

**THE PREVALENCE AND POSTURAL RISK LEVEL  
IDENTIFICATION FOR DEVELOPING MUSCULOSKELETAL  
SYMPTOMS (MSS) AMONG DAIRY FARM WORKERS IN  
BANGLADESH**



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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.

No person's work has been used without due acknowledgement in the main text of the thesis.

This thesis has not been submitted for the award of any other degree or diploma in any other tertiary institution.

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

With my signature I declare the accuracy of these specifications

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## Abstract

**Background:** The Musculoskeletal symptoms in working population represent one of the most important worrying health related issues in working population in recent time. The MSSs prevalence is growing day by day all group of working population and dairy farm workers are also the same conditions as like as other professions. The prevalence of musculoskeletal symptoms (MSS) among Bangladeshi dairy farm workers has not been investigated. So, the purpose of this study is to assess the prevalence of MSS and identify the postural risk levels for developing MSS among dairy farm workers in Bangladesh.

**Methodology:** A cross-sectional study was performed with 105 dairy farm workers conveniently selected from Savar. Two questionnaires were used for the study. The NMQ was used to determine the prevalence & the REBA was used to identify the postural risk level for developing musculoskeletal symptoms among dairy farm workers.

**Result:** The results showed that the prevalence of musculoskeletal symptoms during the 12 months preceding data collection was 95.2%, & the normal activities disruption prevalence was 79.0%. The most affected body parts was the lower back 81.9%. The proportion of neck 70.5%, knee 67.6%, wrist/hand 60.0%, shoulders 30.5%, ankle/feet 22.9%, elbows 17.1%, upper back 17.1% and hip/thigh/buttock 7.6% during the 12 months. The highest prevalence of normal activities disruption at last 12 months was lower back 59.9%. The proportion of neck 54.3%, knee 51.4%, wrist/hand 32.4%, shoulders 18.1%, ankle/feet 17.1, upper back 8.6%, hip/thigh/buttock 4.8, elbows 3.8%. There had no significant association between socio-demographic factors and musculoskeletal symptoms in last 12 months. The risk level to dairy farm workers was found to be 21.0% medium risk, 70.5% high risk and 8.6% very high risk level.

**Conclusion:** There is a high prevalence of lower back musculoskeletal symptoms among dairy farm workers. Therefore more education for farm workers about effective ergonomic management is necessary in order to significantly reduce lower back MSS.

**Key terms:** *Prevalence, Musculoskeletal symptom, Dairy farm workers, Bangladesh.*

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## **List of Acronyms**

**MSDs:** Musculoskeletal Disorders

**MSP:** Musculoskeletal Pain

**MSS:** Musculoskeletal Symptom

**WMSDs:** Work-related Musculoskeletal Disorders

**WMS:** Work-related Musculoskeletal

**BMI:** Body Mass Index

**ADL:** Activities of Daily Living

**BHPI:** Bangladesh Health Professions Institute

**CRP:** Centre for the Rehabilitation of the Paralysed

**REBA:** Rapid Entire Body Assessment

**NMQ:** Nordic Musculoskeletal Questionnaire

**SNQ:** Standardized Nordic Questionnaire

**NMQ:** Nordic Musculoskeletal Questionnaire



# CHAPTER 1 INTRODUCTION

## 1.1. Background

The dairy industry is one of the most significant components of the world food system and is currently undergoing dramatic change. These changes are being driven by a wide range of forces including shifts in the regulatory environment related to dairy production, international trade agreements, consumption trends of dairy products, and changes in technology and the workforce. If the changes seen in the past decade are an indication of the future, it is highly probable that the global dairy industry will look very different in 2020 than it does today (John and David, 2012).

Dairy farmers and workers are exposed to a variety of physical work environment factors that can affect their physical health (Kolstrup, 2008). Douphrate *et al.* (2009) report that a high physical work load, awkward work postures, and repetitive movements, which constitute a risk factor for developing physical health problems such as musculoskeletal disorders (MSD), are associated with dairy farming. A number of international studies confirm that musculoskeletal problems are extensively reported by dairy farmers and workers (Kolstrup and Hultgren, 2011). Farmers appear to have more musculoskeletal symptoms than do non-farmers (Holmberg, 2002).

The prevalence of musculoskeletal problems is very high in most countries. Every year more than 1 million people are affected by work-related musculoskeletal disorders in Bangladesh (Musculoskeletal disorder in Bangladesh, 2010-11). In Korea, the proportion of occupational diseases has decreased, but MSDs has rapidly increased from 38.7% (2901) in 2005 to 67.3 % ( 7723) in 2007 (Park, Lim & Lee, 2010). Xiao *et al.* (2013) made a study in Hong Kong; they found that the prevalence of MSP in the population was higher among females than males. The results of the Douphrate *et al.* (2014) studies showed that females were significantly at risk for both lifelong prevalence of neck pain, and upper limb pain. Herringbone workers reported a higher prevalence of MSS in the wrist/hand, and rotary workers reported higher prevalence of MSS in the neck, upper back, and shoulders. According to the Swedish Work Environment Authority, 70% of reported occupational diseases among people engaged in Swedish farming relate to the musculoskeletal system, compared with 55% for all other occupations (Swedish Work Environment Authority, 2010).

In the European Union, MSD are the most commonly reported work-related health problems, with 23% of European workers reporting that they suffer from aches and pains in the musculoskeletal system (European Agency for Safety and Health at Work, 2007).

Musculoskeletal injuries are common among dairy farm workers. A cross-sectional study of 452 dairy farm workers found that 76% had at least one body part affected by an occupationally related musculoskeletal injury, most commonly in an upper extremity (National Center for Farmworker Health, 2014).

Kolstrup (2012) found the following statistics in farmers and farm workers: 50% of farmers had MSD in the lower back and the 47% MSD in the shoulders; 43% of farm workers had MSD in the lower back and the 43% MSD in the shoulders. MSD were also frequently reported in the neck (33%) among farmers, and in the hands/wrist (41%) among farm workers. MSD in the elbows (23%) and feet (21%) were significantly more frequently reported by farmers than farm workers (5%). Female farmers and farm workers both reported significantly higher frequencies of MSD in the neck (48% and 56%, respectively) and hands/wrists (44% and 61%, respectively) than their male colleagues (24% and 5%; 10% and 21%, respectively). In addition, female farm workers had significantly higher reported frequencies of MSD in the upper and lower back (39% and 61%, respectively) than their male counterparts (5% and 26%, respectively).

Xiao *et al.* (2013) states that, musculoskeletal pain develops from repeated exposures to a stressor among farm workers. Cumulative forces may cause soft tissue damage, leading to inflammatory responses and pain. Long-term exposure to heavy physical work, heavy lifting and carrying, whole-body vibration, and work in awkward postures with trunk flexion may all be risk factors for low back pain.

Dairy workers with tasks in the milking parlor had more than five times very risk of carpal tunnel syndrome as compared to dairy workers with non-milking tasks (National Center for Farmworker Health, 2014). High velocity, repetitiveness and fewer opportunities for rest are risk factors that might lead to disorders in the wrists and hands (Stål, 2003). Age, sex and working with improper position, daily lifting of loads and physically strenuous work increases the risk of MSP significantly (korkmaz *et al.* 2011). Males were more likely to perform heavier manual handling duties and

tasks involving the use of machinery, whereas females performed more routine administration work. Both men and women were exposed to similar physical demands from the performance of a number of commonly reported and strenuous tasks (Innes and Walsh, 2010). High prevalence of hand and wrist symptoms has been found in females working with machine milking (Stål *et al.* 1999). The female farm workers reported MSD more frequently in all the body parts. Low back, knee, and shoulder musculoskeletal symptoms were most frequently reported among workers in smaller dairy operations (Doupbrate *et al.* 2009).

Musculoskeletal symptoms, especially of the lower back, neck and shoulders are also common. Studies show that female dairy farm workers were greatly at risk for both lifelong prevalence of neck pain, and other musculoskeletal injuries (National Center for Farmworker Health, 2014). Musculoskeletal symptoms which are often soft tissue injuries occur when there is a mismatch between the physical requirements of the job and the physical capacity of the human body (European Agency for Safety and Health at Work, 2007).

Park, Lim and Lee (2010) made a study of WMS in dairy farmers against a number of different variables. They found that there were no work-related risk factors involving the neck, arms/elbows, hands/wrists/fingers, and legs/feet in relation to BMI, marital status, number of cows per person of feeding. Based on univariate analysis, gender was an important factor in hands/wrists/finger WMS, low back WMS, and legs/feet WMS. Education was important in shoulders WMS, low back WMS, and legs/feet WMS. Working duration was important in shoulders WMS and legs/feet WMS. Milking and cleaning stalls were important in low back WMS. Based on multiple logistic regression, working duration of 20 years or more was significant in shoulders WMS. Education and milking for 4 or more hours per day were significant in low back WMS.

Lower extremity risk factors included the duration of farming greater than or equal to 10 years, working longer than 5 hours daily in animal barns, milking more than 40 cows, number of years as a dairy farmer and/or farm workers (Osborne *et al.* 2012).

Park, Lim and Lee (2010) states that, The risk factors for MSS include awkward postures, repetition, force, vibration, velocity of work, tool design, and personal factors. Farming is a physically demanding occupation with work tasks that cause

MSDs and work disabilities, such as lifting heavy objects, moving and carrying equipment and awkward working postures. Similarly, dairy farming-related work, such as milking, cleaning stalls, feeding, caring for calves, and milk processing can have a negative impact on the musculoskeletal system.

If dairy farm workers sustain musculoskeletal symptoms for a long period of time they can develop Musculoskeletal Disorders. If MSDs interrupt workers ADLs because he is sick, production of the dairy farm will be lost or hampered, and this will be vulnerable for our economy.

