MUSCULOSKELETAL SYMPTOMS PREVALENCE AND ASSOCIATED RISK FACTORS AMONG OCCUPATIONAL BUS DRIVERS IN BANGLADESH

By

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Statement of Authorship

Except where reference is made in the text of the thesis, this thesis contains no material published elsewhere or extracted in whole or in part from a thesis presented by me for any other degree or diploma or seminar.

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The ethical issues of the study has been strictly considered and protected. In case of dissemination of the findings of this project for future publication, research supervisor will highly concern and it will be duly acknowledged as undergraduate thesis.

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Abstract

Background: Musculoskeletal symptoms are one of the most significant occupational health problems worldwide. Different professional groups have the chance to develop musculoskeletal symptoms in different areas of the body. Most of the literature suggest that the prevalence of musculoskeletal symptoms among occupational bus drivers are high in the area of neck, back, shoulders and knees due to the factors of prolonged sitting, awkward posture, vibration and anthropometric mismatch. However there is no published research about occupational bus drivers from the perspective of ergonomics in Bangladesh. So, this study will reflect the current status of occupational bus drivers in Bangladesh.

Objectives: The purpose of the study is to investigate the musculoskeletal symptoms prevalence and its associated risk factors among occupational bus drivers in Bangladesh.

Method: A cross-sectional study among occupational bus drivers in Dhaka city was carried out to accomplish the objectives of the study by using two questionnaires. First, the Standardized Nordic Musculoskeletal Questionnaire was used to find out the prevalence of musculoskeletal symptoms. Second, the Whole Body Vibration: Periodic Health Surveillance Questionnaire, for physical risk factors identification. The investigator selected Convenience Sampling Procedure for attaining the sample group. 105 occupational bus drivers were adopted from Savar and Gabtoli area, who already had spent at least 1 complete year in the driving profession in their current job.

Result: Out of the 105 occupational bus drivers, this study found neck, knees, shoulders and lower back musculoskeletal problem to be very prevalent (>45.0% to <62.0%) both in the past 12 months and the previous 7 days. A large majority of participants (73.3%) faced difficulties doing their normal activities in the previous 12 months. The investigator identified as major physical risk factors are the number of years the participants had been driving, the number of hours they drives everyday, the condition of the road, the driving posture, vehicle jerk and jolt, vibration, awkward posture and the amount of mechanical work they had to do. But this study established only age, regular exercise and type of ground surface of road have the significant association with musculoskeletal symptoms.

Conclusion: High prevalence of musculoskeletal symptoms, overall 85.7% was recognized among occupational bus drivers. This should be further investigated in prospective studies.

Keywords: Musculoskeletal disorder; Driving; Posture; Vibration; Low back pain.

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List of Abbreviations

WRMSD: Work-Related Musculoskeletal Disorder

MSS: Musculoskeletal Symptoms

MSD: Musculoskeletal Disorder

WBV: Whole Body Vibration

NMQ: Nordic Musculoskeletal Questionnaire

SPSS: Statistical Package for Social Science

BHPI: Bangladesh Health Professions Institute

CHAPTER 1
INTRODUCTION

1.1. Introduction

Work-related musculoskeletal disorders (WRMSDs) are a subset of functional disorder caused by numerous external factors such as occupational repetitive movements, overexertion, force, awkward postures and vibration defined by Cheng, Cheng and Ju, 2013; Kim *et al*. 2010; Sander, 2004. The musculoskeletal complaints in the working population are one of the most worrying work-related health issues at the current time (Parot-Schinkel *et al*. 2012). It is the second most frequently cited disorder (Gyi, Sang and Haslam, 2013) and one of the leading causes of work-related illness (Sang, Gyi and Haslam, 2011). But the incidence of musculoskeletal disorders (MSDs) is not new, Berrandro Ramazzini the father of occupational medicine, first introduced the common musculoskeletal disorders in the eighteenth-century and nowadays its frequency varies from 10% to 25% stated in Sanders, 2004). The prevalence rate of MSDs has increased four times since 20 years ago (Aghilinejad *et al*. 2012).

According to the Occupational Safety and Health Research Institute, found in Kim *et al*. 2010, the proportion of work-related musculoskeletal disorders among the total agreed occupational diseases increased from 49.6% in 2003 to 76.5% in 2007. Commonly, people reported musculoskeletal symptoms (MSS) were in the neck, shoulders, upper back, lower back and hands or wrists (Obembe, Johnson and Tanimowo, 2013; Uysal *et al*. 2012). As a developing country, in Bangladesh the incidence of musculoskeletal symptoms in the spine, neck, shoulder and knee is only now being reported, with incidence rates of 10.9/100 person per year (Haq *et al*. 2008). Occupational drivers are the one group likely to be considered as an at-risk group for developing musculoskeletal disorders in several countries all over the world (Alperovitch-Najenson *et al*. 2010; Prado-Leon, Aceves-Gonzalez and Avila-Chaurand, 2008). So, it could be mentioned that the occupational bus drivers in Bangladesh is a risk group and had the possibility of evolving musculoskeletal symptoms but not strong evidence about this issue at all.

There is evidence that occupational drivers are particularly vulnerable to musculoskeletal symptoms, reported by Sang, Gyi and Haslam, 2011. Another

epidemiological finding, by Raanaas and Anderson (2008) strongly supported that professional drivers are at high risk for musculoskeletal pain. They were the high-risk group for musculoskeletal disorders involving the spine, shoulder, knee and especially the lower back (Alperovitch-Najenson *et al*. 2010; Chen *et al.* 2005; Massaccesi *et al*. 2003). There are numerous reports have a positive relationship between back pain and driving (Magnusson *et al*. 1996) for an example, in Sweden and United States, comparisons have been made between the effects of work-related driving and the experience of pain in the lower back, neck and shoulder (Prado-Leon, Aceves-Gonzalez and Avila-Chaurand, 2008). Symptoms of musculoskeletal in the lower back have frequently been reported as being an increased risk among various occupational driver groups including bus driver (Rehn *et al*. 2009; Okunribido, Magnusson and Pope, 2008; Robb and Mansfield, 2007; Okunribido *et al*. 2007). Urban bus drivers have been found to have high prevalence rates of back problems in overseas studies (Szeto and Lam, 2007).

Factors responsible for developing musculoskeletal symptoms among occupational drivers are environmental conditions, exposure to vibration, noise, prolonged sitting, poor posture, repetitive motion and life style factors (Alperovitch-Najenson *et al*. 2010; Robb and Mansfield, 2007; Chen *et al*. 2005). The impact of musculoskeletal symptoms seems to be dependent on both the intensity and duration of whole-body vibration (WBV) exposure informed by Rehn *et al*. 2009. The drivers who drive for longer periods of time, 20 hours or more per week, are the most susceptible to risks of musculoskeletal disorder or symptoms (Sang, Gyi and Haslam, 2011). These symptoms in bus drivers have also been associated with poor design and the inadequate conditions of the work station (Ferandez-D'Pool *et al*. 2012).

1.2. Background of the study

Work-related musculoskeletal disorders are caused by work activities, for example, awkward postures, forceful and repetitive exertions, described by Spector, Adams and Silverstein, 2011. Several epidemiological studies have reported a high percentage of neck and upper limb disorders among workers in general and bus drivers in particular, but very few studies have evaluated the prevalence of work-related musculoskeletal disorders in the upper body quadrant in professional bus drivers (Alperovitch-Najenson *et al*. 2010). Population surveys conducted in the USA and Canada have both found that back pain frequency among drivers is ~1.6-2.0 times the reference

prevalence. At the same time, similar observations on the high frequency of low back pain and spinal disorders associated with driving have also been reported in both developed and developing countries, such as India and Taiwan for bus drivers, truck drivers and other professional drivers stated by Chen *et al*. 2005.

It has been suggested that many workplace physical factors, for example whole-body vibration, prolonged seating postures, lifting, awkward posture, poor sitting, repetitive motion, manual material handling, work-related injuries (e.g. vehicle collision) and other non-driving factors such as heavy lifting, account for the high frequency of low back disorders in different professional drivers (Chen *et al*. 2005; Okunribido, Magnusson and Pope, 2006; Robb and Mansfield, 2007; Szeto and Lam, 2007; Rehn *et al*. 2009; Samuel and Babajide, 2012; Magnusson *et al*. 1996; Okunribido, Magnusson and Pope, 2008). Over the years numerous studies have identified an adverse relationship between a variety of factors such as; exposure to whole-body vibration, awkward posture, prolonged sitting, type of road, carrying, lifting and seating characteristics and musculoskeletal disorder (Prado-Leon, Aceves-Gonzalez and Avila-Chaurand, 2008; Tiemessen, Hulshof and Frings-Dresen, 2007). Prolonged sitting in the same posture and manual materials handling are also two well-known risks for back pain (Okunribido, Magnusson and Pope, 2006). The prevalence of neck pain was associated with uncomfortable seats, unsuitable back support and the position of the steering wheel (Alperovitch-Najenson *et al*. 2010). Risk factors at the work station such as absence of head support, lumber support, non-sliding seat and noise was blamed for musculoskeletal disorders (Ferandez-D'Pool *et al*. 2012). Working activities like lifting, carrying, pulling and pushing are related to musculoskeletal pain (Raanaas and Anderson, 2008).

Life style factors such as insufficient exercise and smoking can affect or influenced to low back pain (Robb and Mansfield, 2007). Smoking was a risk factor for shoulder pain and little physical exercise was a risk factor for neck and shoulder pain but marital status was not a risk factor for either neck, shoulder or low back pain (Raanaas and Anderson, 2008).

There was a high incidence of MSDs (94%) in university bus drivers, with more occurrences in neck 69%, lower back 60%, superior back 57% and knees 43% (Ferandez-D'Pool *et al*. 2012). An earlier study showed a prevalence of low back pain

in Taipei taxi drivers of 51% and other professional drivers in Taiwan of 33% (Chen *et al*. 2005). A study found that out of three hundred and eighty four male urban bus drivers 21.2% had suffered from neck pain in the last 12 months, 14.7% had suffered from shoulder pain, 8.3% from upper back pain, 3% from elbow and 3% from wrist pain (Alperovitch-Najenson *et al*. 2010). In a two-country cohort study of bus and truck drivers by Magnusson *et al.* (1996), 50% reported low back pain. The prevalence of low back pain among drivers ranged from 44.1% (work drivers) to 63.3% (taxi drivers) (Okunribido, Magnusson and Pope, 2008). In a study Samuel and Babajide (2012) reported that, 1406 taxi drivers were sampled randomly and from those who responded 92% reported the prevalence of work-related musculoskeletal disorders at the neck 67%, right and left wrists 18% & 20%, upper, middle and lower back 29%, 29% & 30%. Another study of Robb and Mansfield (2007) showed that, 81% of professional truck drivers reported musculoskeletal pain during the previous 12 months and 60% reported low back pain, 39% musculoskeletal problem in the shoulder, 35% knee and 35% neck trouble. Most of the drivers in this study of vibration exposure had driven between 12-85 h/week (mean average 48.4 h/week) and average driving distance of 256-6400 km/week (mean average 1469 km/week). According to Spector, Adams and Silverstein (2011), the prevalence of knee symptoms in certain occupational groups, including drivers, varies from 10% to 50%.

Driving 6 to 8 h/day and 31 to 70 h/week was a risk factor for neck, shoulder and low back pain (Raanaas and Anderson, 2008) and 12-85 h/week was a risk factor for lower back, shoulder, neck, knee (Robb and Mansfield, 2007). One of previous study reported that, driving 8-12 h/day is associated with low back pain and in another study they found that driving for >4 h/day was associated with high prevalence of low back pain in the past 12 months (Chen *et al.* 2005). A study of city bus drivers showed from the questionnaire data, drivers who spent on average 7 hours and 36 minutes, among them 37.7% experienced discomfort from sitting during driving with torso bent and torso against backrest, 13.1% from lifting and 68.8% form vibration and form those causes 59% experienced low back pain during the last 12 months, and 19 drivers in the immediate past 7 days (Okunribido *et al.* 2007). From the questionnaire assessment on delivery drivers reported that their driving time on an average 9 hours and 5 minutes (66.7% of the time), 38% of work day was spent performing manual material handling activities, 46.6% drivers adopting torso bent posture during driving,

59.4% performing lifting tasks and experiencing low back pain 50% (Okunribido, Magnusson and Pope, 2006). In Hong Kong 481 bus drivers (404 males, 77 females) assessed by a questionnaire survey evidenced that average worked 9-10 h/day are associated with 90% musculoskeletal discomfort connected to bus driving and the highest 12 month prevalence of neck, back, shoulder and knee extending from 35% to 60% (Szeto and Lam, 2007).

Driving larger vehicles for a significant part is related to musculoskeletal pain in numerous studies, but more recently even driving smaller vehicles has shown harmful whole-body vibration (Raanaas and Anderson, 2008; Szeto and Lam, 2007).

According to Tiemessen, Hulshof and Frings-Dresen (2007), to decrease the risk of MSD in the work place vibration exposure, the intensity of task, the duration and the number of intervals of exposure, need to be reduced.

Most of the literature mentioned above has shown the causal relationship between whole-body vibration, long time driving, design of vehicle, static posture, manual material handling and individual life style with musculoskeletal symptoms or work-related musculoskeletal disorders. Review from the study among bus and other occupational drivers it is significantly proves that occupational bus drivers have a high prevalence of musculoskeletal symptoms in different body parts. But very few studies show the relation between psychosocial factors and musculoskeletal symptoms for professional bus drivers.

1.3. Significance of the study

It is important to prevent the musculoskeletal symptoms among occupational drivers by considering sound work place design, working hours, ergonomically hand tools design, vehicle design, the human-body dimensions as well as other physical risk factors. Utmost of the literature of this study shows the relation between whole-body vibration, long time driving, design of vehicle, static posture, individual life style and musculoskeletal symptoms or musculoskeletal disorders.

Bangladesh is densely populated country. Here, so many people were engaged in driving profession both urban and rural area. Many of physical risk factors were accountable primarily for developing musculoskeletal symptoms. If their working condition, work place design and vehicle design is not good at all, so unfortunately

they are forced to be fitted into the unfit technological system that is available in the market. But yet there is no study about this issue has been done in Bangladesh.

An occupational therapist can work with all kinds working population those have problem with functional activities of daily living. So, if the professional driver's occupation was hampered due to ergonomic physical risk factors and musculoskeletal symptoms, an occupational therapist firstly needs to identify the prevalence rate and those risk factors for the purpose of minimizing musculoskeletal symptoms by using their intervention procedure. Hence, as healthcare professionals we have to know the prevalence rate and associated risk factors of musculoskeletal symptoms in every working population. The occupational therapy professionals are the specialist of human body factors and they can modify working environment according to personnel needs and can prevent risk-factors and reduce musculoskeletal symptoms. It could be prevented by using "participatory ergonomics" (practical ergonomics with participation of the necessary actors in problem solving). This kind of study also would be a factor to discover new job sector for an occupational therapy professionals.

1.4. Aim of the Study

The aim of the study is to investigate the musculoskeletal symptoms prevalence and its associated risk factors among occupational bus drivers in Bangladesh.

1.5. Objectives of the study

- To find out the prevalence of musculoskeletal symptoms in different body regions in last 7 days and 12 months among occupational bus drivers in Bangladesh.
- To identify the interruption of activities of daily living in last 12 months among occupational bus drivers in Bangladesh.
- To identify the associated physical risk factors of musculoskeletal symptoms among occupational bus drivers in Bangladesh.
- To determine the association between prevalence and socio-demographic information and physical risk factors of musculoskeletal symptoms among occupational bus drivers in Bangladesh.

CHAPTER 2
LITERATURE REVIEW

2.1. Musculoskeletal Disorders

Musculoskeletal disorders (MSDs) are conditions that affect the nerves, tendons, muscles and supporting structures (Institution of Occupational Safety and Health, 2014). On the other way MSDs can be defined as, Musculoskeletal disorders are an injury or disorder of the musculoskeletal system resulting from repeated exposure to various hazards and/or risk factors in the workplace and the musculoskeletal system includes all muscles, bones, tendons, tendon sheaths, ligaments, bursa, blood vessels, joints, intervertebral discs, etc. (Public Services Health & Safety Association, 2010; Occupational Health & Safety, 2012).

Musculoskeletal disorders are also called Repetitive Motion Injury, Repetitive Stress Injury, Overuse Injury, Repetitive Strain Injury, Musculoskeletal Injury, Cumulative Trauma Disorder, Occupational Overuse Syndrome or Soft tissue disorders (Canadian Centre for Occupational Health & Safety, 2014; Middlesworth, 2013; Public Services Health & Safety Association, 2010).

2.1.1. Musculoskeletal Disorder Hazards or Risk factors

MSD hazards are usually classified into three categories; biomechanical or physical hazards, additional hazards, individual hazards (Public Services Health & Safety Association, 2010).

Biomechanical or Physical Hazards

Biomechanical risk factors are those which place a load or stress upon structures of the musculoskeletal system. There are many kinds of biomechanical risk factors, for example: high force, awkward posture, repetition, prolonged sitting, prolonged standing, static postures and manual handling (Public Services Health & Safety Association, 2010; European Agency for Safety and Health at Work, 2001). Repetitive work, awkward postures, forceful movements, manual materials handling (lifting, carrying or moving heavy loads) are the most important physical risk factors for musculoskeletal disorders (Bovenzi, 2014).

