

Research Article

Prevalence of Musculoskeletal Disorders among Garment Workers: A Cross-Sectional Study in Bangladesh

Md Abid Hasan^{1,2*}, Muhammad Kamal Hossain^{3,4}, Rony Chandra Shil², Sajia Azmi², Rubaiyat Binte Jahangir² and Nursad Jahan Sultana²

¹Department of Pharmacy, University of Asia Pacific, Dhaka, Bangladesh

²Department of Pharmacy, University of Science and Technology Chittagong, Chittagong, Bangladesh

³PhD Fellow, School of Pharmacy, Jeonbuk National University, South Korea

⁴Department of Pharmacy, Assistant Professor, University of Science and Technology Chittagong, Chittagong, Bangladesh

More Information

*Address for Correspondence: Md Abid Hasan, Department of Pharmacy, University of Asia Pacific, Dhaka, Department of Pharmacy, University of Science and Technology Chittagong, Chittagong, Bangladesh, Email: mdabid.bd@yahoo.com

Submitted: June 28, 2023

Approved: July 11, 2023

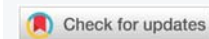
Published: July 12, 2023

How to cite this article: Hasan MA, Hossain MK, Shil RC, Azmi S, Jahangir RB, Sultana NJ, et al. Prevalence of Musculoskeletal Disorders among Garment Workers: A Cross-Sectional Study in Bangladesh. J Nov Physiother Rehabil. 2023; 7: 016-021.

DOI: 10.29328/journal.jnpr.1001051

Copyright License: © 2023 Hasan MA, et al. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Keywords: Musculoskeletal disorders; Backpain; Garment workers; Lower back pain



Abstract

Background: The prevalence of musculoskeletal disorders is particularly high among garment workers, which poses a serious occupational health hazard. This issue is not taken seriously as an important issue in low-income countries like Bangladesh.

Aim: Determine the prevalence of musculoskeletal conditions (MSDs) among garment workers in nine body regions and explore the relationship between MSDs and the general characteristics of the participants.

Materials and methods: A cross-sectional study including 383 garment workers was done. A structured questionnaire (Standardized Nordic Musculoskeletal) was used.

Results: The most common form of pain in the last year was lower back pain. Nine anatomical locations were studied, and workers most commonly experienced problems with their lower back (45.4%), upper back (36.6%), and knees (33.2%). Workers reported having more trouble in the knee (31.9%), upper back (35.0%), and lower back (43.9%) regions over the past seven days. In the past year and the last seven days, shoulder injuries were the least common.

Conclusion: MSDs are widespread among garment industry employees. The back condition is the most commonly affected. The development of MSD is directly correlated with age and work experience.

Introduction

Years spent with a handicap are most commonly caused by musculoskeletal disorders (MSDs) [1]. There is evidence from several epidemiological studies that physical activity at work causes Work-related Musculoskeletal Disorders (WMSDs) [2]. Older, female, more experienced, working for longer hours, awkward postures, repetitive motions, manual material handling, strong exertions, and vibration are common risk factors for WMSDs [3-5]. Nearly four million people are employed in Bangladesh, the world's second-largest maker and supplier of clothing, the majority of whom are young women with limited education and job experience

[6-8]. According to one study, the prevalence of lower back pain, neck pain, and knee pain among Bangladeshi garment workers from October 2015 to February 2016 was 24.7%, 23.7%, and 13%, respectively [9]. Another study found that between November 2016 and January 2017, the prevalence of lower back pain increased by 24.7% to 38% [10]. It is evident that the incidence of musculoskeletal disorders has increased steadily in Bangladesh. Compared to the other professions, garment professionals are more vulnerable to developing musculoskeletal disorders because most of them are not well educated. They do not know the basic concept of working postures, primary health care, and good work management skill. Also, as Bangladeshi garment workers are underpaid,



they cannot go for better health care or garment ownership does not take action for employee's better health. These are the main reasons for increasing these disorders day by day. Therefore, we must pay attention to their health and take the required steps to improve it in order for our economic situation to improve.

There is a paucity of information on WMSDs, particularly the causes of RMG employees' disorders. Only a few Bangladeshi studies have examined the prevalence of musculoskeletal diseases and associated factors. There is not enough literature that determined the nine body regions. The importance of the nine body regions assessment is crucial for comparison.

