

WORK-RELATED MUSCULOSKELETAL DISORDERS AMONG INFORMATION TECHNOLOGY PROFESSIONALS IN RIYADH, SAUDI ARABIA

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ABSTRACT

Background: This study was done to see the prevalence of work-related musculoskeletal disorders among information technology (IT) professionals in Saudi Arabia, the risk factors associated with them, their consequences, and to propose some preventive measures. **Material and Methods:** A self-administered online questionnaire that included questions on the demographic data, job nature, medical history, work-related pain after joining information technology profession and distribution and severity of pain was sent to 250 information technology professionals working in Saudi Arabia. **Results:** Out of 250, 202 (81%) IT professionals participated in the study. At least 62 (32%) reported that they have developed some type of musculoskeletal pain after joining their profession and 38 (61%) respondents further reported that it was so severe that they had to seek some sort of treatment for their pain. On the *Visual Analog Scale* ranging 0–10, 14 (23%) respondents reported that their worst ever pain was >7. Despite lower representation 67% of the females reported to develop work-related pain. **Conclusions:** Development of work-related musculoskeletal pain among information technology professionals has been shown to affect their activities of daily living. It may even force them to change their work setting or reduce working hours. Information technology sector has rapidly grown in Saudi Arabia in the recent times and there is no data on the incidence or prevalence of such disorders among them. Role of ergonomics and counseling should be emphasized during their training that help them work effectively and efficiently. A similar large-scale study should be conducted to see the effect of lifestyle related to COVID-19 on the lives of working population especially IT professionals. *Med Pr.* 2022;73(5):397–406

Key words: occupational health, IT professionals, COVID-19, Riyadh, ergonomics, desktop use

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Received: April 26, 2022, accepted: October 21, 2022

INTRODUCTION

Work-related musculoskeletal disorders (WRMD) are the second largest cause of disability around the world [1,2]. The physical nature associated with different professions has been reported as the risk factor for development of different WRMD [3]. Resulting pain and discomfort may decrease the productivity due to interference with the activities of daily living, and lower the quality of life [4]. Concerning the magnitude this problem, the need for prevention of WRMD has been identified [5]. The data associated with prevalence of WRMD in various professions shall provide a basis for development of strategies to prevent its occurrence in future [6].

Decreased physical activity, work from home, unchecked eating pattern and spending more time while

sedentary activities has become part of COVID-19 pandemic lifestyle around the world [7]. It has further increased use of computers, laptops, and mobile phones as most of the offices have adopted online work from home amid pandemic related restrictions [8]. Prolonged usage of mobile phones and computers has already been shown to cause musculoskeletal pain and altered body posture [9].

Long exposure to computers and high workload, among others are the risk factors for development of WRMD among information technology (IT) professionals [10]. The IT has played a vital role in development of Saudi Arabia, employing millions of professionals [11]. Although the need for identification of IT sector in Saudi Arabia as a high-risk profession for developing WRMD, and to report various risk factors associated with them

and their management has been highlighted, there are no reported data on incidence and prevalence of such disorders among them. This study was done to see the prevalence of WRMD among IT professionals in Saudi Arabia. It also studied its associated risk factors and consequences and some preventive measures are proposed. The objective of this study is even more relevant in the current situation when COVID-19 related precautionary lockdowns have increased time spent while using mobile phones and computers due to work from home.

MATERIAL AND METHODS

Questionnaire

A self-administered online questionnaire that was based on similar studies and adapted according to Saudi work culture was used in this study [3,6,12–14]. A pilot study was done to see if the questionnaire was appropriate to fulfill objective of the study and minor changes were done before actual data collection. It included 41 questions on their demographic data, job nature and other characteristics, medical history, work-related pain after joining IT profession and distribution and severity of pain. Any unpleasant sensation or body pain that developed after joining IT profession was regarded as WRMD. It may or may not have affected their work and non-work-related activities. This study was conducted in January–June, 2019.

