysis was not feasible for this review due to insufficient homogeneity in samples, methods, and results. Since the outcomes were descriptive and no associations or comparisons were assessed, a meta-analysis would have been inappropriate. The review employed a narrative method, so measures of consistency to assess heterogeneity between studies were unnecessary. Quantitative data extraction relied solely on frequencies and percentages from the included studies, with Microsoft Excel used for basic percentage calculations.

Table 1. Search strategy and number of records

Search combination	Filter	Records
Scopus		
TITLE-ABS-KEY (("IT professional" OR "computer operator" OR "programmer" OR "software programmer*" OR "IT technician*" OR "data analysts" OR "Computer user" OR "software developer") AND ("causative factors" OR "ergonomic factors" OR "risk factors" OR "Prevalence" OR "incidence") AND ("MSDS" OR "WMSDS" OR "Musculoskeletal disorders" OR "Musculoskeletal Disease*" OR "musculoskeletal pain" OR "Occupational disease*" OR "occupational health" OR "workplace or occupational injur*")) AND PUBYEAR > 2012 AND PUBYEAR < 2024 AND (LIMIT-TO (LANGUAGE , "English")) AND (LIMIT-TO (DOCTYPE , "ar"))	✓ 2013–2023 ✓ English ✓ Article	70
ScienceDirect		
(“IT professional” OR “software programmer” OR “software developer”) AND (“risk factors” OR “Prevalence”) AND (“WMSDS” OR “Musculoskeletal disorders” OR “Musculoskeletal Disease” OR “Occupational disease”) (“musculoskeletal diseases” OR “musculoskeletal pain” OR “musculoskeletal disorders”) AND (“Information technology” OR “IT Professional” OR “software programmers”) AND “Prevalence”	✓ 2013–2023 ✓ Research	56
ProQuest		
(“IT professional” OR “computer operator” OR “programmer” OR “software programmer*” OR “IT technician*” OR “data analysts” OR “Computer user” OR “software developer”) AND (“causative factors” OR “ergonomic factors” OR “risk factors” OR “Prevalence” OR “incidence”) AND (“MSDS” OR “WMSDS” OR “Musculoskeletal disorders” OR “Musculoskeletal Disease*” OR “musculoskeletal pain” OR “Occupational disease*” OR “occupational health” OR “workplace or occupational injur*”)	✓ 2013–2023 ✓ Scholarly Journals ✓ English	277
PubMed		
#1 “information technology” OR “IT professional” OR “computer operator” OR “programmer” OR “software programmer*” OR “IT technician*” OR “data analysts” OR “Computer user” OR “software developer” OR "Information Technology"[Mesh] OR "Software"[Mesh] #2 “causative factors” OR “influencing factors” OR “ergonomic factors” OR “risk factors” OR “Prevalence” OR “frequency” OR “incidence” OR “epidemiology” OR “posture” OR “upper extremity” OR “lower extremity” OR “symptom” OR “disease” OR "Prevalence"[Mesh] OR "Risk Factors"[Mesh] OR "Occupational Health"[Mesh] OR "Epidemiology"[Mesh] #3 “MSDS” OR “WMSDS” OR “Occupational disease*” OR “occupational health” OR "Musculoskeletal Diseases/classification"[Mesh] OR "Musculoskeletal Diseases/complications"[Mesh] OR "Musculoskeletal Diseases/diagnosis"[Mesh] OR "Musculoskeletal Diseases/epidemiology"[Mesh] OR "Musculoskeletal Diseases/prevention and control"[Mesh] OR "Occupational Health"[Mesh] (#1 AND #2) AND #3	✓ 2013–2023 ✓ English	631
Web of Science		
(“IT professional” OR “computer operator” OR “programmer” OR “software programmer*” OR “IT technician*” OR “data analysts” OR “Computer user” OR “software developer”) AND (“causative factors” OR “ergonomic factors” OR “risk factors” OR “Prevalence” OR “incidence”) AND (“MSDS” OR “WMSDS” OR “Musculoskeletal disorders” OR “Musculoskeletal Disease*” OR “musculoskeletal pain” OR “Occupational disease*” OR “occupational health” OR “workplace or occupational injur*”)	✓ 2013–2023 ✓ English ✓ Research	13
Springer		
(“IT professional” OR “computer operator” OR “programmer” OR “software programmer*” OR “IT technician*” OR “data analysts” OR “Computer user” OR “software developer”) AND (“causative factors” OR “ergonomic factors” OR “risk factors” OR “Prevalence” OR “incidence”) AND (“MSDS” OR “WMSDS” OR “Musculoskeletal disorders” OR “Musculoskeletal Disease*” OR “musculoskeletal pain” OR “Occupational disease*” OR “occupational health” OR “workplace or occupational injur*”)	✓ 2013–2023 ✓ English ✓ Article	73
Wiley		
(“IT professional” OR “computer operator” OR “programmer” OR “software programmer*” OR “IT technician*” OR “data analysts” OR “Computer user” OR “software developer”) AND (“causative factors” OR “ergonomic factors” OR “risk factors” OR “Prevalence” OR “incidence”) AND (“MSDS” OR “WMSDS” OR “Musculoskeletal disorders” OR “Musculoskeletal Disease*” OR “musculoskeletal pain” OR “Occupational disease*” OR “occupational health” OR “workplace or occupational injur*”)	✓ 2013–2023 ✓ Journal	27

