

## RESEARCH ARTICLE



# Musculoskeletal disorders among IT Professionals in South Bangalore

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## Abstract

**Objectives:** To analyze the prevalence of work-related musculoskeletal disorders (WR-MSD) among the IT professionals from Bangalore South and to detect the correlation between musculoskeletal disorders and age, gender, and working hours a person puts in. **Materials and Method:** A population of 563 IT Professionals from various multinational companies in Bangalore South was sent a self-assessed Nordic quiz to find the prevalence of MSD, which includes pain in different body parts like the neck and shoulders lower back, etc. To examine the associations between different variables, correlation analysis was conducted. The duration of the study was six weeks. **Results:** A population of 563 participants was analyzed for the study. Out of those participants, (34.2%) reported WR-MSD affecting the neck, upper back (35.5%), and lower back (37.3%) during the past 12 months, including overlapping between the two sites or even all the three sites making cervical and lumbar the most common sites of pain. Office work pressure, meeting project deadlines, social media, lack of breaks, and poor understanding of ergonomics were significantly correlated with WR-MSD. Analysis also revealed that younger age groups, females, and people working between 9-10 hours are at increased risk of developing musculoskeletal disorders, and have difficulties in doing ADL. **Conclusion:** Age, gender, and the number of working hours play a major role in the prevalence of WR-MSD in IT professionals in Bangalore South. Based on findings in the study, it is suggested that prevention and treatment efforts be directed towards avoidance of WR-MSD and focus on cognitive work factors such as the harmful way of work and biomechanical risk factors. **Novelty:** The novelty of this study was to find out the prevalence and the correlation between the age, gender, and working hours which has not been done before, and to spread the awareness to the said population on how to avoid the physical strain and reach out for help whenever required to improve productivity.

**Keywords:** Activities of Daily Living; Musculoskeletal Diseases; Ergonomics; Prevalence

## 1 Introduction

As per the World Health Organization (WHO), Working activities and conditions significantly induce and intensify work-related musculoskeletal disorders (WR-

MSDs)<sup>(1)</sup>. WR-MSDs are widespread and have a huge impact on modern society<sup>(2)</sup>. In many working populations, especially in the IT sector, work-related musculoskeletal disorders (WR-MSD) are liable for morbidity. They are understood as a crucial occupational hazard with huge loss of productivity, health costs, and lower quality of life<sup>(3)</sup>. The WR-MSD within the IT sector is pullulating as heightened ill health and represents a mammoth effect on the daily chores of the IT professionals. The WR-MSD represents the second-largest explanation for brief or interim work disability after flu<sup>(4)</sup>. The WR-MSD catalogs many erythrogonic conditions that cause aches and dysfunction, affecting the cervical region, shoulders, thoracic region, lumbar region, elbows, wrists, and hands<sup>(4-6)</sup>. Several studies have defined WR-MSD among IT professionals quite differently. The literature review shows that WR-MSD are most common in computer users in the banking sector. Major factors causing WR-MSD are repetition, number of working hours, high or sudden vigor, poor posture, sedentary work, and exposure to vibration. MSD has been defined as inflammatory and degenerative diseases that affect muscles, tendons, ligaments, joints, peripheral nerves, and supportive structures like intervertebral discs<sup>(7)</sup>.

Although many studies have dealt with MSDs among office workers in other countries, this important health problem's exact nature and prevalence have not been studied before in Bangalore South. This study on WR-MSD among the IT Professionals in Bangalore South would proffer its sight to recognize the problems, take needful measures to curtail WR-MSD among IT professionals, make work cost-effective and reduce lesions related to ergonomic hazards of IT professionals. Considering the above actuality, it is crucial to do such research to center the prevalence upon which pertinent steps for avoiding WR-MSD, boosting and maintaining the health of the IT professionals can be done. This study was directed to find the prevalence of WR-MSD and determine the correlation of WR-MSD with age, gender, and the number of working hours among the IT professionals in Bangalore South.