Subjects

Regional association of IT professionals was approached for this study and a convenience sample of 250 members, who were working in Saudi Arabia for at least 1 year were identified. The web link of an online questionnaire was sent to them. After 2 weeks, another reminder was sent to them to fill the questionnaire. They were assured that their data will be confidential. Incomplete questionnaires were excluded.

Ethics approval and consent to participate

This study was done according to the ethical standards for human research as followed by King Saud University. This study was approved by the institutional review board.

Data analysis

The data entry and analysis were done using Microsoft Excel 2013. Descriptive statistics were presented as mean and percentage. The final data was summarized as percentage and analyzed by cross tabulation and pivot table for different variables.

RESULTS

Demographic data

Out of 250, 202 (81%) IT professionals participated in the study. Among these, only 196 (97%) completed the questionnaire and included in the study. Among the respondents 18 (9%) and 178 (91%) were females and males, respectively. Majority of the respondents, 163 (83%), reported to be under the age of 40 years. Among all, 152 (78%) respondents were Saudi in origin. At least 110 (56%) respondents reported that they did not do any outdoor physical activities like walking, workout in a gym or playing sports like football. More demographic details of the respondents have been provided in Table 1.

Job nature and other characteristics of the respondents

Out of the 196 respondents, 75 (38%) reported to have Bachelor's degree and 59 (30%) were working as IT professional. Work experience of 128 (65%) respondents was >5 years and 82 (42%) were employed in the government sector. Majority of respondents, 182 (93%), reported to work full time. At least 158 (81%) reported that they were well satisfied with their job.

At least 113 (58%) of the respondents reported that they have to use computers for >4 h daily. The most common position during daily work routine was sitting with at least 128 (65%) respondents reporting it. Among respondents who reported sitting as their frequent posture 33 (25%) also reported using revolving chair in their workplace while 55 (43%) used chairs with an arm rest. More details and gender-based distribution about job nature and other characteristics are provided in Table 1.

Medical history before joining IT profession

One hundred and sixty-three (83%) of the respondents reported that they were not under treatment for hypertension, diabetes mellitus or any similar chronic medical conditions. At least 9 (5%) respondent reported to suffer from both hypertension and diabetes mellitus. Seventy-one (36%) respondents reported that they suffered headache. Among these 28 (39%) reported that it was so severe that they had to seek medical advice. Out of the 196 respondents, 167 (85%) and 169 (86%) each reported that they had no musculoskeletal pain or functional limitation before joining the IT profession. More details about medical history and its gender-based classification have been provided in Table 1.

Table 1. Demographic data including job details and medical history of the respondents (IT professionals), Riyadh, Saudi Arabia, January–June, 2019