On pub med, Google scholar, there are some articles about dairy farm workers, and this type of research is held in different countries but no research held in Bangladesh. That means there is no established article in Bangladesh about dairy farm workers. Bangladeshi culture is different from other countries so working patterns and the materials that the dairy farm workers use on their farm is different from other countries. Within the world several studies have been conducted about dairy workers but there has been no conducted study about dairy farm workers in Bangladesh. So the researcher has selected this topic.

This type of research will be helpful for the dairy farm workers in Bangladesh and also helpful for those people who work with the dairy farm workers in future. So this is why the researcher has selected this topic.

## **1.2. Significance of the study**

In Bangladesh, there are many peoples are working in this area as a dairy farm. But there are no published articles in Bangladesh about MSSs among dairy farm workers. The purpose of this study is threefold: to assess the prevalence of musculoskeletal symptoms, to identify risk levels for developing musculoskeletal symptoms, and to discover if MSSs interrupt daily normal activities. This study result will be used in future for further study. So this study will provide the baseline evidence for the future. It will be help to established ergonomic guidelines for the dairy farm workers which are mandatory for the dairy farm workers. This study will also help to discover the lacking area of dairy farm, especially about their posture before doing any activities in dairy farm. Beside this it will be help to professional development which is mandatory for an occupational therapist in current situation. In the occupational therapy view, it

is very important to know the ergonomic risk factors of dairy farm workers, because the occupational therapist has a major role in the ergonomics area. It will help to discover the role and importance of occupational therapy in this sector of Bangladesh. This study will benefit those workers who are already affected by different type of disorder and risk developing MSS in the future. As a result of this research, workers will know about the risk factors and then they may take necessary steps to avoid them.

### **1.3. Aim of the study**

To discover the prevalence and postural risk level identification for developing musculoskeletal symptoms among dairy farm workers in Bangladesh.

### **1.4. Objectives of the study**

- To identify the prevalence of musculoskeletal symptoms in the last 12 months among dairy workers in Bangladesh.
- To find out the prevalence of interruption of daily normal activities due to musculoskeletal symptoms in the last 12 months.
- To find out the association between demographic factors and musculoskeletal symptoms in the last 12 months.
- To identify the ergonomic postural risk level (negligible, low, necessary, high, and very high) for developing musculoskeletal symptoms.

## CHAPTER:2 LITERATURE REVIEW

### 2.1. Prevalence of dairy farm workers

The proportion of individuals in a population has a disease or characteristic. Prevalence is a statistical concept referring to the number of cases of a disease that are present in a particular population at a given time, whereas incidence refers to the number of new cases that develop in a given period of time. In this research the researcher tries to find out the musculoskeletal symptoms prevalence among dairy farm workers in last 12 months.

Lifetime prevalence and 1-year prevalence rates for farmers are very high; two studies recorded rates of 90.6 (Holmberg *et al.* 2002) and 92% (Kolstrup *et al.* 2006).

The most frequently reported upper limb pain. They showed a higher prevalence for neck (68.9%), shoulder (73.4%) and low back pain (59.2%). Results between 1997 and 2005 there were more than 50,000 workers' compensation accepted claims for WMSDs per year in Washington State (Work-related Musculoskeletal Disorders of the Neck, Back, and Upper Extremity in Washington State, 1997-2005).

Using the Nordic questionnaires, a study of neck and upper extremities MSS for Iowa dairy farmers in the USA indicated that the prevalence of neck MSS was 43%, shoulders 54%, elbows 24%, and wrists/hands 40 % (Park, Lim and Lee, 2010).

Three-fourths (76.4%) of parlor workers reported work-related MSS in at least one body part. Highest prevalence was reported in the upper extremity (55%). Herringbone workers reported a higher prevalence of MSS in the wrist/hand, and rotary workers reported higher prevalence of MSS in the neck, upper back, and shoulders (Doughrate *et al.* 2014).

Park, Lim and Lee (2010) stated that the most commonly reported musculoskeletal problems were back pain (22%), knee pain (15%), foot pain (15%), and hand pain (14%). Among Kansas farm workers, the 12-month period prevalence of musculoskeletal pain was 37.5% for low back pain, 25.6% for shoulder pain, 23.6% for knee pain, and 22.4% for neck pain (Xiao *et al.* 2013). MSD were frequently reported by dairy farm workers (86%), most often in the upper extremities (52%) and the back (60%). Female dairy farm workers reported MSD more frequently in all

body parts, especially the shoulders (71%) and wrists/hands (57%), than their male colleagues (36% and 11%, respectively) (Park, Lim and Lee, 2010).

## **2.2. Musculoskeletal symptoms**

Symptoms of musculoskeletal disorders can hamper everyday tasks, such sitting, walking, gripping. Work-related muscular pains in shoulders, neck and/or upper/lower limbs not only pain but also soreness, numbness, discomfort, ache in different body parts. Cambridge advanced learner's dictionary (2008) states that; musculoskeletal symptoms (MSS) include pain, sensitivity, weakness, swelling, and numbness.

**Pain:** pain originating musculoskeletal system and it is physical feelings cause by injury.

**Ache:** A continuous pain which unpleasant but not strong. It is used in combination with parts of the body to means continuous pain in the stated part.

**Discomfort:** A feeling of being uncomfortable physically or mentally, or something that causes short sleep during the day.

**Numbness:** numbness describes a loss of sensation or feelings in a part of body.

### **2.2.1. Musculoskeletal disorder**

Musculoskeletal disorders are injuries of muscle, nerve, tendon, ligament, joint, cartilage, or spinal discs. In Musculoskeletal disorder, different body parts are affected (Such as, shoulder, arm, wrist, upper and lower back, knee, ankle etc. (Dul and weerdmeester, 2008). Musculoskeletal disorders (MSDs) refer to conditions that involve the nerves, tendons, muscles, and supporting structures of the body (Park, Lim and Lee, 2010).

### **2.2.2. Work related musculoskeletal disorder**

Work related musculoskeletal disorders (or injuries) are a group of painful disorders of muscle, tendon & nerves. Work activity which are frequent & repetitive, or activities with awkward postures cause these disorders which may be painful during work or rest (Canadian Centre for Occupational Health & Safety, 2005).

Work-related musculoskeletal disorders are not typically the result of an acute or event but rather the result of chronic development. Repetitive motion, excessive force, awkward and/or sustained postures, prolonged sitting and standing have been

associated with WMSDs. Osborne *et al.* (2012) stated that during the working day farm workers are exposed to a variety of these physical hazards: Lifting and carrying heavy loads, working with the trunk in sustained flexion, risk of trips and falls on slippery and uneven walkways, unpredictable actions of livestock, and exposure to vibration from farm vehicles and power hand tools. Many farm work tasks are physically very strenuous, and farmers and farm workers are at particular risk of developing MSDs compared with other workers.

### **2.3. Physical risk factors**

Physical risk factors are the aspects of a job or task that make force a biomechanical stress on the worker. Physical risk factors are the most synergistic elements of musculoskeletal disorder hazards or problems (Environmental Health & safety, 2005). There are different studies shown that the exposure to physical risk factors in the workplace can cause or contribute to the risk of developing the MSDs (Environmental Health & safety, 2005). Musculoskeletal disorders arise from ordinary arm and hand movements such as bending, straightening, gripping, holding, twisting, clenching and reaching (Dul and Weerdmeester, 2008). These common movements are not particularly harmful in everyday life while performing the ordinary activities (Canadian Centre for Occupational Health & Safety, 2005). It makes them hazardous in work situations if it is the continual repetition, often in a forceful manner and most of all, the speed of the movements and the lack of recovery time (Environmental Health & safety, 2005; Canadian Centre for Occupational Health & Safety, 2005).

MSDs are associated with work patterns that include (Canadian Centre for Occupational Health & safety, 2013):

- ❖ Awkward postures
- ❖ Force
- ❖ Repetition
- ❖ Lifting



### **2.3.1. Awkward posture**

There are two aspects of body posture that contribute to the development of injuries in jobs involving repetitive tasks (Canadian Centre for Occupational Health & Safety, 2005). The first relates to the position of the body part is upper limb, usually the upper limb that performs the actual task. Like the tasks that require repetitive movements to the extreme ranges of the joint in the wrists, elbows or shoulders contribute to the occurrence of a painful condition in those areas (Canadian Centre for Occupational Health & Safety, 2005). Poor layout of the workstation and improper selection of equipment and tools can lead to these hazardous body movements (Dul and Weerdmeester, 2008).

The other postural aspect is the fixed position of the neck and the shoulders. This postural aspect that's responsible for the contribution of MSDs (Canadian Centre for Occupational Health & Safety, 2005). To perform any controlled movement of an upper limb, the worker must need to stabilize the shoulder-neck region (Dul and Weerdmeester, 2008). The muscles in the shoulder and the neck contract and stay contracted to hold the position stable for as long as the task requires, then the contracted muscles create pressure on the vessel (Dul and Weerdmeester, 2008).

The contracted muscles squeeze the blood vessels & this restricts the flow of blood all the way down to the working muscles of the hand where the blood, because of the intense muscular effort, is needed the most (Canadian Centre for Occupational Health & Safety, 2005). The neck-shoulder muscles become fatigued, even though there is no movement. This contributes to pain in the neck area. At the same time, the reduced blood supply to the remaining parts of the upper limb accelerates fatigue in the moving muscles, making them more susceptible to injury (Canadian Centre for Occupational Health & Safety, 2005).

#### **2.3.1.1. Maintaining same work positions or posture for a long period**

The maximum people usually complaint that when they worked for a long time in the same position, they feel "stiff, sore and tired." There are some effects to the development of MSDs that result when tasks involve static postures (Environmental Health & safety, 2005).