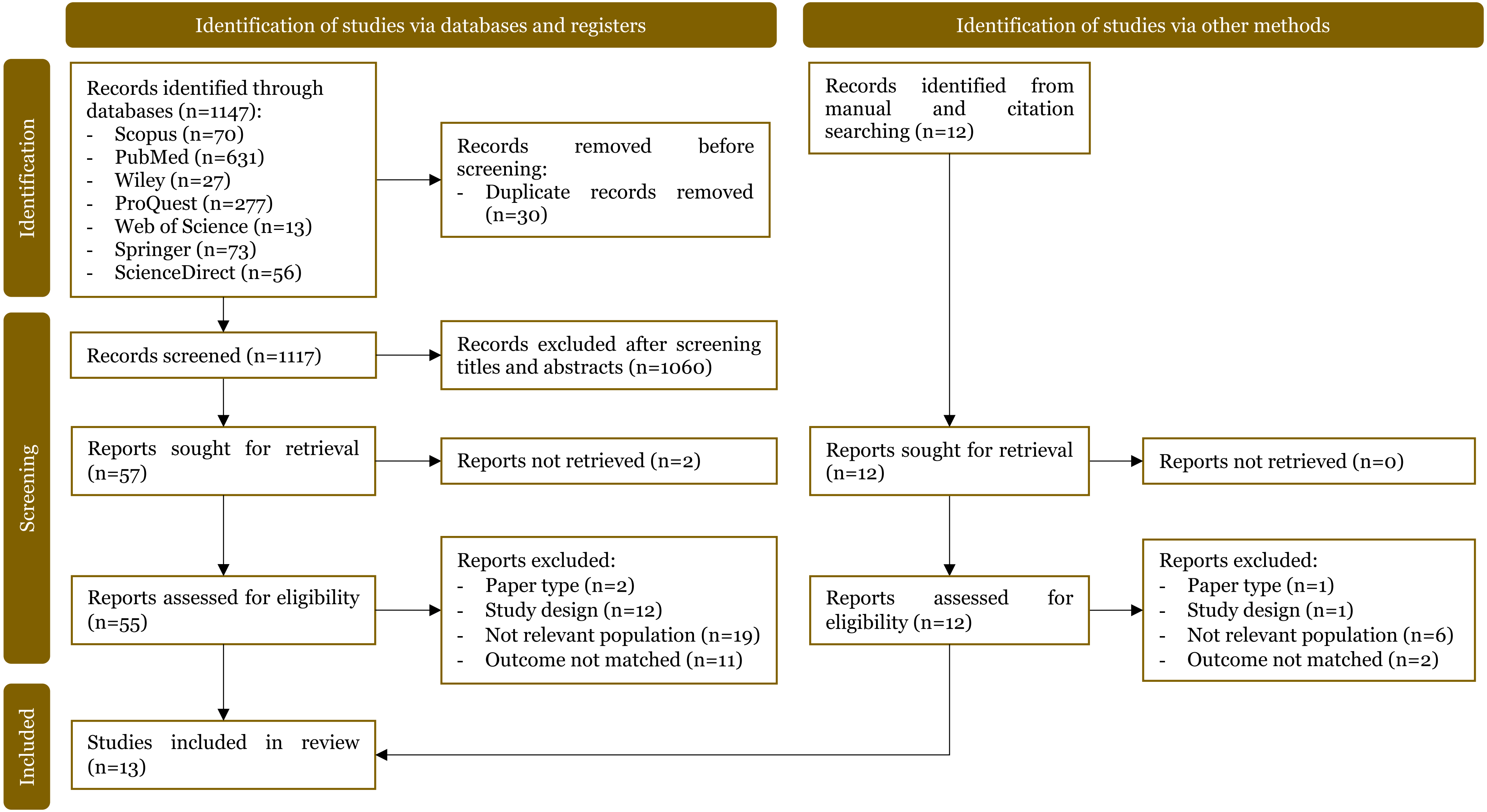

Figure 1. Flow diagram of the PRISMA guideline for the study selection.