Variable	Participants (N = 196) [n (%)]			Variable	Participants (N = 196) [n (%)]		
	females (N = 18, 9%)	males (N = 178, 91%)	total		females (N = 18, 9%)	males (N = 178, 91%)	total
Demographic factors				Job – cont.			
age				designation			
<40 years	17 (94)	146 (82)	163 (83)	IT			
40–50 years	1 (6)	25 (14)	26 (13)	professionals	4 (22)	55 (31)	59 (30)
>50 years	0 (0)	7 (4)	7 (4)	assistants	4 (22)	35 (20)	39 (20)
height				technicians	5 (28)	34 (19)	39 (20)
<168 cm	13 (72)	51 (29)	64 (33)	other	5 (28)	54 (30)	59 (30)
168–177 cm	3 (17)	97 (54)	100 (51)	work experience			
>177 cm	2 (11)	30 (17)	32 (16)	<2 years	5 (28)	24 (13)	29 (15)
weight				2–5 years	12 (367)	27 (15)	39 (20)
<60 kg	5 (28)	27 (15)	32 (16)	>5 years	1 (6)	127 (71)	128 (65)
60–80 kg	12 (67)	85 (48)	97 (49)	work setting			
>80 kg	1 (6)	66 (37)	67 (34)	government	13 (72)	69 (39)	82 (42)
nationality				private	5 (28)	109 (61)	114 (58)
Saudi	16 (89)	136 (76)	152 (78)	job type			
expatriates	2 (11)	42 (24)	44 (22)	full time	14 (78)	168 (94)	182 (93)
living				part time	4 (22)	10 (6)	14 (7)
alone	0 (0)	38 (100)	38 (19)	job satisfaction			
with family	18 (100)	140 (89)	158 (81)	yes	16 (89)	142 (80)	158 (81)
smoking				no	2 (11)	36 (20)	38 (19)
yes	0 (0)	66 (37)	66 (34)	computer usage			
no	18 (100)	112 (63)	130 (66)	<2 h/day	0 (0)	27 (15)	27 (14)
daily activity				2–4 h/day	10 (56)	46 (26)	56 (29)
gym workout	0 (0)	30 (17)	30 (15)	>4 h/day	8 (44)	105 (59)	113 (58)
walking >1 h/day	13 (72)	15 (8)	28 (14)	most common position during daily routine work			
outdoor sports like football	0 (0)	28 (16)	28 (14)	sitting	15 (83)	113 (63)	128 (65)
no outdoor physical activities	5 (28)	105 (59)	110 (56)	standing or walking	3 (17)	65 (37)	68 (35)
Job				chair in work setting			
highest degree				revolving	2 (11)	41 (23)	43 (22)
diploma	0 (0)	51 (29)	51 (26)	with arm rest	7 (39)	67 (38)	74 (38)
bachelors	9 (50)	66 (37)	75 (38)	without arm rest	0 (0)	7 (4)	7 (4)
masters	7 (39)	29 (16)	36 (18)	fixed	9 (50)	63 (35)	72 (37)
doctorate	2 (11)	32 (18)	34 (17)	Medical history			
				under treatment for any medical disease			
				no	5 (28)	158 (89)	163 (83)
				yes			
				hypertension	8 (44)	20 (11)	28 (14)
				diabetes mellitus	12 (67)	2 (1)	14 (7)

Table 1. Demographic data including job details and medical history of the respondents (IT professionals), Riyadh, Saudi Arabia, January–June, 2019 – cont.

Variable	Participants (N = 196) [n (%)]		total
	females (N = 18, 9%)	males (N = 178, 91%)	
Medical history – cont.			
headaches			
yes	17 (94)	54 (30)	71 (36)
<3 times/week	11 (61)	35 (20)	46 (23)
3–5 times/week	6 (33)	15 (8)	21 (10)
>5 times/week	1 (6)	3 (2)	4 (2)
no	1 (6)	124 (70)	125 (64)
physical disability			
yes	3 (17)	13 (7)	16 (8)
no	15 (83)	165 (93)	180 (92)
problem before joining IT profession			
musculoskeletal pain			
yes	7 (39)	22 (12)	29 (15)
no	11 (61)	156 (88)	167 (85)
functional limitations			
yes	6 (33)	21 (12)	27 (14)
no	12 (67)	157 (88)	169 (86)

Work-related pain after joining IT profession

At least 62 (32%) of the respondents reported that they have developed some musculoskeletal pain after joining this profession. Among these 22 (35%) further reported that it was sudden or acute in origin and 38 (61%) added that their pain was so severe that they had to take some treatment for it. For 17 (27%) respondents the average duration of pain was >4 weeks. Due to pain, 29 (47%) of these respondents were not able to practice their regular work-related activities. Further, pain has caused at least 43 (69%) of the respondents to decrease or stop their non-work-related activities especially those involving bending, twisting and prolonged sitting or standing. Forty-five (73%) of the respondents reported to suffer from some work-related pain while taking this survey. The severity of pain had even forced 23 (37%) of the respondents to either reduce their working hours or go on sick leave. Respondents attributed various reasons for their work-related pain. Twenty-two (35%) respondents, reported that it was associated with the use

of computers while 6 (10%) reported low job control and high exertion as the reason for them for developing pain. Among other reasons, 13 (21%) of the respondents reported that adopting strenuous back positions frequently during work as the cause of developing pain. Gender-based details about work-related pain among respondents after joining IT profession has been provided in Table 2.