High Force

Force is the amount of effort exerted by the muscles in order to complete a task, the greater level of force is required to produce greater level of stress, placed on the

musculoskeletal system (Public Services Health & Safety Association, 2010). Applying manual force, stresses the muscle and tendons of the arms (Burno and Vieria, 2010). There is also evidence for a vital relationship between neck disorders and forceful movements (Bovenzi, 2014).

Awkward Posture

An awkward posture is any fixed or constrained body position that overloads muscles, tendons or joints (Public Services Health & Safety Association, 2010). In awkward postures joints are more vulnerable to injuries and the muscles have less capacity for applying force (Burno and Vieria, 2010). Epidemiological studies have provided strong evidence for an association between neck pain and awkward working postures (Bovenzi, 2014).

Repetition

A task is repetitive when similar exertions, actions, or movements are done frequently during a specific period of time (Public Services Health & Safety Association, 2010). Repetitive work using for the same muscle and tendons may be responsible for fatigue and injuries if enough recovery time is not provided (Public Services Health & Safety Association, 2010; Burno and Vieria, 2010). There is also evidence for a causal relationship between highly repetitive work and neck and shoulder pain (Bovenzi, 2014).

Prolonged standing

Prolonged standing may result in fatigue and discomfort in the legs and can lead to the development of musculoskeletal disorders (e.g. painful feet and other foot problems) and swollen veins (European Agency for Safety and Health at Work, 2001).

Prolonged sitting

Prolonged sitting requires the muscles to hold the trunk, neck and shoulders in a fixed position that squeezes the blood vessels in the muscles and reducing the blood supply. An insufficient blood supply hurries fatigue and makes the muscles prone to injury (European Agency for Safety and Health at Work, 2001).

Manual handling

Manual handling refers to the transfer, pushing, pulling and carrying of loads (Aptel, Aublet-Cuvelier and Cnockaert, 2002). When heavy manual handling is repetitive and joint with awkward work postures there may be a risk of MSDs in the lumbar region (European Agency for Safety and Health at Work, 2001).

Additional Hazards

An additional hazard for MSDs is includes vibration, temperature, contact stress and work methods (Public Services Health & Safety Association, 2010).

Vibration

There are primarily two types of vibration, whole-body and segmental. Whole-body vibration is typically transmitted through the feet or buttocks to the rest of the body and segmental vibration, also referred as when a particular segment of the body is exposed to vibration, such as the hands when holding a power tool (Public Services Health & Safety Association, 2010). Expose the hands to vibration contribute to potential disruption to the blood circulation in the fingers and to the nerves of hands and arms (Buckle, 2005).

Temperature

Working in either very cold or very hot environments can increase the risk for an MSD. In cold temperatures, the blood flow to the muscles and tissues is reduced and hot may cause dehydration and muscle fatigue (Public Services Health & Safety Association, 2010).

Contact Stress

Contact stress occurs when a part of the body comes in contact with hard, sharp surfaces or objects. The point of contact places a stress on the musculoskeletal system. Repeated or prolonged contact could result in inflamed tendons, obstructed blood flow and muscle fatigue (Public Services Health & Safety Association, 2010).

Work Methods

Work methods denote to the way, the work is done (technique or habits). Factors negatively affecting work method can include poor physical and mental status (fatigue from shift work), the lack of proper training in safe operating procedures or safe work practices (Public Services Health & Safety Association, 2010).

Individual Hazards

Certain number of features about an individual may also lead to an MSD. These can include age, body size, previous injuries, and genetic predisposition (Public Services Health & Safety Association, 2010).

2.1.2. Risk Factors of Musculoskeletal Disorders

Various risk factors are assumed to be associated with MSDs. These includes: repetitive and/or heavy lifting, bending and twisting, repeating an action too

frequently, uncomfortable working position, exerting too much force, working too long without break, adverse working environment (e.g. hot or cold), psychosocial factors (e.g. high job demands, time pressures and lack of control), awkward posture, and poor health habits (Institution of Occupational Safety and Health, 2014; Middlesworth, 2013). The precise cause occasionally depends on the age, occupation, activity level and lifestyle (Cherney, 2013).

2.1.3. Body region affected by Musculoskeletal Disorders

MSDs can affect all key areas of the body, including the; neck, shoulders, wrists, back (upper and lower), hips, legs, knees and feet. Low back pain is the most common MSD and typically starts affecting adults in their 30 to 40 years (Cherney, 2013).

2.1.4. Symptoms of Musculoskeletal Disorders

Symptoms of musculoskeletal disorders can hinder everyday tasks. MSDs are esteems as if anyone experience; recurrent pain, painful joints, swelling, dull aches (Cherney, 2013), inflammation, redness, decreased range of motion, loss of function, tingling, numbness, stiffness, tenderness, muscle weakness, fatigue etc. (Occupational Health & Safety, 2012).

2.2. Work-related Musculoskeletal Disorders

Work-related musculoskeletal disorders (WRMSDs) are a group of painful disorders of muscles, tendons, and nerves (Canadian Centre for Occupational Health & Safety, 2014). Most WRMSDs affect the hands, wrists, elbows, neck, and shoulders and work using the legs can lead to disorders of the legs, hips, ankles, and feet (Canadian Centre for Occupational Health & Safety, 2014).

2.2.1. Risk factors for work-related musculoskeletal disorders

Work-related musculoskeletal disorders are associated with the factors of work postures and movements, repetitiveness and pace of work, force of movements, vibration, temperature, increase pressure (e.g. to produce more), monotonous tasks and perception of low support (e.g. manager or co-worker) (Canadian Centre for Occupational Health & Safety, 2014; Simoneau, St-vincent and Chicoine, 1996).

2.2.2. How work-related musculoskeletal disorders occur

Work-related musculoskeletal disorders include three types of injuries:

Muscle Injury

A muscle contraction that lasts a long time decreases the blood flow. It may cause severity of the pain depends on the duration of the muscle contractions and the amount of time between activities for the muscles (Canadian Centre for Occupational Health & Safety, 2014; Simoneau, St-vincent and Chicoine, 1996).

Tendon injury

Inflammation and swelling of the tendon sheath is known as tenosynovitis. It may occur when the inner walls of the sheaths not produce enough fluid to lubricate the tendon for the reason of repetitive or excessive movement Canadian Centre for Occupational Health & Safety, 2014; Simoneau, St-vincent and Chicoine, 1996).

Nerve injury

With repetitive motions and awkward postures, the tissues surrounding nerves become swollen and squeeze or compress nerves. Compression of a nerve causes muscle weakness, sensations of "pins and needles" and numbness (Canadian Centre for Occupational Health & Safety, 2014; Simoneau, St-vincent and Chicoine, 1996).

2.2.3. Symptoms of work-related musculoskeletal disorders

Pain is the most common symptom related with WRMSDs. In some circumstances there may be joint stiffness, muscle tightness, redness and swelling of the affected area. Some workers may also experience sensations of "pins and needles," numbness, and decreased sweating of the hands (Canadian Centre for Occupational Health & Safety, 2014; Simoneau, St-vincent and Chicoine, 1996).

2.2.4. Stages of work-related musculoskeletal disorders

Early stage

Aching and tiredness of the affected limb occur during the work shift but vanish at night and during end of work. No decrease of work performance (Canadian Centre for Occupational Health & Safety, 2014).

Intermediate stage

Aching and tiredness occur at early in the work shift and continue at night. Gradually, it may reduce the capacity for repetitive work (Canadian Centre for Occupational Health & Safety, 2014).

Late stage

Aching, fatigue, and weakness persist at rest. Inability to sleep and could not to perform light duties (Canadian Centre for Occupational Health & Safety, 2014).

2.3. Musculoskeletal Pain

Musculoskeletal pain is pain that affects the muscles, ligaments and tendons, and bones (Pain Management Health Center, 2013). The frequency of musculoskeletal pain and rheumatic disorders is substantial in this Bangladeshi population (Haq *et al.* 2008).

2.3.1. Causes Musculoskeletal Pain

The causes of musculoskeletal pain are varied. Trauma to an area (jerking movements, falls, fractures, sprains, dislocations, and direct blows to the muscle) can cause musculoskeletal pain. Other causes of pain include postural strain, repetitive movements, overuse, and prolonged immobilization (Pain Management Health Center, 2013).

2.3.2. Symptoms of Musculoskeletal Pain

People with musculoskeletal pain sometimes complain that their entire bodies ache. Their muscles may feel like they have been pulled or overworked. Sometimes, the muscles twitch or burn. Symptoms vary from person to person, but the common symptoms are pain, fatigue and sleep disturbances (Pain Management Health Center, 2013).

2.4. Vibration

In its simplest form, vibration can be considered to be the oscillation or repetitive motion of an object around an equilibrium position (Azima, 2009). In another way vibration can be defined as, vibration is the oscillation of an object about a static position (Arpeggio Acoustic Consulting, 2014).

There is strong epidemiological evidence for an association between occupational exposures to whole-body vibration and low back symptoms or disorders (Bovenzi, 2014). While, epidemiological data are insufficient to provide support for a relationship of WBV to neck and/or shoulder pain, nevertheless more recent studies have reported some associations between symptoms in the neck and upper extremities and driving occupations with combined exposures to WBV and other physical risk factors such as awkward postures and lifting (Bovenzi, 2014). Long-term exposure to vibration containing multiple shocks has an adverse effect on a person's lumbar spine (Blood, Rynell, and Johnson, 2011; Waters *et al.* 2007).

2.4.1. Types of vibration

Hand-arm vibrations

Hand-arm vibrations sensed during work with vibrating hand-held machinery such as grinders, clipping hammers, rammers, plate vibrators, rock drills, breakers, hammer drills, chain saws etc. (International Social Security Association, 2010; Occupational Health and Safety, 2013). As a result, fingers turn white or bluish, especially when exposed to the cold. This condition is commonly called "white finger" disease. Its medical name is Hand-Arm Vibration Syndrome (Canadian Centre for Occupational Health & Safety, 2014; Safety, Health and Environment, 2007). Symptoms can include a tingling sensation and numbness, or whiteness of parts of the fingers (Healthy Working Lives, 2012).

Whole-body vibration

Whole-body vibrations means vibration on whole body that triggered from the mobile machinery and equipment such as lorries, forest machines, wheel or crawler-type loaders, tractors, bus, fork-lift trucks operating on uneven ground, military vehicles (International Social Security Association, 2010; Occupational Health and Safety, 2013). WBV is caused by machinery vibration passing through the buttocks of seated people or the feet of standing people. The most widely reported WBV injury is back pain (Safety, Health and Environment, 2007).

2.4.3. Hazards of vibration

The strains to which individuals are exposed depend on intensity of vibrations, frequency, duration of exposure, working techniques and type of activity (International Social Security Association, 2010).

2.4.4. Impact of hand-arm vibration

The impact of hand-arm vibrations are circulation disorders, nerve function disorders, muscular tissue changes and bone and joint damage (wrists, elbow and acromioclavicular joints) (International Social Security Association, 2010), white finger, (also known as "dead finger") carpel tunnel syndrome and other symptoms similar to occupational overuse syndrome (Occupational Health and Safety, 2013).

2.4.5. Impact of whole-body vibrations

The impact of whole-body vibrations impair the senses and may lead to balance disorders, kinetoses or visual disturbances, affect the spine (International Social

Security Association, 2010), lower back pain, motion sickness and also bone damage (Occupational Health and Safety, 2013).

2.5. Manual Material Handling or Manual Handling

Manual handling states is any transporting or supporting of a load by one or more workers. It includes the following activities like as; lifting, holding, putting down, pushing, pulling, carrying or moving of a load (European Agency for Safety and Health at Work, 2006). Manual material handling entails lifting, but also usually includes climbing, pushing, pulling and pivoting, all of which pose the risk of injury to the back (University of California, 2011).

Manual material handling (MMH) is the most common cause of occupational fatigue and low back pain (Canadian Centre for Occupational Health & Safety, 2014). Work-related low back pain and injuries are the most common musculoskeletal disorders, caused by manual handling (European Agency for Safety and Health at Work, 2006). Recent studies show that nearly 70% of low back injuries are related to manual material handling (University of California, 2011; Purdue University, 2014).

2.5.1. Negative health effects of manual handling

Manual handling can result in fatigue and lead to injuries of the back, neck, shoulders, arms or other body parts. Two groups of injuries may result from manual handling: first one is cuts, bruises, fractures etc. due to sudden or unexpected events such as accidents and second one is damage to the musculoskeletal system of the body as a consequence of repetitive manual handling (European Agency for Safety and Health at Work, 2006).

2.5.2. Hazards of Manual Material handling

To assess the hazards of manual material handling, operations consider the load, the task, the environment. A load may be hazardous because of weight, size, shape, slippery or damaged surfaces and absent or inappropriate handles and imbalance (Industrial Accident Prevention Association, 2008). The task or method of handling may be hazardous when it involves lifting or lowering repetitively, quickly, for extended periods of time (Industrial Accident Prevention Association, 2008). Environmental factors include, temperature (beyond a 19-26°C range), relative humidity (beyond a 35-50% range) lighting, noise, physical conditions such as obstacles, floor surfaces (Industrial Accident Prevention Association, 2008).

2.6. Bus Driver

Research indicates that bus driving is a stressful occupation associated with increased health risks. Epidemiological studies have found that, compared to other occupations, bus drivers are at higher risk of cardiovascular, gastrointestinal and musculoskeletal problems (Machin and Nancey Hoare, 2008; Sadri, 2003).

Bus drivers transport passengers on local, national or overseas journeys with ensuring road safety and drivers are responsible for the safety of their passengers. To be a bus driver, must have an excellent driving skills and knowledge of traffic rules (National Careers Service, 2012).

2.6.1. Work of a Bus Driver

A bus driver would travel alongside local routes, making scheduled stops along the way to pick up and drop off passengers. Their duties would include; taking charges and giving tickets, checking transport licenses, giving schedule or route information, helping travelers who are having difficulty getting on or off the vehicle (National Careers Service, 2012; Machin and Nancey Hoare, 2008).

2.6.2. Skills, Interests and Qualities of a Bus Driver

Bus drivers have to be an excellent driving skill and knowledge of traffic guidelines, patient manner and responsible attitude, the ability to read traffic signs and follow instructions, good numeracy skills, clear communication skills, an assertive but polite approach and good geographical knowledge (National Careers Service, 2012).

2.6.3. Bus Drivers Rights and Responsibilities

The bus drivers have to be safe, to be respected and treated with politeness, to be trained in the code and behavior management policies, to receive help and support from the bus operator in dealing with the questions of misconduct (Queensland Government, 2013).

The bus drivers have some responsibilities such as; to drive safely, to utilize behavior management strategies appropriately in handling bus behavior, to communicate in a clear, suitable and respectful way (Queensland Government, 2013).

2.6.4. Getting into Driving Profession in Bangladesh

Becoming a driver followed an ongoing and systematic procedure. A survey was reported that in Bangladesh 96.4% of the respondents learnt driving from ostads, at

the beginning they became helper in order to learn driving. The rest 3.1% became driver by attending driving schools and by paying professional drivers (BRAC Centre, 2007).

2.7. Awkward Posture

Awkward posture is a position of the joint and its connecting limbs that deviates from the neutral posture and the muscles are not in equilibrium (Adams, 2014). Working in these postures is a contributing factor to musculoskeletal disorders (Environmental Health and Safety, 2014; Environmental Health and Safety, 2013).

2.7.1. Some common examples of awkward postures

If mentioned the awkward posture in ergonomic perspective these are, extended wrist, flexed wrist, bent neck, squatting, working overhead, back bent forward, leaning backward, turning the head to either side reaching, kneeling, rotating the forearm, (Environmental Health and Safety, 2014; Ergonomics, 2008) contact stress, force, repetition (Occupational Safety & Health Administration, 2014).

2.7.2. Working in awkward postures

If an individual working in awkward posture the muscles can be stretched or compressed causing them to be unproductive and resulting in possible fatigue and overexertion. Non-neutral postures can pull and stretch tendons, blood vessels and nerves over ligaments or bone where they can become strained and restricted and prone to musculoskeletal symptoms (Adams, 2014).

2.7.3. Why awkward postures leads to MSDs

When a joint is not in its neutral range of postures, its muscles are either shorter or longer than resting length and when joints are involve range of movement near the risky positions, the tissues around the joint are stretched or compressed (Ergonomics, 2008; Adams, 2014).

Similarly, ligaments, tissue and muscle in particular are stretched in extreme postures because in extreme postures; the ligaments do not immediately return to their appropriate length, tissue may compressed and produce exhaustions or pain, the muscles have less strength and cannot produce force to their maximum level so, it fatigue more quickly and increasing the risk for injury (Ergonomics, 2008; Adams, 2014).

2.8. Low back pain

Acute low back pain is defined as low back pain existing for up to six weeks. It may be experienced as aching, burning, stabbing, sharp or dull, well-defined, or vague. The pain may radiate into one or both buttocks or even into the thigh/hip area (North American Spine Society, 2014). Chronic low back pain is long-lasting, lower back pain, it is defined as continuing for more than three months and has many different causes (Dartmouth-Hitchcock, 2014).