Table 2. The study selection criterion for the final review

Inclusion criteria	Exclusion criteria
Population: IT professional	Not matched with the study subjects
Types of study: Observational, cross-sectional, case-control, cohort studies	Not matching the study design (case series, follow-up studies, and interventional studies)
Publication years: 2013 and later	Published before 2013
Professional study outcome focuses on MSD prevalence, ergonomic exposure, and MSD risk factor	Studies concerning treatment outcome, lack of the data of prevalence of musculoskeletal disorders in various body parts)
Article type: Original research	Not the original research (commentary, editorial, letters to editor, review)
Studies published in English only	The article was published in other languages except English
Full text available	Unavailability of full-paper

Results

Study selection

The primary literature search across seven databases retrieved 1,147 records, of which 1,117 remained after removing 30 duplicates, allowing for the screening process. In addition, 12 records were retrieved through manual and citation searches. During the first step of screening, 1060 records were excluded, and the remaining articles were retrieved for full paper download. During the second step of screening, 67 records were selected for a detailed review to check the eligibility criteria. During the eligibility check stage, a total of 54 studies (including ten from the manual search) were excluded due to various reasons. Specifically, three studies had mismatched paper types, 13 studies had mismatched designs, 25 studies involved irrelevant populations, and 13 studies had mismatched outcomes. The studies with mismatched outcomes focused on topics such as computer vision syndrome and blink detection [11,21-23], occupational burnout [24], depression and anxiety [25], head posture and neck disability [13,15,26], evaluation of MUEQ questionnaire [27], system assessment of MSDs [28], workweek variation [29], and future perspectives on MSD prevention [30]. As a result of the literature search in databases based on PRISMA guidelines, 13 studies were finally included in this systematic review (**Figure 1**). Among them, eight papers were published before 2020, and five papers were published after 2020. In this review, the selected studies were from Brazil [31], China [18], India [16,17,32-35], Iran [36], Lithuania [37], Pakistan [38,39], and Saudi Arabia [10], with a total sample size of 4,632 participants, comprising approximately 48% female and 52% male participants (**Figure 2**).

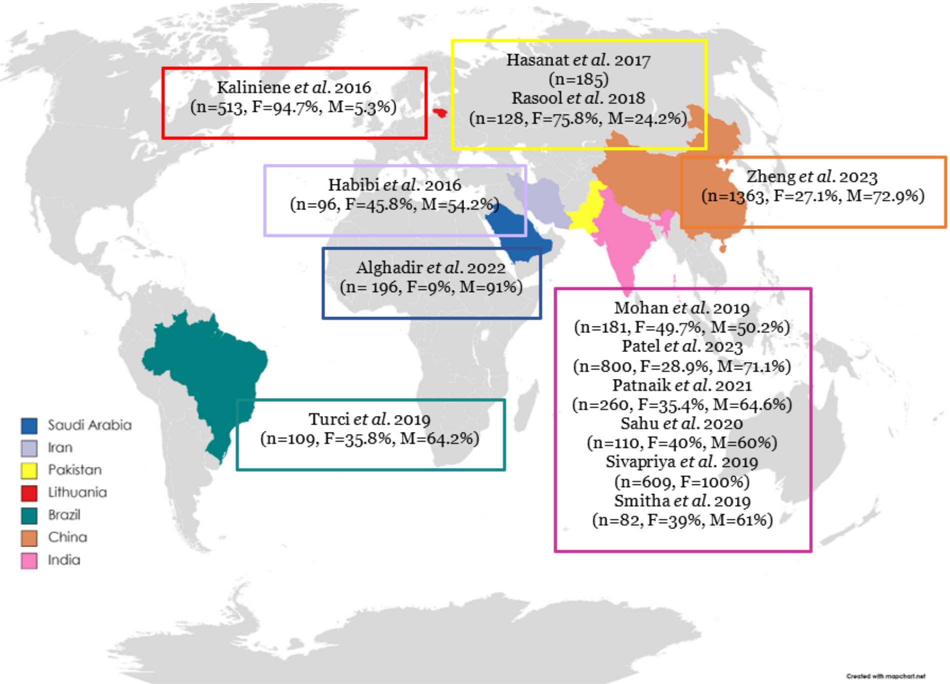

Figure 2. Studies from different countries and the sample size distribution. F: female; M: male; n: total number.

The quality of the included studies was assessed using the JBI quality appraisal, as presented in **Table 3**. All 13 studies met a majority of the quality indicators, although there was some variability in specific items. Most studies (11 out of 13) had appropriate sample frames and sampling methods, meeting criterias 1 and 2. Additionally, all studies provided adequate descriptions of study subjects and settings (item 4), which supports generalizability within their target populations. However, three studies demonstrated limitations in sample size adequacy (item 3), potentially affecting the strength of their findings. While most studies (12 out of 13) used reliable and standardized methods to measure the condition of interest (item 7), only nine studies achieved full coverage of identified samples during data analysis (item 5), potentially impacting the precision of their prevalence estimates. Most studies used appropriate statistical analysis (item 8), supporting reliable interpretation of results. However, two studies had unclear or missing information on response rates and how they were managed (item 9). Overall, based on the JBI appraisal scores, all included studies were deemed to have adequate methodological quality for inclusion, although some showed areas requiring improvement, particularly in sample size and response rate reporting.