Severity and distribution of pain among respondents

At least 23 (51%) of the respondents reported that their current pain was >3 on *Visual Analog Scale* (VAS). Fourteen (23%) respondents reported that their worst ever pain was >7. Majority of the respondents reported that they had developed pain in >1 region. At least 15 (24%) respondents reported pain in back and buttocks region. Gender-based distribution and severity of work-related pain after joining IT profession has been provided in Table 2.

Characteristics of respondents reporting to develop work-related pain after joining IT profession

Among the respondents who reported to develop pain after joining IT profession, 12 (67%) were females, 47 (76%) were <40 years of age, 42 (68%) were Saudi in origin and 35 (56%) also reported to suffer headache frequently. Among these, 22 (35%) reported that they smoked tobacco every day. As compared to those with lesser work experience, 40 (65%) respondents with work experience of >5 years had a higher prevalence of work-related pain. Respondents with higher duration of computer use also reported higher prevalence of work-related pain with at least 35 (56%) reporting to use computers for >4 h. Respondents aged >40 years reported back and neck region to most affected while younger respondents had also reported pain in upper back, shoulders, knees, and hands. Male respondents had most complaints in the lower back, shoulder and hands region while females reported neck region to be more painful.

DISCUSSION

The results of this study show that prevalence of WRMD among IT professionals in Saudi Arabia was found to be high and further suggests that age, gender, duration of daily computer use, etc., are all related to the development of work-related pain among IT profession.

This study has more relevance in the current era of COVID-19. People are spending more time while using computers and mobile phones in a non-ergonomic

Table 2. Work-related pain among respondents after joining IT profession, Riyadh, Saudi Arabia, January–June, 2019

Variable	Participants (N = 196) [n (%)]			Variable	Participants (N = 196) [n (%)]		
	females (N = 18, 9%)	males (N = 178, 91%)	total		females (N = 18, 9%)	males (N = 178, 91%)	total
Musculoskeletal pain developed after joining IT profession				Work-related pain – cont.			
yes	12 (67)	50 (28)	62 (32)	seeking the following due to the work-related pain			
no	6 (33)	128 (72)	134 (68)	sick leave	8 (67)	8 (16)	16 (26)
Seeking any treatment for work-related pain				reduced working hours	2 (17)	5 (10)	7 (11)
yes	12 (100)	26 (52)	38 (61)	change of work setting	0 (0)	5 (10)	5 (8)
no	0 (0)	24 (48)	24 (39)	compensation	0 (0)	3 (6)	3 (5)
Work-related pain				others	5 (41)	26 (52)	31 (50)
onset				cause for the complaint (participants' opinion)			
acute (sudden)	6 (50)	16 (32)	22 (35)	use of computers	5 (41)	17 (34)	22 (35)
chronic (gradual)	6 (50)	34 (68)	40 (65)	high exertion	1 (8)	2 (4)	3 (5)
duration				high job demand	1 (8)	3 (6)	4 (6)
<2 weeks	8 (67)	23 (46)	31 (50)	low job control	2 (17)	1 (2)	3 (5)
2–4 weeks	2 (17)	12 (24)	14 (23)	strenuous back positions	6 (50)	7 (14)	13 (21)
>4 weeks	2 (17)	15 (30)	17 (27)	others	8 (67)	9 (18)	17 (27)
pain preventing from regular work-related activities				Distribution and severity			
yes	5 (41)	24 (48)	29 (47)	Visual Analogue Scale (VAS)			
no	7 (59)	36 (52)	33 (53)	present rate			
ability to practice the non-work-related activities during pain				<3 cm	7 (59)	16 (32)	23 (51)
yes	12 (100)	31 (62)	43 (69)	3–7 cm	0 (0)	12 (24)	12 (27)
no	0 (0)	19 (38)	19 (31)	>7 cm	5 (41)	5 (10)	10 (22)
pain preventing from the activities				the worst ever pain rate			
bending and twisting	7 (59)	14 (28)	21 (34)	<3 cm	4 (33)	22 (44)	26 (42)
stooping	5 (41)	19 (38)	24 (39)	3–7 cm	4 (33)	18 (36)	22 (35)
prolonged standing and sitting	0 (0)	16 (32)	16 (26)	>7 cm	4 (33)	10 (20)	14 (23)
others	0 (0)	12 (24)	12 (19)	pain location			
current work-related pain				neck and shoulder region	12 (100)	14 (18)	28 (45)
yes	12 (100)	33 (66)	45 (73)	elbow and hand region	2 (17)	1 (2)	3 (5)
no	0 (0)	17 (34)	17 (27)	back and buttocks region	5 (41)	5 (10)	15 (24)
				thighs, leg, knee and foot	1 (8)	2 (4)	3 (5)
				other	12 (100)	9 (18)	21 (34)