Through this study, we tried to estimate the frequency of MSDs and comprehend the relationship between MSDs and general worker characteristics. Given that Bangladesh's economy is primarily dependent on the labor of garment workers, I think this is an extremely significant matter. Our research demonstrates the current prevalence situation. Try to find out factors associated with musculoskeletal pain.

Materials and methods

Design and sample size

A cross-sectional study was conducted by organizing a four-week campaign (from February to March 2022) around garment factories located in Kalurghat, Chattagram, Bangladesh. There are seven garment factories in the Kalurghat area. Our initiative offered participants free first-aid services such as free blood pressure and glucose checks, advice on how to take their medications properly, and free over-the-counter medications. A cluster sampling method was used in this study. The selected participants had more than one-year job experience. The majority of participants had no experience with annual health checkups from the factory owner or any other health care services. Their income is not sufficient enough that they cannot go for health checkups on their own. More than 600 participants participated in our campaign and received first aid facilities. 383 participants were chosen for the final analysis after screening. The interviewers received sufficient training before conducting interviews. The inclusion criteria were: older than 18 years old, without traumatizing past, who has experience in the garment for more than one year, and exclusion criteria: Pregnant women, employees who have been there for less than a year, those who have had recent surgeries, or those who have fractures. With a margin of error of 5% and an expected prevalence of 30%, the necessary sample size of 377 was calculated.

Questionnaire

Both quantitative continuous data (such as age, employment experience, height, and weight) and qualitative factors with two to four categories are included in the questionnaire. A previously created questionnaire was used to collect data, which includes (1) demographic characteristics (gender, age, weight, height, job experience, and type of job); and (2) a standard Nordic questionnaire [NMQ] to determine

the frequency of musculoskeletal illnesses, which is reliable and valid [11]. Participants were made aware that they could quit the study at any time.

Case definition

In this investigation, having an ache, pain, discomfort, numbness, or other physical limitation in one or more body parts that lasted for more than 24 hours and did not disappear with rest was considered an MSD case.

Statistical analysis

Data were collected and entered in Microsoft Excel 2016 and IBM's Social Science Statistical Package (SPSS) application version 26.0 was used to analyze data. The prevalence and categorical variables were reported as frequency and percentage; and Body Mass Index (BMI), which was determined from height and weight. The connection between MSDs and the sociodemographic characteristics of the research population was evaluated using the chi-square test. At a *p* - value of 0.05, all statistical tests were considered statistically significant.

Ethics

The study was approved by the Ethics Committee of the University of Science and Technology Chittagong (USTC), Chattagram, Bangladesh. The willing individual gave his or her verbal agreement to participate in our investigation.

Results

383 garment workers in total participated in this study. Among them, 205 (53.5%) were men and 178 (46.5%) were women. The majority of garment workers (97.1%) worked full-time and were between the ages of 26 and 35. Most (44.6%) had BMIs within the normal range, while 2.6% and 41.0% were underweight and overweight, respectively, and obesity was (11.7%). 51.1 percent of them have less than five years of work experience. Details and demographic information are given in Table 1.

According to the results of the Nordic Musculoskeletal Questionnaire, the lower back had the highest prevalence rate of MSD in the last year (45.4%) and the past week (43.9%).

Table 1: Demographic characteristics of the respondents (N = 383).

Variables	N = 383	N (%)
Sex	Male	205 (53.5)
	Female	178 (46.5)
Age (years)	18 - 25	124 (32.4)
	26 - 35	198 (51.7)
	36 - 45	57 (14.9)
	More than 46	4 (1)
BMI	Less than 18.5	10 (2.6)
	18.5 - 23.9	171 (44.6)
	24 - 27.5	157 (41.0)
	More than 28	45 (11.7)
Types of Job	Part-time	11 (2.9)
	Full time	372 (97.1)
Job Experience	Less than 5	192 (51.1)
	5 - 9	77 (20.1)
	10 - 14	87 (22.7)
	More than 15	27 (7.0)



Lower back (45.4%), upper back (36.6%), knee (33.2%), and elbow (32.1%) were the body parts with the most often reported discomfort during the past 12 months; the same complaints were most common over the previous week. During the previous 12 months, the prevalence of MSD was lowest in the wrist/hand (26.6%) and shoulder (26.6%), and in the past week, the neck (23.2%) and shoulder (25.1%) (Table 2).