Static postures increase the amount of force on the muscles & required more force to do a task because, in addition to the force required performing the task. The effects of

maintaining the same work positions can occur in almost all joint of the body. So the static posture has a major role to increase the MSDs (Dul and Weerdmeester, 2008).

### **2.3.1.2. Sitting for a long time**

The majority peoples are worked in a sitting position while performing any task, sitting for long periods without the opportunity to stand up and move around is another way in which employees are exposed to static loading of tissues, primarily in the lumbar area of the back. It can also affect the upper back, neck and legs. The problem is exacerbated where awkward postures are also present (Environmental Health & safety, 2005).

Employees may be exposed to static postures when they must sit for a prolonged period on chairs, stools or benches that do not provide adequate lumbar support, that is, there is no back rest on the seat (Dul and Weerdmeester, 2008). When there is no lumbar support and the back is bent forward, the muscles of the back are trying to force the lumbar region out of its natural curve (proper alignment of the vertebrae), which places pressure on the discs and reduces blood supply to the spinal tissue. The constant exertion of the contraction forces leads to muscle fatigue (Smith, 2008).

When the back muscles become sore, people tend to slouch & the posture more force is being placed on the back and the discs. As the static loading continues, pressure continues to be applied to the membranes of the discs and they may become stressed. Stressed discs, in turn, may put pressure on blood vessels and may pinch a nerve (sciatic nerve), which results in pain & discomfort (Environmental Health & safety, 2005).

When the chair has a back rest with lumbar support to help maintain the back in a neutral position (Smith, 2008), employees still may continue to be exposed to static loading because they cannot take advantage of the back rest & the measurement of the back rest is not appropriate for the employees (Dul and Weerdmeester, 2008). Many employees respond by sitting forward, instead of against the back rest, so that their feet can be on the ground, thus pressing the spine out of the natural curve and placing pressure on the discs (Smith, 2008).

### **2.3.1.3. Bending or twisting**

Bending or twisting while manual handling creates an awkward posture and changes the way forces are distributed in the spine (Dul and Weerdmeester, 2008). When the spine is in its natural position, forces are directed along the bony structure and distributed into the tissue as the spine curves. However, bending and twisting redirects the forces, placing more compressive and shear forces on the discs (Violante, Armstrong and Kilbom, 2000).

### **2.3.2. Repetition**

Many jobs that involve repetition of the same job again and again are apparent even upon cursory observation: assembly line jobs where motions are repeated every few seconds, data processing jobs, mechanics, directory assistant operators, court reporting, letter and package sorting (Environmental Health & safety, 2005). Workers performing highly repetitive tasks are at the highest risk for developing of MSDs (Violante, Armstrong and Kilbom, 2000). This evidence shows that repetition of movements is most likely the strongest risk factor for developing MSDs. Although, it never acts separately, it is the combination of many factors. Tasks requiring repetitive movements always involve other risk factors for MSDs such as fixed body position and force as well as lifting (Canadian Centre for Occupational Health & Safety, 2005).

Repetitive movement jobs include performance of identical motions again and again, but also include repeating multiple tasks where the motions of each task are very similar and involve the same muscles and tissues (Environmental Health & safety, 2005). This is because the worker cannot fully recover in the short periods of time that are given between tasks. With time, the effort to maintain the repetitive movements, even if they involve minimal forces, steadily increases. When the work activity is continued in spite of the developing fatigue, injuries occur (Canadian Centre for Occupational Health & Safety, 2005).

Evidence in the Health Effects section shows a strong association between the occurrence of MSDs and jobs involving exposure to repetitive motion. The joints are most susceptible to repetitive motion injuries, especially the wrists, fingers, shoulders, and elbows. Repetitive work that is done with the foot (operating foot activated

controls) or knees (climbing ladders or using a carpet kicker) may also result in an MSD (Environmental Health & safety, 2005).

### **2.3.2.1. Performing motions constantly without short pauses or breaks in between (inadequate recovery time)**

Pace of work determines the amount of time available for rest and recovery of the body between cycles of a particular task. The faster the pace, the less time is available and the higher the risk for MSDs (Canadian Centre for Occupational Health & Safety, 2005).

Jobs that do not provide short pauses or breaks between motions or task cycles are often a problem because there may not be adequate time for muscles to recover from the effects of the exertion before the motion must be repeated (Dul and Weerdmeester, 2008). If there are no pauses between motions or the pauses are too short, the muscles cannot recover to the rested condition. Thus, the effects of the forces on the muscles accumulate and the muscles become fatigued and strained. The lack of adequate recovery time often occurs in jobs involving highly repetitive tasks (Dul and Weerdmeester, 2008). This happens when task cycle lengths are very short, which also means that the job involves a high number of cycle repetitions per minute.

For example, some research shows that tendons and muscles in the wrists may not be able to recover where repeated task cycles are less than 5 seconds in length, that is, they are repeated more than 12 times per minute (Environmental Health & safety, 2005).

Jobs involving constant muscle activity (static contractions) also may not provide adequate recovery time. These types of jobs may involve continuously holding hand tools (knife, paint brush, staple gun), which means that employees have constant exposure to static postures and low contraction forces (Environmental Health & safety, 2005).

The longer motions or job tasks are performed, the less likely that there will be adequate recovery time (Dul and Weerdmeester, 2008). The accumulation of exposure leads to muscle fatigue or overuse. In addition, where the intensity of exposure is greater, for example, in repetitive motion jobs that involve exposure to additional risk factors (force, awkward postures, or static postures), the increased forces required for

the exertion also increase the amount of recovery time that is needed (Dul and Weerdmeester, 2008). Any part of the musculoskeletal system involved in moving the body is subject to injury where there is inadequate recovery time, and the recovery times needed vary by body part. For example, although employees may not be at high risk for forearm injury if task cycles are 25 seconds long or not repeated more than 3 times per minute, they may be at high risk of shoulder injury under this regimen (Environmental Health & safety, 2005).

### **2.3.3. Forceful exertion**

It is easy to understand why jobs that require employees to apply a lot of physical effort may involve significant exposure to ergonomic risk factors and pose an increased risk of MSDs (Environmental Health & safety, 2005). The force required doing the task & the force also plays an important role in the onset of MSD (Canadian Centre for Occupational Health & Safety, 2005). More force equals more muscular effort, and consequently, a longer time is needed to recover between tasks. Since in repetitive work, as a rule, there is not sufficient time for recovery, the more forceful movements develop fatigue much faster (Violante, Armstrong and Kilbom, 2000). Exerting force in certain hand positions is particularly hazardous. The amount of force needed depends on the weight of the tools and objects that the worker is required to operate or move and their placement in relation to the worker's body (Violante, Armstrong and Kilbom, 2000). More strength has to be used, the farther away from the body the force has to be applied. The shape of the tool plays an important role, also. Tools that do not allow the best position of the wrist, elbow and shoulder substantially increase the force required. Worn and poorly maintained tools are very important as well. For example, a worn screwdriver, pliers with worn jaws, or dull scissors can increase the operating force as much as tenfold (Canadian Centre for Occupational Health & Safety, 2005).

Forceful exertions require an application of considerable contraction forces by the muscles, which cause them to fatigue rapidly during performing (Rahman, Aziz and Yusuff, 2009). The more force that must be applied in the exertion, the more quickly the muscles become fatigue. Excessive exposure to forceful exertions also leads to overuse of muscles and may result in muscle strain, soreness and damage (Rahman, Aziz and Yusuff, 2009). Performing forceful exertions can also irritate tendons, joints and discs, which lead to inflammation, fluid buildup, and constriction of blood vessels

and nerves in the area. Increased compression of nerves from the pressure imposed by inflamed tendons or muscle contractions may cause disorders of the nervous system (carpal tunnel syndrome and other nerve entrapment disorders) (Environmental Health & safety, 2005).

Injuries related to forceful exertions can occur in any tissue or joint. As mentioned above, back injuries from overexertion are a leading cause of workplace injuries and workers' compensation cases. A number of studies also show that repeated forceful exertions of the hands and arms are associated with work-related MSDs (using tools, pinching or pushing with the fingers) (Environmental Health & safety, 2005).

#### **2.3.4. Lifting heavy objects**

Lifting is an activity that is an essential part of everyday life. The lifting of heavy objects have major role to increase MSDs (Violante, Armstrong and Kilbom, 2000). Workers lift, lower and move items every day. The heavier the weight that has to be lifted lowered and/or moved. The heavier the weight, the closer the contraction required of the muscles will be to their maximum capability (Canadian Centre for Occupational Health & Safety, 2005). When muscles contract at or near their maximum, they fatigue more rapidly and the likelihood of damage to the muscle and other tissues involved in the activity (Violante, Armstrong and Kilbom, 2000).

##### **2.3.4.1. Manual handling**

Forceful manual handling activities are a leading cause of workplace injury and illness (Violante, Armstrong and Kilbom, 2000). Studies discussed in the Health Effects section indicate that employees performing manual handling tasks have a significantly higher risk of back injury where they are exposed to force, repetition and/or awkward postures in the job (Environmental Health & safety, 2005).

#### **2.4. Dairy farm workers**

A dairy is a business enterprise established for the harvesting of animal milk mostly from cows or goats, but also from buffalo, sheep, horses or camels for human consumption. A dairy is typically located on a dedicated dairy farm or section of a multi-purpose farm that is concerned with the harvesting of milk.

Dairy farming is a form of agriculture where livestock most commonly cattle are specially bred and artificially selected to produce greater quantities of milk than they

would naturally produce, to help fulfill a great demand by those who cannot raise their own cows to get their own milk. Cows (mature female bovines) are the most valued and prized possession of the dairy farm and are what make a dairy farm.