## 2 Materials and Methods

The study was an analytical cross-sectional study where a pretested, validated by 85%, and reliable, standardized Nordic-style questionnaire was handed to the IT professionals having problems with WR-MSD pains working in various multinational companies in south Bangalore. A total population of 1000 IT professionals were targeted, sample size for which was estimated using Slovin's Formula. The questionnaire was used for both the genders who used computers and had musculoskeletal pain problems, out of which 680 responded and finally 563 were considered for the study after applying inclusion and exclusion criteria. All the respondents gave their informed consent. The questionnaire employed as the study tool was a self-administered questionnaire consisting of multiple-choice questions. The population was between 21 years to 40 years, both males and females, a working minimum of 8 hours/day or more on the computer with work experience: 2 years or above. People younger than 21 years and older than 40 years and working less than 8 hours/day or with pathological musculoskeletal disorders or traumatic musculoskeletal disorders were excluded. Potential confounders were eliminated while applying inclusion-exclusion criteria. The sampling method used for the survey is non-probabilistic purposive sampling. Using the available data, the study subjects were contacted through e-mail, telephone, or face-to-face and explained the study over six weeks. Potential sources of bias were eliminated by getting the answers in a Yes/No format and ensuring that the questionnaire was circulated among IT professionals in Bangalore South. The questionnaire determines the pain experienced by the person in the last 12 months in neck, upper and lower back and upper and lower limbs. The Neck, Shoulder, Upper back, Elbows, Wrist/ Hands, Lower Back, Hips/Thighs, Knees, Ankle/Feet were analyzed using the questionnaire.

### 2.1 Procedure

A study by Sharma et al. in Delhi reported the prevalence of work-related MSD within 20-93% of the studied population<sup>(8)</sup>. The study aimed to spot the prevalence of musculoskeletal disorders among Indian IT professionals in Bangalore South, as the city being called the Silicon Valley of India, having huge number of IT professionals, and determine the correlation between age, gender and musculoskeletal disorders in the same population. And to determine the correlation between the duration of working hours and musculoskeletal disorders among IT professionals. Participating IT professionals were asked to fill in the Nordic questionnaire, the survey tool on WR-MSD, which contained questions on the incidence of the same in the previous 12 months, need to see a physician, or affect their daily life activities<sup>(9,10)</sup>.

### 2.2 Statistical Analysis

SPSS V 20 and MS Excel were used for analyzing the data. Descriptive statistics were used to summarize the prevalence of WR-MSD, and risk factors were also analyzed. The correlation of pain with danger elements was evaluated by linear regression and encapsulated by odds ratio (ORs) with 95% confidential intervals (CIs). The WR-MSD were analyzed separately for gender,

age, and working hours. The cases investigated were the ones having complete data on each variable.

### 3 Results

Analysis was done for all 563 respondents.

The results showed the pain across 9 areas of the body among which the neck region, upper back, and lumbar regions were analyzed as these three joints showed the maximum complaints of pain in the last 12 months (Table 1).

**Table 1. Distribution of pain area in the whole body**

Joint	Percentage of people having Pain
Neck	69
Shoulder	57
Upperback	60
Elbows	13
Wrist/Hands	35
Lower Back	65
Hips/Thighs	21
Knees	43
Ankle/Feet	33

**Distribution of Pain in the Area**

Respondents were mostly men (326, 57.37%) with a mean age of 31 years and having work experience between 2-10 years, with working hours of between 8-10 hours every day. Most participants (34.2%) reported WR-MSD affecting the neck, upper back (35.5%), and lower back (37.3%) during the past 12 months, including overlapping between the two sites or even all the three sites making the neck region and lumbar region the most typical sites of pain (Table 2).

**Table 2. Gender wise distribution**

Trouble in last 12 months	Gender	Neck pain * Gender Cross tabulation	Upper Back pain* Gender Cross tabulation		Lower Back pain * Gender Cross tabulation		
			Female	Male	Female	Male	Female
No	Count	148	222	148	215	156	197
	% Within MSD	40.00%	60.00%	40.80%	59.20%	44.20%	55.80%
Yes	Count	89	104	89	111	81	129
	% Within MSD	46.10%	53.90%	44.50%	55.50%	38.60%	61.40%
Total	Count	237	326	237	326	237	326
	% Within MSD	42.10%	57.90%	42.10%	57.90%	42.10%	57.90%

The above table explains the gender wise disorders in IT professionals in Bangalore South.