environment due to work from home which is a part of precautionary lockdowns. This along with decreased physical activity and unhealthy eating pattern has become part of the COVID-19 pandemic lifestyle. A similar large-scale study should be conducted to see the effect of COVID-19 pandemic lifestyle on the working population associated with IT industry.

Although there are various studies about WRMD from the region, most of these papers are about incidence and prevalence of such disorders among healthcare professionals like nurses, dentists, physical therapists, etc., warehouse workers and construction workers [6,14–17]. There are no published studies about the incidence, prevalence, risk factors, development, presentation or prevention of such disorders among IT professionals in Saudi Arabia and this is one of the first kind of study from the region. The IT sector has played a great role in transforming Saudi Arabia making it one of the fastest growing economy in the world and attracting innovational entrepreneurs and businesses from around the world [11]. Besides it has also generated millions of job opportunities [18]. Although, introduction of computers and IT has been regarded as the single biggest drive impacting Saudi Arabia economically, socially and culturally in the past decades [19,20], no published studies are available that report risk of development of work-related disorders among professional workers in this sector.

Prevalence of WRMD varies in different occupational groups across the world that depends on assessment tools, work setting organizational structure and cultural variation [21,22]. National Institute for Occupational Health has proposed 5 psychosocial factors associated with development of WRMD: job satisfaction, workload, nature of work, job control, and social environment [23,24]. Current study has tried to cover all these factors to see how these can affect IT professionals.

With the advent of the internet and more time spent on it, many studies have focused on development of such disorders among computer users in the developed countries [18,25]. It has been estimated that >25% of all the computer users suffer from one or other associated problem worldwide [4,26]. In the United States, WRMD present more than half of the work-related diseases and the number is growing [27]. Study by Shah et al. reported that at least 93.56% of the software professionals suffered from similar problems [28]. Results of this study also show that respondents with higher duration of computer use have higher prevalence of work-related pain.

Individual factors such as gender, age, work experience, educational status, culture, job satisfaction, and type of personality have all been associated with development of WRMD [29,30]. Initial symptoms of the musculoskeletal symptoms are mild and temporary that tend to become more severe and permanent with age [31]. Most of the IT professionals are relatively younger at the beginning of their career having work experience of <10 years. Cumulative effect of WRMD can make it difficult for them to practice in future if not managed timely and effectively [32,33]. Data from World Health Organization suggests that prevalence of stress varies between 14–70% among computer operators [34]. Stress is more at the initial stage, which is further influenced by type of job and work content [35]. Development of WRMD have also been shown more among those professionals who are single, as compared to married individuals who can reduce their stress level while spending time with their family at home [36].

In most of the occupations, the rate of development of WRMD has been shown to be higher among female that has been attributed to various reasons including their higher body weight and smaller height [25,37–39]. Although only 9% of the respondents in this study were female that shows the lower representation of females in IT sector, at least 67% of them reported to develop work-related pain.