Those people who work in dairy farm is called dairy farm workers. Dairy farm workers work in a selected place and the workers use different type of equipment for preparation and feeding the animals, milking, Pasture management, herd management and animal caring. In the dairy farm some people preparation and feeding the animals, some people cutting grasses, some people milking, some people store the milk, some people pasteurized and homogenized before delivery, some sell the milk to the customer, some people clean the stalls. Those people are dairy farm workers.

## **2.5. Bangladesh**

Bangladesh is an over populated country and the country's population is almost evenly distributed throughout its 64 districts except for the three Hill Tracts districts. On average, a district has a population of about 1.8 million, a thana 230,000, a union 25,000 and a village 2,000. There are 490 thanas, 4,451 unions and 59,990 villages. There are 4 metropolitan cities and 119 municipalities in the country. The level of urbanization is low at 20%. This leaves 80% of the country's total population of about 120 million to live in the rural areas which primarily depend on a poorly developed agriculture for livelihood. The capital city of Dhaka has an estimated population of 8.58 million (The mangrove tours and travels, 2011). In Bangladesh lots of people are involved in working and they felt musculoskeletal problem and carrying out from activities. Nahar *et al.* (2012) states that in Dhaka city of Bangladesh complained of LBP; the prevalence is much higher in her study. Mahabub *et al.* (2006) state that in a developing country like Bangladesh, very little attention is given to the health problems of the workers in different unrecognized sectors, as there is no comprehensive occupational health service in Bangladesh.

## **CHAPTER 3 METHODOLOGY**

### **3.1. Study Design**

The investigator used cross-sectional method to conduct this study. Cross-sectional studies are carried out at one time point to or over a short period. They are usually conducted to estimate the prevalence of the outcome of interest for a given population. Cross sectional studies provide a ‘snapshot’ of the outcome at a specific point in time (Levin, 2006).

The study at one time point and estimate the prevalence of individual self-reported musculoskeletal symptoms in different body parts in last 12 months in the dairy farm workers. So the study gave a snapshot of prevalence and risk level of dairy farm workers musculoskeletal symptoms. So in this study used cross-sectional method for the research under quantitative study design.

### **3.2. Study setting & participants**

The data was collect in the Savar dairy farm. Its area is 792 hector. It is 24km far from Dhaka city. In this dairy farm there have a primary school, a high school and a mosque. There have 700 animals in this dairy farm. The study participants were who works in the dairy farm. There have 760 workers work in this dairy farm. There are some inclusion and exclusion criteria for select participant. These are,

#### **3.2.1. Inclusion criteria**

- Only the male participant’s was selected. In Bangladesh, only male who work in the dairy farm & the females are not involved in this work. So only the male participants were selected.
- The selected participant’s age was average 14-45 years. According to the Labour Law of Bangladesh 2006, the minimum legal age for employment was 14 (Daffodil International University, 2014). That’s why the participant’s minimum age was 14. The participant’s maximum age was 45 years. Above 45 years the person has possibility to affect different conditions like joint disease, postural abnormality and low back pain (Burnett, 2009).
- Participants working in dairy farm at least 12 months.
- Participants working in dairy farm at least 8 hours per day.



### 3.2.2. Exclusion criteria

- The workers who has joint disease such as (Rheumatoid Arthritis, Ankylosing Spondylitis, & other arthritic conditions), gout, diabetes and trauma during one year before data collection. Their symptoms are similar to as like work-related musculoskeletal symptoms (Punnett and Wegman, 2004).

### 3.3. Study sampling procedure

Convenient sampling was used in this study. Savar dairy farm was selected in convenient way for data collection. Survey was started when participant was fulfilling the inclusion criteria and they were response to give information and volunteer to participate in the study. So the researcher was selecting all dairy farm workers in savar dairy farm because the participant is available. Researcher told the workers about the study purpose and who was participate willingly researcher was selecting those people. In this way researcher was select the participant.

### 3.4. Sample size

105 dairy farm workers were select for the study. There is no stabilized prevalence of musculoskeletal symptoms among dairy farm workers in Bangladesh so the researcher use 50% prevalence and the Sample size is  $Z^2 PQ (1-P)/R^2 = (1.96)^2 \times .5 \times .5 / (.05)^2 = 372.4$  by using the standard formula of sample size calculation where confidence level is 95%. Here P= prevalence and that is 50% = .5, Z=constant number and that is 1.96, Q= (1-P) and that is .5, R= Sampling errors and that is 5%= .05. That is too difficult for the researcher to fulfill the participant within 2 months because researcher will get only 2 months for data collection. In this short time it is impossible to cover standard amount. And the researcher is under graduate and complete his\her researcher within a limited time so the researcher select 105 participant for the study. And the formula is  $Z^2 PQ (1-P)/R^2 = (1.64)^2 \times .5 \times .5 / (.08)^2 = 105.703$  sample size for the study. Where confidence level is 90%, P= prevalence and that is 50% = .5, Z=constant number and that is 1.64, Q= (1-P) and that is .5, R= Sampling errors and that is 5%= .05. Here researcher reduce the constant number of Z and R and get this result.

### 3.5. Data collection Instruments/Tools

- Paper
- Pen and pencil

- Consent form
- Questionnaire: Nordic Musculoskeletal Questionnaire (Dickinson *et al.* 1992), Rapid Entire Body Assessment (REBA) (Hignett, 2006; Hignett and McAtamney, 2000) and Demographic questionnaire.

### **3.5.1. Nordic musculoskeletal questionnaire**

In Nordic musculoskeletal questionnaire there are yes or no box for answering questions and separate box for different body parts. Every question will be answer by using tick in every box and there are 3 column the first column of this questionnaire will describe that have you at any time during the last 12 months had trouble (such as ache, pain, discomfort, numbness) in different body parts like neck, shoulder, elbow, wrist/hand, upper back lower back, thigh, ankle etc. The second column describe that 'have you had trouble during the last 7 days in different body parts. Last column describe that during the last 12 months have you been prevented from carrying out normal activities (e.g. Job, household, hobbies) because of this trouble. The questionnaire just takes only 5 to 10 minutes to complete and very easy to entry data in compute (Dickinson *et al.* 1992).

### **3.5.2 REBA (Rapid Entire Body Assessment)**

It was used to find out the risk level of dairy farm workers. This observational tool is specifically designed to be sensitive to the type of unpredictable working postures found in health care and other service industries. To define the initial body segment codes, specified simple tasks were analyzed with variations in the load, movement distance and height. The REBA was a quick & easy observational postural analysis tool for whole body activities to measure the risk of injury (Hignett, 2006). The postural analysis was a powerful technique for assessing work activities (Hignett and McAtamney, 2000). The movement & scoring system were used to analysis the postural movement. The position of the individual body segments was observed & the more there is deviation from the neutral posture the higher will the score of each body part (Hignett, 2006). Observer was observed the participant and codes the point according to their working posture & also codes the load/force & coupling (Hignett and McAtamney, 2000). There are 4 steps in REBA scale first is action level, 2nd REBA score, 3rd Risk level, 4th action (including further assessment).

Action level	REBA score	Risk level	Action (including further assessment)
0	1	Negligible	None necessary
1	2-3	Low	May be necessary
2	2-7	Necessary	Necessary
3	8-10	High	Necessary soon
4	11-15	Very high	Necessary now

(Hignett and McAtamney, 2000)

### 3.6. Data collection procedure

In this study, the data obtained with questionnaire and direct observation. Questionnaire prepared based on Standard Nordic Questionnaire, Rapid Entire Body Assessment and demographic questionnaire. Before data collection ethical approval for this study was obtained from ethical committee of BHPI and Dairy Farm authority.

The data collected after getting the verbal consent of the participant. In this study standardized Nordic questionnaire used. The validity and reliability of this questionnaire investigated and approved in different studies and several languages. The data collector described the purpose of the study to each participant and ask question to them and fulfill the questionnaire. Then the investigator asked the participant “Have you at any time during the last 12 months been prevented from doing your normal work because of any dis comfort”. After that, the data collector used the REBA to identify the physical risk factors of musculoskeletal symptoms among dairy farm workers. The observation was done in the actual workplace of the worker during their daily work time and gave a score of the abnormal posture. And depend on this score; severity was depending who was at high risk level. If anyone gets 4, in the REBA scores then the risk level is very high for the workers and in this way severity was measure. The workers were observed throughout the day. The focus of the observation was to identify and verify the presence of physical risk level according to REBA. Risk level were rated as present if the researcher observed the workers involved in any of the following: lift/ pull or push/ carry heavy loads (more than 20 kg); repetitive movement (repeated movements more than 4 times per minute); awkward and twisting movements (more than 20° flexion and extension

movement of the trunk, neck, upper arms, lower arms, wrist and leg); bending or extended reaching for objects and maintaining the same postural position for an extended period of time (more than one hour). Exerting force during lifting, pulling, pushing; scattered tools in the working environment (yes or no).

### **3.7. Data analysis**

Data entry and analysis was performed by using the Statistical Package for social science (SPSS) 17. The presentation was performed in SPSS & in Microsoft Office Excel. Every question was rechecked for missing information double quoted response or unclear information. The variables were labeled in a list & the researcher established a computer based data definition record file that consisted of a list of variables in order. The researcher has put the id number of the variables in the variable view of SPSS and defined the types, width, decimal, label, & value. The next step was cleaning new data files to check that the input data was set to ensure that all data was accurately transcribed from the questionnaire sheet to the SPSS data view. Finally, the raw data was ready for analysis in SPSS.