2.8.1. Signs of low back pain

The sign of back pain are, mild to severe pain in the lower back that has lasted for more than three months, morning stiffness, sleep interruptions due to pain, tiredness and/or irritability, inability to sit or stand for long periods of time (Dartmouth-Hitchcock, 2014).

2.8.2. Causes of low back pain

There are several causes of low back pain such as an accident or physical trauma on the lower back, wrong movements at work, posture-related causes, cauda equina syndrome, sciatica, spinal degeneration, spinal stenosis, osteoporosis, scoliosis, stiffness and tenderness of the connective tissue structures (fibromyalgia, fibromyositis), severe infection to or inflammation of the spinal joints, osteomyelitis (Dartmouth-Hitchcock, 2014), spondylitis, lifts something too heavy or overstretches, bending, obesity, smoking, poor physical condition and posture inappropriate for the activity being performed (National Institute of Neurological Disorders and Stroke, 2014; American Academy of Orthopaedic Surgeons, 2013).

2.8.3. Commonly reported histories of low back pain

People with low back pain commonly reported that lifting and/or twisting while holding a heavy object, operating a machine that vibrates, prolonged sitting (e.g. long-distance bus driving, truck driving), involvement in a motor vehicle collision and falls (Hills, 2014; American Academy of Orthopaedic Surgeons, 2013).

2.9. Neck pain

Neck pain is just that pain in the neck (Borenstein, 2012). Neck pain may be caused by injury, inflammation, or infection (Center for the Study and Treatment of Pain, 2014). Pain can be localized to the cervical spine or may radiate down an arm

(radiculopathy). People who sitting on computer screens for long periods of time may be at an increased risk, although all age groups are at risk of emerging neck pain. About 10% of the population has an incident of neck pain each year (Borenstein, 2012).

2.9.1. Types of neck pain

Nonspecific neck pain

This is sometimes called 'simple' or 'mechanical' neck pain. Often the exact cause or origin of the pain is not known. It may include minor strains and sprains to muscles or ligaments in the neck. Bad posture may also be a contributing factor in some cases (Kenny, Tidy and Cox, 2013).

A 'whiplash' jolt to the neck

This is most commonly due to an accident involving a vehicle, such as a car crash (Kenny, Tidy and Cox, 2013).

Sudden-onset (acute) torticollis

This is sometimes called 'wry neck'. A torticollis is when the head becomes twisted to one side and it is very painful to move the head back straight. However, it may be due to a minor strain or sprain to a muscle or ligament in the neck (Kenny, Tidy and Cox, 2013).

Cervical spondylosis

Wear and tear of the spinal bones (vertebrae) and the discs between the vertebrae is a common cause or recurring or persistent neck pain in older people (Kenny, Tidy and Cox, 2013).

Cervical radiculopathy

When the root of a nerve is pressed on or damaged as it comes out from the spinal cord in the neck (cervical) region, the condition is known as cervical radiculopathy. As well as neck pain, there are symptoms such as loss of feeling (numbness), pins and needles, pain and weakness in parts of an arm supplied by the nerve (Kenny, Tidy and Cox, 2013).

2.9.2. Causes of neck pain

Neck pain usually results from strains and sprains. Injuries, arthritis, a ruptured or herniated disk, meningitis, spinal stenosis and fibromyalgia are other causes (Center for the Study and Treatment of Pain, 2014; Borenstein, 2012).

2.9.3. Symptoms of neck pain

Symptoms of neck pain related with numbness, tingling, tenderness, sharp shooting pain, difficulty swallowing, swishing sounds in the head, dizziness or lightheadedness and lymph node swelling (Center for the Study and Treatment of Pain, 2014).

2.10. Shoulder pain

Shoulder pain includes any pain that rises in or around shoulder. Shoulder pain may originate in the joint itself, or from any of the many surrounding muscles, ligaments or tendons (National Health and Safety, 2012). Shoulder pain usually worsens with activities or movement of your arm or shoulder (Mayo Clinic, 2014).

2.10.1. Causes of shoulder pain

A common cause of shoulder pain is soreness of the tendon of the rotator cuff muscle and the sub-acromial bursa (American Academy of Family Physicians, 2012). Shoulder pain can develop from one or more of the following causes such like strains from overexertion, tendonitis from overuse, shoulder joint instability, dislocation, pinched nerves (also called radiculopathy) (Ratini, 2013), poor posture, frozen shoulder, rotator cuff disorders, shoulder instability, osteoarthritis, a fractured bone etc. (National Health and Safety, 2012).

2.10.2. Symptoms of shoulder pain

Injury can affect any of the ligaments, bursa, or tendons surrounding the shoulder joint and also affect the ligaments, cartilage, and bones of the joint. The symptoms of shoulder pain are bursitis, tendonitis, rotator cuff dysfunction, frozen shoulder etc. (Shiel 2014).

2.11. Elbow pain

Elbow pain is most often the result of tendinitis, which can affect the inner or outer elbow. Elbow pain has many other causes including arthritis and bursitis and sometimes, it also causes the pain in the fingers (Shiel, 2012).

2.11.1. Symptoms of elbow pain

Some of the symptoms of elbow pain include, dull ache when at rest, pain when making a fist (golfer's elbow), pain when opening the fingers (tennis elbow), soreness around the affected elbow bump, weak grip, difficulties and pain when trying to grasp objects (LA TROBE University, 2014).

2.11.2. Causes of elbow pain

Some of the many conditions and events that may contribute to elbow injuries includes, poor technique during sporting activities that puts too much tension on elbow joint, inappropriate sporting equipment, repetitive movements of the hands and arms, overuse injuries such as tennis and golfer's elbow, osteoarthritis, nerve entrapment, ligament sprain, bone fracture and other factors such as neck symptoms or nerve irritation (LA TROBE University, 2014; Ingraham, 2014).

2.12. Wrist pain

Wrist pain is any pain or discomfort in the wrist. Gradual onset wrist injuries arise on over a period of time, the beginning of which is difficult to identify and they are usually caused by overuse (Vorvick, 2011).

2.12.1. Causes of wrist pain

Wrist problems may be caused by an injury. But there are numerous additional causes of finger, hand or wrist problems these are carpal tunnel syndrome, tendon pain, de-quervain's disease, repetitive motion syndrome, writer's cramps, trigger finger or trigger thumb, dupuytren's disease etc. (WebMD, 2012; Vorvick, 2011).

2.12.2. Sign and symptoms of wrist pain

Signs and symptoms of wrist injury include swelling, heat/warmth, pain, discoloration, limited ability to move the joint (Hooker, 2014), inability to carry objects or use the arm, joint deformity, decreased joint range of movement, swelling or bruising around the joint, redness, pain occurs at night or while resting and pain that persists past a few days (Cluett, 2014).

2.13. Knee pain

Pain that occur in the knee from diseases or conditions that involve the knee joint, the soft tissues and bones surrounding the knee refers knee pain (Shiel, 2013). Knee pain may began as a minor discomfort, then slowly worsen knee pain is a common complaint that affects people of all ages (Zieve *et al.* 2012).

2.13.1. Causes of knee pain

In many cases, the true reason of knee pain may not be clear (Shiel, 2013). The number of factors may be involved in causes knee pain are imbalance of thigh muscles, poor flexibility, supporting heavy loads, using inappropriate sports training

methods or tools and overdoing sports activities (Shiel, 2013; American Academy of Orthopaedic Surgeons, 2010).

2.13.2. Symptoms of knee pain

The pain usually begins gradually. An individual might experience the common symptoms like as, popping or crackling sounds in the knee when climb stairs or stand up, pain at night, pain during activities, pain related to a change in activity level or intensity, (American Academy of Orthopaedic Surgeons, 2010) arthritis (rheumatoid arthritis, osteoarthritis and gout), bursitis, connective tissue disorders, tendinitis and strain or sprain (Zieve *et al.* 2012).

2.13.3. Risk factors of knee pain

Risk factors for knee pain include aging, athletic activities and trauma injuries. Obesity is also a risk factor for the development of many kinds of knee pain as a result of the extra stress forces the knee must meet with weight-bearing (Shiel, 2013).

2.14. Ankle pain

Ankle is the hinged joint, pain in ankle pain involves any discomfort in one or both ankles cause to take on a lot of stress (Karamloo, 2014; Benjamin 2013). Recurring or chronic pain on the outer side of the ankle often develops after an injury such as a sprained ankle. However, some others condition also may cause chronic ankle pain (American Orthopaedic Foot & Ankle Society, 2014).

2.14.1. Causes of Ankle pain

Ankle pain is frequently due to an ankle sprain. Sprain is an injury to the ligaments, and most of the cases, the ankle is twisted inward, causing small tears in the ligaments which can leads to swelling and bruising the joint (Karamloo, 2014; Benjamin 2013). In addition to ankle sprains, ankle pain can be caused by injury or swelling of tendons or cartilage, osteoarthritis, gout, rheumatoid arthritis, achilles tendon rupture and fracture (Karamloo, 2014; Benjamin 2013).

2.14.2. Symptoms of Ankle pain

Ankle pain is occasionally connected with other symptoms including swelling, redness, tenderness, stiffness, warmness, discoloration of the skin (blue, gray or red), inability to bear weight and pain associated with other joints (Karamloo, 2014).

CHAPTER 3
METHODOLOGY

3.1. Study design

The study aim is to find out the musculoskeletal symptoms prevalence and its associated risk factors among occupational bus drivers in Bangladesh. A quantitative research model in the form of a cross-sectional study type in design was used. Cross-sectional study was selected because in this way it is possible to identifying a defined population at a particular point of time (Oslen and George, 2004). A cross sectional study can evaluate a large number of participants at little cost or effort and ways to provide a still picture of outcome and also the characteristics associated with it within a specific period of time (Levin, 2006). Since cross sectional studies is the best way to determine prevalence and are useful at identifying associations (Mann, 2003).

3.2. Study site

This cross-sectional study was conducted among occupational bus drivers at the area of Gabtoli bus terminal and Savar bus stand in the Dhaka city of Bangladesh. The investigator selected study site in convenient method.

3.2.1. Gabtoli bus terminal

Gabtoli bus terminal is one of the biggest bus stations in Dhaka city. The distance from Savar to Gabtoli is almost 17 km. There are only two connecting intra city bus route in Dhaka and Gabtoli bus terminal is one of them, serve almost 65 percent of the passenger (Mahmud and Hoque, 2012). Here different type of bus such as double-decker, single-decker, minibus, long journey bus and also local bus are available. These kinds of bus are running from Dhaka to other districts of Bangladesh at day and overnight. The Gabtoli bus terminal is along with the Mirpur technical road and from this point Dhaka-Aricha highway is begin. In front of the Gabtoli bus station a few space for moving bus and getting in and out of the passenger from the bus and behind the station a large space for staying bus after finishing the trip. There are huge numbers of ticket counter in the middle point of Gabtoli station.

3.2.2. Savar bus stand

Savar is another site that is approximately 25 km away from Dhaka city. It is situated in the Savar bazar. One side of the road buses are running towards Dhaka city and

another side vehicles are running away from Dhaka city. It is a crowded place and ticket counter is spread out here and there. The vehicle these are leaving from Gabtoli running through the Savar bus stand and then another route. In the northern part of the stand local buses are waiting serially. Due to metropolitan police long route buses could not stance anywhere in the station. In mid-point there is no space for stopover, in while some of vehicles stay unlawful way. In the southern part of the station long route buses stop anterior of the ticket counter for little instant. Same as Gabtoli varieties categories of vehicle are available at this point.

3.3. Study participant

Sample should be representing the population as closely as possible. For survey research, it is better to get many subjects as possible with the consideration of the size of ideal population (Bowling, 1997). In this study sample collected in convenient way. Study participants were occupational drivers who engaged in bus driving profession. Investigator selected 105 occupational bus drivers who meet the inclusion criteria in the study. The investigator was explained the aim of the research, also inform consent form and at last selected participants who enthusiastically participate in this project.

Who are considered as a driver? Drives operate the vehicle on a scheduled route and perform related duties as required (Bus driver definition, 1990). Bus drivers transport people between various places including work, school and shopping malls and across state or national borders and required a registration or licensing (Bureau of Labor Statistics, 2014). So, occupational bus driver operate bus cause of earn money for leading a productive life and driving is related to their profession or job. The characteristics of occupational bus drivers are both extrovert and introvert, little educated or illiterate, depressed, anger, heavy smoker, tensed, exposes of work stressor, ill health and get little time for sleep (Issever *et al.* 2002).

3.4. Inclusion criteria

- Only male bus drivers were included (Alperovitch-Najenson *et al*. 2010). In Bangladeshi context almost majority percent of drivers engage in driving as professions are male in number and a female bus driver is rare.
- The age range of the drivers for the study was 21 to 45 years. According to the Bangladesh Labour Act, 2006 no person shall be employed as driver, in an

establishment on a road transport service unless he has attained the age of twenty one years (Bangladesh. ***Bangladesh Labour Act***, 2006). Studies have shown that there are marked health differences (cardiovascular disease, musculoskeletal problems and gastrointestinal disorders) for urban bus driver aged between 40 and 49 years (Tse, Flin, and Mearns, 2006). So the mean age is 44.5 years but for avoiding decimal investigator was select 45 years.

- Respondent drivers have to spend at least 1 complete year in driving profession in their current job (Okunribido, Magnusson and Pope, 2008; Okunribido *et al.* 2007).

3.5. Exclusion criteria

- Exclude respondents those had spondyloarthrosis or any other musculoskeletal disease such as osteoarthritis, rheumatoid arthritis, joint disease (Prado-Leon, Aceves-Gonzalez and Avila-Chaurand, 2008) including traumatic injuries to their musculoskeletal systems (Alperovitch-Najenson *et al*. 2010).
- Respondents who had mental, psychological or cognitive disorders that would restrict their ability to answer interview questions (Prado-Leon, Aceves-Gonzalez and Avila-Chaurand, 2008).

3.6. Sample size determination

For calculating sample size the investigator used the principle of sample size determination: $n = z^2.pq/r^2$ (Hicks, 2000). If the investigator use 95% confidence interval for this study, thus the confidence interval, $z = 1.96$ and 5% sampling error, thus the sampling error, $r = 0.05$. The investigator did not know the prevalence rate of musculoskeletal symptoms among occupational bus drivers in Bangladesh, whether the prevalence, $p = 50\% = 0.5$ & $q = (1- p) = (1-0.5) = 0.5$, so $q = 0.5$. Then, if the investigator calculates the sample size (n), it was stand for:

$$n = \frac{(1.96)^2 \times 0.5 \times 0.5}{(0.05)^2}$$

$$= \frac{0.9604}{0.0025}$$

$$= 384.16$$

$$\therefore n = 384.16$$

But the investigator selected 105 participants rather than 384 cause of the time limitation of academic course curriculum. Yet, it was quite difficult as a student to collect data within three months from this huge sample.

3.7. Data collection tools

Following instruments was used during data collection period for the purpose of accumulating data from the participants and fulfill the aim and objectives of the study:

- Information sheet & Consent form
- Nordic Musculoskeletal Questionnaire
- Whole Body Vibration: Periodic Health Surveillance Questionnaire
- Weight machine (Novenaii, a product of crockery garden limited)
- Tape measure (Company: MEX, 16 feet, 5 meter)
- Seal pad
- Hardboard
- Paper, pen, pencil and eraser

3.7.1. Information sheet & Consent form

Information sheet and consent form (Appendix 10) is a vital part of any kind of study, because it is a formal settlement or agreement of participation which was taken from the participants before preliminary the interview.

An Information sheet including the details information on study aim and objectives, study design, study duration, institute affiliation, identity of investigator, participant's confidentiality, participant's rights and responsibilities, potential risk, benefit and further information related to study, was prepared for participants to provide prior to take informed consent.

A written consent form was also prepared for the participants to verify the level of understanding of the information sheet, awareness about the potential benefits and risks of the participants and their volunteer participation with signature. So it was significant to take consent from them who were interested to participate in the study. Before starting the interview, signatures were obtained from each participant on a consent form.

In the study the investigator was explained the investigator identity, study title, institute affiliation, participant's confidentiality, rights and their potential benefits in

information sheet and participants was gave their written agreement, when they were interested to participate in the study.

3.7.2. Nordic Musculoskeletal questionnaire (NMQ)

It was recognized that the Nordic Musculoskeletal Questionnaire (Appendix 4) was suitable for application in a wide diversity of workplaces and could accommodate very large number of workers in a study very quickly and cheaply (Dickinson *et al.* 1992). The NMQ has been documented to have acceptable validity and reliability (Chen *et al.* 2005).

Nordic Musculoskeletal Questionnaire has three sections. First section of this questionnaire defines the information about musculoskeletal ache, pain, discomfort and numbness during the last 12 months in the area of neck, shoulders, elbows, wrists or hands, upper back, lower back, hips or thighs or buttocks, knees and ankles or feet. The second section explains as if the participants have had any trouble in different body region like as neck, shoulders, elbows, wrists or hands, upper back, lower back, hips or thighs or buttocks, knees and ankles or feet during the last 7 days. The third section also covers what kinds of activities have been prevented from carrying out normal activities during the last 12 months because of the participants musculoskeletal problems. The body parts that comprise two in number like as right and left elbow or shoulder or wrist, the questionnaire has three options right, left and both to describe the body parts precisely (Kuorinka *et al.* 1987; Dickinson *et al.* 1992).