Table 3. Summary of the Joanna Briggs Institute's (JBI) appraisal criteria to evaluate the studies

Author, year	JBI appraisal items and the score									Overall appraisal
	1	2	3	4	5	6	7	8	9	
Alghadir *et al.*, 2022 [10]	✓	✓	×	✓	✓	✓	✓	×	✓	Included
Habibi *et al.*, 2016 [36]	✓	✓	✓	-	✓	✓	✓	✓	✓	Included
Hasanat *et al.*, 2017 [38]	✓	✓	×	✓	✓	✓	✓	✓	✓	Included
Kaliniene *et al.*, 2016 [37]	✓	✓	✓	✓	✓	✓	✓	✓	✓	Included
Mohan *et al.*, 2019 [32]	✓	✓	✓	✓	✓	✓	✓	✓	✓	Included
Patel *et al.*, 2023 [16]	✓	✓	✓	✓	✓	✓	✓	✓	✓	Included
Patnaik *et al.*, 2021 [33]	✓	✓	✓	✓	✓	✓	✓	✓	✓	Included
Rasool *et al.*, 2018 [39]	✓	✓	✓	✓	✓	✓	✓	✓	✓	Included
Sahu *et al.*, 2020 [34]	✓	✓	✓	✓	✓	✓	✓	✓	×	Included
Sivapriya *et al.*, 2019 [35]	✓	✓	✓	✓	✓	✓	✓	✓	✓	Included
Smitha *et al.*, 2019 [17]	✓	-	×	✓	✓	✓	✓	✓	✓	Included
Turci *et al.*, 2019 [31]	✓	✓	✓	-	✓	✓	✓	✓	✓	Included
Zheng *et al.*, 2023 [18]	✓	✓	✓	✓	✓	✓	✓	✓	✓	Included

(✓): yes; (×): no; (-): unclear
Item 1: Was the sample frame appropriate to address the target population?
Item 2: Were study participants sampled in an appropriate way?
Item 3: Was the sample size adequate?
Item 4: Were the study subjects and the setting described in detail?
Item 5: Was the data analysis conducted with sufficient coverage of the identified sample?
Item 6: Were valid methods used for the identification of the condition?
Item 7: Was the condition measured in a standard, reliable way for all participants?
Item 8: Was there appropriate statistical analysis?
Item 9: Was the response rate adequate, and if not, was the low response rate managed appropriately?

Characteristics of the studies

The general characteristics of the selected studies are reported in **Table 4**. All the chosen studies adopted a cross-sectional study design, encompassing a diverse group of IT professionals aged 20 years and above. The study results also showed that IT professionals are spending 2–10 hours per day for their profession. The studies used different tools for measuring the prevalence and risk factors of MSDs, including Nordic Musculoskeletal Questionnaire (NMQ), The Maastricht Upper Extremity Questionnaire (MUEQ) questionnaire, self-administrable questionnaire, Disabilities of the Arm, Shoulder and Hand (DASH) questionnaire, Chinese Musculoskeletal Disorders Questionnaire, The Core Occupational Stress Scale (COSS), and The Self-diagnosis Checklist for Assessment of Workers Accumulated Fatigue.

Prevalence and risk factors of MSDs among IT professional

The prevalence rate of MSDs among IT professionals from different countries is reported in **Table 5**. The review study showed that the maximum prevalence rate of MSDs is 89% [17], while the minimum prevalence rate is 20% [37]. The study participants were both male and female, some of them were affected in high risk or low risk of MSDs. The body of IT professionals affected by MSDs can be widely divided into 3 body regions, such as back (neck, shoulder, buttock, upper back, lower back, hip), arms (elbow, wrist, fingers), and legs (thigh, knee, foot). In addition, it may cause other health problems, including pain, cramping, aching, burning, tingling/numbness, tingling sensation in the hand, any upper extremity, fatigue and exhaustion, visual problems, headache, depression, stress, eye strain, stiffness, computer vision syndrome, redness of eyes, watering of eyes, burning/itching sensation in the eyes, etc.

The relation between the work duration and the MSDs is listed in **Table 6**. The duration of work per day and the total work experience may affect musculoskeletal problems. Most of the studies showed almost similar patterns of high MSD prevalence with long working duration (working hours per day).