Respondents have attributed various reasons for the development of their work-related pain including high exertion, low job control and adoption of frequent strenuous back positions during work. Various studies have reported that working for a long-time at a poorly designed workstations results in various WRMD [40]. This is associated with poor ergonomic factors such as remaining seated in awkward or uncomfortable postures for longer periods, fixed keyboard height, repetitive joint movements, poor lighting conditions, mouse use, and psychosocial factors [2,41,42]. It can lead to development of WRMD in back, shoulders, elbows, arms, wrists, hands, legs, feet, etc. [43–45], and symptoms often include pain, tenderness, tingling, swelling and stiffness [46]. Poor postures while working have been associated with decreased performance due to associated body discomfort [47]. Deviation of posture from normal alignment due to imbalance puts strain on musculoskeletal structures that can lead to inflammation [48]. Using devices such as mouse and keyboard involves sustained ulnar deviation and wrist flexion [31]. This causes sustained contraction of hand muscles and friction at the wrist joints that can lead to tenosynovitis and

reduction in the speed of median nerve transmission through the carpal tunnel [49,50]. Studies have also reported relation between computer work and tension neck syndrome [51,52]. Such load on upper limbs, especially hands, can be reduced by adoption of technological innovations like tracking ball in place of cursor control, voice recognition devices, etc. [46]. Introduction of a new mouse design that reduces hand pronation has been shown to have beneficial effect on wrist and hand pain [53,54].

Pain had prevented majority of the respondents from practicing their regular work and non-work-related activities involving bending, twisting and prolonged sitting or standing. The severity of pain had even forced at least 37% of the respondents to either reduce their working hours or go on sick leave. Previous studies have also reported that WRMD decreases the individual's productivity at work and may lead to absenteeism, sick leave, and even early retirement [55,56]. It has also been shown to affect daily activities other than work including shopping, cooking, home care, etc. [14]. The WRMD tend to affect not only the individuals but also their organization and society as a whole. This may further be associated with economic loss [57,58].

Results of this study have brought various factors that can contribute to the development of WRMD among IT professionals into focus. Its higher prevalence makes it necessary for the responsible authorities to enforce suitable preventive measures [59]. Assessment of exposure to WRMD is the base for planning and implementation of interventional ergonomics program in the work setting [52]. The application of ergonomics principles to the work stations could reduce these health risks [60]. Goal of such ergonomic processes is to redesign and modify work space to fit in the individual capabilities and limitations [61,62]. Early diagnosis is the key to ease the symptoms and decreasing further body damage. This can be done by periodic medical examinations [63]. It is also recommended that improving psychosocial factors through modification of work organization would reduce development of WRMD [56]. Frequent rest breaks between working hours have been shown to protect against the development of WRMD [31,64]. It limits computer exposure and allows muscle relaxation [65]. Physical exercise and fitness activities like walking, swimming, running, and stretching exercise have also been shown to decrease pain associated with excessive computer use [66]. Proper working posture should be promoted and employers must provide healthy working conditions must be

provided which can make the work easier and more relaxed [67]. Government needs to devise primary and secondary prevention strategies in order to decrease the incidence of WRMD among IT professionals. This would help them to perform their duty effectively and efficiently. Education of professionals by regularly organizing awareness programs, workshops, training programs and lectures about development and prevention of WRMD has been shown to play an important part in preventing and coping with such disorders [68].

There are several limitations that should be identified. This study used a self-reported online questionnaire which increases the possibility that respondents may overestimate their pain experiences. Sample size was relatively low and limited statistical tests were used. Further research to know the knowledge of IT professionals about ergonomic principles and how to plan primary and secondary strategy to prevent development of such disorders among them is recommended. Authors of this study also propose that future studies should also see the relationship between occurrence of work-related musculoskeletal disorders with their risk factors including workplace ergonomics using detailed statistical analysis.

CONCLUSIONS

Development of work-related musculoskeletal disorders among IT professionals has shown to affect their activities of daily living and even forced them to either reduce their working hours or change their work setting. Although, IT sector has rapidly grown in Saudi Arabia in the recent times still there is lack of data on the incidence and prevalence of such disorders among them. Role of ergonomics and counseling needs to be emphasized during their training so that they can work effectively and efficiently. A similar large-scale study should be conducted to study the effect of COVID-19 related lifestyle on the lives of working population especially IT professionals.

Availability of data and material

The datasets used in this study are available on reasonable request from the corresponding author.

ACKNOWLEDGMENT

The authors are grateful to the Researchers Supporting Project No. RSP-2021/382, King Saud University, Riyadh, Saudi Arabia for funding this research.

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