The investigator used Bengali version of Nordic Musculoskeletal questionnaire (Appendix 5) for identifying the prevalence of musculoskeletal symptoms.

3.7.3. Whole Body Vibration: Periodic Health Surveillance Questionnaire

Occupational health surveillance in general is defined as the ongoing systematic collection, analysis, interpretation and the distribution of data for the purpose of prevention and surveillance to identify work-related risks initially using national statistics (Pope *et al.* 2002). Whole Body Vibration: Periodic Health Surveillance Questionnaire (Appendix 6) had the questions grouped in four sections: 1) personal and general information; 2) work environment information; 3) musculoskeletal health information; 4) work satisfaction; (Okunribido, Magnusson and Pope, 2008) but the

investigator chosen section 1 & 2 for getting socio-demographic information and identify the risk factors of MSS respectively.

The questions concerning driving experience were in terms of years of driving and daily driving hours, surface and environment of driving, style of driving and discomfort from of vibration (Okunribido *et al.* 2007). Those regarding posture were describes as five different possible configurations of the torso (torso against backrest, torso straight, torso bent, torso twisted and torso bent and twisted simultaneously) and three possible frequencies of occurrence (Okunribido *et al.* 2007). The questions as regards manual material handling were in terms of the weight of load and frequency in a typical workday, for lifting and pushing tasks, whether handling was done in awkward postures, for example with bent torso or with twisted torso (never, occasionally, often) and whether handling was done immediately after driving (never, sometime, often) (Okunribido, Magnusson and Pope, 2008). The work environment information also comprise category of road, seat suspension, break time, load lifting, vehicle jerk or jolt in details (Pope *et al.* 2002). Personal and general information offers documents about socio-demographic figures that were helped to make association between musculoskeletal symptoms prevalence and demographic data.

So to obtain information about socio-demographic questionnaires, exposure to vibration, postural demands, manual material handling and all over the working environment with potential associated physical risk factors of MSS Bengali version of Whole Body Vibration: Periodic Health Surveillance Questionnaire (Appendix 7) had been used.

3.7.4. Procedure of translation and field test of the questionnaires

For translating NMQ and Whole Body Vibration: Periodic Health Surveillance Questionnaire in Bengali the investigator was select two translators those are health professionals and who had already completed their graduation. Both translators converted original Nordic Musculoskeletal Questionnaire and Whole Body Vibration: Periodic Health Surveillance Questionnaire in Bengali independently with a focus to produce a conceptually equivalent translation of the original questionnaire & consider familiar & easily understandable language but not a word-for-word translation.

After receiving independent forward A & B translation, investigator and a bilingual expert who was experienced in instrument development and translation discussed two

forward versions of both questionnaires during a meeting and approved a combined version in order to produce a conceptually equivalent translation named Bangla version NMQ 1.0 and Whole Body Vibration: Periodic Health Surveillance Questionnaire 1.0 of the original questionnaire.

After finalizing Bangla version 1.0 for both questionnaires, investigator sent the questionnaire to bilingual expert who did not have any access to the original English version of the both questionnaire to produce a backward translation into English.

Comparison of this backward translation with Version 1.0 was done by the bilingual expert panel during a meeting to discuss any discrepancies, mistakes, mistranslations or inaccuracies. Some misunderstanding and inaccuracy in the Bangla version 1.0 and backward translation were identified. Finally misunderstanding and inaccuracy was resolved by considering linguistic features, spoken and standard language and try to use easily understandable word until a satisfactory version was reached with focusing conceptual and cultural equivalence. Thus way it gave rise to the second version of both questionnaires (NMQ version 2.0 & Whole Body Vibration: Periodic Health Surveillance Questionnaire version 2.0).

Pre-testing and cognitive interviewing of Version 2.0 was done in the study setting with 10 participants who speaks in Bengali language in order to conduct a comprehension test through face to face interview and during this period the interviewer (investigator) investigated whether the subjects had any difficulty to understanding and also examined the participant's interpretation or expression of all question. Based on participant's interpretation the third version of both questionnaires was developed by prioritizing what they choose better alternatives to their usual language. The third version of both questionnaires was considered as final version.

3.8. Data collection procedure

At first the investigator had taken ethical permission from Institutional Review Committee of "Bangladesh Health Professions Institute" (BHPI) (Appendix 1) and approved the study protocol. The authorities of "Dhaka Zilla Janbahon Shromik Union" (Appendix 2 & 3) also provided permission to conduct the study in selected settings without any disruption to daily work flow. The investigator was fixed a date and time for conducting the procedure of data collection. Formerly the investigator briefly explained about information sheet and consent form (Appendix 11) with study

aim and objectives were mentioned to all the participants for make sense about the study clearly and how they assist the investigator. When the participants gave accord, there were asked to give written consent and also asked to take part in face to face interview and then the investigator went for next phase. Data collection method by face to face interview using structured questionnaires allowed investigator to briefly describe the terms of the questionnaire according to need and understanding level of the participants, so that they was able to response and answer appropriately.

Firstly, data related to personal and general information was collected. Secondly, standard NMQ and Whole body vibration: periodic health surveillance questionnaire was used for collecting data interrelated with musculoskeletal symptoms prevalence and risk factors of bus driving among occupational bus drivers. The questionnaires was filled in by the investigator when participant illiterate and when participant literate it was filled in by them. The investigator was described any question specifically while participants had any doubt. The investigator had been neutral during data collection time for ease off the personal biasness related to study. The data was noted down based on participant's estimation. Data was collected during the time that was convenient for the participants and not impede the participant's productivity. To collect data from each participant via questionnaires was taken grossly 22 minutes.

3.9. Ethical Issues

The investigator was fully aware about the ethical issues. These issues were:

- The investigator taken approval from the ethical committee of Bangladesh Health Professions Institute (BHPI).
- The investigator taken permission from the authority of NMQ and Whole Body Vibration: Periodic Health Surveillance Questionnaire (Appendix 8 & 9) to use both questionnaires for this study.
- The investigator taken consent from the Dhaka Zilla Janbahon Shromik Union by informing them about the study and samples were not detriment by the study.
- Written consent form was contributed by investigator to the participants to ensure voluntary participation in the study.

- An information sheet provided to inform the subjects about the aim of the study, confidentiality of the participant's information and also mentioned the subjects had full right to withdraw themselves from the study at any time without any disinclination.
- The questionnaires were administered in the available time of the participants.
- The study was overseen under the observation of the study supervisor.

CHAPTER 4
DATA ANALYSIS AND RESULTS

4.1. Data analysis

The data analysis was performed both manually and by using the Statistical Package for Social Science (SPSS) version 17.0 (SPSS Inc., Chicago, IL, USA). To lessen the influence of the missing value and increase the trustworthiness of the analysis, the total analysis process was carried out using the SPSS software. Every questionnaire had a code number for avoiding the missing or overwriting data into the SPSS. At first the researcher was selected the variable & all the question of the questionnaire was considered as variables, then input the data into SPSS. The raw data was put on the SPSS and Microsoft Office Excel sheet. The process of data analysis was followed the study objectives. For fulfilling the study aim, investigator sequentially solves the study objectives at an organized process.

Quantitative data can be effectively analyzed using descriptive statistics. It is used when investigator has collected a quantity of data (Hicks, 2000). Thus, descriptive analysis was used by using descriptive statistical techniques such as; bar graph and table for find out the frequency and percentage of different socio-demographic data and prevalence of musculoskeletal symptoms to represent the study findings (Alperovitch-Najenson *et al.* 2010; Hicks, 2000). Inferential statistics like as, chi-square test was accompanied with $p<.05$, to find out the association between the prevalence of musculoskeletal symptoms and socio-demographic and physical risk factors (Alperovitch-Najenson *et al.* 2010; Hicks, 2000).

Confidence interval (CI) are also calculated manually because, a study recruits only a small sample of the overall population. The confidence interval indicates the level of uncertainty around the measure of effect (Students 4 Best Evidence, 2013). So, by having an upper and lower CI limit we can infer that, the true population effect lies between these two points. The law of measuring CI is:

95% CI = $[\pm 1.96 \times$ Standard Error (SE)$]$

And, SE= $\sqrt{\frac{P(1-P)}{n}}$ | Here, P= Prevalence
n= Study subjects

For an example, the prevalence of overall musculoskeletal symptoms among participants 85.7% in the past 12 months and total participants were 105.

$$\therefore \text{SE} = \sqrt{\frac{0.857(1-0.857)}{105}}$$

$$= \sqrt{\frac{0.122551}{105}}$$

$$= \sqrt{0.001167152}$$

$$= 0.034163606$$

$\therefore$ SE = 3.41%

If standard error 3.41% then 95% confidence interval will be,

95% CI = $(\pm 1.96 \times 3.41\%)$

$= \pm 6.69\%$

$\therefore$ 85.7% (95% CI 79.01% – 92.39%)

Consequently, this finding shows that within 95% confidence interval and 85.7% prevalence, the upper and lower limit of CI lies between 92.39% and 79.01%.

4.2. Result

4.2.1. Demographic variables (n= 105)

Selected Demographic Factors	n	(%)	Mean	SD
Age			33.60	8.21
21 to 29 yrs	41	39.0		
30 to 37 yrs	23	21.9		
38 to 45 yrs	41	39.0		
BMI			22.66	2.35
18 to 21	48	45.7		
22 to 25	46	43.8		
26 to 29	11	10.5		
Marital Status			-	-
Single	20	19.0		
Married	85	81.0		
Educational Status			-	-
Illiterate	24	22.9		
Primary	66	62.9		
Secondary	10	9.5		
Higher Secondary	5	4.8		
Monthly Income			-	-
Less than 5000	8	7.6		
5000 to 10000	14	13.3		
More than 10000	83	79.0		
Smoking/Chew Tobacco			-	-
Yes	91	86.7		
No	14	13.3		
Regular Exercise			-	-
Yes	1	1.0		
No	104	99.0		
Sports Participation			-	-
Yes	16	15.2		
No	89	84.8		

Table-1: Demographic information of occupational bus drivers

n= Number of drivers, %= Percentage of drivers, SD= Standard Deviation

In this cross sectional study, most of the driver's age range between 21-29 (39%) and 37-45 (39%) years. Here, the investigator used three categories of age that are 21-29, 30-37 & 38-45 and within this range participants mean age (average age) is 33.60 and standard deviation (average deviation around the mean) was 8.21. Entire of the study subjects were male and their Body Mass Index (BMI) score 18 to 21 (45.7%), 22 to 25 (43.8%), 26 to 29 (10.5%), their mean BMI 22.66 and its deviation score 2.35 around the mean. Almost, all of the drivers, 81% were married and few of them, 19% were unmarried. Educational status were categorized in illiterate, primary, secondary and higher secondary within this range their educational eminence are 22.9%, 62.9%,

9.5% and 4.8% respectively. More than seventy percent study participants (79%) monthly income was above 10000, 13.3% participants monthly income within 5000-10000, and rest of the participants, 7.6% income was below 5000. Smoking and chewing tobacco is one of most common habit of bus drivers, in this study estimated majority of the subjects, 86.7% had the habit of smoking and/or chewing tobacco and lesser amount of the subjects, 13.3% had not habituate with smoking and/or chewing tobacco. Nearly all over the study participants, 104 (99%) had no contact with regular exercise, but only one participant had linkage with regular exercise. Same as exercise most of the subjects, 84.8% had not participated in sports activity weekly and smaller number of participants, 15.2% participated in sports activity in every week (Table-1).

4.2.2. The prevalence of developing musculoskeletal symptoms

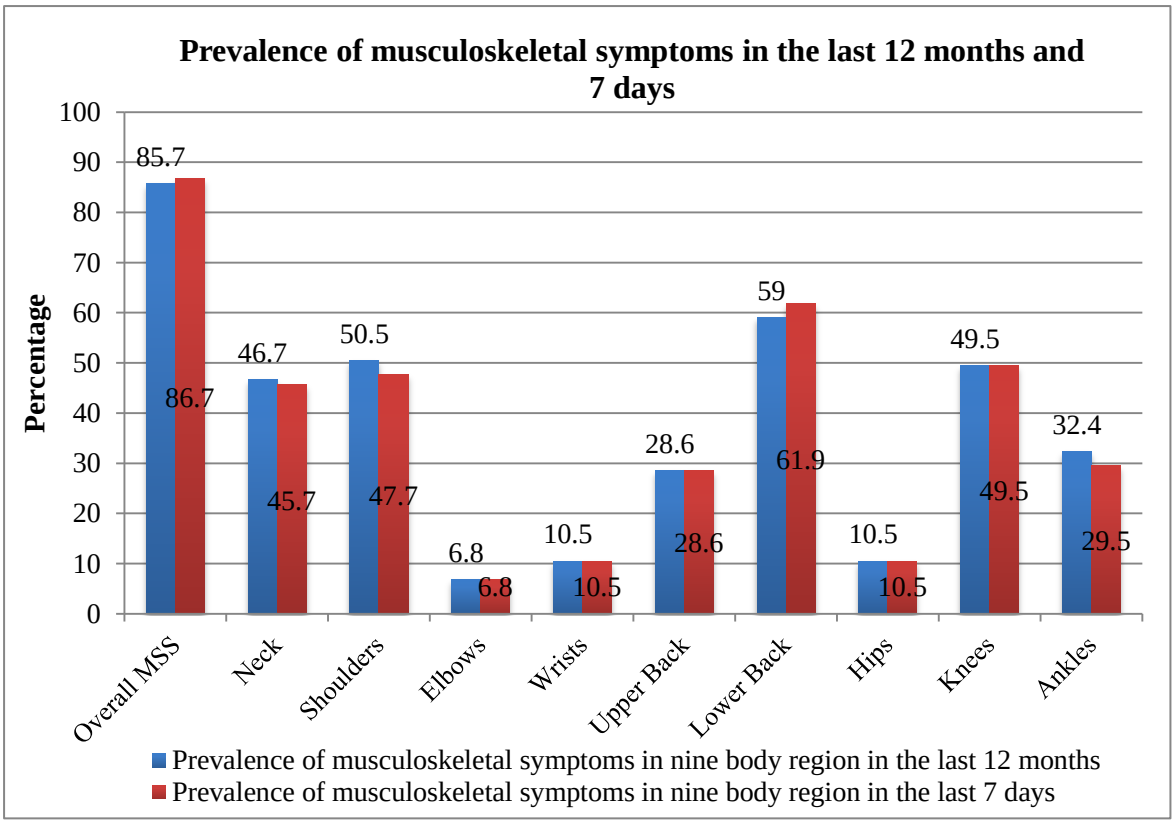

Figure-1: Prevalence (%) of musculoskeletal symptoms in the last 12 months & 7 days in nine body regions (Study subjects, n= 105)

Figure-1 demonstrates the prevalence of overall musculoskeletal symptoms and also notifies specifically musculoskeletal symptoms in nine body regions in the last 12 months and 7 days prior to data collection. By analyzing this study, the investigator invented that 86.7% (95% CI 80.21%-93.19%) occupational bus drivers had been faces trouble of musculoskeletal symptoms at least one region in the body at last 7

days (Figure-1 & Table-2). Besides this musculoskeletal symptoms were in neck 45.7%, shoulders 47.7%, elbows 6.8%, wrists 10.5%, upper back 28.6%, lower back 61.9%, hips 10.5%, knees 49.5% & ankles 29.5% at last 7 days. Similar way in this study, the investigator found that 85.7% (95% CI 79.01% – 92.39%) occupational bus drivers had been experience musculoskeletal symptoms at least one region in the body at last 12 months. The prevalence of musculoskeletal symptoms in the last 12 months were in neck 46.7%, shoulders 50.5%, elbows 6.8%, wrists 10.5%, upper back 28.6%, lower back 59%, hips 10.5%, knees 49.5% & ankles 32.4%. Figure-1 also describes the most common body regions with high prevalence of musculoskeletal symptoms among study participants were neck, shoulders, lower back & knees.