Within the past 12 months, the percentage of participants who reported disruption in activities of daily living (ADL) because of pain in the neck region was 25.8%, the upper back was 26.2%, and the lower back was 37.4%, making the lower back the most prevalent anatomical site of WR-MSD as shown in (Table 3) and the % age of respondents who required consultation with a physician regarding pain at one or more out of three anatomical sites was 31.2% for cervical pain, 26.2% for upper back pain, and 37.4% for the lumbar pain (Table 4). Whereas, when the analysis was done between gender and musculoskeletal disorders among IT professionals, the results show that in the last 12 months, females showed less prevalence in neck pain, 46.1%, compared to 53.9 % in males. The upper back pain was 44.5% in females compared to 55.5% in males and lower back pain 38.6% in females compared to 61.4% in males (Table 5), and odds ratio calculation (no/yes) and risk estimation show that females are more at risk than males.

**Table 3. The functional difficulty in activities of daily living**

Trouble in doing ADL'S			Neck pain * Gender Cross tabulation		Upper Back pain* Gender Cross tabulation		Lower Back pain * Gender Cross tabulation	
			Female	Male	Female	Male	Female	Male
Gender	No	Count	176	241	175	240	146	206
		% Within MSD	42.20%	57.80%	42.20%	57.80%	41.50%	58.50%
Gender	Yes	Count	61	85	62	86	91	120
		% Within MSD	41.80%	58.20%	41.90%	58.10%	43.10%	56.90%
Total		Count	237	326	237	326	237	326
		% Within MSD	42.10%	57.90%	42.10%	57.90%	42.10%	57.90%

The above table shows functional difficulty in activities of daily living indicating functional difficulty more in males as compared to females.

**Table 4. The gender wise requirement for physician's consultation**

Need to see a physician			Neck pain Gender Cross tabulation		Upper Back pain Gender Cross tabulation		Lower Back pain * Gender Cross tabulation	
			Female	Male	Female	Male	Female	Male
Gender	No	Count	160	227	187	262	189	245
		% Within MSD	41.30%	58.70%	41.60%	58.40%	43.50%	56.50%
Gender	Yes	Count	1	0	50	64	1	0
		% Within MSD	100.00%	0.00%	43.90%	56.10%	100.00%	0.00%
Total		Count	76	99	237	326	47	81
		% Within MSD	43.40%	56.60%	42.10%	57.90%	36.70%	63.30%

The above table indicates that more males needed physician consultation as compared to females.

Odds ratio for gender distribution for estimation of Work-related musculoskeletal disorders (WR-MSD).

**Table 5. The tabulation for gender distribution**

Neck	Value	Upper Back	Value	Lower Back	Value
Odds Ratio for Neck (No / Yes)	0.779	Odds Ratio for Upper Back (No / Yes)	0.859	Odds Ratio for Lower Back (No / Yes)	1.261
For cohort Gender = Female	0.867	For cohort Gender = Female	0.916	For cohort Gender = Female	1.146
For cohort Gender = Male	1.113	For cohort Gender = Male	1.067	For cohort Gender = Male	0.908
N of Valid Cases	563	N of Valid Cases	563	N of Valid Cases	563

The above table indicates that males have higher proportion of (WR-MSD) estimated using Odds ratio.

When the risk estimation was done, and the odds ratio was estimated, it showed that males are more at risk of developing WR-MSD than females. (Table 6).

**Table 6. Age distribution of pain**

Trouble in last 12 months		Neck pain		Upper back pain		Lower back		
		Middle Age	Young	Middle Age	Young	Middle Age	Young	
Age	No	Count	208	162	205	158	195	158

*Continued on next page*

*Table 6 continued*

	<b>% Within MSD</b>	56.20%	43.80%	56.50%	43.50%	55.20%	44.80%
<b>Yes</b>	<b>Count</b>	106	87	109	91	119	91
	<b>% Within MSD</b>	54.90%	45.10%	54.50%	45.50%	56.70%	43.30%
<b>Total</b>	<b>Count</b>	314	249	314	249	314	249
	<b>% Within MSD</b>	55.80%	44.20%	55.80%	44.20%	55.80%	44.20%

The table shows Pain prevalence among middle and young population.

