

A Cross Sectional Study to Assess Musculoskeletal Disorders among Bangladeshi Cycle Rickshaw Pullers and its Association with Ergonomics and Work-related Factors

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Abstract

Background: Musculoskeletal Disorders (MSDs) are the most common and largest category of work-related illness seen both in a developed & developing country.

Purpose: The purpose of the study to assess the MSDs of Cycle Rickshaw (CR) Pullers & to find out the significance between MSDs with related variables.

Material & Methods: A descriptive cross-sectional study was conducted among 136 CR Pullers residing in the Dhaka Metropolitan city. Purposive sampling technique was used where data were collected by a structure administered questionnaire with face to face interview & data was analyzed by SPSS (Version 20).

Results: Results indicated that the prevalence of MSDs was 91% where upper back, lower back, leg & calf muscle, & knee joint was the more prevalent site. Some ergonomics and work related factors are responsible for developing MSDs. However, there was a significant relationship between MSDs with weight bearing ($P < 0.05$) & daily rickshaw pulling time ($p < 0.05$). In addition, an extremely high significant relationship found between MSDs with age ($p < 0.001$) and BMI ($p < 0.001$).

Conclusion: It is concluded that MSDs among CR pullers were extremely high. Awareness of ergonomics and work-related factors might help to prevent and reduce the prevalence of MSDs among CR pullers.

Keywords: Musculoskeletal Disorders, Rickshaw puller, Ergonomics, Work-related factors, **BMI:** Body Mass Index

Abbreviations

CR: Cycle rickshaw

MSDs: Musculoskeletal Disorders

MSK pain: Musculoskeletal pain

WRMD: Work related musculoskeletal disorder

BDT: Bangladeshi Taka

Introduction

Dhaka is famous as the rickshaw capital of the world. Approximately 400,000 cycle rickshaws (CR) run daily. CR in Bangladesh is available for hire throughout the country. Increasing traffic congestion, and the resulting collisions have led to the banning of CR on many major streets in the city. CR is the only vehicle that can travel through the narrow streets in Dhaka metropolitan city.

CR drivers are called as Rikshawala in Bangla & mostly come from the villages. Because of the recent famine and fewer job opportunities, people from the villages migrate to Dhaka, Sylhet and Chittagong to operate cycle rickshaws [1]. Professional drivers are at risk of developing health problems due to irregular working hours & duration, shift work, poor posture, improper dietary habits, & other work-related stress factors [2]. Driving is a task of prolonged sitting, a fixed posture & vibration which could directly lead to musculoskeletal (MSK) trouble. Driving position exerts extensive forces on the spine which causes some problems with MSK system, especially, backaches, neck problems, pulled muscles & general stiffness. In moving a vehicle, the driver's body is subjected to lateral swaying from side to side, & the body up & down vibration leading to Musculoskeletal Disorders (MSDs) which decreased work capacity [3]. The term MSDs identifies a large group of conditions that result from traumatizing the body in either a minute or way over a period. It affects the MSK system like bone, joint, & muscles. However, other areas can be strained and their response to that trauma can be an injury [4]. Drivers are vulnerable to work-related MSDs due to various factors like postural stress, exposure to vibrations & so on [5, 6]. Moreover, ergonomics and MSDs are a major issue that can affect a country's social economic conditions. Ergonomics are the scientific study of people at work that helps to reduce stress, injuries, and disorders related with the overuse of muscles, bad posture, and recurring tasks. This is accomplished by designing tasks, workspaces, controls, displays, tools, lighting, and equipment to fit the employee's physical capabilities and limitations [7]. The rickshaw pullers carry out the jobs many times per day, sometimes without proper rest pauses between trips [8]. This study was expected to determine prevalence and factors associated with musculoskeletal disorders among rickshaw pullers as well to examine the magnitude of these problems. This study was also expected to disseminate the findings of this study to take necessary steps to minimize rickshaw pulling related musculoskeletal disorders and reduce the cost and injuries associated with ergonomic hazards of rickshaw pullers.

Bangladeshi Cycle Rickshaw

Bangladeshi typical cycle rickshaw originally denoted three-wheeled passenger cart which is generally pulled by one man as shown in (Figure 1)[1].