Confidence Interval (CI) for prevalence of musculoskeletal symptoms

95% (CI)	Last 12 months		Last 7 days	
	Upper limit	Lower limit	Upper limit	Lower limit
Overall MSS	92.39	79.01	93.19	80.21
Neck	56.24	37.16	55.22	36.18
Shoulders	60.06	40.94	57.25	38.15
Elbows	11.61	1.99	11.61	1.99
Wrist	16.36	4.64	16.36	4.64
Upper back	37.24	19.96	37.24	19.96
Lower back	68.40	49.60	71.18	52.62
Hips	16.36	4.64	16.36	4.64
Knees	59.06	39.94	59.06	39.94
Ankles	41.36	23.44	38.22	20.78

Table-2: Confidence interval for prevalence of musculoskeletal symptoms in the last 12 months & 7 days in nine body regions of occupational bus drivers (study subjects, n= 105)

4.2.3. Identify the interruption of activities of daily living in the last 12 months

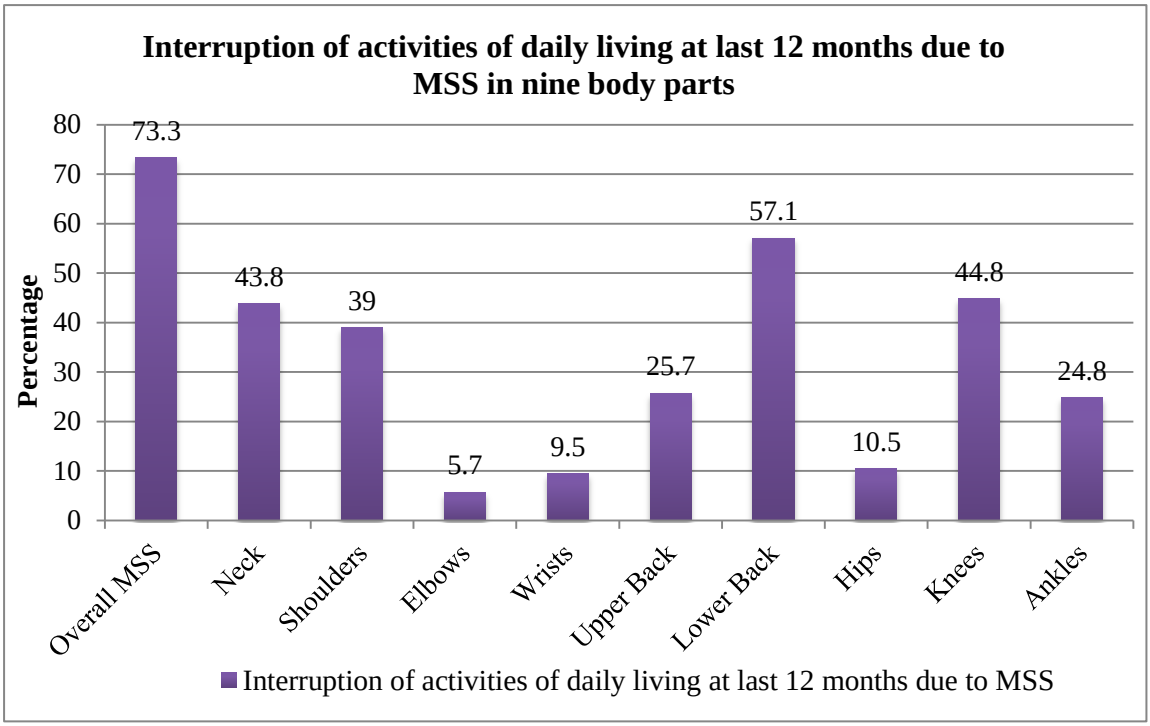

Figure-2: Interruption (%) of activities of daily living in the last 12 months due to musculoskeletal symptoms in nine body parts (Study subjects, n= 105)

Figure-2 demonstrates participant's interruption of activities of daily living at last 12 months due to musculoskeletal symptoms at least one region in the body and also specifically notifies which body region are responsible had been prevented from carrying out normal activities (e.g. job, housework, hobbies) because of this trouble. From this study, the investigator acknowledged that 73.3% (95% CI 64.84%–81.76%) faces difficulties to doing their activities of daily living for the reason of overall musculoskeletal problem (at least one part of their body) and 43.8% of study participants prevented from doing their normal activities of daily living owing to neck trouble (Figure-2 & Table-3). At the same way 39% prohibited from their normal daily living activities due to shoulders trouble, 5.7% for elbows trouble, 9.5% for wrists trouble, 25.7% for upper back trouble, 57.1% for lower back trouble, 10.5% for hips trouble, 44.8% for knees trouble and 24.8% for ankles trouble. Figure-2 also clearly defines the most common body regions that prevented occupational bus drivers from their normal activities these were neck, shoulders, lower back and knees.

Confidence Interval (CI) for interruption of activities of daily living

95% (CI)	Last 12 months	
	Upper limit	Lower limit
Overall MSS	81.76	64.84
Neck	53.29	34.31
Shoulders	48.32	29.68
Elbows	10.13	1.27
Wrist	15.10	3.90
Upper back	34.05	17.35
Lower back	66.56	47.64
Hips	16.36	4.64
Knees	54.31	35.29
Ankles	33.06	16.54

Table-3: Confidence interval for interruption of activities of daily living in the last 12 months in nine body regions of occupational bus drivers (study subjects, n= 105)

4.2.4. Association between socio-demographic factors and reported musculoskeletal symptoms

Socio-demographic factors	At least one region pain at last 12 months				At least one region pain at last 7 days			
	Yes (n)	No (n)	$\chi 2$ value	P-value*	Yes (n)	No (n)	$\chi 2$ value	P-value*
Age			5.961	.051			7.229	.027
21 to 29 years	31	10			31	10		
30 to 37 years	22	1			22	1		
38 to 45 years	37	4			38	3		
BMI			2.088	.352			2.157	.340
18 to 21	40	8			40	8		
22 to 25	39	7			40	6		
26 to 29	11	0			11	0		
Marital Status			.659	.417			.950	.330
Single	16	4			16	4		
Married	74	11			75	10		
Educational Status			1.135	.769			.308	.958
Illiterate	20	4			21	3		
Primary	56	10			57	9		
Secondary	9	1			9	1		
Higher Secondary	5	0			4	1		
Monthly Income			1.919	.383			.917	.632
Less than 5000	8	0			7	1		
5000 to 10000	11	3			11	3		
More than 10000	71	12			73	10		
Smoking			.673	.412			.013	.910
Yes	77	14			79	12		
No	13	1			12	2		
Regular Exercise			6.058	.014			6.563	.010
Yes	0	1			0	1		
No	90	14			91	13		
Participate in sports			.307	.579			2.223	.136
Yes	13	3			12	4		
No	77	12			79	10		

***Chi- square test**

Table-4: Association between socio-demographic factors and reported musculoskeletal symptoms in the last 12 months and 7 days prior to data collection

n= Number of participants

A chi-square analysis was conducted with $p<.05$ to find out the significant association between socio-demographic factors and reported musculoskeletal symptoms. Within nine socio-demographic factors only two factors had significant association with musculoskeletal symptoms. Association between at least one region pain in the last 12 months and age (p value= .051) and regular exercise (p value= .014), but no

significant association between at least one region pain in the last 12 months and BMI, marital status, educational status, monthly income, smoking and sports participation for emerging musculoskeletal symptoms.

Same as above only two factors; age (p value= .027) and regular exercise (p value= .010) had significant association with at least one region pain in the last 7 days, but no significant association between at least one region pain in the last 12 months and BMI, marital status, educational status, monthly income, smoking and sports participation for developing musculoskeletal symptoms (Table-4).

4.2.5. Physical risk factors and association between reported work-related physical risk factors and reported musculoskeletal symptoms

Reported physical risk factors	At least one region pain at last 12 months				At least one region pain at last 7 days			
	Yes (%)	No (%)	$\chi 2$ value	P-value*	Yes (%)	No (%)	$\chi 2$ value	P-value*
Working years of present job			5.578	.134			4.867	.182
1 to 11 yrs	47.6	12.4			48.6	11.4		
12 to 22 yrs	28.6	1.0			28.6	1.0		
23 to 33 yrs	7.6	1.0			7.6	1.0		
34 to 44 yrs	1.9	0.0			1.9	0.0		
Driving hour/day			.525	.769			.680	.712
4 to 8 hours	21.9	4.8			21.9	4.8		
9 to 13 hours	29.5	3.8			29.5	3.8		
14 to 18 hours	34.3	5.7			35.2	4.8		
Driving day/week			3.019	.555			1.664	.797
3 days	2.9	0.0			2.9	0.0		
4 days	7.6	2.9			8.6	1.9		
5 days	14.3	1.0			14.3	1.0		
6 days	14.3	1.9			13.3	2.9		
7 days	46.7	8.6			47.6	7.6		
Type of ground surface			6.069	.048			7.596	.022
Pitch with good condition	38.1	5.7			40.0	3.8		
Pitch with bad condition	47.6	7.6			46.7	8.6		
Both pitch & track	0.0	1.0			0.0	1.0		
Good back rest support			.915	.339			1.069	.301
Yes	83.8	13.3			84.8	12.4		
No	1.9	1.0			1.9	1.0		
Driving posture			.586	.746			1.241	.538
Bent forward often	44.8	8.6			8.6	8.6		
Lean against backrest often	37.1	4.8			4.8	3.8		
Both	3.8	1.0			1.0	1.0		
Vehicle jerk or jolt that uplifted driver			.527	.768			1.006	.605
>5 times a day, but <5 times an hour	1.0	0.0			1.0	0.0		
>5 times an hour, but <5 times a minute	41.0	5.7			41.9	4.8		
>5 times a minute	43.8	8.6			43.8	8.6		
Discomfort from vibration or shock			.906	.341			.028	.868
Yes	27.6	2.9			26.7	3.8		
No	58.1	11.4			60.0	9.5		
Lifting			.784	.376			1.346	.246
Yes	50.5	6.7			51.4	5.7		
No	35.2	7.6			35.2	7.6		
Lift with awkward posture			.028	.868			.315	.575
Yes	30.5	4.8			31.4	3.8		
No	55.2	9.5			55.2	9.5		
Other low back or neck stress			1.835	.176			1.232	.267
Yes (mechanical work)	44.8	4.8			44.8	4.8		
No	41.0	9.5			41.9	8.6		

*** Chi- square test**

Table-5: Physical risk factors and association between reported work-related physical risk factors and reported musculoskeletal symptoms in the last 12 months and 7 days

Descriptive statistics were used for representing associated physical risk factors of musculoskeletal symptoms (Table-5). Table-5 was emphasizes which physical risk factors were accountable for developing musculoskeletal symptoms with their percentage. Working years of bus driving had a great risk factor, when working years was increased then percentages of musculoskeletal symptoms was increased in both last 12 months and 7 days. Within 1.9% participants whose working years between 34-44 years, 1.9% reported they had musculoskeletal symptoms. Driving hour per day was count from 4-18 hours and the drivers who drives 3 days and/or above in a week had greater percentages of musculoskeletal symptoms. Type of ground surface of road, which includes pitch with good condition (43.8%) and pitch with bad condition (55.2%) both are considered as risk factors for developing musculoskeletal symptoms. Wicked back rest support had 1.9% risk for musculoskeletal symptoms among 2.9% occupational bus drivers. Driving posture also a risk factors, who (53.3%) drives bent forward often had 44.8% musculoskeletal symptoms in the last 12 months and 7 days, again who (41.9%) drives lean against backward often had 37.1% and 38.1% musculoskeletal symptoms last 12 months and 7 days. Vehicles jerk and jolt that uplifted driver had also the factor had relation with musculoskeletal symptoms. Moreover, 30.5% of drivers said that, they feel discomfort from vibration or shock, from them 27.6% had musculoskeletal symptoms last 12 months and 26.7% had musculoskeletal symptoms last 7 days. The drivers those were engaged with lifting activity had risk of musculoskeletal symptoms more rather than those were not engaged with lifting activity. Same as lifting, lifting with awkward posture considered as physical risk factor in this study. 35.2% bus drivers are engaged in lifting with awkward posture, within this percent 30.5% had musculoskeletal symptoms in the last 12 months and 31.4% last 7 days. The investigator discovered other physical risk factors (mechanical work) that stress on back and neck on drivers.

A chi-square analysis was conducted with $p<.05$ to find out the significant association between reported work-related physical risk factors and reported musculoskeletal symptoms at least one region in the last 12 months and 7 days. Within nine socio-demographic factors only one factor have significant association with musculoskeletal symptoms. Significant association had been existing between at least one region pain in the last 12 months and type of ground surface (p value= .048), but no significant association between at least one region pain at last 12 months and working years of

present job, driving hour/day, driving day/week, good back rest support, driving posture, vehicle jerk or jolt, discomfort from vibration or shock, sitting without vibration a day, lifting, lift with awkward posture and other low back or neck stress for evolving musculoskeletal symptoms.

Same as above only one factors; type of ground surface (p value= .022) had significant association with at least one region pain in the last 7 days, but no significant association between at least one region pain in the last 12 months and working years of present job, driving hour/day, driving day/week, good back rest support, driving posture, vehicle jerk or jolt, discomfort from vibration or shock, lifting, lift with awkward posture and other low back or neck stress for emerging musculoskeletal symptoms (Table-5).

CHAPTER 5
DISCUSSION

The incidence of musculoskeletal symptoms is considerable in Bangladeshi community (Haq *et al.* 2008). Bangladesh is a small country with bring on a great quantity of population and most of the employee were labor. The entire figure of working population is about 70.86 million (Occupational Health & Safety 2010). Within this working population, a few percent of are accountable as occupational bus drivers. As Bangladesh has no evidence about the prevalence rate of musculoskeletal symptoms among occupational bus drivers but in overseas countries presented the strong evidence of high prevalence ratio and ergonomics risk factors those are responsible for developing musculoskeletal symptoms with their association.

The first objective of this study was to estimate the prevalence of musculoskeletal symptoms in the last 12 months, and 7 days among occupational bus drivers. The investigator showed that the highest prevalence of musculoskeletal symptoms in lower back was 59.0% in the last 12 months and 61.9% in the last 7 days among 105 occupational bus drivers. However, Okunribido, Magnusson and Pope (2008) found, in a cross sectional self-assessment study among 61 occupational bus drivers, only 52.8% experienced back pain in the last 12 months and 42.1% in the last 7 days. Another observational cross sectional study among urban bus drivers in the company of public transportation in Tel Aviv metropolitan area include 384 male bus drivers found four most common musculoskeletal complaints were lower back, neck, shoulder and knee (Alperovitch-Najenson *et al.* 2010). This study totally showed similar result because this study indicated most affected areas were lower back, shoulders, knees and neck. Same way another study was conducted in Hong Kong with 481 urban bus drivers again proved that highest 12 months prevalence of musculoskeletal symptoms in neck, back, shoulders and knees (Szeto and Lam, 2007). One more study conducted in US among bus drivers of a public university had 35 participants estimated musculoskeletal disorders in neck 69%, lower back 60%, superior back 57% and knees 43% and this findings almost same in this study (Ferandez-D'Pool *et al.* 2012). A study was executed in Scotland at one public transport Bus Company where sample was 80 bus drivers, showed 59.0% experienced low back pain last 12 months that was exactly similar with this study (Okunribido *et al.* 2007).

The second objective of this study was to identify the interruption of activities of daily living in last 12 months due to musculoskeletal symptoms. This study showed that 73.3% participants faces difficulties to doing their activities of daily living for the reason of overall musculoskeletal problem and very specifically participants prevented from their normal daily living activities due to musculoskeletal symptoms in lower back 57.1%, knees 44.8%, neck 43.8% and shoulders 39% in the last 12 months. A study in Scotland among city bus drivers supported this study, for the reason that their questionnaire data indicated that back pain had little effect on ability to work and on ability to take part in recreational or social activities (Okunribido *et al.* 2007).

The third objective of this study was to identify the physical risk factors of musculoskeletal symptoms and for this purpose this study categorized some factors, these are working year, driving hour, ground surface of road, driving posture, vehicle jerk and jolt, vibration, lifting, awkward posture and mechanical work. The maximum of the factors have been connected with other cross sectional studies because in similar way one of the study in UK considered lifting loads, awkward posture, vibration and postural factors as physical risk factors among 416 participants (Okunribido, Magnusson and Pope, 2008). A study of Hong Kong along with bus drivers identified prolonged sitting and driving hour as the risk factors of musculoskeletal discomfort as like this study (Szeto and Lam, 2007). Some risk factors that are not similar in this study like as head support, lumber support, noise and non-sliding seat were identified in one US cross sectional study of bus drivers (Ferandez-D'Pool *et al.* 2012). Another study was executed in Scotland at one public transport bus company where sample was 80 bus drivers acknowledged that drivers spent 7 hour 36 minutes in driving and that's why 37.7% experienced discomfort from sitting, 68.8% indicated discomfort from vibration and 13.1% performed lifting had considered risk factors (Okunribido *et al.* 2007) and in this study driving hour range from 4 to 18 hour and for that cause discomfort from sitting 2.9% due to had poor back support, 100% adapt awkward posture and 30.5% discomfort from vibration.

The fourth objective of this study was to find out the association between prevalence and socio-demographic factors and physical risk factors of musculoskeletal symptoms. This study showed statistically significant association between musculoskeletal symptoms and age, regular exercise, type of ground surface of road

in the last 12 months and 7 days. But this findings was not matched with other cross sectional studies, a study in UK was find out driving style, awkward posture, manual materials handling have associated with musculoskeletal symptoms (Okunribido, Magnusson and Pope, 2008). Like that another a cross sectional study in Israeli professional bus drivers found uncomfortable seats, back support and steering wheel had the association with musculoskeletal symptoms (Alperovitch-Najenson *et al.* 2010). A study of Szeto and Lam (2007) found a different relation, that means they exhibited grip strength was significantly related with neck and shoulder discomfort. Age had the association with musculoskeletal symptoms demonstrated by a cross sectional study of university bus drivers in US like this study but they did not found any other association between physical risk factors or variables and musculoskeletal symptoms (Ferandez-D'Pool *et al.* 2012).