The selected studies reported several risk factors related to musculoskeletal diseases (**Table 7**), including work duration, work experience, gender, high exertion, low job control, strenuous back positions, smoking, physical inactivity, previous MSD history, uncomfortable workstation, work-related mental stress and insufficient sleep at night, body mass index (BMI), workstation setting, job demand, breaks during work, workspace, body posture, exercise status, cushioned chair, soft keypads, long working hours, excessive usage of smartphones, lack of exercise, incorrect workstation adjustments, incorrect posture, sitting over long periods, alcohol consumption, etc.

Discussion

This present review shows that the maximum prevalence rate of MSDs is 89% [17]. This indicates that MSD issues among IT occupational need more societal attention because it is noticeably higher than in other occupations [40-42]. Several studies also reported about prevalence of MSDs among different professionals. A study in 2021 showed that 245 bank staff out of 335 (73.1%) reported disorders in various body parts, including the hand, leg, back, neck, and shoulder [43]. A study among bankers in Ethiopia showed that almost 66% were affected by MSDs [44]. Another study reported about MSDs among garment workers in Bangladesh showed that 24.7% of respondents had lower back pain and 23.7% reported neck pain [45]. The prevalence of musculoskeletal disorders varies across different professions, depending on the nature of work and work environments [46]. Studies have shown that the MSDs are common among IT professionals. The findings in this present review contribute as an alert for the relevant bodies, to pay sincere attention to the work environment and health concerns of IT professionals [47].

Office or computer workers spend the majority of their working hours in a seated position with extensive computer use duration. This sedentary work environment is believed to elevate the risk of developing various chronic diseases [48,49]. The well-being of workers, encompassing their physical, mental, economic, and social aspects, is profoundly shaped by their work context. When this work environment is safe and promotes health, it inevitably contributes positively to the overall well-being of workers. This, in turn, extends its beneficial effects to employees' families, communities, and society at large [1].

Studies included in this review reported several risk factors. Besides IT professionals, similar types of occupations, like computer bank office employees, also have a similar pattern of MSD risk factors. A study conducted among computer bank office employees in India showed that age, improper work posture, unhealthy working environment, smoking or alcohol habits, and risk of unemployment also play a role in increased musculoskeletal disorders [50]. However, cross-sectional studies cannot accurately estimate the occurrence of an outcome since they have limited validity for validating risk factors like exposure time [41]. In a study, stress and insufficient sleep are described as risk factors; however, these issues may result from inadequate work processes [38]. Sleep quality is important for a healthy lifestyle and is also related to physical activity [8]. In addition, work organization is a significant variable that can impact the MSDs-related health issues among IT professionals. IT professionals predominantly use desktops, laptops, or tablets; thus, several factors may affect health conditions, including monitor or device position, design of the chair, keyboard position, design and position of the mouse, design of the armrest and wrist rest, and incorrect posture [34].

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Table 4. General characteristics of the studies included in this systematic review

Authors	Place of study	Study time	Study design	Types of occupation	Minimum working experience	Age in years (% of participants)	Work duration in hours/day (% of participants)	Working experience in years (% of participants)	Instruments used
Alghadir *et al.* [10]	Riyadh, Saudi Arabia	2019	Cross-sectional	IT professional	1 year	<40 (83), 40–50 (13), >50 (4)	<2 (14), 2–4 (29), >4 (58)	<2 (15), 2–5 (20), >5 (65)	Self-administered four-part online questionnaire
Habibi *et al.* [36]	Iran	NR	Cross-sectional	Computer professional	1 year	27–43 (NR)	NR	NR	NMQ
Hasanat *et al.* [38]	Karachi, Pakistan	2016	Cross-sectional	Software engineer	6 months	20–35 (NR)	NR	NR	Self-administrable questionnaire
Kaliniene *et al.* [37]	Lithuania	2010	Cross-sectional	Computer professional	1 year	45.9±11.1[a] (NR)	<4 (3.7), 4–6 (17.2), >6 (78.9)	1–5 (22.4), 6–15 (55.9), 16–36 (21.7)	Three-part NMQ
Mohan *et al.* [32]	Bangalore, India	NR	Cross-sectional	Professional in the software company	1 year	20–29 (49.2), 30–39 (39.2), >40 (11.6)	2–4 (9.9), 5–7 (60.7), 8–10 (29.4)	1–3 (33.1), 3–8 (28.2), 5–8 (24.3), >8 (14.4)	Screening questionnaire and MUEQ
Patel *et al.*, [16]	Ahmedabad City, India	NR	Cross-sectional	Software development workers, call center workers, and data entry operators	1 year	NR	>3 (NR)	>1 (NR)	Self-designed five-part survey
Patnaik *et al.* [33]	Mumbai, India	2016	Cross-sectional	Software professional	1 year	31.8±4.9[a] (NR)	7.87±2.3[a] (NR)	NR	Self-administered three-part online questionnaire
Rasool *et al.* [39]	Faisalabad, Pakistan	2015	Cross-sectional	Participants from mobile franchises and banks	1 year	30.78[b] (NR)	6–7 (52.34), 8–9 (39.84), >10 (7.81)	1–4 (64.08), 4–10 (29.57), >10 (6.25)	MUEQ
Sahu *et al.* [34]	India	2016	Cross-sectional	IT professional	1 year	29.73±6.09[a] (NR)	2–5 (18.18), 6–9 (86.3), 10–13 (11.8)	1–5 (93.6), 6–10 (6.4)	Online MUEQ and OSHA
Sivapriya *et al.* [35]	Chennai, India	NR	Cross-sectional	Women IT professional	1 year	24.9±2.1[a] (NR)	<10 (73.9), ≥10 (26.1)	<3 (57.2), 3–6 (29.6), 6–9 (12.2), ≥9 (1)	Structured questionnaire; Wong-Baker faces scale
Smitha *et al.* [17]	Mysuru and Bengaluru, India	NR	Cross-sectional	IT professional	6 months	29±6[a] (NR)	NR	<5 (67), >5 (33)	NMQ, visual symptoms, and work-related variables
Turci *et al.* [31]	Brazil	NR	Cross-sectional	Computer professional	1 year	34.28±10.93[a] (NR)	NR	NR	MUEQ and DASH questionnaire
Zheng *et al.* [18]	Chongqing, China	2021	Cross-sectional	IT professional	6 months	20–25 (18), >25–30 (36.1), >30–35 (23.8), >35 (22.2)	NR	<5 (36.5), 5–10 (33.3), 10–15 (16.9), ≥15 (13.4)	CMDQ; COSS; Self-Diagnosis Checklist for Assessment of Workers Accumulated Fatigue