Association between prevalence of MSDs and participant details

There was a strong correlation between age and experience in employment and the frequency of MSDs. The prevalence of MSD increases with increasing age. The age of the elderly was significantly associated with neck discomfort and lower back pain ($p = 0.0001$ and $p = 0.000$, respectively). Over 46-year-olds experience the highest rates (100%) of neck discomfort and lower back pain. A striking correlation was also found between lower back pain ($p = 0.000$) and participants with a job history of more than 15 years; over 85.2% of them reported having lower back discomfort.

The participant's sex, BMI, and kind of employment did not significantly correlate with the prevalence of MSDs.

The association between MSDs and participant demographic characteristics is given in Tables 3-7.

Table 2: Results of Musculoskeletal Disorders from NMQ.

Area of Body	Last 7 days occurrence (%)	Last 12 months' occurrence (%)	Pain Interferes with Work (%)
Neck	89 (23.2)	113 (29.5)	108 (28.2)
Shoulders	96 (25.1)	102 (26.6)	97 (25.3)
Upper back	134 (35.0)	140 (36.6)	131 (34.2)
Elbows	118 (30.8)	123 (32.1)	118 (30.8)
Wrists/Hands	99 (25.8)	102 (26.6)	96 (25.1)
Lower back	168 (43.9)	174 (45.4)	171 (44.6)
Hips/Thighs	99 (25.8)	108 (28.2)	104 (27.2)
Knees	122 (31.9)	127 (33.2)	125 (32.6)
Ankles/Feet	102 (26.6)	107 (27.9)	102 (26.6)

Table 3: Associate between MSDs and sex.

MSDs		Sex		X ²	p value
		Male (%)	Female (%)		
Neck	Yes	64 (31.2)	49 (27.5)	0.624	0.435
	No	141 (68.8)	129 (72.5)		
Shoulder	Yes	53 (25.9)	49 (27.4)	0.137	.729
	No	152 (74.1)	129 (72.5)		
Upper Back	Yes	83 (40.5)	57 (32)	2.944	.090
	No	122 (59.5)	121 (68)		
Elbows	Yes	70 (34.1)	53 (29.8)	.835	.382
	No	135 (65.9)	125 (70.2)		
Wrists/Hands	Yes	57 (27.8)	45 (25.3)	.311	.643
	No	148 (72.2)	133 (74.7)		
Lower Back	Yes	94 (45.9)	80 (44.9)	.032	.918
	No	111 (54.1)	98 (55.1)		
Hips/Thighs	Yes	57 (27.8)	51 (28.7)	.034	.909
	No	148 (72.2)	127 (71.3)		
Knees	Yes	69 (33.7)	58 (32.6)	.050	.829
	No	136 (66.3)	120 (67.4)		
Ankles/Feet	Yes	58 (28.3)	49 (27.5)	.028	.909
	No	147 (71.7)	129 (72.5)		

Table 4: Associate between MSDs and age.

MSDs		Age				X ²	p value
		18 - 25(%)	26 - 35(%)	36 - 45(%)	>46(5)		
Neck	Yes	22 (17.7)	61 (30.8)	26 (45.6)	4 (100)	23.807	0.000
	No	102 (82.3)	137 (69.2)	31(54.4)	0 (0)		
Shoulder	Yes	27 (21.8)	47 (23.7)	26 (45.6)	2 (50)	13.251	0.003
	No	97 (78.2)	151 (76.3)	31 (54.4)	2 (50)		
Upper Back	Yes	39 (31.5)	70 (35.4)	30 (52.6)	1 (25)	7.845	.041
	No	85 (68.5)	128 (64.6)	27 (47.4)	3 (75)		
Elbows	Yes	25 (20.2)	74 (37.4)	24 (42.1)	0 (100)	15.072	0.001
	No	99 (79.8)	124 (62.6)	33 (57.9)	4 (100)		
Wrists/Hands	Yes	22 (17.7)	59 (29.8)	19 (33.3)	2 (50)	8.982	0.024
	No	102 (82.3)	139 (70.2)	38 (66.7)	2 (50)		
Lower Back	Yes	40 (32.3)	88 (44.4)	42 (73.7)	4 (100)	31.880	0.000
	No	84 (67.7)	110 (55.6)	15 (26.3)	0 (0)		
Hips/Thighs	Yes	24 (19.4)	53 (26.8)	29 (50.9)	2 (50)	19.455	0.000
	No	100 (80.6)	145 (73.2)	28 (49.1)	2 (50)		
Knees	Yes	26 (21.0)	74 (37.4)	24 (42.1)	3 (75.0)	15.357	0.001
	No	98 (79.0)	124 (62.6)	33 (57.9)	1 (25.0)		
Ankles/Feet	Yes	22 (17.7)	67 (33.8)	16 (28.1)	2 (50.0)	11.326	0.008
	No	102 (82.3)	131 (66.2)	41 (71.9)	2 (50.0)		

Table 5: Associate between MSDs and BMI.