When the relationship between age and musculoskeletal disorders among IT professionals was analyzed, the results show that in the last 12 months, younger people showed less prevalence in WR-MSD due to neck pain 45.1% as compared to 54.9% in middle-aged, 45.5% in young as compared to 54.5% in middle-aged for upper back pain and 43.3% in young as compared to 56.7% in middle-aged for the lower back (Table 7).

**Table 7. Age distribution for functional difficulties in activities of daily living**

<b>Trouble in doing ADL'S</b>		<b>Neck pain</b>		<b>Upper back pain</b>		<b>Lower back</b>	
		<b>Middle Age</b>	<b>Young</b>	<b>Middle Age</b>	<b>Young</b>	<b>Middle Age</b>	<b>Young</b>
<b>No</b>	<b>Count</b>	208	162	205	158	195	158
	<b>% Within MSD</b>	56.20%	43.80%	56.50%	43.50%	55.20%	44.80%
<b>Yes</b>	<b>Count</b>	106	87	109	91	119	91
	<b>% Within MSD</b>	54.90%	45.10%	54.50%	45.50%	56.70%	43.30%
<b>Total</b>	<b>Count</b>	314	249	314	249	314	249
	<b>% Within MSD</b>	55.80%	44.20%	55.80%	44.20%	55.80%	44.20%

The above table shows functional difficulty in activities of daily living indicating functional difficulty more in young population.

The results show that 45.1% of the young population has trouble doing ADL as compared to 54.5% middle-aged population in the last 12 months due to neck pain, and 45.5% of the young population and 54.5% of middle-aged population had trouble in ADL due to upper back and 43.3% of young and 56.7% of the middle-aged population had trouble in ADL due to lower back and odds ratio calculation (no/yes) and risk estimation shows that the young age group is more at risk than the middle age group. Also, the results show that 45.1% of young population had to see a physician as compared to 54.9% of middle-aged population in last 12 months due to neck pain and 45.5% of the young population and 54.5% of middle-aged population had to see a physician due to upper back, and 43.3% of young and 56.7% of the middle-aged population had to see the physician due to lower back (Table 8).

The risk estimation and the odds ratio were estimated to show that younger people are more at risk of developing WR-MSD than the middle age group (Table 9).

When the relationship between hours of work and musculoskeletal disorders among IT professionals was analyzed, the results show that only 29.9% of people working for less than 10 hours showed the prevalence of neck pain in the last year compared to 71.0% of people working for more than 10 hours.

Only 28.0% of people working less than 10 hours showed prevalence due to upper back pain as compared to 72.0% in people working more than 10 hours and

28.6% of people work less than 10 hours compared to 71.4% of people working more than 10 hours due to lower back pain. (Table 10), and odds ratio calculation (no/yes) and risk estimation show that people working less than 10 hours are more at risk than the people working more than 10 hours.

Also, when the relationship between hours of work and WR-MSD among IT professionals was analyzed to check the disruption of ADL, the results show that only 29% of people who worked for more than 10 hours showed the prevalence of cervical pain in the last one year compared to 71.0% in people who worked for less than 10 hours.

Only 28.0% of people working more than 10 hours showed prevalence due to upper back pain as compared to 72.0% in people who worked for less than 10 hours and

28.6% of people who worked for more than 10 hours compared to 71.4% of people working less than 10 hours due to lower back pain. (Table 11).

Also, when the relationship between hours of work and WR-MSD among IT professionals was analyzed to check the need to see the physician in the last 12 months, the results show that only 29% of people who worked for more than 10 hours showed prevalence of cervical pain in the last 1 year as compared to 71% in people who worked for less than 10 hours.

**Table 8. The age distribution of requirement for physician’s consultation**

Need to see a physician		Neck pain		Upper back pain		Lower back	
		Middle Age	Young	Middle Age	Young	Middle Age	Young
No	Count	208	162	205	158	195	158
	% Within MSD	56.20%	43.80%	56.50%	43.50%	55.20%	44.80%
Yes	Count	106	87	109	91	119	91
	% Within MSD	54.90%	45.10%	54.50%	45.50%	56.70%	43.30%
Total	Count	314	249	314	249	314	249
	% Within MSD	55.80%	44.20%	55.80%	44.20%	55.80%	44.20%

The above table indicates that the younger population needed physician consultation as compared to older ones.