Not only bus drivers study findings but also the study findings of other occupational drivers like as; taxi drivers, truck drivers, forest machine drivers, police drivers, tractor drivers, works drivers and delivery drivers have similarities with this study. Furthermore, it is also evident that all kinds of occupational drivers have an increased risk of developing musculoskeletal symptoms.

A cross sectional self-assessment questionnaire survey study among occupational drivers in USA where included 58 police drivers, 60 tractor drivers, 64 truck drivers, 34 works drivers and 30 taxi drivers and those drivers prevalence of low back pain in the past 12 months are ranged from tractor drivers 43.3% (lowest) to taxi drivers 63.3% (highest). At the same time they identified current low back pain prevalence are ranged from taxi drivers 44.1% (highest) to tractor drivers (lowest). Overall occupational factors were found lifting loads, manual materials handlings, awkward posture, vibration and postural factors among all groups of drivers. Factors had association was includes driving style, awkward posture, manual materials handling with musculoskeletal symptoms (Okunribido, Magnusson and Pope, 2008). This result is nearly similar in this bus drivers study in case of past 12 months prevalence but last 7 days prevalence shows higher percentage of low back pain, risk factors also have the similarities but in term of association have dissimilarities was established.

Another cross sectional study in Taiwan encompassed 1242 urban taxi drivers in which reported 51% low back pain in the past 12 months and the prevalence of

musculoskeletal symptoms had relation with daily driving duration like this study. Both study found increased daily driving hour have increased risk of musculoskeletal symptoms. They found bending or twisting had association with low back pain moreover, also found association between low back pain and socio-demographic factors, (age, regular exercise) have greatly corresponding with this study (Chen *et al.* 2005).

In 2007 a study was performed in the areas of England and Scotland with 192 professional truck drivers, estimated that 81% of the drivers reported musculoskeletal problems at least one area in the body past 12 months, 34% reported musculoskeletal problems at least one area past 7 days and 30% reported they prevented from their activity due to musculoskeletal symptoms problem last 12 months. They also found the association between vibration, manual material handling and musculoskeletal symptoms (Robb and Mansfield, 2007). Their result may compared with this study because bus drivers study estimated that 85.7% of the drivers reported musculoskeletal problems at least one area in the body past 12 months, 86.7% reported musculoskeletal problems at least one area past 7 days and 73.3% reported they prevented from their activity due to musculoskeletal problem last 12 months. But there is no association between vibration, manual material handling and musculoskeletal symptoms in this study.

Another randomized control trial study contained 311 male professional forest machine drivers in northern Sweden on the organization of Swedish Forest Entrepreneur. In which 106 case group drivers 34% reported had neck pain the previous 12 months and 7 days and 56 of drivers also reported pain in arms. The estimated risk for neck pain from whole body vibration was not conformed in any case group and no significant differences were found between case and non-case group. In this study, bus driver's neck pain percentage is higher than forest machine drivers and also this study found vibration was a risk factor for musculoskeletal symptoms but they reported vibration was not a factor in both case and non-case group (Rehn *et al.* 2009).

In 2008 a cross sectional study in Norway constituted totally 823 taxi drivers including 586 owner-drivers showed higher prevalence of neck, shoulders and low back pain. They also found that driving 6 to 8 hours per day, handling baggage,

smoking and physical exercise those are the risk factors for neck, shoulders and low back pain (Raanaas and Anderson, 2008). Their findings have little similarities with this bus drivers study because this study found higher percentage of neck, shoulders and low back pain also identified driving hour, lifting, regular exercise as the risk factors of musculoskeletal symptoms except smoking.

One more study among Nigerian taxicab drivers were randomly sampled 406 occupational taxi drivers for the purpose of identifies the prevalence of work-related musculoskeletal disorders. Respondents reported work-related musculoskeletal disorders at the neck 67%, wrists 20%, upper back 29%, lower back 30% and buttock 19%. The prevalence of their study showed higher prevalence in neck and lower in buttock but this study showed prevalence of musculoskeletal symptoms higher in lower back and lower in elbows (Samuel and Babajide, 2012).

Similarly a study was designed with three parts (self-assessment, systematic observation and direct measurements) in Scotland by including 64 delivery drivers and the findings of their study was; averaged driving period 9 hour and 10 minutes, 26.6% experienced discomfort from sitting, 40.6% adopting torso bent posture, 59.4% performing lifting task, 53.1% lifting loads immediately after driving and 50.0% experienced low back pain during the last 12 months and also 21 drivers reported current low back pain (Okunribido, Magnusson and Pope, 2006). The similarities of their findings with this study was driving hour, driving posture, sitting discomfort and prevalence of low back pain but the dissimilarities are lifting task and lifting immediately after driving. So, the differences between bus and delivery drivers are that delivery drivers engage lifting activity more than bus drivers.

CHAPTER 6
LIMITATION AND RECOMMENDATION

6.1. Limitation

The investigator identifies some factors that limiting the findings of this study.

- Firstly, the result of this study could not be generalized. Two factors were responsible for this:
    1. First one, the sample size was relatively small in number, if it would be compared with other published study. The limited sample may often change the study outcome and sometimes does not represent the actual impression of investigation.
    2. Second one, the limited sample was taken conveniently from selected study setting and sample selection procedure was followed non-probability sampling strategy, which does not signify the total population.
- Secondly, the investigator was not found any one literature related to musculoskeletal symptoms among occupational bus drivers in Bangladeshi perspective for comparing the findings between them.
- Thirdly, the procedure of translation and field test of the questionnaires was not in an accurate way because the investigator did not ensured a bilingual, whose mother language is English for backward translation on the other hand, only used three participants for field test of study questionnaires.

Therefore, this cross sectional study characterizes the association between socio-demographic factors and physical risk factors and overall musculoskeletal symptoms (at least one body region pain in the past 12 months and 7 days). However, it does not specify the relation between physical risk factors and musculoskeletal symptoms in nine body parts and also not specify the relation between demographic factors and musculoskeletal symptoms in nine body region.

6.2. Recommendation

This study showed the association of musculoskeletal symptoms with demographic factors and physical risk factors. Further studies should consider psychosocial and environmental factors having association or not with musculoskeletal symptoms. In addition, it will be better to find out the fundamental relationship between musculoskeletal symptoms and different factors (socio-demographic, physical,

psychosocial and environmental) simultaneously. Prevention, intervention and outcome regarding musculoskeletal symptoms should be considered for future studies.

Some of studies supported that anthropometric mismatch one of the factors having relation with musculoskeletal symptoms among occupational bus drivers, as they steering wheel, control gear manually and feeling discomfort from sitting. So, the estimation of anthropometric measurement in different dimension among occupational bus drivers also should be significant for furthermore studies.

In spite of this, the scarcity of available studies regarding occupational drivers especially among occupational bus drivers in Bangladesh concerning musculoskeletal symptoms, provokes the requirement of conducting a study at a large scale in Bangladesh.

CHAPTER 7
CONCLUSION

In summary, this study found lower back, shoulders, knees and neck musculoskeletal problem to be very prevalent both in the past 12 months and past 7 days among professional bus drivers. For the causes of musculoskeletal trouble in different body area majority percent of participants faces difficulties for doing their normal activities of daily living in the previous 12 months. There are some factors were identified as the physical risk factors of musculoskeletal symptoms, these are working year, driving hour, ground surface of road, driving posture, vehicle jerk and jolt, vibration, lifting, awkward posture and mechanical work. But this study established only age, regular exercise and type of ground surface of road have the significant association with musculoskeletal symptoms.

Work is the part and parcel of our life. So, the work-related musculoskeletal disorders or musculoskeletal symptoms could not be ignored easily from the country as like as Bangladesh. Many of occupational group including occupational bus drivers have highly risk for developing musculoskeletal symptoms. Thus, it is the high time for the health care professionals to conscious about this miserable condition and plays a vital role to prevent this issue. Occupational Therapy is a health care profession can make the occupational health safe and sound by exerting their holistic involvement.

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APPENDIX

Appendix 1

Permission letter from BHPI ethical committee

Permission letter from BHPI ethical committee

05 August 2014
The Head of the Department
Department of Occupational Therapy
Bangladesh Health Professions Institute (BHPI)
CRP, Chapain, Savar, Dhaka-1343
Subject: Prayer for seeking permission to conduct the research project.

Sir,
With due respect and humble submission to state that I am a 4th year student of B.Sc. in Occupational Therapy of Bangladesh Health Professions Institute, the academic institute of Centre for the Rehabilitation of the Paralysed (CRP). I am sincerely seeking permission to conduct my research project as the part of fulfillment of the requirements of degree of B.Sc. in Occupational Therapy. The title of my research is, "Musculoskeletal Symptoms Prevalence and Associated Risk Factors Among Occupational Bus Drivers In Bangladesh". The aim of the study is "To investigate the musculoskeletal symptoms prevalence and its associated risk factors among occupational bus drivers in Bangladesh."

So, I therefore hope that you would be kind enough to grant me by giving the permission of conducting the research and will help me to complete a successful study as a part of my course.

Sincerely,

Md. Arif Hossain
4th year, B.Sc. in Occupational Therapy,
Bangladesh Health Professions Institute (BHPI)
CRP-Chapain, Savar, Dhaka-1343

Approved by	Signature and Comments
Head of the Department Nazmun Nahar Assistant professor & Head of the department, Department of Occupational Therapy BHPI,CRP-Chapain ,Savar,Dhaka-1343	It may allow to conduct this study as per supervisor's comment. 13.08.14
Research supervisor Shamima Akter Lecturer in Occupational Therapy Department of Occupational therapy BHPI,CRP-Chapain ,Savar,Dhaka-1343	The study proposal has been approved to carry on. Good luck. 09.08.14

Appendix 2

Permission letter to Dhaka Zilla Janbahon Shromik Union from BHPI

বাংলাদেশ হেল্‌থ প্রফেশন্স ইনষ্টিটিউট (বিএইচপিআই)

BANGLADESH HEALTH PROFESSIONS INSTITUTE (BHPI)

(The Academic Institute of CRP)

CRP-Chapain, Savar, Dhaka, Tel: 7745464-5, 7741404 , Fax: 7745069

BHPI-Mirpur Campus, Plot-A/5, Block-A, Section-14, Mirpur, Dhaka-1206. Tel: 8020178,8053662-3, Fax: 8053661

তারিখ ঃ ২৫.০৯.২০১৪

প্রতি

সভাপতি

ঢাকা জেলা যানবাহন শ্রমিক ইউনিয়ন

গাবতলি, ঢাকা।

বিষয় ঃ রিসার্চ প্রজেক্ট (dissertation) এর জন্য আপনার প্রতিষ্ঠান সফর প্রসঙ্গে।

জনাব,

আপনার সদয় অবগতির জন্য জানাচ্ছি যে, পক্ষাঘাতগ্রস্তদের পুনর্বাসন কেন্দ্রে-সিআরপি'র শিক্ষা প্রতিষ্ঠান বাংলাদেশ হেলথ্ প্রফেশনস্ ইনষ্টিটিউট (বিএইচপিআই) ঢাকা বিশ্ববিদ্যালয় অনুমোদিত বিএসসি ইন অকুপেশনাল থেরাপি কোর্স পরিচালনা করে আসছে।

উক্ত কোর্সের ছাত্রছাত্রীদের কোর্স কারিকুলামের অংশ হিসাবে বিভিন্ন বিষয়ের উপর রিসার্চ ও কোর্সওয়ার্ক করা বাধ্যতামুলক।

বিএইচপিআই'র ৪র্থ বর্ষ বিএসসি ইন অকুপেশনাল থেরাপি কোর্সের ছাত্র মোঃ আরিফ হোসেন তার রিসার্চ সংক্রান্ত কাজের জন্য আপনার সুবিধামত সময়ে আপনার প্রতিষ্ঠানে সফর করতে আগ্রহী।

তাই তাকে আপনার প্রতিষ্ঠান সফরে সার্বিক সহযোগীতা প্রদানের জন্য অনুরোধ করছি।

ধন্যবাদান্তে

অধ্যাপক ডাঃ এম এ কাদের
অধ্যক্ষ
বিএইচপিআই।

Appendix 3

Permission letter from Dhaka Zilla Janbahon Shromik Union

Permission letter from Bangladesh Road Transport Workers Federation in Bengali

০৫ সেপ্টেম্বর ২০১৪

সভাপতি,

ঢাকা জিলা যানবাহন শ্রমিক ইউনিয়ন

গাবতলি, ঢাকা

বিষয়ঃ একটি গবেষণা প্রকল্প পরিচালনা করার অনুমতির জন্য আবেদন পত্র।

জনাব,

যথাযথ সম্মান প্রদর্শন পূর্বক এবং অত্যন্ত বিনয়ের সাথে আপনাকে জানানো যাইতেছে যে, আমি মোঃ আরিফ হোসেন, পক্ষাঘাতগ্রস্তদের পুনর্বাসন কেন্দ্র (সিআরপি) এর একটি শিক্ষা প্রতিষ্ঠান, বাংলাদেশ হেলথ প্রফেশন্স ইনস্টিটিউট (বি এইচ পি আই), এর অকুপেশনাল থেরাপীতে অধ্যায়নরত স্নাতক শ্রেণীর একজন ৪র্থ বর্ষের ছাত্র। স্নাতক ডিগ্রীর পরিপূর্ণতার প্রয়োজনে ৪র্থ বর্ষে একটি গবেষণা কর্ম পরিকল্পনা পরিচালনা করার জন্য আমি আপনার আন্তরিক অনুমতির প্রার্থনা করছি। আমার গবেষণার শিরোনামটি হলো "বাংলাদেশের পেশাজীবী বাস চালকদের পেশী ও অস্থি সম্বন্ধীয় সমস্যার প্রাদুর্ভাবের হার এবং কাজের পরিবেশ সংক্রান্ত ঝুঁকিসমূহ" এবং এই গবেষণার লক্ষ্য হলো বাংলাদেশের পেশাজীবী বাস চালকদের পেশী ও অস্থি সম্বন্ধীয় সমস্যার প্রাদুর্ভাবের হার এবং কাজের পরিবেশ সংক্রান্ত ঝুঁকিসমূহের কারন খুঁজে বের করা।

সুতরাং, আমি আশা করব যে, আপনি আমার গবেষণা কার্যক্রম পরিকল্পনা পরিচালনা করার জন্য আপনার মূল্যবান অনুমতি প্রদান করে আমাকে বাধিত করবেন এবং সফলতার সাথে আমার গবেষণা কার্যক্রম সম্পূর্ণ করার ক্ষেত্রে সহায়তা করবেন।

আপনার একান্ত অনুগত,

০৫/০৯/১৪.

মোঃ আরিফ হোসেন

৪র্থ বর্ষ, বিএসসি ইন অকুপেশনাল থেরাপি

বাংলাদেশ হেলথ প্রফেশন্স ইনস্টিটিউট (বি এইচ পি আই)

সিআরপি-চাপাইন, সাভার, ঢাকা-১৩৪৩

01681411507.

সভাপতির স্বাক্ষর ও মন্তব্য (ঢাকা জিলা যানবাহন শ্রমিক ইউনিয়ন)

শ্রমিকদের কাজের ক্ষতি না হয়
যোগাযোগ রক্ষা রেখে প্রয়োজনীয়
সহযোগিতা করা অনুরোধসহ অনুমতি
প্রদান করা হলো

০৬/৯/১৪

মোঃ আতিকুর রহমান
সাধারণ সম্পাদক
ঢাকা জিলা যানবাহন শ্রমিক ইউনিয়ন।

Appendix 4

Nordic Musculoskeletal Questionnaire (NMQ) in English

Please answer by using the tick boxes ☑
– *one tick for each question*

Please note that this part of the questionnaire should be answered, even if you have never had trouble in any parts of your body.