MSDs		BMI				X ²	p value
		<18.5 (%)	18.5-23.9 (%)	24-27.9 (%)	>28 (%)		
Neck	Yes	2 (80)	41 (24.0)	56 (35.7)	14 (31.1)	5.871	.118
	No	8 (80)	130 (76.0)	101 (64.3)	31 (68.9)		
Shoulder	Yes	4 (40)	42 (24.6)	45 (28.7)	11 (24.4)	1.731	.630
	No	6 (60)	129 (75.4)	112 (71.8)	34 (75.6)		
Upper Back	Yes	3 (30)	66 (38.6)	57 (36.3)	14 (31.1)	1.072	.784
	No	7 (70)	105 (61.4)	100 (63.7)	31 (68.9)		
Elbows	Yes	3 (30)	50 (29.2)	56 (35.7)	14 (31.1)	1.599	.660
	No	7 (70)	121 (70.8)	101 (64.3)	31 (68.9)		
Wrists/Hands	Yes	1 (10)	45 (26.3)	47 (29.9)	9 (20)	3.315	.346
	No	9 (90)	126 (73.7)	110 (70.1)	36 (80)		
Lower Back	Yes	2 (20)	80 (46.8)	74 (47.1)	18 (40)	3.454	.327
	No	8 (80)	91 (53.3)	83 (52.9)	27 (60)		
Hips/Thighs	Yes	1 (10)	47 (27.5)	46 (29.3)	14 (31.1)	1.961	.580
	No	9 (90)	124 (72.5)	111 (70.7)	31 (68.9)		
Knees	Yes	4 (40)	54 (31.6)	56 (35.7)	13 (28.9)	1.220	.748
	No	6 (60)	117 (68.4)	101 (64.3)	32 (71.1)		
Ankles/Feet	Yes	1 (10)	51 (29.8)	42 (26.8)	13 (28.9)	2.031	.566
	No	9 (90)	120 (70.2)	115 (73.2)	32 (71.1)		

Table 6: Associate between MSDs and Job experience.

MSDs		Job Experience				X ²	p value
		<5 (%)	5 - 9 (%)	10 - 14 (%)	>15 (%)		
Neck	Yes	34 (17.7)	27 (35.1)	37 (42.5)	15 (55.6)	29.895	.000
	No	158 (82.3)	50 (64.9)	50 (57.5)	12 (44.4)		
Shoulder	Yes	40 (20.8)	23 (29.9)	25 (28.7)	14 (51.9)	12.703	.005
	No	152 (79.2)	54 (70.1)	62 (71.3)	13 (48.1)		
Upper Back	Yes	52 (27.1)	35 (45.5)	38 (43.7)	15 (55.6)	16.163	.001
	No	140 (72.9)	42 (54.9)	49 (56.3)	12 (44.4)		
Elbows	Yes	39 (20.3)	36 (46.8)	36 (41.4)	12 (44.4)	25.144	.000
	No	153 (79.7)	41 (53.2)	51 (58.6)	15 (55.6)		
Wrists/Hands	Yes	34 (17.7)	30 (39.0)	25 (28.7)	13 (48.1)	20.409	.000
	No	158 (82.3)	47 (61.0)	62 (71.3)	14 (51.9)		
Lower Back	Yes	56 (29.2)	40 (51.9)	55 (63.2)	23 (85.2)	50.121	.000
	No	136 (70.8)	37 (48.1)	32 (36.8)	4 (14.8)		
Hips/Thighs	Yes	34 (17.7)	23 (29.9)	37 (42.5)	14 (51.9)	26.827	.000
	No	158 (82.3)	54 (70.1)	50 (57.5)	13 (48.1)		
Knees	Yes	41 (21.4)	35 (45.5)	37 (42.5)	14 (51.9)	25.027	.000
	No	151 (78.6)	42 (54.5)	50 (57.5)	13 (48.1)		
Ankles/Feet	Yes	33 (17.2)	27 (35.1)	34 (39.1)	13 (48.1)	23.808	.000
	No	159 (82.8)	50 (64.9)	53 (60.9)	14 (51.9)		

Table 7: Associate between MSDs and Types of Job.