**Table 9. Tabulation of Age distribution for estimation of Work-related musculoskeletal disorders (WR-MSD)**

Neck	Value	Upper Back	Value	Lower Back	Value
Odds Ratio for Neck (No / Yes)	1.054	Odds Ratio for Upper Back (No / Yes)	1.083	Odds Ratio for Lower Back (No / Yes)	0.944
For cohort Age = Middle Age	1.024	For cohort Age = Middle Age	1.036	For cohort Age = Middle Age	0.975
For cohort Age = Young	0.971	For cohort Age = Young	0.957	For cohort Age = Young	1.033
N of Valid Cases	563	N of Valid Cases	563	N of Valid Cases	563

The above table indicates that young population have higher proportion of (WR-MSD) estimated using Odds ratio.

**Table 10. Relationship of working hours with musculoskeletal disorders**

Trouble in last 12 months		Neck pain		Upper back pain		lower back pain	
		8-10 hours	10-14 hours	8-10 hours	10-14 hours	8-10 hours	10-14 hours
No	Count	257	113	250	113	244	109
	% within MSD	69.50%	30.50%	68.90%	31.10%	69.10%	30.90%
Yes	Count	137	56	144	56	150	60
	% within MSD	71.00%	29.00%	72.00%	28.00%	71.40%	28.60%
Total	Count	394	169	394	169	394	169
	% within MSD	70.00%	30.00%	70.00%	30.00%	70.00%	30.00%

The above table indicates that people with more working hours have lesser WR- MSD.

**Table 11. Relationship of working hours with trouble in doing functional activities.**

Trouble in doing ADES		Neck pain		Upper back pain		lower back pain	
		8-10 hours	10-14 hours	8-10 hours	10-14 hours	8-10 hours	10-14 hours
No	Count	257	113	250	113	244	109
	% within MSD	69.50%	30.50%	68.90%	31.10%	69.10%	30.90%
Yes	Count	137	56	144	56	150	60
	% within MSD	71.00%	29.00%	72.00%	28.00%	71.40%	28.60%
Total	Count	394	169	394	169	394	169
	% within MSD	70.00%	30.00%	70.00%	30.00%	70.00%	30.00%

The above table shows that the population with lesser working hours have more difficulties in performing activities of daily living.

Only 28.0% of people who worked for more than 10 hours showed the prevalence of upper back pain as compared to 72.0% in people who worked for less than 10 hours and

28.6% of people who worked for more than 10 hours showed the prevalence of lower back as compared to 71.4% of people who worked for less than 10 hours (Table 12).

When the risk estimation was done, and the odds ratio was estimated, it showed that people working less than 10 hours are more at risk of developing WR-MSD than the people working more than 10 hours (Table 13).

**Table 12. Relationship of working hours with requirement for physician's consultation.**

Need to see a physician	Hours of work		Neck pain		Upper back pain		lower back pain	
			8-10 hours	10-14 hours	8-10 hours	10-14 hours	8-10 hours	10-14 hours
No		Count	257	113	250	113	244	109
		% within MSD	69.50%	30.50%	68.90%	31.10%	69.10%	30.90%
Yes		Count	137	56	144	56	150	60
		% within MSD	71.00%	29.00%	72.00%	28.00%	71.40%	28.60%
Total		Count	394	169	394	169	394	169
		% within MSD	70.00%	30.00%	70.00%	30.00%	70.00%	30.00%

The above table indicates that people having lesser working hours needed physician consultation as compared to older ones.

**Table 13. Working hour's distribution for estimation of WR-MSD**

Neck	Value	Upper Back	Value	Lower Back	Value
Odds Ratio for Neck (No / Yes)	0.93	Odds Ratio for Upper Back (No / Yes)	0.86	Odds Ratio for Lower Back (No / Yes)	0.895
For cohort Hours at Work = 8-10 hours	0.979	For cohort Hours at Work = 8-10 hours	0.957	For cohort Hours at Work = 8-10 hours	0.968
10-14 work hours	1.053	For cohort Hours at Work = 10-14 hours	1.112	For cohort Hours at Work = 10-14 hours	1.081
N of Valid Cases	563	N of Valid Cases	563	N of Valid Cases	563

The above table indicates that population working less than 10 hours have higher proportion of (WR-MSD) estimated using Odds ratio.