Have you at any time during the **last 12 months** had **trouble (such as ache, pain, discomfort, numbness)** in:	Have you had **trouble** during the **last 7 days:**	During the **last 12 months** have you been **prevented** from carrying out normal activities (eg. job, housework, hobbies) because of this trouble:
1 ***Neck*** No 1☐ Yes 2☐	2 ***Neck*** No 1☐ Yes 2☐	3 ***Neck*** No 1☐ Yes 2☐
4 ***Shoulders*** No 1☐ Yes 2☐ in the right shoulder 3☐ in the left shoulder 4☐ in both shoulders	5 ***Shoulders*** No 1☐ Yes 2☐ in the right shoulder 3☐ in the left shoulder 4☐ in both shoulders	6 ***Shoulders (both/either)*** No 1☐ Yes 2☐
7 ***Elbows*** No 1☐ Yes 2☐ in the right elbow 3☐ in the left elbow 4☐ in both elbows	8 ***Elbows*** No 1☐ Yes 2☐ in the right elbow 3☐ in the left elbow 4☐ in both elbows	9 ***Elbows (both/either)*** No 1☐ Yes 2☐
10 ***Wrists/hands*** No 1☐ Yes 2☐ in the right wrist/hand 3☐ in the left wrist/hand 4☐ in both wrists/hands	11 ***Wrists/hands*** No 1☐ Yes 2☐ in the right wrist/hand 3☐ in the left wrist/hand 4☐ in both wrists/hands	12 ***Wrists/hands (both/either)*** No 1☐ Yes 2☐
13 ***Upper back*** No 1☐ Yes 2☐	14 ***Upper back*** No 1☐ Yes 2☐	15 ***Upper back*** No 1☐ Yes 2☐
16 ***Lower back (small of the back)*** No 1☐ Yes 2☐	17 ***Lower back*** No 1☐ Yes 2☐	18 ***Lower back*** No 1☐ Yes 2☐
19 ***One or both hips/thighs/buttocks*** No 1☐ Yes 2☐	20 ***Hips/thighs/buttocks*** No 1☐ Yes 2☐	21 ***Hips/thighs/buttocks*** No 1☐ Yes 2☐
22 ***One or both knees*** No 1☐ Yes 2☐	23 ***Knees*** No 1☐ Yes 2☐	24 ***Knees*** No 1☐ Yes 2☐
25 ***One or both ankles/feet*** No 1☐ Yes 2☐	26 ***Ankles/feet*** No 1☐ Yes 2☐	27 ***Ankles/feet*** No 1☐ Yes 2☐

Appendix 5

Nordic Musculoskeletal Questionnaire (NMQ) in Bengali

দয়া করে উত্তরের জন্য সঠিক বক্সে (আপনার জন্য যেটি প্রযোজ্য) টিক চিহ্ন দিন

প্রতিটি প্রশ্নের জন্য একটি টিক চিহ্ন ব্যবহার করুন [√]

বিঃ দ্রঃ অনুগ্রহ করে মনে রাখবেন প্রতিটি প্রশ্নের উত্তর দিতে হবে, যদিও আপনার শরীরের কোন অংশে সমস্যা না থাকে।

বিগত ১২ মাসের মধ্যে, কোন সময়ে আপনি কি নিম্নে উল্লেখিত শরীরের অংশসমূহে কোন ধরনের সমস্যা বোধ করেছেন? (যেমনঃ অবিরাম অস্বস্তিকর বেদনা, ব্যথা, অস্বস্তি, অবশ)	বিগত ৭ দিনের মধ্যে আপনি কি কোন ধরণের সমস্যা বোধ করেছেন ?	উল্লেখিত সমস্যা সমূহের জন্য (অবিরাম অস্বস্তিকর বেদনা, ব্যথা, অস্বস্তি, অবশ) বিগত ১২ মাসের মধ্যে আপনি কি আপনার স্বাভাবিক কার্যাবলি (যেমনঃ চাকুরি, গৃহস্থলির কাজ, শখ) থেকে বিরত থেকেছেন
১ ঘাড় না হ্যাঁ ১ ☐ ২ ☐	২ ঘাড় না হ্যাঁ ১ ☐ ২ ☐	৩ ঘাড় না হ্যাঁ ১ ☐ ২ ☐
৪ কাঁধসমূহ ১ না হ্যাঁ ☐ ২ ☐ ডান কাঁধে ৩ ☐ বাম কাঁধে ৪ ☐ উভয় কাঁধে	৫ কাঁধসমূহ না হ্যাঁ ১ ☐ ২ ☐ ডান কাঁধে ৩ ☐ বাম কাঁধে ৪ ☐ উভয় কাঁধে	৬ কাঁধসমূহ (এক কাঁধ/ উভয় কাঁধ) না হ্যাঁ ১ ☐ ২ ☐
৭ কনুইসমূহ না হ্যাঁ ১ ☐ ২ ☐ ডান কনুইয়ে ৩ ☐ বাম কনুইয়ে ৪ ☐ উভয় কনুইয়ে	৮ কনুইসমূহ না হ্যাঁ ১ ☐ ২ ☐ ডান কনুইয়ে ৩ ☐ বাম কনুইয়ে ৪ ☐ উভয় কনুইয়ে	৯ কনুইসমূহ (এক কনুই / উভয় কনুই) না হ্যাঁ ১ ☐ ২ ☐
১০ কব্জিসমূহ / হাতসমূহ না হ্যাঁ ১ ☐ ২ ☐ ডান (কব্জি / হাত) ৩ ☐ বাম (কব্জি / হাত) ৪ ☐ উভয় কব্জি / হাত	১১ কব্জিসমূহ / হাত সমূহ না হ্যাঁ ১ ☐ ২ ☐ ডান (কব্জি / হাত) ৩ ☐ বাম (কব্জি / হাত)	১২ কব্জিসমূহ / হাতসমূহ (এক হাত অথবা এক কব্জি / উভয় হাত অথবা উভয় কব্জি) না হ্যাঁ ১ ☐ ২ ☐
১৩ পিঠ না হ্যাঁ ১ ☐ ২ ☐	১৪ পিঠ না হ্যাঁ ১ ☐ ২ ☐	১৫ পিঠ না হ্যাঁ ১ ☐ ২ ☐

১৬ কোমর (পিঠের নিচের অংশ) না হ্যাঁ ১ ☐ ২ ☐	১৭ কোমর না হ্যাঁ ১ ☐ ২ ☐	১৮ কোমর না হ্যাঁ ১ ☐ ২ ☐
১৯ এক অথবা উভয় (উরুঅস্থিদয়ের সংযোগস্থল/ উরুদ্বয়/ নিতম্ব) না হ্যাঁ ১ ☐ ২ ☐	২০ উরুঅস্থিদয়ের সংযোগস্থল/ উরুদ্বয়/ নিতম্ব না হ্যাঁ ১ ☐ ২ ☐	২১ উরুঅস্থিদয়ের সংযোগস্থল/ উরুদ্বয়/ নিতম্ব) না হ্যাঁ ১ ☐ ২ ☐
২২ এক অথবা উভয় হাঁটু না হ্যাঁ ১ ☐ ২ ☐	২৩ উভয় হাঁটু না হ্যাঁ ১ ☐ ২ ☐	২৪ উভয় হাঁটু না হ্যাঁ ১ ☐ ২ ☐
২৫ এক অথবা উভয় (গোড়ালির গাঁট/গিরা/ পায়ের পাতা) না হ্যাঁ ১ ☐ ২ ☐	২৬ গোড়ালির গাঁট/গিরা/ পায়ের পাতা না হ্যাঁ ১ ☐ ২ ☐	২৭ গাড়ালির গাঁট/গিরা/ পায়ের পাতা না হ্যাঁ ১ ☐ ২ ☐

Appendix 6

A validated Questionnaire (Whole Body Vibration: Periodic Health Surveillance Questionnaire) in English

Section 1: personal and general information

Code number:

Date of birth (day / month / year): _____ Sex: M ☐ F ☐

Age: _____ (years)

Height: _____ m(ft) _____ cm(in) Weight: _____ kg(lbs)

Marital Status: Single ☐ Married ☐ Divorced/Separated ☐

1. What is your educational status? _____

2. Monthly income: Less than 5000 ☐ 5000 to 10000 ☐ More than 10000 ☐

3. Do you smoke or chew tobacco or have you ever smoked? Yes ☐ No ☐

4. Do you exercise regularly? Yes ☐ No ☐

5. What sports, if any, do you weekly participate in? _____

Section 2: Work environment information

1. How many years have you spent working in your present job? _____ Years
2. What kind of transportation do you use to get to and from work?

   Car☐ Bus☐ Train☐ Bicycle☐ Walk☐

3. How long does it take you to get to work?

   Less than 20 min ☐ 20-40 min ☐ 41-60 min ☐ More than 1 hour ☐

4. What kind of vehicles did and do you drive in your current job? (i.e., car, bus, van, truck, train, tram, helicopter, other)

Type of vehicle	from - until	hours/day	days/week	weeks/year
_____	_____ - _____	_____ hrs	_____ days	_____ weeks
_____	_____ - _____	_____ hrs	_____ days	_____ weeks
_____	_____ - _____	_____ hrs	_____ days	_____ weeks
_____	_____ - _____	_____ hrs	_____ days	_____ weeks
_____	_____ - _____	_____ hrs	_____ days	_____ weeks

5. On which type of ground surface do you drive regularly?
   Asphalt/Concrete:

   Good condition ☐ no ☐ yes _____ hours/day _____ type of vehicle

   Poor condition ☐ no ☐ yes _____ hours/day _____ type of vehicle

Paved road (cobble) ☐ no ☐ yes _____ hours/day _____ type of vehicle

Track ☐ no ☐ yes _____ hours/day _____ type of vehicle

Other, namely ☐ no ☐ yes _____ hours/day _____ type of vehicle

6. In which environment do you usually drive?

	% time	vehicle
Highway	_____	_____
Country side road	_____	_____
City street	_____	_____
Mixed	_____	_____

7. What is your normal style/speed of driving? smooth☐ slow☐ fast☐

accelerating/braking☐

8. On what kind of driver seat do you sit regularly?

Type _____ has suspension? yes ☐ no ☐

Type of suspension? ☐ mechanical suspension ☐ air suspension

☐ hydraulic suspension ☐ foam/cushion suspension

Is your seat adjustable? yes ☐ no ☐

Do you adjust your seat? yes ☐ no ☐ not applicable ☐

Did you receive instruction on how to adjust your seat? yes ☐ no ☐

Do you use automatic or manual gear? Automatic ☐ Manual ☐

9. Does your back rest give good support of your back? yes ☐ no ☐

Do you use a separate back support when you drive? yes ☐ no ☐

Does your seat have arm rests? yes ☐ no ☐

Do you use arm rests when you drive? yes ☐ no ☐ not applicable ☐

10. Which postures do you adopt when driving?

	Often	Occasionally	Never
Bent forward	☐	☐	☐
Twisted	☐	☐	☐
Lean against backrest	☐	☐	☐

Any other constrained posture? _____

11. How often does your vehicle jerk or jolt so much that you are uplifted from your seat?

☐Never

☐Less than 5 times a day

☐More than 5 times a day, but less than 5 times an hour

☐More than 5 times an hour, but less than 5 times a minute

☐More than 5 times a minute

12. How often does your seat bottom out while you are driving?

☐Never

☐Less than 5 times a day

☐More than 5 times a day, but less than 5 times an hour

☐More than 5 times an hour, but less than 5 times a minute

☐More than 5 times a minute

13. Do you experience discomfort by mechanical vibration or shock in your work?

yes ☐ no ☐

14. How many hours a day do you spend sitting without vibration on the job _____hours
How many days a week do you spend sitting? _____days
How many weeks a year do you spend sitting? _____weeks

15. Do you have to maintain a twisted posture without vibration often and/or for prolonged

times? yes ☐ no ☐

16. How many hours on a typical day do you spend standing/walking on the job?_____hours
How many days a week do you work? _____ days
How many weeks a year do you work? _____ weeks

17. Does your job include lifting? yes ☐ no ☐

Up to 5 kg (10lbs) ☐ Times/day ☐

5-10 kg (10-20 lbs) ☐ Times/day ☐

More than 10 kg (20 lbs) ☐ Times/day ☐

18. Do you lift in awkward postures? (bent/twisted) yes ☐ no ☐

19. If you drive and lift on the job how often do you lift immediately after driving?

Seldom ☐ Occasionally ☐ Often ☐

20. Does your job include (on an average working day) any of the following conditions? Prolonged or recurrent work done with your back:

    Bent forwards, backwards or side wards yes ☐ no ☐

    Twisted yes ☐ no ☐

    Bent and twisted simultaneously yes ☐ no ☐

    Any other constrained posture? _____

21. Does your job include repeated, prolonged or uncomfortable carrying, pushing or pulling of loads? yes ☐ no ☐

22. Are there any other duties required in your job that stress your low back or neck?

    _____

23. How many breaks do you usually take during the workday (this means getting out of your vehicle)? _____

24. How long are your breaks? _____ minutes

25. What do you do during your breaks? Walk around ☐ Sit ☐ Stand ☐ Other ☐

"Thank you for completing this questionnaire"

Appendix 7

A validated Questionnaire (Whole Body Vibration: Periodic Health Surveillance Questionnaire) in Bengali

ব্যক্তিগত এবং সাধারণ তথ্য

কোড নংঃ

জন্মতারিখ (দিন /মাস/বছর) ঃ _____ লিঙ্গঃ পুং □ স্ত্রী □ বয়সঃ _____ (বছর)

উচ্চতাঃ _____ মিঃ(ফুট)_____ সেমিঃ(ইঞ্চি) ওজনঃ _____ কেজি (পাউন্ড)

বৈবাহিক অবস্থাঃ অবিবাহিতি □ বিবাহিত □ তালাকপ্রাপ্ত/বিবাহবিচ্ছেদ □

১। আপনার শিক্ষাগত যোগ্যতা কতটুকু ? _____

২। আপনার মাসিক আয় কত ? ৫০০০ টাকার কম □ ৫০০০ থেকে ১০০০০ টাকার মধ্যে □ ১০০০০ টাকার বেশি □

৩। আপনি কি ধূমপান অথবা তামাকজাত পণ্য চিবানো অথবা কখনো ধূমপান করেছেন ? হ্যাঁ □ না □

৪। আপনি কি নিয়মিত ব্যায়াম করেন ? হ্যাঁ □ না □

৫। আপনি কি প্রতি সপ্তাহে কোন ধরনের খেলাধূলায় অংশগ্রহণ করেন ? যদি থাকে, _____

কাজের পরিবেশ সম্পর্কিত তথ্য

১। আপনি কত বছর যাবত আপনার বর্তমান পেশার সাথে জরিত আছেন ? _____ বছর

২। কর্মক্ষেত্রে আসা এবং যাওয়ার ক্ষেত্রে আপনি কোন ধরনের যানবাহন ব্যবহার করেন ?

গাড়ি □ বাস □ ট্রেন □ বাইসাইকেল □ হাঁটা □

৩। কর্মক্ষেত্রে পৌঁছাতে আপনার কতক্ষণ সময় লাগে ? ২০ মিনিটের কম □ ২০-৪০ মিনিট □ ৪১-৬০ মিনিট □ ১ ঘণ্টার বেশি □

৪। বর্তমান পেশায় আপনি কোন ধরনের যানবাহন চালনা করতেন এবং এখন চালনা করেন ? (উদাহরণস্বরূপঃ গাড়ি, বাস, পণ্য পরিবহনের গাড়ি, ট্রাক, ট্রেন, ট্র্যাম, হেলিকপ্টার, অন্যান্য)

যানবাহনের ধরন	হইতে – পর্যন্ত	ঘণ্টা/দিন	দিন/সপ্তাহ	সপ্তাহ/বছর
_____	_____ - _____	_____ ঘণ্টা	_____ দিন	_____ সপ্তাহ
_____	_____ - _____	_____ ঘণ্টা	_____ দিন	_____ সপ্তাহ
_____	_____ - _____	_____ ঘণ্টা	_____ দিন	_____ সপ্তাহ
_____	_____ - _____	_____ ঘণ্টা	_____ দিন	_____ সপ্তাহ
_____	_____ - _____	_____ ঘণ্টা	_____ দিন	_____ সপ্তাহ

৫। কোন ধরনের রাস্তায় আপনি নিয়মিত যানবাহন চালনা করেন ?

আলকাতরা মিশ্রিত/বালু সিমেন্ট মিশ্রিতঃ

ভাল অবস্থা	না □ হ্যাঁ □	_____ ঘণ্টা/দিন	_____ যানবাহনের ধরন
খারাপ অবস্থা	না □ হ্যাঁ □	_____ ঘণ্টা/দিন	_____ যানবাহনের ধরন
পাকা রাস্তা (অপিচ)	না □ হ্যাঁ □	_____ ঘণ্টা/দিন	_____ যানবাহনের ধরন
কাঁচা রাস্তা	না □ হ্যাঁ □	_____ ঘণ্টা/দিন	_____ যানবাহনের ধরন
অন্যান্য, নামত	না □ হ্যাঁ □	_____ ঘণ্টা/দিন	_____ যানবাহনের ধরন

৬। সচরাচর কোন ধরনের পরিবেশে আপনি যানবাহন চালান ?

	% সময়	যানবাহন
মহাসড়ক	_____	_____
দেশের ছোট সড়ক	_____	_____
মহানগরীর সড়ক	_____	_____
সব ধরনের সড়ক	_____	_____

৭। যানবাহন চালানোর সময় আপনার গাড়ির স্বাভাবিক ধরন/গতি কেমন থাকে ? স্বাভাবিক □ ধীর □ দ্রুত □ গতিবৃদ্ধি/গতিরোধ □

৮। প্রতিনিয়ত আপনি কোন প্রকারের আসন ব্যবহার করেন? প্রকার _____ স্প্রিং বা ঘাত-শোষক আছে কি ?

হ্যাঁ □ না □

স্প্রিং বা ঘাত-শোষক কোন ধরনের ?

□ যান্ত্রিক ঘাত-শোষক □ বায়ু ঘাত-শোষক □ জল/তরল পদার্থের ঘাত-শোষক □ ফোম/গদি ঘাত-শোষক

আপনার আসন কি নিয়ন্ত্রণ করা যায় ? হ্যাঁ □ না □

আপনি কি আপনার আসন নিয়ন্ত্রণ করেন ? হ্যাঁ □ না □ প্রযোজ্য নয় □

কিভাবে আসন নিয়ন্ত্রণ করতে হয় আপনি কি তার কোন নির্দেশনা পেয়েছিলেন ? হ্যাঁ □ না □

আপনি কি স্বয়ংক্রিয় গিয়ার না কি হস্তচালিত গিয়ার ব্যবহার করেন ? স্বয়ংক্রিয় □ হস্তচালিত □

৯। আপনার পিঠের ভার বহন করার জন্যে আপনার আসন কি পিটকে ভাল সহায়তা প্রদান করে ? হ্যাঁ □ না □

যানবাহন চালানোর সময় আপনার পিটকে সহায়তা প্রদান করার জন্যে আপনি আলাদা কোন সরঞ্জাম ব্যবহার করেন কি ?