#### **Data Analysis process of NMQ**

The investigator used the raw data in SPSS to find out the prevalence of musculoskeletal symptoms in nine body regions. For finding the percentage of socio-demographic factors & prevalence of musculoskeletal symptoms in nine body regions, the investigator used frequencies in SPSS. A chi-square test was conducted at with  $p < .05$ , to find out the association between the prevalence of musculoskeletal symptoms and socio-demographic factors.

#### **Data analysis process of REBA**

The investigator used REBA employee assessment worksheet to find out the REBA score. The REBA questionnaire is observation based questionnaire; during observation the investigator observed the dairy farm workers trunk, neck, legs, upper arms, lower arms & wrists movement or position. The investigator observed the dairy farm workers during working in dairy farm. According to Hignett and McAtamney (2000), the investigator used specific score for specific movement or position. In trunk movement, the investigator used score 1 for trunk upright, score 2 for  $0^\circ - 20^\circ$  flexion or  $0^\circ - 20^\circ$  extension, score 3 for  $20^\circ - 60^\circ$  flexion, more than  $20^\circ$  extension

& score 4 for more than 60° flexion. The investigator added score +1 if the trunk twisting or side flexed.

Similarly, the investigator used score for the movement of neck. In neck movement, the investigator used score 1 for 0° – 20° flexion or 0° – 20° extension & score 2 for more than 20° flexion or more than 20° extension. The investigator also added score +1 if the neck twisting or side flexed. The investigator also used score for the position of legs. In legs position, the investigator used score 1 for bilateral weight bearing, walking / sitting & score 2 for unilateral weight bearing, feather weight bearing or an unstable posture. The investigator also added score +1 if the knee(s) flexed in between 30° – 60° flexion & score 2 added for more than 60° flexion (not in sitting position). Similarly, the investigator used score for the position of upper arms. In the position of the upper arms, the investigator used score 1 for 20° extension to 20° flexion, score 2 for more than 20° extension or 20° - 45° flexion, score 3 for 45° - 90° flexion & score 4 for more than 90° flexion. The investigator added score +1 if the arm(s) abducted or rotated or raised & used minus 1 for the leaning or supporting weight of arm or if posture is gravity assisted.

In the movement of lower arms, the investigator used score 1 for 60° - 100° flexion & score 2 for less than 60° flexion or more than 100° flexion. In the movement of wrists, the investigator used score 1 for 0° – 15° flexion or 0° – 15° extension & score 2 for more than 15° flexion or more than 15° extension. The investigator also added score +1 if the wrist is twisted or deviated. Then the investigator used REBA scoring sheet for the find out of group A & group B by using of table A & table B. Then the investigator added load/force with the score of table A & added coupling with the score of table B. Here, the investigator added score 0° for the load/force of less than 5 kg, score 1 for the load/force of 5-10 kg & score 2 for the load/force of more than 10 kg. The investigator also added score 0° for good (well-fitting handle & a mid-range, power grip), score 1 for fair (hand hold acceptable but not ideal or coupling is acceptable via another part of the body), score 2 for poor (hand hold not acceptable although possible), score 3 for unacceptable (awkward, unsafe grip, no handles, coupling is unacceptable using other parts of the body) of coupling. Then the investigator found the result of score A & B. Then the investigator found the result of score C by using table C. After that the investigator added activity score +1 (1 or more body parts are static or repeated small range actions or action causes rapid large

ranges in posture or an unstable base) with the score C. Then the investigator found the REBA score.

### **3.8. Ethical considerations**

- All the participants and authority informed about the purpose of the study, the process of the study and their written consent obtained.
- Investigator has taken permission from the authority of Nordic Musculoskeletal Questionnaire & REBA to use for the dissertation.
- All the interviews taken in a confidential to maximize the participant's comfort and feelings of security.
- Took consent who interested to be a participant of the study before starting the interview signature taken from each participant on a consent form.
- The researcher was ensuring the confidentiality of participant's information, sharing information only with the research supervisor.
- Researcher will never publish this research or use result in any journal or publications without permission from dairy farm authority.

## CHAPTER 4 RESULT

The result section is showing the socio-demographic characteristics of the study participants. Association between participants MSS with socio-demographic and related factors, prevalence of MSS in most common affected body parts and normal activities disruption in last 12 months in different body parts and postural risk level of awkward posture of the participants and the activities of daily living problem those are associated with in dairy farm workers.

### 4.1. General Socio-demographic characteristics of the participants

Table 01 show that, total 105(100%) participants was participated in this analysis part and all participants were male. Here, the mean age of the participants was 46.52 years (SD  $\pm$  11.503). The literate participants were 63(60.0%) and illiterate participants were 42(40.0%). All participants were married that's 105(100%) participants were married. The mean length of employment of the participants was 21.30 years (SD  $\pm$  11.888). Here 69(65.7%) have smoking habit and 36(34%) have not. According to participants statement 4(3.8%) participants were involving in physical exercise and 101(96.2%) not. 9(8.6%) participants had chronic health problem and 96(91.4%) have not. Here, the mean hour per week working with cows 46.11 hours (SD  $\pm$  7.795) and the mean hour per week for milking 38.98 hours (SD  $\pm$  11.892).

**Table-01: Socio-demographic characteristics of the participants**

<b>Factors</b>	<b>Frequency</b>	<b>%</b>
<b>Sex</b>		
Male	105	100.0
<b>Age</b>		
20-29 years	5	4.8
30-39 years	25	23.8
40 or more years	75	71.4
<b>Mean <math>\pm</math> SD years of age</b>	<b>46.52 <math>\pm</math> 11.503</b>	
<b>Body Mass Index</b>		
Underweight	5	4.8
Normal weight	97	92.4

Overweight	3	2.9
<b>Education</b>		
Illiterate	42	40.0
Literate	63	60.0
<b>Marital status</b>		
Married	105	100.0
<b>Length of Employment</b>		
1-9 years	20	19.0
10-19 years	22	21.0
20 or more years	63	60.0
<b>Mean ± SD length of employment</b>	<b>21.30±11.888</b>	
<b>Smoking</b>		
Yes	69	65.7
No	36	34.3
<b>Taking physical exercise regularly at least 2 hour per week</b>		
Yes	4	3.8
No	101	96.2
<b>Having chronic health problem(Diabetes, Allergy, Asthma)</b>		
Yes	9	8.6
No	96	91.4
<b>Time per week spent working with cows (hour)</b>		
40-49	67	63.8
50-59	38	36.2
<b>Mean ± SD Time per week spent working with cows (hour)</b>	<b>46.11±7.795</b>	



<b>Time per week spent milking (hour)</b>		
1-9	3	2.9
10-19	1	1.0
20-29	14	13.3
30-39	11	10.5
40-49	55	52.4
50-59	21	20.0
<b>Mean ± SD Time per week spent milking (hour)</b>	<b>38.98±11.892</b>	

**\*n=105**

#### **4.2. Prevalence of MSS and normal activities disruption due to MSS during last 12 months at least one body region of the participant's:**

Among 105 participants 95.2% had MSS at least one body parts in last 12 months. And 79.0% had carrying out from normal activities disruption like hobbies, Job, Households activities because is MSS in last 12 months.

**Table - 02: Prevalence of MSS and normal activities disruption in last 12 months**

<b>Variables</b>	<b>Frequency</b>	<b>Percentage</b>
Prevalence of MSS during last 12 months	100	95.2%
Prevalence of normal activities disruption due to MSS during last 12 months	83	79.0%

**\*n=105**

#### **4.3. The prevalence of developing musculoskeletal symptoms in nine body regions and normal activities disruption in last 12 months**

Table-03 shows that the prevalence of musculoskeletal symptoms in nine body regions at 12 months and normal activities disruption in last 12 months preceding data collection. In this study, the investigator found that the highest prevalence of MSS in the last 12 months by body site was the lower back 81.9%. The proportion of neck

70.5%, knee 67.6%, wrist/hand 60.0%, shoulders 30.5%, ankle/feet 22.9%, elbows 17.1%, upper back 17.1% and hip/thigh/buttock 7.6% at last 12 months. In this study, the researcher found that the highest prevalence of normal activities disruption at last 12 months was lower back 59.9%. The proportion of neck 54.3%, knee 51.4%, wrist/hand 32.4%, shoulders 18.1%, ankle/feet 17.1, upper back 8.6%, hip/thigh/buttock 4.8, elbows 3.8%.

**Table-03: Prevalence of developing MSS in nine body regions and normal activities disruption in last 12 months**

<b>Most affected body parts</b>	<b>Prevalence of MSS during 12 months (%)</b>	<b>Prevalence of normal activities disruption due to MSS in last 12 months (%)</b>
<b>Neck</b>	70.5	54.3
<b>Shoulder</b>	30.5	18.1
<b>Elbow</b>	17.1	3.8
<b>Wrist/hand</b>	60.0	32.4
<b>Upper back</b>	17.1	8.6
<b>Lower back</b>	81.9	59.0
<b>Hip/thigh/buttock</b>	7.6	4.8
<b>Knee</b>	67.6	51.4
<b>Ankle/feet</b>	22.9	17.1

\*n=105

#### **4.4. Association between socio- demographic factors and musculoskeletal symptoms at last 12 months:**

Socio-demographic factors like sex, age, marital status, BMI, physical exercise, smoking habit, length of employment, education level, chronic health problem, working hour with cows per week, working hour with milking per week did not show any significant association with MSS in last 12 months. There had no significant association with MSS because there p-value is  $>.05$ .