MSDs		Types of Job		X ²	p value
		Part-time (%)	Full-time (%)		
Neck	Yes	1 (9.1)	112 (30.1)	2.269	.186
	No	10 (90.9)	260 (69.9)		
Shoulder	Yes	1 (9.1)	101 (27.2)	1.783	.301
	No	10 (90.9)	271 (72.8)		
Upper Back	Yes	2 (18.2)	138 (37.1)	1.648	.341
	No	9 (81.8)	234 (62.9)		
Elbows	Yes	2 (18.2)	121 (32.5)	1.008	.514
	No	9 (81.8)	251 (67.5)		
Wrists/Hands	Yes	2 (18.2)	100 (26.9)	.414	.734
	No	9 (81.8)	272 (73.1)		
Lower Back	Yes	3 (27.3)	171 (46.0)	1.506	.358
	No	8 (72.7)	201 (54.0)		
Hips/Thighs	Yes	3 (27.3)	105 (28.2)	.005	1.000
	No	8 (72.7)	267 (71.8)		
Knees	Yes	1 (9.1)	126 (33.9)	2.960	.109
	No	10 (90.9)	246 (66.1)		
Ankles/Feet	Yes	1 (9.1)	106 (28.5)	1.998	.304
	No	10 (90.9)	266 (71.5)		

Discussion

In this study, we looked at the prevalence of MSDs in nine different body regions among Bangladeshi textile workers and evaluated the relationship between MSDs and the general demographic factors of the participant. Compared to previous Bangladeshi investigations [9], our results were more significant as we assessed nine body regions carefully.

In this study, the parts most frequently impacted by garment workers within the last 7 days were shoulders (25.1%), lower back (43.9%), neck (23.2%), knees (31.9%), and elbows (30.8%). Other researchers in Bangladesh made similar findings [12], but at that time prevalence was less than our findings, which accounted for shoulders (17.9%), lower back (15.2%), neck (13.8%), and knees (10.8%).

In this study, the 12-month prevalence of lower back pain was 45.4%, which was almost double the finding of cross-sectional research published in Bangladesh in 2018 [13], where lower back pain was 24.7%, and 25% in another study [9].

Some earlier studies [12-14] reported that age and service duration were strongly related to MSD, our studies found the same results.

One study investigated MSD among bank employees reported that lower back pain was the highest (64.3%) compare to others for the 51-59 age group people [15]. Unfortunately, our study revealed that 100% of the people who worked in garment aged more than 46 was suffered from lower back pain.

Another study published that 52.25% of university students experienced lower back pain [16]. 61.80% of bicycle, and rickshaw pullers had lower back pain according to a study conducted on bicycle and rickshaw pullers in 2019 [17]. In our

study, 45.4% of workers had lower back pain, which is slightly less than in other professions. According to the literature review, Bangladeshi physical therapists are less suffering from lower back pain (15.2%) [18]. Neck pain is the most affected part among the physical therapist (25.7%) [18] and dentists (56.2%) [19].

From our investigation, it has been observed that the prevalence of MSD increases with age. Lower back issues were reported by 32.3% of the employees in this series who were under the age of 25, 73.7% of those who were between the ages of 36 and 45, and 100% of those who were beyond the age of 46. Lower back pain, neck, and knee pain issues were more common among older workers. Participants aged 18 to 25 reported a neck complaint at a rate of 17.7%, but those over 46 had a neck complaint at a rate of 100%. Therefore, age and MSD had a strong relationship.

Additionally, as job time rose, the frequency of MSDs also increased. In terms of other places, the lower back is the most commonly affected. Nearly 85.2% of the workers (those with more than 15 years on the job) reported having lower back discomfort over the previous 12 months. This was more than a third (29.2%) of those with less than five years of professional experience.

Sex, BMI, and type of job were not associated with MSDs we found in our study.

This study had a few limitations. The prevalence estimate was precise; however, the contributing elements were not carefully evaluated. This study looked only at sociodemographic factors associated with MSD, there are so many factors such as psychological, workplace, and individual factors associated with MSD which were not assessed in this study because of the short interview periods. Other limitations of this study include that it is cross-sectional, the possibility of recollection bias, and the dependence on self-report of MSDs. In this study, no data were collected on the role of factors such as job demands, social support, or job satisfaction.