হ্যাঁ □ না □

আপনার হাতকে সহায়তা প্রদান করার জন্যে আপনার আসনে কোন সহায়তাকারী সরঞ্জাম আছে কি ? হ্যাঁ □ না □

যানবাহন চালানোর সময় আপনার হাতকে সহায়তা প্রদান করার জন্যে আপনি কি কোন সরঞ্জাম ব্যবহার করেন ?

হ্যাঁ □ না □ প্রযোজ্য নয় □

১০। যানবাহন চালানোর সময় আপনি কোন ধরনের অঙ্গস্থিতি অবলম্বন করেন ?

	প্রায়ই	মাঝে-মধ্যে	কখনো না
সামনের দিকে ঝুঁকে	□	□	□
মোচড়ানো অবস্থায়	□	□	□
আসনের বিপরীতে হেলান দিয়ে	□	□	□

অন্য কোন অস্বস্তিকর/অস্বাভাবিক অঙ্গস্থিতি ? _____

১১। কতবার আপনার যানবাহন অনেক বেশি পরিমানে ঝাঁকুনি অথবা ধাক্কা খায় এবং যার কারনে আপনি আপনার আসন থেকে উর্ধ্বে উঠে আসেন ?

□ কখনই না
□ দিনে ৫ বারের কম
□ দিনে ৫ বারের বেশি, কিন্তু ঘণ্টায় ৫ বারের কম
□ ঘণ্টায় ৫ বারের বেশি, কিন্তু মিনিটে ৫ বারের কম
□ মিনিটে ৫ বারের বেশি

১২। যানবাহন চালানো অবস্থায় কতবার আপনার আসন তলদেশ বাইরে বেরিয়ে আসে ?

□ কখনই না
□ দিনে ৫ বারের কম
□ দিনে ৫ বারের বেশি, কিন্তু ঘণ্টায় ৫ বারের কম
□ ঘণ্টায় ৫ বারের বেশি, কিন্তু মিনিটে ৫ বারের কম
□ মিনিটে ৫ বারের বেশি

১৩। আপনি কি আপনার পেশায় যান্ত্রিক কম্পন বা স্পন্দন দ্বারা অস্বস্তিবোধ করেন ? হ্যাঁ □ না □

১৪। আপনার পেশায় আপনি দিনে কত ঘন্টা কম্পন ছাড়া বসে থাকেন ? _____ ঘন্টা

সপ্তাহে কত দিন কম্পন ছাড়া বসে কাটান ? _____ দিন।

বছরে কত সপ্তাহ কম্পন ছাড়া বসে কাটান ? _____ সপ্তাহ।

১৫। আপনি কি প্রায়ই এবং/অথবা অনেক সময়ের জন্য কম্পন ছাড়া মোচড়ানো অঙ্গস্থিতি বজায় রাখেন ? হ্যাঁ □ না □

১৬। আপনি আপনার পেশায় সচরাচর দিনগুলোতে কত ঘন্টা দাঁড়িয়ে অথবা হাটাহাটি করে কাটান ? _____ ঘন্টা

সপ্তাহে কত দিন আপনি কাজ করেন ? _____ দিন। বছরে কত সপ্তাহ আপনি কাজ করেন ? _____ সপ্তাহ।

১৭। আপনার পেশায় কি কোন কিছু উত্তোলন করা বা তোলার কাজ আছে ? হ্যাঁ □ না □

৫ কেজি অথবা তার কম (১০ পাউন্ড) □ দিনে কতবার _____

৫-১০ কেজি (১০-২০ পাউন্ড) □ দিনে কতবার _____

১০ কেজির বেশি (২০ পাউন্ড) □ দিনে কতবার _____

১৮। আপনি কি নাজুক অঙ্গস্থিতিতে কোন কিছু উত্তোলন করেন (ঝুঁকে বা মুচড়িয়ে) ? হ্যাঁ □ না □

১৯। আপনি যদি আপনার পেশায় চালানো এবং উত্তোলনের কাজ করে থাকেন, তাহলে গাড়ি চালানোর পরপরই কতবার উত্তোলন করার কাজ করেন ? কদাচিৎ □ মাঝেমাঝে □ প্রায়ই □

২০। আপনার পেশার মধ্যে নিচের যেকোন অবস্থাগুলো কি অন্তর্ভুক্ত (গড়পড়তায় কাজের দিনগুলোতে) ? অনেক সময়ধরে বা পুনঃপুন কাজ করা হয় পিঠেরঃ সামনে, পেছনে অথবা পার্শ্বদেশে ঝুঁকে হ্যাঁ □ না □

মোচড়ানো অবস্থায় হ্যাঁ □ না □

একই সাথে ঝুঁকে এবং মুচড়িয়ে হ্যাঁ □ না □

অন্য কোন অস্বস্তিকর/অস্বাভাবিক অঙ্গস্থিতি ? _____

২১। আপনার পেশায় কি বারবার, অনেকসময় ধরে এবং অস্বস্তিকর অবস্থায় কোন কিছু বহন করা, ধাক্কা দেয়া অথবা টেনে তোলার কাজ অন্তর্ভুক্ত ? হ্যাঁ □ না □

২২। আপনার পেশায় এমন এর কোন ধরনের কাজ করতে হয়, যা আপনার পিঠের নিচের অংশে (কোমোড়) এবং ঘাড়ে চাপ/অশান্তির সৃষ্টি করে ? _____

২৩। আপনার কাজের দিনগুলোতে আপনি কতবার বিরতি নেন (এর মানে যানবাহন থেকে বাইরে থাকেন) ? _____

২৪। আপনার বিরিতির সময়কাল কতটুকু দীর্ঘ হয় ? _____ মিনিট

২৫। আপনি আপনার বিরতির সময় কি করেন ? হাঁটাহাঁটি □ বসে থাকা □ দাঁড়িয়ে থাকা □ অন্যান্য □

"এই প্রশ্নাবলী পূরণ করার জন্য আপনাকে ধন্যবাদ"

Appendix 8

Permission letter from the author of Nordic Musculoskeletal Questionnaire

RUSH UNIVERSITY MEDICAL CENTER IT'S HOW MEDICINE SHOULD BE

arifhossain14ot.crp@gmail.com

Last Sign In: Aug 9, 2014 3:50 AM

Received: Aug 8, 2014 2:11 PM
Expires: Aug 22, 2014 2:11 PM
From:gunnar_andersson@rush.edu
To:arifhossain14ot.crp@gmail.com
Subject:RE: Permission for using Nordic Musculoskeletal Questionnaire (NMQ)

This message was sent securely using ZixCorp.

Dear Dr. Hossain,

You certainly have my permission to use the Nordic Musculoskeletal Questionnaire in your study. Appropriate reference to the publication be much appreciated. Good luck in your study.

Sincerely yours,

Gunnar B. J. Andersson, MD, PhD

From: Arif Hossain [arifhossain14ot.crp@gmail.com]
Sent: Wednesday, August 06, 2014 8:05 AM
To: Gunnar Andersson
Subject: Permission for using Nordic Musculoskeletal Questionnaire (NMQ)

Mr. Andersson,

I am Md. Arif Hossain , a 4th year student of B.Sc. in Occupational Therapy of Bangladesh Health Professions Institute (BHPI), the academic institute of Centre for the Rehabilitation of paralysed (CRP). I am writing you to get permission from you to use your Nordic Musculoskeletal Questionnaire (NMQ) in my study. I obtained your e-mail address from ***https://www.rushortho.com/cv/cvAndersson.pdf***.

For the fulfillment of the requirements of Bachelor degree it is compulsory to conduct a research project in 4th year. My study title is"Musculoskeletal Symptoms Prevalence and Associated Risk Factors Among Occupational Bus Drivers In Bangladesh". Under this study I want to use your questionnaire but as a student in Bangladesh it is quite difficult for me to purchase this questionnaire due to economic barrier.

So, I request you please grant me by giving your valuable permission to use your NMQ in my study and oblige thereby. Thank you for your patience and cooperation. I am eagerly looking forward to hearing from you.

Respectfully,
Md. Arif Hossain
Occupational Therapy Department
Bangladesh Health Professions Institute (BHPI)
Centre for the Rehabilitation of the Paralysed (CRP)
Email: **arifhossain14ot.crp@gmail.com**

This message was secured by **ZixCorp**(R).

Rush University Medical Center
1653 W. Congress Parkway, Chicago, Illinois 60612

Appendix 9

Permission order of Guidelines for Whole-Body Vibration: Health Surveillance Questionnaire

Thank You For Your Order!

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Appendix 10

Information Sheet and Consent Form in English

Information Sheet

I am Md. Arif Hossain, a 4th year student of the Bachelor of Science in Occupational Therapy of Bangladesh Health Professions Institute (BHPI), the academic institute of Centre for the Rehabilitation of the Paralyzed (CRP), Chapain, Savar, Dhaka-1343. For the fulfillment of requirements for the Bachelor Degree, it is compulsory to conduct a research project in 4th year. I would like to invite you to take part in my study. The research title is "Musculoskeletal Symptoms Prevalence and Associated Risk Factors Among Occupational Bus Drivers In Bangladesh" and the aim is "To investigate the musculoskeletal symptoms prevalence and its associated risk factors among occupational bus drivers in Bangladesh."

Your participation in this study is voluntary. You are not forced to participate at all. If you want to withdraw from the study, you may do that at any time without any hesitation. You will not be harmed/injured or disadvantaged by the study.

Only your personal details (not including your identity such as name) and answers of the questionnaire will be documented and used for the study purpose. Without investigator and study supervisor nobody will permit to know the data associated with study. The investigator will maintain confidentiality of all proceedings. Without your permission, the data provided by you will never be used.

If you take part in the study it may need nearly 22 minutes. You will not be paid for your participation.

Consent Form

To be completed by the:

A. Participant (if participant is literate)/Investigator (if participant is illiterate)

1. Have you read the information sheet? Yes/No
2. Have you had an opportunity to discuss this study and ask any question? Yes/No
3. Have you had satisfactory answers to all of your questions? Yes/No
4. Have you received enough information about the study? Yes/No
5. Was the study explained to you? Yes/No
6. Do you understand that you are free to withdraw from the study at any time, without having to give a reason? Yes/No
7. Information collected by the investigator from you might be examined by other research assistants. However, all personal details will be treated as highly confidential. Will you give permission for these individuals to have access to your records? Yes/No
8. Have you had sufficient time to come to your decision? Yes/No
9. Do you agree to take part in this study? Yes/No

By signing below you are agreeing that you have read and understood above questions and give accord you are taking part in this study voluntarily (without coercion).

Participant's signature/thumb-mark: _____ Date: _____

B. Investigator

I have explained the study to the above participant precisely and she has indicated her willingness to take part in the study.

Investigator's signature: _____ Date: _____

Appendix 11

Information Sheet and Consent Form in Bengali

তথ্যপত্র

আমি মোঃ আরিফ হোসেন, পক্ষাঘাতগ্রস্থদের পুনর্বাসন কেন্দ্র (সিআরপি) এর একটি শিক্ষা প্রতিষ্ঠান, বাংলাদেশ হেলথ প্রফেশন্স ইনস্টিটিউট (বি এইচ পি আই), চাপাইন, সাভার, ঢাকা-১৩৪৩, এর অকুপেশনাল থেরাপীতে অধ্যায়নরত স্নাতক শ্রেণীর একজন ৪র্থ বর্ষের ছাত্র। স্নাতক ডিগ্রীর পরিপূর্ণতার প্রয়োজনে ৪র্থ বর্ষে একটি গবেষণা কর্ম পরিচালনা করা বাধ্যতামূলক। আমি আমার গবেষণায় অংশগ্রহণ করার জন্য আপনাকে আমন্ত্রণ জানাচ্ছি। গবেষণার শিরোনামটি হলো "বাংলাদেশের পেশাজীবী বাস চালকদের পেশী ও অস্থি সম্বন্ধীয় সমস্যার প্রাদুর্ভাবের হার এবং কাজের পরিবেশ সংক্রান্ত ঝুঁকিসমূহ" এবং এই গবেষণার লক্ষ্য হল বাংলাদেশের পেশাজীবী বাস চালকদের পেশী ও অস্থি সম্বন্ধীয় সমস্যার প্রাদুর্ভাবের হার এবং কাজের পরিবেশ সংক্রান্ত ঝুঁকিসমূহের কারন খুঁজে বের করা।

এই গবেষণায় আপনার অংশগ্রহণ ঐচ্ছিক। যদি আপনি এই গবেষণা থেকে নিজেকে প্রত্যাহার করতে চান, আপনি যে কোন সময় কোন দ্বিধা ছাড়াই তা করতে পারেন। এই গবেষণার দ্বারা আপনি ক্ষতিগ্রস্থ বা অসুবিধাপ্রাপ্ত হবেন না।

একমাত্র আপনার ব্যক্তিগত বিবরণ (নাম ব্যতীত) ও প্রশ্নপত্রের উত্তরসমূহের দলিল রাখা এবং ব্যবহার করা হবে এই গবেষণার উদ্দেশ্যে। গবেষক এবং গবেষণার তত্ত্বাবধায়ক ব্যতীত অন্য কাউকে গবেষণা বিষয়ক তথ্যাবলী সম্বন্ধে অবহিত করা হবে না। গবেষক গবেষণা চলাকালীন প্রতিটি ধাপে গোপনীয়তা বজায় রাখবেন। আপনার অনুমতি ছাড়া, আপনি যে তথ্যাবলী দিয়েছেন তা কখনোই ব্যবহার করা হবে না।

আপনি যদি গবেষণায় অংশগ্রহণ করেন তাহলে এর জন্য আনুমানিক ২২ মিনিটের মত সময় লাগতে পারে। আপনার অংশগ্রহণের জন্য আপনাকে আর্থিক সুবিধা প্রদান করা হবে না।

সম্মতিপত্র

পরিপূর্ণ করা হবে যাদের দ্বারাঃ

ক. অংশগ্রহণকারী (যদি অংশগ্রহণকারী শিক্ষিত হয়) অথবা গবেষক (যদি অংশগ্রহণকারী অশিক্ষিত হয়)

১. আপনি কি তথ্যপত্র পড়েছেন অথবা জেনেছেন ? হ্যাঁ/না

২. এই গবেষণা আলোচনা এবং কোন প্রশ্ন জিজ্ঞাসা করাতে আপনার কি সুযোগ হয়েছে ? হ্যাঁ/না

৩. আপনি কি আপনার সকল প্রশ্নসমূহের সন্তোষজনক উত্তরসমূহ পেয়েছেন ? হ্যাঁ/না

৪. গবেষণা সম্পর্কে আপনি কি যথেষ্ট তথ্য গ্রহণ করেছেন ? হ্যাঁ/না

৫. গবেষণাটি কি আপনার কাছে ব্যাখ্যা করা হয়েছিল ? হ্যাঁ/না

৬. কোন কারণ দেয়া ছাড়াই যে কোন সময় গবেষণা থেকে প্রত্যাহার করায় আপনি স্বাধীন, এটা কি আপনি বুঝতে পেরেছেন ? হ্যাঁ/না

৭. গবেষক আপনার থেকে যে তথ্য সংগ্রহ করবে তা অন্য সহযোগী গবেষক দ্বারা পরীক্ষিত হতে পারে। যাহোক, সকল ব্যক্তিগত বিবরণ সর্বোচ্চ গোপণীয় হিসেবে পরিচালনা করা হবে। এই ব্যক্তিদেরকে আপনার বিবরণীসমূহে প্রবেশের জন্য আপনি কি অনুমতি দিবেন ? হ্যাঁ/না

৮. আপনি আপনার সিদ্ধান্তে আসতে কি পর্যাপ্ত সময় পেয়েছেন ? হ্যাঁ/না

৯. এই গবেষণায় অংশগ্রহণ করতে আপনি কি সম্মত ? হ্যাঁ/না

নিচে স্বাক্ষর করার মাধ্যমে আপনি প্রকাশ করছেন যে আপনি উপরের প্রশ্নগুলো পড়েছেন, বুঝতে পেরেছেন, সম্মতি দিচ্ছেন এবং এই গবেষণায় ঐচ্ছিকভাবে অংশগ্রহণ করছেন (জোরপূর্বক ব্যতিরেকে)।

অংশগ্রহণকারীর স্বাক্ষর/টিপসইঃ _____ **তারিখঃ** _____

খ. গবেষক

আমি গবেষণাটি উপরের অংশগ্রহণকারীকে যথাযথভাবে ব্যাখ্যা করেছি এবং এই গবেষণায় অংশগ্রহণ করতে সে তার ইচ্ছা নির্দেশ করেছে।

গবেষকের স্বাক্ষরঃ _____ **তারিখঃ** _____