Figure 1: Bangladeshi typical cycle rickshaw

Materials and Methods

It was a descriptive cross-sectional study conducted among 136 Male cycle rickshaw pullers & data was collected from Dhaka Cantonment, Mirpur, & Khafrul situated in northern Dhaka Metropolitan city. The study was carried out over six months from October 2017 to March 2018. Purposive sampling technique was used & data were collected through face to face interview with the interviewer-administered structured questionnaire. The questionnaire was developed to obtain

information on the respondents about the following factors like socio-demographic and socioeconomic factors, ergonomics and work-related factors and site of pain. The required information was collected from the patients after obtaining their due consent & the corrected data were statistically analyzed by using SPSS (version 20). Statistical comparisons were carried out using the Chi-square test. In association, the p-value of < 0.05 was considered significant, p-value < 0.01 was considered highly significant, & p-value < 0.001 was considered as very highly significant.

Results

Table 1 revealed that a greater number (n=55, 40.4%) of the participants were belonged to age >32 years. According to educational level, more than half (57.4%) of respondents reported illiterate. About two-third (86.8%) of the respondents were married as except some were unmarried (11.8%). Data indicate that about half (53.7%) of respondents had 5-8 family members. The monthly family income ranged from 2000 - >13000 BDT, where maximum (54.4%) respondents' monthly income was in 7001-10,000BDT. Most of the respondents (66.2%) daily income was 301-600 BDT. Among the respondents, about two third of the participants (83.8%) pulled rickshaw on rent.

Table 1: Distribution of the respondents by Socio-demographic and Socio-economic Characteristics (n=136)

Variables	n	%
Age of respondents		
18-22 Years	7	5.1
23-27 Years	27	19.9
28-32 Years	47	34.6
>32 Years	55	40.4
Education level		
Illiterate	78	57.4
Primary	48	35.3
Below SSC	8	5.9
SSC	1	0.7
Others	1	0.7
Marital status		
Married	118	86.8
Unmarried	16	11.8
Divorced	1	0.7
Separated	1	0.7
Number of family members		
1-4	56	41.2
5-8	73	53.7
>8	7	5.1
Monthly income		
2000-4000 BDT	2	1.5
4001-7000 BDT	48	35.3
7001-10,000 BDT	74	54.4
10,001-13,000 BDT	11	8.1
>13,000 BDT	1	0.7

Daily income		
100-300 BDT	14	10.3
301-600BDT	90	66.2
601-900BDT	32	23.5
Ownership of rickshaw		
Own	22	16.2
On rent	114	83.8

Notes: %= percent responded, n= Number of responses, BDT= Bangladeshi Taka

Considering Body Mass Index (BMI) of respondents, more than half (69.8%) of the participants were with normal weight, followed by 29.4% was with underweight and only a single person (0.7%) was with overweight as shown in table 2.

Table 2: Distribution of the respondents by BMI (n=136)

BMI of respondents	n (%)
<18.5(Under weight)	40(29.4)
18.5-25(Normal weight)	95(69.8)
25-30(Over weight)	1(0.7)
>30(Heavily over weight)	0(0)

Notes: %= percent responded, n= Number of responses

Table 3 reveals that maximum respondent (86%) drives their rickshaw in standing position with >1 minute followed by 7.4% respondents with ≤ 30 Sec. More than half (61.8%) of respondent's seat condition were good & about two third (78.7%) reported that they were pulling rickshaw with a straight posture of the back, whereas more than half (66.2%) said that they were pulling rickshaw with leaning forward posture. About two third of respondents informed not to be used a pad on rickshaw seat. A greater number of participants carried 151-200 kg by their rickshaw.

Table 3: Distribution of the respondents by ergonomics related factors

Variables	n (%)
Without seating how long respondents can drive their rickshaw in standing position	
< 30 sec	4 (2.9)
30 sec	5 (3.7)
30 sec-1 min	10 (7.4)
> 1min	117 (86.0)
Respondents seat's condition on rickshaw	
Good	84 (61.8)
Average	38 (27.9)
Bad	14 (10.3)
Pad on rickshaw seat	
Yes	33 (24.3)
No	103 (75.7)
Respondents posture were straight during rickshaw pulling	
Yes	107 (78.7)
No	29 (21.3)

Respondents posture were leaning forward during rickshaw pulling	
Yes	90 (66.2)
No	46 (33.8)
Maximum weight bearing through rickshaw by respondents	
> 100 Kg	3 (2.2)
101-150 Kg	34 (25.0)
151-200 Kg	54 (39.7)
>200 Kg	45 (33.1)

Notes: %= percent responded, n= Number of responses

According to work related factors, most of the respondents experienced for 11-15 years, followed by 29.4% for 6-10 years, 16.9% for 1-5 years, 13.2% for 16-20 years, & only 4.4% for > 20 years. Maximum respondents worked daily followed by 18.4% for 2-3 days, & 13.2% in 4-5 days weekly. By the duration of hours per day, most of them reported driving >8 hours per day. However, about the status of the road, almost all respondents informed average road condition & few of them reported well but 2.9% complained with bad as shown in table 4.