**Table-04: Association between participants Socio-demographic factors with MSS in last 12months**

Socio demographic factors	MSS in last 12 months			
	Yes (%)	No (%)	X <sup>2</sup> value	P value
<b>Age</b>				
20-29 years	5	0	3.864	.145
30-39 years	22	3		
40 or more years	73	2		
<b>Body Mass Index</b>				
Under weight	5	0	.433	.805
Normal weight	92	5		
Overweight	3	0		
<b>Education</b>				
Illiterate	38	4	3.500	.061
Literate	62	1		
<b>Length of Employment</b>				
1-9 years	19	1	1.453	.484
10-19 years	22	0		
20 or more years	59	4		
<b>Smoking</b>				
Yes	66	3	.076	.783
No	34	2		
<b>Taking physical exercise regularly at least 2 hour per week</b>				
Yes	4	0	.208	.648
No	96	5		
<b>Having chronic health problem(Diabetes, Allergy, Asthma)</b>				
Yes	9	0	.492	.483
No	91	5		
<b>Time per week spent working with cows (hour)</b>				
40-49	64	3	.033	.856
50-59	36	2		
<b>Time per week spent milking (hour)</b>				
1-9	3	0	1.938	.858
10-19	1	0		
20-29	13	1		
30-39	10	1		
40-49	52	3		
50-59	21	0		

\*n=105

#### **4.5. Risk level of awkward posture of the participants:**

In this study the investigator found that 21.0% dairy farm workers are affected by the category of medium risk level, 70.5% dairy farm workers are affected by the category of high risk level and 8.6% dairy farm workers are affected by the category of very high risk level (table-05).

**Table - 05: Postural risk levels of the participants**

<b>Risk level</b>	<b>n</b>	<b>Percentage</b>
Medium Risk	22	21.0
High Risk	74	70.5
Very High Risk	9	8.6

**n\*=105**

## CHAPTER 5 DISCUSSION

### **The prevalence of musculoskeletal symptoms in the last 12 months**

The study demonstrated the prevalence of musculoskeletal symptoms in nine body regions that reported by 105 dairy farm workers in last 12 months. The present study show that 95.2% dairy farm workers had musculoskeletal problem at least one body region which is very high like another study. A cross-sectional study of 452 dairy parlor workers found that 76% had at least one body part affected by an occupationally related musculoskeletal injury, most commonly in an upper extremity (National Center for Farmworker Health, 2014). Another study shows that quite similar results and these results are three-fourths (76.4%) of parlor workers reported work-related MSS in at least one body part (Doughrate *et al.* 2014). Pinzke (2003) reported that 83% of the male and 90% of the female dairy farmers in Sweden reported some kind of musculoskeletal symptoms (Douglas and Reinemann, 2005). But in this study the investigator selected only male participants because in Bangladeshi culture a male person easily works in dairy farm but it is too difficult for female participants. Another study showed that 86% of dairy stockmen reported symptoms of MSD in at least one body part during a period of 12 months (Kolstrup, n.d). It is quite similar the present study. In this study, the investigator found that the highest prevalence of MSS in the last 12 months by nine body regions was the lower back 81.9%. The proportion of neck 70.5%, knee 67.6%, wrist/hand 60.0%, shoulders 30.5%, ankle/feet 22.9%, elbows 17.1%, upper back 17.1% and hip/thigh/buttock 7.6% at last 12 months. The result is quite similar in some region to the Xiao *et al.* study. The study of Xiao *et al.* (2013) shows that the most commonly reported musculoskeletal problems were back pain (22%), knee pain (15%), foot pain (15%), and hand pain (14%). The study of Doughrate *et al.* (2014) shows the prevalence of MSS in the upper extremity (55%). It is quite similar result to this study results. Another study of Park, Lim and Lee (2010) shows that the highest prevalence of MSS by body site was the legs/feet (11.7%). The proportion of low back WMS was 11.5%, shoulders 10.0%, arms/elbows 5.0%, hands/wrists/fingers 4.2%, and neck 2.2%. The prevalence of WMS at any site was 33.3%, and the prevalence of WMS at two or more sites was 8.5% (Park, Lim and Lee, 2010). It is lower prevalence than the present study.

### **The prevalence of interruption of daily normal activities due to musculoskeletal symptoms in the last 12 months**

In this study 79.0% participant are carrying out from normal activities like job, leisure activity, household work in last 12 month because of MSS and specific body region lower back 59.9%, neck 54.3%, knee 51.4%, wrist/hand 32.4%, shoulders 18.1%, ankle/feet 17.1, upper back 8.6%, hip/thigh/buttock 4.8, elbows 3.8%. No established information about the specific region that hamper activities of dairy farm workers. So this study results is baseline for further study.

### **The association between demographic factors and musculoskeletal symptoms in the last 12 months**

In this study, findings showed no significant association between socio-demographic factors & musculoskeletal symptoms at least one region pain in last 12 months. The sample size of the research was too small, so it was difficult to find any significant relationships from the data. Some study shows significant relationship in some variables. The study of Park, Lim and Lee found that education and milking 4 or more hours per day were significant in low back MSS (Park, Lim and Lee, 2010). In Bangladesh, there are many people are illiterate or received education up to the primary level. In this study the maximum people are illiterate or received education up to the primary or secondary level. So they have no idea about working posture, rest or taking short breaks as well as working hours. Most of the time the dairy farm workers worked prolonged time without rest or shorts break. They do not know the rest is the part of the work. The investigator also found in this study, the most of the dairy farm workers are not taking consultancy from any doctor or therapist after feelings pain or discomfort in different body regions.

### **The ergonomic postural risk level for developing musculoskeletal symptoms**

When dairy farm workers work in dairy farm different awkward posture the investigator observed it and find out the postural risk level of dairy farm workers by using REBA for this study. In this study the investigator found that 21.0% dairy farm workers are affected by the category of medium risk level, 70.5% dairy farm workers are affected by the category of high risk level and 8.6% dairy farm workers are affected by the category of very high risk level. There was no established article

which uses REBA for identifying dairy farm workers awkward posture but National Center for Farmworker Health (2014) state dairy workers with tasks in the milking parlor had more than five times risk as compared to dairy workers with non-milking tasks. Prevalence varies because of cultural issue that means Bangladeshi dairy farm culture is different from other country. In Bangladeshi people use parlor milking system (the level of the working position in the parlor milking system is lower than the cows nipples by 65-90 cm, so dairy farmers bend their back less than in other milking system) in floor in sitting position and most of the activity perform in floor and posture is more awkward than other workers who work in other countries such as a pipeline milking system, and a bucket milking system. So in Bangladesh dairy farm workers MSS prevalence is high and postural risk level is high, so ergonomic intervention is necessary for dairy farm workers.

## **CHAPTER 6**

### **LIMITATIONS, RECOMMENDATIONS**

#### **6.1. Limitations of the study**

There are some factors limiting to the findings of this investigation. The overall sample size was relatively small & the place were selected by the convenient method & samples were chosen only one areas of Bangladesh in Dhaka. The samples were selected from this place by using convenient method. The result of the present study should be cautious to generalize. There was not enough resource found of the prevalence and postural risk level for developing MSS among dairy farm workers in Bangladesh. Related article was found but it was different countries and in our culture dairy farm work and equipment was different. So, no significant statistics result was included in this study in the basis of Bangladeshi culture.

#### **6.2. Recommendations of the study**

Recommends is that future similar research will be conducted in the area with large number of sample size. And also needed to identify what kinds of musculoskeletal symptoms are reported by the dairy farm workers without pain. In this study a huge number of peoples are affected by musculoskeletal symptoms, so it is necessary to prevent or improve the management of musculoskeletal symptoms amongst dairy farm workers.



## CHAPTER 7 CONCLUSIONS

### 7.1. Conclusion

In Bangladesh, there is no actual information about the musculoskeletal symptoms prevalence and postural risk level among dairy farm workers. Therefore, this study aim was to determine the prevalence & identify postural risk level for developing musculoskeletal symptoms among dairy farmworkers. This study found a high prevalence of musculoskeletal symptoms among dairy farm workers based on their self-report measures. The majority of all respondents reported musculoskeletal symptoms in different parts of the body at last 12 months and high risk of MSS with normal activities disruption in last 12 months. In these studies the most affected area was low back & others regions are affected respectively. Now a day's all over the world MSS are one of the common problems in working population and many people are already affected by different type of disorder. MSS also affect their performance that means quality of life. Number of occupational factor like forward neck bend, repetitive wrist movement, forward bend of trunk, carry heavy load, instrument is not adjustable during work, long duration of work, are related to higher prevalence of MSS and postural risk level. Workers are needed ergonomic intervention immediately to overcome the MSS and postural risk level that will help them to their daily life. Work related musculoskeletal symptoms are a great suffering to workers physical & mental health & also impact on individuals work & leisure activities. So it is important for an occupational therapist to explore their role in these areas & run different prevention programs efficiently & effectively. The government can play a vital role to decrease the rate of incidence, prevention & treatment.

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## Appendix 1

### Permission letter for conducting study

Date- 24/Jul/2014  
To  
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,

I beg most respectfully to state that I am student of 4<sup>th</sup> year B.Sc in Occupational Therapy of Bangladesh Health Professions Institute, the academic institute of Center for the Rehabilitation of the Paralyzed (CRP). In 4<sup>th</sup> year, there has a requirement to conduct a research project. The title of my research is "Prevalence and risk level for developing musculoskeletal symptoms among dairy farm workers in Bangladesh". The aim of the study is "To determine prevalence and postural risk level for developing musculoskeletal symptoms among dairy farm workers in Bangladesh". I need seeking permission to conduct my research project as a part of requirement to fulfill the degree of B.Sc in occupational therapy.



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

Your most obediently,

Sanjida Akhter  
24.07.2014

Sanjida Akhter  
4<sup>th</sup> year

B.Sc in Occupational Therapy Department  
Bangladesh health professions institute,  
Center for the Rehabilitation of the Paralyzed (CRP). Chapain, Savar, Dhaka-1343

Approved by	Signature
<b>Nazmun Nahar</b> Assistant professor & Head of the Department Department of Occupational Therapy BHPI,CRP,Chapain,Savar,Dhaka-1343	As per supervisor's comment it may allow to conduct this study. 
<b>Md. Monjurul Habib</b> Lecturer in Occupational Therapy Department of Occupational Therapy BHPI,CRP,Chapain,Savar,Dhaka-1343	This proposal can be appn- -oved for further proceeding. 