Our study focused on MSDs in the nine body regions which are very important aspects of occupational health. A proper questionnaire was used but not conducted in a large population. As Bangladesh is a highly dense country, future studies should consider a large population. We recommend workers on taking frequent breaks while working, change their position during work, go for annual health checkups, stay away from long-duration work once a time, and stay hydrated to prevent MSD. To have a better understanding of MSD, future studies should take into account longitudinal and experimental study approaches. And evaluate psychological, workplace-related, and individual factors (such as physical ability, and health conditions) to correlate with disorders. Also, cohort studies are needed to identify specific factors for individual pain in the body part.



Conclusion

The lower back, neck, elbows, and shoulders were found to be the most frequently affected body regions in this population. Older and more experienced employees showed a significant propensity for these diseases. Long hours of work without breaks and heavy physical load are the reason for developing musculoskeletal disorders. Bangladeshi garment employees are underpaid as a result they are not able to check their health frequently even though they got musculoskeletal pain initially, as a consequence they do ignore it and develop long time pain. Another reason is that they work extra hours or do overtime duties to earn more money, which yields MSD gradually. Awareness of ergonomically designed working postures and frequent health checkups are needed to take preventive action in reducing MSDs.

Data availability

The participant data were examined, and the results are presented in the manuscript. The authors are willing to provide the SPSS data upon request.

Acknowledgement

The assistance and support of multiple people involved in the entire research activity at various stages allowed for the completion of this study. The research team is thankful to all respondents who gave us their time and experience, as well as the respected teacher Muhammad Kamal Hossain, for the study concept, design, and recommendations. Md. Abid Hasan, who oversaw data collection in the field under challenging circumstances, analyzed the data using statistical tools and wrote the manuscript. The research team also appreciates the efforts of the researchers Sajia Azmi, Rubaiyat Binte Jahangir, and Rony Chandra Shil, who collected the data. All authors reviewed the manuscript.