CMDQ: Chinese musculoskeletal disorders questionnaire; COSS: core occupational stress scale; DASH: disabilities of the arm, shoulder, and hand; IT: information technology; NR: not reported; NMQ: nordic musculoskeletal questionnaire; MUEQ: Maastricht upper extremity questionnaire; OSHA: occupational safety and health administration
Presented as [a]mean±SD or [b]mean

Table 5. Musculoskeletal disorders (MSD) prevalence rate, reported body area, and associated health issues

Study	Total MSD prevalence, %	Prevalence among females, %	Prevalence among males, %	Affected area (prevalence in %)			Other health problems (prevalence in %)
				Back	Arms	Legs	
[10]	32	67	28	Neck and shoulder (45) Back and buttock (24)	Elbow and hand (5)	Thigh, leg, knee, foot (5 each)	Other issues (34)
[36]	NR	56.80	43.20	Neck (54.9) Back (53.1)	Elbow (43.2) Hand/wrist (31.5) Arm (38.7)	Knee (39.6) Foot (18.9)	NR
[38]	26.5	NR	NR	Neck (26.5)	NR	NR	Cramping (23.8) Aching (34.6) Burning (2.2)
[37]	Approximately 20	NR	NR	Shoulder (50.5) Upper back (44.8) Low back (56.1)	Elbow (20.3) Wrist/hand (26.3)	NR	NR
[32]	58.60	56.00	61.10	Neck (52.49) Shoulder (43.09)	Upper arm (21.55) Elbow (28.18) Lower arm (14.36) Wrist (37.02) Hand (30.39)	NR	Any upper extremity (58.56)
[16]	Approximately 76.72	74.03	77.86	Neck (38.63) Back (51.00) Shoulder (22.63)	Arm (10.13) Wrist (20.63) Hand/fingers (13.50) Tingling/numbness (24.25)	Thigh (7.50) Knee (6.50) Leg (6.75) Feet (3.63)	Weakness in upper extremity (10.88) Fatigue and exhaustion (24.50)
[33]	63.07	60.80	64.30	Back (53.8) Neck (46.2) Shoulder (46.2)	Hand (24.6)	NR	The feeling of having health problems due to their job (53.8) Visual problems (70.8) Headache (38.5) Feeling depressed (35.4) Feeling stressed (67.7)
[39]	62.50	67.74	47.42	Neck (52.34) Shoulder (53.13)	Elbow (12.5) Upper arm (20.31) Lower arm (18.75) Wrist (22.66) Hand (28.91)	NR	NR
[34]	38.20	43.18%	34.85	Neck (22.7) Lower back (22.7) Upper back (13.6) Shoulder (12.7)	Right wrist (7.5) Left upper arm (5.3)	NR	Eye strain (21.8) Fatigue and exhaustion (90.4) Stiffness (95.2) Numbness (95.2) Tingling sensation (92.8) Weakness (92.8)
[35]	73.10	NR	NR	Low Back (38.59) Neck (37.44)	Arm (29.06) Finger/hand (12.32) Wrist (10.18) Elbow/forearm (3.78)	Foot (10.01) Knee (15.60)	NR