## Appendix 2

### Permission letter for data collection



বাংলাদেশ হেল্থ প্রফেশন্স ইনস্টিটিউট (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 : ২১.০৯.২০১৪

প্রতি

উপ পরিচালক

কেন্দ্রীয় গো-প্রজনন ও দুগ্ধ খামার

সভার, 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 হেল্থ প্রফেশন্স ইনস্টিটিউট (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 বাধ্যতামূলক।

বিএইচপিআই'র ৪র্থ বর্ষ বিএসসি ইন অকুপেশনাল থেরাপি কোর্সের ছাত্রী সানজিদা আক্তার তার রিসার্চ সংক্রান্ত কাজের জন্য আপনার সুবিধামত সময়ে আপনার প্রতিষ্ঠানে সফর করতে আগ্রহী।

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

ধন্যবাদান্তে

অধ্যাপক ডাঃ এম এ কাদের  
অধ্যক্ষ  
বিএইচপিআই।



মোঃ মাহবুবুর রহমান  
সহকারী পরিচালক (প্রশাসন)  
কেন্দ্রীয় গো-প্রজনন ও দুগ্ধ খামার  
সভার, ঢাকা।

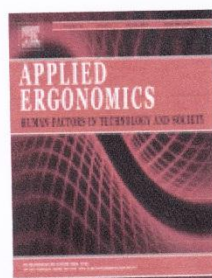


## Appendix 3(A) Permission for Nordic Musculoskeletal Questionnaire



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Title: Standardised Nordic questionnaires for the analysis of musculoskeletal symptoms  
Author: I. Kuorinka, B. Jonsson, A. Kilbom, H. Vinterberg, F. Biering-Sørensen, G. Andersson, K. Jørgensen  
Publication: Applied Ergonomics  
Publisher: Elsevier  
Date: September 1987  
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Permission Request Submitted

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Order Date	Aug 07, 2014
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Licensed content publication	Applied Ergonomics
Licensed content title	Standardised Nordic questionnaires for the analysis of musculoskeletal symptoms
Licensed content author	I. Kuorinka, B. Jonsson, A. Kilbom, H. Vinterberg, F. Biering-Sørensen, G. Andersson, K. Jørgensen
Licensed content date	September 1987
Licensed content volume number	18
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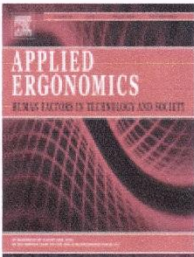
## Appendix 3(B)

### Permission for REBA (Rapid Entire Body Assessment)





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Title: Rapid Entire Body Assessment (REBA)

Author: Sue Hignett,Lynn McAtamney

Publication: Applied Ergonomics

Publisher: Elsevier

Date: 3 April 2000

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Licensed content author	Sue Hignett,Lynn McAtamney
Licensed content date	3 April 2000
Licensed content volume number	31
Licensed content issue number	2
Number of pages	5
Type of Use	reuse in a thesis/dissertation
Portion	figures/tables/illustrations
Number of figures/tables/illustrations	4
Format	print
Are you the author of this Elsevier article?	No
Will you be translating?	No
Title of your thesis/dissertation	Prevalence and risk level for developing Musculoskeletal symptoms among dairy farm workers
Expected completion date	Feb 2015

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Total	Not Available

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## Appendix 4(A) Informed consent for participant in Bangla

### সম্মতিপত্র অংশগ্রহনকারীর জন্য

গবেষনাকারী.....হচ্ছে বাংলাদেশ হেলথ প্রফেশন্স ইনস্টিটিউট এর অধীনে, বি,এস,সি ইন অকুপেশনাল থেরাপী বিভাগের একজন ছাত্রী, আমি একটি গবেষণা করতে চাই যে ‘কি কি বুকির পর্যায় এর কারনে, যারা দুঃখ খামারে কাজ করে তাদের অস্তিপেশীর রোগের লক্ষণ হয়ে থাকে এবং তা কতটুকু প্রকোপ’। গবেষনাকারীর উদ্দেশ্য হচ্ছে, ‘কি কি বুকির কারণগুলো আছে এবং তা কতটুকু প্রকোপ যারা দুঃখ খামারে কাজ করে, তাদের জন্য, তা খুঁজে বের করা। পরস্পর সাক্ষাত এ অংশগ্রহন করার জন্য, অংশগ্রহনকারীর কাছে থেকে অনুমতি নিচ্ছে গবেষনাকারী। আপনাদের তথ্যগুলো অন্য কারো সাথে আলোচনা করা হবে না। এই গবেষণায় অংশগ্রহনকারীরা কোন ধরনের লাভবান বা ক্ষতির সম্মুখীন হবে না গবেষণার মাধ্যমে। যে সব তথ্য সংগ্রহ করা হবে সাক্ষাত এর মাধ্যমে সেগুলো খুব গোপনীয়তার সাথে রাখা হবে। অংশগ্রহনকারীরা যে কোন সময় এই গবেষণা ছেড়ে চলে যেতে পারবেন।

এই গবেষণায় আমি .....একজন অংশগ্রহনকারী এবং এই গবেষণার উদ্দেশ্য সম্পর্কে খুব ভালোভাবে জানি। আমি নিজের আগ্রহে এই গবেষণায় অংশগ্রহন করতে চাই। আমার অধিকার আছে যে কোন সময় এই গবেষণার অংশগ্রহন করা থেকে চলে যাওয়ার। এই জন্য আমি আমার উত্তর দিতে দ্বিধাগ্রস্থ নয়। গবেষনাকারী গবেষণা সংক্রান্ত যে কোন প্রশ্নের উত্তর যে কোন সময় দিতে প্রস্তুত। সুতরাং আমি আমার সজ্ঞানে এই গবেষণায় অংশগ্রহন করতে ইচ্ছুক।

(যারা লেখাপড়া করতে পারে না, তাদের সামনে পড়ে শুনানো হবে)

অংশগ্রহনকারীর আঙ্গুলের ছাপ/নাম/সাক্ষর .....	তারিখ:
গবেষনাকারীর নাম/সাক্ষর .....	তারিখ:
অংশগ্রহনকারী সাক্ষর আঙ্গুলের ছাপ/নাম/সাক্ষর .....	তারিখ:

## Appendix 4(B)

### Demographic questionnaire for participants in Bangla

#### জনসংখ্যা ভিত্তিক প্রশ্নাবলী

অংশগ্রহণকারীর নাম -

কোড নং-

লিঙ্গ - পুরুষ/মহিলা

বয়স-

শরীরের ভর নির্ণয়- কম ওজন/ স্বাভাবিক ওজন/ বেশি ওজন/ ভীষণ মোটা

শিক্ষা - অশিক্ষিত/শিক্ষিত (প্রাথমিক বিদ্যালয় / উচ্চ বিদ্যালয়)

বৈবাহিক অবস্থা- বিবাহিত/ অবিবাহিত

চাকরির সময়কাল - \_\_\_\_\_ বছর

ধূমপান - হ্যাঁ/না

নিয়মিত শারীরিক ব্যায়াম করে (কমপক্ষে সপ্তাহে দুই দিন)- হ্যাঁ/না

দীর্ঘস্থায়ী স্বাস্থ্য সমস্যা - হ্যাঁ (ডায়াবেটিস, এলার্জি, হাঁপানি)/না

সপ্তাহে কত সময় ব্যয় হয় গাড়ীর সাথে কাজ করে- \_\_\_\_\_ ঘণ্টা

সপ্তাহে কত সময় ব্যয় হয় দুধ দোয়ানোর কাজে- \_\_\_\_\_ ঘণ্টা

## Appendix 4(C)

### Nordic Musculoskeletal Questionnaire in Bangla

#### নরডিক মাসকুলোস্কেলিটাল প্রশ্নাবলী

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

প্রতিটি প্রশ্নের জন্য একটি টিক চিহ্ন ব্যবহার করুন

বিঃ দ্রঃ দয়া করে সকল প্রশ্নের উত্তর দিন, যদিও আপনার শরীরের কোন অংশে সমস্যা না থাকে।