References

- Vos T, Flaxman AD, Naghavi M, Lozano R, Michaud C, et al. Years lived with disability (YLDs) for 1160 sequelae of 289 diseases and injuries 1990-2010: a systematic analysis for the Global Burden of Disease Study 2010. *Lancet*. 2012 Dec 15;380(9859):2163-96. doi: 10.1016/S0140-6736(12)61729-2. Erratum in: *Lancet*. 2013 Feb 23;381(9867):628. AlMazroa, Mohammad A [added]; Memish, Ziad A [added]. PMID: 23245607; PMCID: PMC6350784.
- Anderson VP, Bernard B, Estill C, Fine L. *Musculoskeletal Disorders and Workplace Factors: A Critical Review of Epidemiologic Evidence for Work-Related Musculoskeletal Disorders of the Neck, Upper Extremity, and Low Back*. National Institute for Occupational Safety and Health. 1997. <https://www.researchgate.net/publication/255875317>
- Okezue OC, Anamezie TH, Nene JJ, Okwudili JD. Work-Related Musculoskeletal Disorders among Office Workers in Higher Education Institutions: A Cross-Sectional Study. *Ethiop J Health Sci*. 2020 Sep;30(5):715-724. doi: 10.4314/ejhs.v30i5.10. PMID: 33911832; PMCID: PMC8047279.
- Punnett L, Wegman DH. Work-related musculoskeletal disorders: the epidemiologic evidence and the debate. *J Electromyogr Kinesiol*. 2004 Feb;14(1):13-23. doi: 10.1016/j.jelekin.2003.09.015. PMID: 14759746.
- Jin X, Dong Y, Wang F, Jiang P, Zhang Z, He L, Forsman M, Yang L. Prevalence and associated factors of lower extremity musculoskeletal disorders among manufacturing workers: a cross-sectional study in China. *BMJ Open*. 2022 Feb 2;12(2):e054969. doi: 10.1136/bmjopen-2021-054969. PMID: 35110322; PMCID: PMC8811580.
- Steinisch M, Yusuf R, Li J, Stalder T, Bosch JA, Rahman O, Strümpell C, Ashraf H, Fischer JE, Loerbroks A. Work stress and hair cortisol levels among workers in a Bangladeshi ready-made garment factory - Results from a cross-sectional study. *Psychoneuroendocrinology*. 2014 Dec;50:20-7. doi: 10.1016/j.psyneuen.2014.08.001. Epub 2014 Aug 11. PMID: 25199982.
- Akhter S, Rutherford S, Akhter Kumkum F, Bromwich D, Anwar I, Rahman A, Chu C. Work, gender roles, and health: neglected mental health issues among female workers in the ready-made garment industry in Bangladesh. *Int J Womens Health*. 2017 Aug 16;9:571-579. doi: 10.2147/IJWH.S137250. PMID: 28860866; PMCID: PMC5566390.
- Naved R, Rahman T, Willan S, Jewkes R, Gibbs A. Female garment workers' experiences of violence in their homes and workplaces in Bangladesh: A qualitative study. *Soc Sci Med*. 2018 Jan;196:150-157. doi: 10.1016/j.socscimed.2017.11.040. Epub 2017 Nov 21. PMID: 29182963.
- Hossain MD, Aftab A, Al Imam MH, Mahmud I, Chowdhury IA, Kabir RI, Sarker M. Prevalence of work related musculoskeletal disorders (WMSDs) and ergonomic risk assessment among readymade garment workers of Bangladesh: A cross sectional study. *PLoS One*. 2018 Jul 6;13(7):e0200122. doi: 10.1371/journal.pone.0200122. PMID: 29979734; PMCID: PMC6034848.
- Rabbi F, Tithi MK, Mirza T, Anannya SR, Hossain A. Prevalence and Occupational Factors Associated with Low Back Pain Among the Female Garment Workers: A Cross-Sectional Study in Bangladesh. *Global Perspectives on Medical Sciences*. 2018; 2(1):8. doi: 10.26535/gpms.v2i1.10
- Kuorinka I, Jonsson B, Kilbom A, Vinterberg H, Biering-Sørensen F, Andersson G, Jørgensen K. Standardised Nordic questionnaires for the analysis of musculoskeletal symptoms. *Appl Ergon*. 1987 Sep; 18(3):233-7. doi: 10.1016/0003-6870(87)90010-x. PMID: 15676628.
- Ahmad SKA, Sayed MHS, Khan MH, Faruquee MH, Yesmin N, Sarwar AFM, Hossain Z, Begum P, Selimuzzaman ABM. Musculoskeletal disorders and ergonomics factors among the garments workers. *JOPSOM*. 2007; 26(2):97-110.
- Shazzad MN, Ahmed S, Haq SA, Islam MN, Abu Shahin M, Choudhury MR, Hasan ATMT, Abdal SJ, Rasker JJ. Musculoskeletal symptoms and disorders among 350 garment workers in Bangladesh: A cross-sectional pilot study. *Int J Rheum Dis*. 2018 Dec;21(12):2063-2070. doi: 10.1111/1756-185X.13423. Epub 2018 Nov 5. PMID: 30398010.
- Das M, Mondal R, Paul S, Saha T. Prevalence of Musculoskeletal Disorders among the Bangladeshi Garments Workers. *SMU medical journal*. 2015; 2(1):2349-1604.
- Ali M, Ahsan GU, Hossain A. Prevalence and associated occupational factors of low back pain among the bank employees in Dhaka City. *J Occup Health*. 2020 Jan;62(1):e12131. doi: 10.1002/1348-9585.12131. PMID: 32715531; PMCID: PMC7383126.
- Parvez MS, Tasnim N, Talapatra S, Ruhani A, Hoque ASMM. Assessment of Musculoskeletal Problems among Bangladeshi University Students in Relation to Classroom and Library Furniture. *Journal of the Institution and Engineers (India): Series C*. 2022; 103:279-292. <https://doi.org/10.1007/s40032-021-00792-7>
- Rahman MM, Hossain A, Kamrujjaman M, Bayzid B, Roy RC. A Cross-Sectional Study to Assess Musculoskeletal Disorders among Bangladeshi Cycle Rickshaw Pullers and its Association with Ergonomics and Work-related Factors. *Journal of Anesthesia and Pain Medicine*. 2019; 4(1):1-5.



18. Hossain A, Proma TS, Raju R, Ahmed S, Islam A. Employment-related musculoskeletal complications experienced by the physical therapists in Bangladesh: a comprehensive cross-sectional case study. *Bulletin of Faculty of Physical Therapy*. 2022; 27:36. <https://doi.org/10.1186/s43161-022-00096-6>
19. Ibn F, Sadeq. Prevalence of common work-related musculoskeletal disorders among the dentists at two selected dental college hospitals. *Dspace Repository*. 2012. <http://library.crp-bangladesh.org:8080/xmlui/handle/123456789/491>