Table 4: Distribution of respondents based on work related factors (n=136)

Variables	n (%)
Rickshaw pulling duration	
1-5 years	23(16.9)
6-10 years	40(29.4)
11-15 years	49(36.0)
16-20 years	18(13.2)
>20 years	6(4.4)
Regularity in rickshaw pulling	
< Once a week	1(0.7)
2-3 days of a week	25(18.4)
4-5 days of a week	18(13.2)
Almost every day	92(67.6)
Daily rickshaw pulling duration	
<2 hours	1(0.7)
<4 hours	3(2.2)
4-6 hours	23(16.9)
6-8 hours	52(38.2)
>8 hours	57(41.9)
Road's condition of the respondents where they pull rickshaw is good	
Yes	17(12.5)
No	119(87.5)
Road's condition of the respondents where they pull rickshaw is bad	
Yes	19(14.0)
No	117(86.0)

Notes: %= percent responded, n= Number of responses

Musculoskeletal Disorders

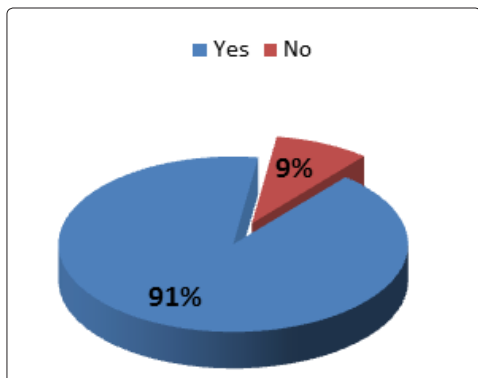


Figure 2: Prevalence of MSDs

The current study found 91% prevalence of MSDs among Rickshaw Pullers as shown in figure 2.

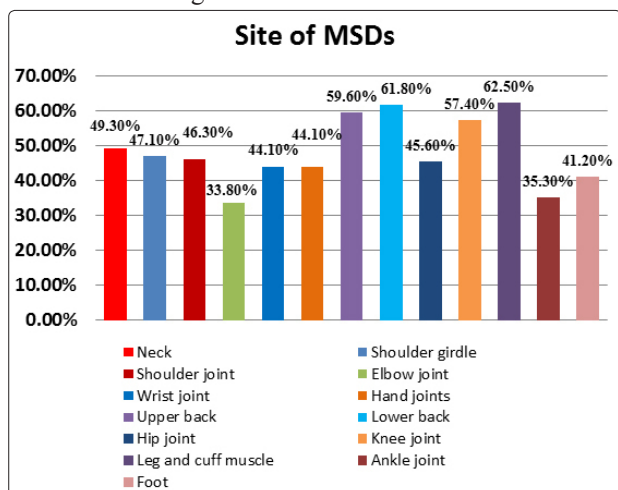


Figure 3: Distribution of respondents based on site of MSDs

Figure 2 shows, leg/calf muscle (62.50%), lower back (61.80%), & knee joint (57.40) were the more prevalent site of MSDs compares to other sites.

Table 5: Association of MSDs with age group and BMI

Age Group	Musculoskeletal Disorders		p-value
	Present n (%)	Absent n (%)	
18-22	3 (5.1)	4 (4.4)	.001
23-27	26 (19.9)	1 (1.5)	
28-32	45 (34.6)	2 (2.2)	
>32	50 (40.4)	5 (7.5)	
BMI			
<18.5(Under weight)	31 (25.7)	9 (13.5)	.001
18.5-25(Normal weight)	92 (72.8)	3 (5.1)	
25-30(Over weight)	1 (1.5)	0 (0.7)	

p-value indicated as a very highly significant relation was found between MSK pain with age group (.001<0.05) & BMI (.001<.05).