Study	Total MSD prevalence, %	Prevalence among females, %	Prevalence among males, %	Affected area (prevalence in %)			Other health problems (prevalence in %)
				Back	Arms	Legs	
[17]	89	NR	NR	Lower back (56.1) Upper back (28.04) Neck (46.3) Shoulder (37.8) Hip (21.95)	Wrist (41.46) Elbow (23.17)	Knee (13.41)	Computer vision syndrome (86.5) Redness of eyes (57.3) Headache (54.9) Watering of eyes (54.9) Burning/itching sensation in the eyes (50)
[31]	45.87	44.28	48.71	Neck (44) Shoulder (36)	Wrist (12) Arm (8)	NR	NR
[18]	72.30	80.20	67.10	NR	NR	NR	NR

NR: not reported

Table 6. Musculoskeletal disorders (MSD) prevalence in different body parts as stratified by working duration and period

Study	Working duration		Working period	
	Duration (hours/day)	Affected area (prevalence in %)	Duration (years)	Affected area (prevalence in %)
[10]	NR	Not reported	Before employed	Unspecified (15)
			After employed	Unspecified (32)
[37]	<4	Shoulder and elbow (30), wrist (25), upper and lower back (40)	1–5	Shoulder (41.7), elbow (1.2), wrist (22.6), upper back (34.8), lower back (53.9)
	4–6	Shoulder (53.4), elbow (15.9), wrist (19.3), upper back (40.9), lower back (62.5)	6–15	Shoulder (53), elbow (22.6), wrist (27.9), upper back (50.2), lower back (57.5)
	>6	Shoulder (50.9), elbow (20.7), wrist (27.9), upper back (45.9), lower back (55.6)	16–36	Shoulder (53.2), elbow (22.5), wrist (26.1), upper back (41.4), lower back (55)
[32]	<8	Unspecified (63.20)	Not reported	Not reported
	>8	Unspecified (45.80)		
[16]	3–5	Unspecified (46.99)	1–3	Unspecified (65.35)
	>5	Unspecified (80.19)	3–5	Unspecified (80.70)
			>5	Unspecified (88.48)
[35]	<10	Unspecified (72.4)	<6	Unspecified (72.60)
	≥10	Unspecified (77.50)	≥6	Unspecified (76.30)
[17]	Breaks during work	Upper back (17.9), knee (5.4), wrist (33.9), elbow (16.1)	≤5	Neck (32.7), shoulder (25.5)
	No break	Upper back (50), knee (30.8), wrist (57.7), elbow (38.5)	>6	Neck (74.1), shoulder (63)

Table 7. Risk factors, reported important findings, and recommendation

Risk factors	Important findings	Recommendations	Studies
Work duration and related factors			
Work duration/long working hours	Development of work-related musculoskeletal pain may force IT professionals to change their work setting or reduce working hours	Emphasize ergonomics training and counseling during education	[10,32,34,35,39]
Breaks during work	The need for breaks is crucial to reduce strain and improve comfort	Encourage regular breaks to minimize the risk of MSDs	[17,32,35]
Sitting over long periods	Awkward posture and prolonged sitting contribute to upper limb and neck pain	Promote standing desks and regular movement	[31]
Work experience and job role			
Work experience/duration of job	High prevalence of MSDs correlated with years of experience in IT roles	Provide ergonomic assessments based on experience levels	[10,17,37]
Role in project	Higher prevalence of musculoskeletal problems among software developers compared to project leaders	Implement continuous health education and ergonomic support	[35]
Posture and ergonomic setting			
Strenuous back positions/incorrect body posture	Significant correlation between poor posture and pain	Focus on ergonomic training and workstation adjustments	[10,32,34]
Uncomfortable work setting/incorrect workstation adjustments	Poorly designed workstations can lead to discomfort and pain	Redesign workstations for comfort and usability	[32,34,38]
Non-ergonomic cushioned chairs	Those without cushioned chairs had significantly higher musculoskeletal problems (p=0.000). Neck pain prevalence was higher among those without cushioned chairs	Ensure chairs are ergonomically designed to promote proper posture	[33]
Not using soft keypads	It can contribute to discomfort and repetitive strain injuries. Tingling sensations were significantly higher among those not using soft keypads (p=0.013).	Evaluate and provide ergonomic keyboards	[33]
Physical health and activity			
Physical inactivity/lack of exercise	Prolonged inactivity is strongly associated with MSDs	Promote regular physical activity and exercise breaks	[16,18,34,38]
High exertion	10% reported that high exertion contributed to their pain. Strenuous tasks can increase the risk of developing MSDs	Evaluate task demands and provide adequate training	[10]
Smoking	Smoking was significantly (p=0.015) associated with neck pain. Linked to increased risk of MSDs due to reduced circulation	Encourage smoking cessation programs	[38]
Alcohol consumption	Alcohol consumption may cause serious MSDs (p<0.05). It may impact overall health, imbalanced work, and recovery from MSDs.	Promote responsible consumption and support programs	[18]
Job-related stress and control			
Low job control	10% reported that low job control contributed to their pain. Increased stress and risk of developing MSDs	Foster a supportive work environment with autonomy	[10]
Job demand	High demands correlate with increased risk of pain and stress	Balance workloads and provide resources for stress management	[32]
Job-related mental stress	Strongly linked to the development of MSDs. Work-related mental stress was significantly (p=0.038) associated with neck pain	Implement mental health support initiatives	[38]
Insufficient sleep	Insufficient sleep at night was significantly (p=0.003) associated with neck pain. Sleep deprivation can exacerbate pain perception.	Encourage healthy sleep habits among employees	[38]
Demographic factors			