## 4 Discussion

Work-related musculoskeletal disorders (WR-MSD) are the set of injuries happening because of repetitive strain put on various body parts over a period.<sup>(6)</sup> It is influenced by various factors, including age, gender, and the number of daily working hours on the computer.<sup>(6)</sup> The prevalence of WR-MSD was high, especially in the cervical region, upper back, and lumbar region among the IT professionals in Bangalore South in this study. Various risk factors were recognized. Their connection with aches at all three sites was statistically significant.

The neck pain prevalence observed in the last 12-month in this study was significantly higher (69%) than reported by Cagnie B, Danneels L, (45.5%)<sup>(11)</sup> and computer users in New Zealand (51%) among the office workers in a study done by Hanna F et al. in 2019,<sup>(12)</sup> and lower back and upper shows the next two most reported sites of pain in this study. In contrast, the odds ratio for risk estimation revealed that the females are more at risk than the males, which correlates with what is reported by Cagnie B, Danneels L,<sup>(11)</sup>.

A study done by Hanna F, Daas RN among university employees suggests that stationary desk-bound workers are at risk of health hazards like lower back pain, neck pain and psychological problems. Plan of action should be focused on reducing desk-bound time with a more active lifestyle inculcated into the office wellness policy to prevent WR-MSD like lower back pain, neck pain, and psychological problems.<sup>(12)</sup>

This can be due to the sedentary lifestyle and no participation in active activities at home apart from the office work.<sup>(13)</sup>

Singh RM et al. states that computer related psychological health hazards<sup>(14)</sup>. The relationship of age shows the opposite when we estimate the risk; it shows that the young population, 21-31 years is more at risk than the middle-aged people, 31-40 years. This can be again due to the sedentary lifestyle followed by the younger population compared to the older age group, as

evident from a study done by Oha K, Animägi L et al. in 2014.<sup>(13)</sup>

A cross-sectional study was done by Oha K, Animägi et al. on work-related risk factors for musculoskeletal pain among Estonian computer users found a high prevalence of MSP, especially in the neck and low back, among Estonian computer users. Various risk factors were identified, and several showed statistically significant pain-associated associations at all four of the analyzed anatomical sites.<sup>(13)</sup>

Studies showed that musculoskeletal diseases are more prevalent in the young population, and prevention should be focused on this group, showing prevalence in the low back of about 42.9%.<sup>(15,16)</sup> Impact of several working hours revealed that people working more than 10 hours show less reporting of WR-MSD than the people working less than 10 hours, which can be due to either their body adapting to the working conditions or following an active lifestyle.

The preponderance of pain reported by participants in this study and the indication of WR-MSD was high in our study sample. The fact that as many as 31.2% of the participants needed to consult a physician in the last one year because of cervical pain suggests that symptoms were chronic and significant.

This prevalence study attributes to the fact that lack of awareness, low fitness levels, and long working hours add to the increase in WR-MSDs in the younger population.<sup>(17)</sup>

The studies have shown that workstation ergonomics awareness, adopting a more active lifestyle, and self-awareness can help prevent and manage such WR-MSDs.<sup>(18-21)</sup>

**Limitations of the study:** This study had limitations as we cannot exclude the possibility that WR-MSD can be impacted by emotional weariness and distress from somatic symptoms and the stress from the job.<sup>(22)</sup> And a further limitation of the information about other activities apart from work, such as sports, yoga, and gym, that might have contributed to, or relieved symptoms have not been taken into consideration.

**Suggestions:** Further interventional study can be done considering the potential factors associated with the WR-MSD and ergonomic awareness programs can be conducted and impact seen for the reduction of WR-MSD among IT professionals. The study can be further explored in various populations viz a viz, teachers, entrepreneurs and bankers.

## 5 Conclusion

WR-MSD was prevalent in the studied IT professionals in Bangalore south. The main area of symptoms was the cervical and lower back region. The symptoms were well correlated with independent factors of age, gender, and the number of working hours; male participants less than 30-years of age and working less than 10 hours per day were more at risk. So, the present study is a foretoken for IT- Professionals. The cognizance, tutelage, and training programs on averting and stalling the WR-MSD and improving their productivity are recommended.

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