Table 6: Association between MSDs with related variables

Variables	Musculoskeletal Disorders		p-value
	Present n (%)	Absent n (%)	
Experience of rickshaw pulling			
1-5 Years	19 (16.9)	4 (4.4)	.082
6-10 Years	37 (29.4)	3 (5.1)	
11-15 Years	47 (36.0)	2 (2.2)	
16-20 Years	17 (13.2)	1 (1.5)	
>20 Years	4 (4.4)	2 (2.2)	
Duration of daily rickshaw pulling			
<2 hours	0 (0.7)	1 (1.5)	.008*
< 4 hours	2 (2.2)	1 (1.5)	
4-6 hours	20 (16.9)	3 (5.1)	
6-8 hours	49 (38.2)	3 (5.1)	
> 8 hours	53 (41.9)	4 (4.4)	
Maximum weight bearing through rickshaw pulling			
> 100 Kg	1 (2.2)	2 (2.2)	.004*
101-150 Kg	31 (25.0)	3 (5.1)	
151-200 Kg	49 (39.7)	5 (7.5)	
>200 Kg	43 (33.1)	2 (2.2)	
Leaning forward posture during rickshaw pulling			
Yes	81 (66.2)	9 (13.5)	.499
No	43 (33.8)	3 (5.1)	

p- Value reached from chi-square. Mark (*) represents a significant association of MSK pain with duration of daily rickshaw pulling (p-value .008) and maximum weight bearing through a rickshaw (p-value .004).

Discussion

The principal purpose is to find out the ergonomics and work-related factors that influencing of MSDs. The current study found a very higher prevalence (91%) of MSDs & the upper back, lower back, leg/calf muscle, & knee joints were the most common site. Massaces et al. found a higher prevalence of occupational disorders than other groups [9]. A study by Shaik et al. stated that lower back, knee, neck, & ankle troubles are more prevalent in Auto-rickshaw drivers which are similar comparing this study [10]. In a study conducted among taxi drivers in Nigeria, more than half (67%) of drivers reported discomfort in the neck, about 18% & 20% reported symptoms in right & left wrist joints respectively [11]. Jadhava et al. found that lower back pain & neck pain as the most prevalent musculoskeletal impairments among bus drivers [12]. The study revealed that in between age range 18 to 35 years, most of age group was more than 32 years & considering the educational level more than half reported illiterate. In this study, a moderate percentage of rickshaw puller was underweight & there was a highly most relationship found between age group & BMI. The Majority of the rickshaw pullers experienced 11 to 15 years, whereas more than half of the participants' rickshaw drive duration was more than 8 hours and most of the participants worked for pulling rickshaw almost every day. There was a significant relation between daily rickshaw pulling and MSDs. On the other hand, a previous study stated, work experience, & working hours per week showed a significant positive

relation with MSDs which shows similar findings [10]. Considering the Ergonomics, about two-thirds of the respondents reported to not using a pad on the rickshaw seat that allows the spine for forward and backward bending and responsible for creating MSDs. More than half of the respondents were leaning forward during a rickshaw pulling & maximum respondent carry weight bearing 151-200kg per pulling which is one of the key causes for developing MSDs & there was a significant relation was found between weights bearing with rickshaw driving. Most of the respondents drive their rickshaw more than 1 minute in standing position. According to socioeconomic factors, about half of respondent's monthly family income was 7001-10000BDT as well as 301-600BDT in daily income. Maximum respondents drive rickshaw for rent. Skov et al. stated that most rickshaw drivers were owners, while there were a few who took the vehicle for rent in India [13]. Most of them drove between 100 to 150 km in a day and their daily income averaged Rs 150-200. Thus, the rickshaw-pulling represents an important source of self-employment, as well as a convenient mode of Para-transit for many of commuters within the city.

Conclusion

It is concluded that an extremely high prevalence of MSDs was seen among cycle rickshaw pullers where upper back, lower back, leg & calf muscle, & knee joint were the commonest sites. There was highly significant relationship found between MSD with age and BMI. It was found that the proportion of MSDs was higher among those rickshaw pullers whose age was more than 32 years. Some ergonomic factors such as pulling time in standing position, weight bearing, using a seating pad, & leaning forward were the responsible factors for influencing MSDs & there were a significant relation between weight bearing and MSDs. Other factors like work experience, duration of daily rickshaw driving were the work-related key factors of the MSDS. In addition, there were significant relations between the duration of daily rickshaw pulling with MSDs. It should have proper attention to ergonomics, & some work-related factors to control, prevent, & reduce the risk of MSDs & to enhance their quality of life.

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Conflict of Interest: Nil

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