Risk factors	Important findings	Recommendations	Studies
Gender/female	MSD problems were notably higher among women, likely due to different physical demands at work. Women are generally more prone to MSDs, especially in the neck, shoulders, and lower back.	Implement ergonomic treatments and educate users about ergonomics	[10,17,32,33,36, 37,39]
Age (30 to 35 years)	Younger workers may be less aware of ergonomic practices, leading to higher risks	Increase awareness and training for younger employees	[17,18,37,39]
Marital status (married and living together)	Marital status may influence work-life balance and stress levels. Respondents who married and living together had serious musculoskeletal disorders (*p*<0.05)	Consider family support in wellness programs	[18]
Income level	Higher-income may correlate with access to better ergonomic solutions	Ensure equitable access to ergonomic resources	[18]
Health history and biometrics			
MSDs history	Previous history of any muscular pain and neck pain was significantly (*p*=0.0001) associated with neck pain. Previous history of MSDs increases the risk of recurrence	Provide tailored ergonomic support for those with a history of MSDs	[38]
Body mass index (BMI)	Higher BMI correlates with an increased risk of MSDs. A BMI over 25 kg/m² was significantly associated only with low back pain.	Promote healthy lifestyle programs	[37]
Technology and device usage			
Excessive smartphone usage	Smartphone users (55.56%) were more prone to discomfort and pain. It linked to an increased risk of neck and shoulder pain	Promote balanced technology use and ergonomics training	[34]
Computer work experience	Correlated with awareness and implementation of ergonomic practices	Continuous education on ergonomics for all experience levels	[37]

MSD: musculoskeletal disorder

A limitation of this study is that only a few articles were included in this review. This is due to the selection criteria and research focusing on specific professional backgrounds. Several studies were excluded because they did not match the inclusion-exclusion criteria. One common issue was that studies reporting on Musculoskeletal Disorders (MSDs) and Work-related Musculoskeletal Disorders (WMSDs) were often excluded, although these studies shared similar concepts, their emphasis may have varied. Additionally, the lack of reported or standardized data collection instruments in several studies, such as well-established questionnaires, hinders the ability to compare findings and may impact the reliability of prevalence rates. Finally, a meta-analysis could not be performed due to the heterogeneity of selected studies and the lack of similar statistical data. Similarly, the changes in the prevalence rate of MSDs over time were not explored in this study. Moreover, there is a dearth of research papers from different parts of the world about MSDs prevalence among IT professionals. In this review, the included studies were from Brazil, China, India, Iran, Lithuania, Pakistan, and Saudi Arabia. There was no literature from several parts of the world including Western Europe, the United States, Canada, Russia, Africa, and Australia. Therefore, future research also needs to focus on this area to advance the understanding of the overall scenario in different parts of the world.

Conclusion

This systematic review reveals a high prevalence of musculoskeletal disorders (MSDs) among IT professionals, with rates ranging from 20% to 89%. Key risk factors identified include work duration, experience, gender, strenuous back positions, smoking, physical inactivity, history of MSDs, uncomfortable workstation settings, mental stress, insufficient sleep, and poor body posture. To address these issues, it is essential to implement specific interventions, such as ergonomic assessments to optimize workstation setups, promoting regular breaks to reduce strain, and encouraging physical activity through structured wellness programs. Enhancing occupational health education will also raise awareness of these risk factors, provide prevention strategies, and encourage employees to adopt healthier practices. Additionally, promoting a culture of safety and well-being can further mitigate risks. Future research should focus on diverse populations to develop effective strategies and reduce MSD prevalence in the IT sector.

Ethics approval

Not required.

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Competing interests

All the authors declare that there are no conflicts of interest.

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Underlying data

Derived data supporting the findings of this study are available from the corresponding author on request.

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