অংশগ্রহণকারীর নাম:	বয়স:	কোড নং:
বিগত ১২ মাসের মধ্যে, যে কোন সময়ে আপনি কি নিম্নে উল্লেখিত শরীরের অংশসমূহে কোন ধরনের সমস্যা বোধ করেছেন? (যেমনঃ অবিরাম অস্থিতিকর বেদনা, ব্যাথা, অস্থিতিকর বেদনা, ব্যাথা, অস্থিতিকর বেদনা, ব্যাথা, অস্থিতিকর বেদনা, ব্যাথা)	বিগত ৭ দিনের মধ্যে আপনি কি কোন ধরনের সমস্যা বোধ করেছেন?	উল্লেখিত সমস্যা সমূহের জন্য (অবিরাম অস্থিতিকর বেদনা, ব্যাথা, অস্থিতিকর বেদনা, ব্যাথা) বিগত ১২ মাসের মধ্যে আপনি কি আপনার স্বাভাবিক কার্যাবলি (যেমনঃ চাকুরি, গৃহস্থালির কাজ, শখ) থেকে বিরত থেকেছেন?
১ ঘাড় না <input type="checkbox"/> হ্যাঁ <input type="checkbox"/> ১ <input type="checkbox"/> ২ <input type="checkbox"/>	২ ঘাড় না <input type="checkbox"/> হ্যাঁ <input type="checkbox"/> ১ <input type="checkbox"/> ২ <input type="checkbox"/>	৩ ঘাড় না <input type="checkbox"/> হ্যাঁ <input type="checkbox"/> ১ <input type="checkbox"/> ২ <input type="checkbox"/>
৪ কাঁধ সমূহ ১ না <input type="checkbox"/> হ্যাঁ <input type="checkbox"/> ২ <input type="checkbox"/> ডান কাঁধে ৩ <input type="checkbox"/> বাম কাঁধে ৪ <input type="checkbox"/> উভয় কাঁধে	৫ কাঁধ সমূহ ১ না <input type="checkbox"/> হ্যাঁ <input type="checkbox"/> ২ <input type="checkbox"/> ডান কাঁধে ৩ <input type="checkbox"/> বাম কাঁধে ৪ <input type="checkbox"/> উভয় কাঁধে	৬ কাঁধ সমূহ (এক কাঁধ/ উভয় কাঁধ) না <input type="checkbox"/> হ্যাঁ <input type="checkbox"/> ১ <input type="checkbox"/> ২ <input type="checkbox"/>
৭ কনুই সমূহ না <input type="checkbox"/> হ্যাঁ <input type="checkbox"/> ১ <input type="checkbox"/> ডান কনুইয়ে ৩ <input type="checkbox"/> বাম কনুইয়ে ৪ <input type="checkbox"/> উভয় কনুইয়ে	৮ কনুই সমূহ না <input type="checkbox"/> হ্যাঁ <input type="checkbox"/> ১ <input type="checkbox"/> ডান কনুইয়ে ৩ <input type="checkbox"/> বাম কনুইয়ে ৪ <input type="checkbox"/> উভয় কনুইয়ে	৯ কনুই সমূহ (এক কনুই/ উভয় কনুই) না <input type="checkbox"/> হ্যাঁ <input type="checkbox"/> ১ <input type="checkbox"/> ২ <input type="checkbox"/>
১০ কব্জিসমূহ/ হাত সমূহ না <input type="checkbox"/> হ্যাঁ <input type="checkbox"/> ১ <input type="checkbox"/> ডান (কব্জি/ হাত) ৩ <input type="checkbox"/> বাম (কব্জি/ হাত) ৪ <input type="checkbox"/> উভয় কব্জি/ উভয় হাত	১১ কব্জি সমূহ/ হাত সমূহ না <input type="checkbox"/> হ্যাঁ <input type="checkbox"/> ১ <input type="checkbox"/> ডান (কব্জি/ হাত) ৩ <input type="checkbox"/> বাম (কব্জি/ হাত) ৪ <input type="checkbox"/> উভয় কব্জি/ উভয় হাত	১২ কব্জি সমূহ/ হাত সমূহ (এক হাত অথবা এক কব্জি/ উভয় হাত অথবা উভয় কব্জি) না <input type="checkbox"/> হ্যাঁ <input type="checkbox"/> ১ <input type="checkbox"/> ২ <input type="checkbox"/>
১৩ পিঠ না <input type="checkbox"/> হ্যাঁ <input type="checkbox"/> ১ <input type="checkbox"/> ২ <input type="checkbox"/>	১৪ পিঠ না <input type="checkbox"/> হ্যাঁ <input type="checkbox"/> ১ <input type="checkbox"/> ২ <input type="checkbox"/>	১৫ পিঠ না <input type="checkbox"/> হ্যাঁ <input type="checkbox"/> ১ <input type="checkbox"/> ২ <input type="checkbox"/>
১৬ কোমর (পিঠের নিচের অংশ) না <input type="checkbox"/> হ্যাঁ <input type="checkbox"/> ১ <input type="checkbox"/> ২ <input type="checkbox"/>	১৭ কোমর না <input type="checkbox"/> হ্যাঁ <input type="checkbox"/> ১ <input type="checkbox"/> ২ <input type="checkbox"/>	১৮ কোমর না <input type="checkbox"/> হ্যাঁ <input type="checkbox"/> ১ <input type="checkbox"/> ২ <input type="checkbox"/>
১৯ এক অথবা উভয় (উরুঅস্থিঘরের সংযোগ স্থল/ উরুদ্বয়/ নিতম্ব) না <input type="checkbox"/> হ্যাঁ <input type="checkbox"/> ১ <input type="checkbox"/> ২ <input type="checkbox"/>	২০ উরুঅস্থিঘরের সংযোগ স্থল/ উরুদ্বয়/ নিতম্ব না <input type="checkbox"/> হ্যাঁ <input type="checkbox"/> ১ <input type="checkbox"/> ২ <input type="checkbox"/>	২১ উরুঅস্থিঘরের সংযোগ স্থল/ উরুদ্বয়/ নিতম্ব না <input type="checkbox"/> হ্যাঁ <input type="checkbox"/> ১ <input type="checkbox"/> ২ <input type="checkbox"/>
২২ এক অথবা উভয় হাঁটু না <input type="checkbox"/> হ্যাঁ <input type="checkbox"/> ১ <input type="checkbox"/> ২ <input type="checkbox"/>	২৩ উভয় হাঁটু না <input type="checkbox"/> হ্যাঁ <input type="checkbox"/> ১ <input type="checkbox"/> ২ <input type="checkbox"/>	২৪ উভয় হাঁটু না <input type="checkbox"/> হ্যাঁ <input type="checkbox"/> ১ <input type="checkbox"/> ২ <input type="checkbox"/>
২৫ এক অথবা উভয় (গোড়ালির পঁটি/ পায়ের পাতা) না <input type="checkbox"/> হ্যাঁ <input type="checkbox"/> ১ <input type="checkbox"/> ২ <input type="checkbox"/>	২৬ গোড়ালির পঁটি/ পায়ের পাতা না <input type="checkbox"/> হ্যাঁ <input type="checkbox"/> ১ <input type="checkbox"/> ২ <input type="checkbox"/>	২৭ গোড়ালির পঁটি/ পায়ের পাতা না <input type="checkbox"/> হ্যাঁ <input type="checkbox"/> ১ <input type="checkbox"/> ২ <input type="checkbox"/>

## Appendix 5(A)

### Informed consent for participants in English

#### Informed Consent for Participants

The researcher ----- is a B.Sc. student of Occupational Therapy Department of Bangladesh Health Professions Institute (BHPI), want to conduct a research about **‘Prevalence and risk level for developing musculoskeletal symptoms among dairy farm workers’** The aim of the study is to determine prevalence and postural risk level for developing musculoskeletal symptoms among dairy farm workers.

Researcher will receive permission from participant to take part in the interview. Their information will not share with others. Participant of the study will not benefit or harm from this study. They are free to decline answering any question during interview. All the information that is collected from the interview would be kept safety and maintained confidentiality. Participants can withdraw from the study at any time.

In this study I am----- a participant and I have been clearly informed about the purpose of the study. I am willing to participant in this study and I will have the right to refuse in taking part any time at any stage of the study. For this reason I will not to be bounded to answer to anybody. The researcher will be available to answer any study related question or inquiry to the participant. So with my best knowledge I agree to participant willingly with my full satisfaction in this study.

(It will be read in front of the illiterate participant)

Name & Signature / finger print of participant:

Date:

Name & Signature of Researcher:

Date:

Name & Signature / finger print of witness:

Date:



**Appendix 5(B)**  
**Demographic Questionnaire in English**

**Demographic questionnaire**

**Participant's name:**

Code no:

**Sex:** Male/Female

**Age:**

**Body mass index:** Under weight/Normal weight/overweight/obese

**Education:** Illiterate/Literate (primary school/high school)

**Marital status:** Married/Unmarried

**Length of employment:** \_\_\_\_\_ years

**Smoking:** yes/no

**Taking physical exercise regularly (at least 2 h per week):** yes/no

**Chronic health problem:** yes (diabetes, allergy, asthma)/no

**Time per week spent working with cows:** \_\_\_\_\_ hours

**Time per week spent milking:** \_\_\_\_\_ hours

## Appendix 5(C)

### Nordic Musculoskeletal Questionnaire in English

#### Nordic Musculoskeletal Questionnaire

C E DICKINSON, K CAMPION, A F FOSTER, S J NEWMAN, A M T O'ROURKE AND P G THOMAS

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:
<b>1 Neck</b> No Yes 1 <input type="checkbox"/> 2 <input type="checkbox"/>	<b>2 Neck</b> No Yes 1 <input type="checkbox"/> 2 <input type="checkbox"/>	<b>3 Neck</b> No Yes 1 <input type="checkbox"/> 2 <input type="checkbox"/>
<b>4 Shoulders</b> No Yes 1 <input type="checkbox"/> 2 <input type="checkbox"/> in the right shoulder 3 <input type="checkbox"/> in the left shoulder 4 <input type="checkbox"/> in both shoulders	<b>5 Shoulders</b> No Yes 1 <input type="checkbox"/> 2 <input type="checkbox"/> in the right shoulder 3 <input type="checkbox"/> in the left shoulder 4 <input type="checkbox"/> in both shoulders	<b>6 Shoulders (both/either)</b> No Yes 1 <input type="checkbox"/> 2 <input type="checkbox"/>
<b>7 Elbows</b> No Yes 1 <input type="checkbox"/> 2 <input type="checkbox"/> in the right elbow 3 <input type="checkbox"/> in the left elbow 4 <input type="checkbox"/> in both elbows	<b>8 Elbows</b> No Yes 1 <input type="checkbox"/> 2 <input type="checkbox"/> in the right elbow 3 <input type="checkbox"/> in the left elbow 4 <input type="checkbox"/> in both elbows	<b>9 Elbows (both/either)</b> No Yes 1 <input type="checkbox"/> 2 <input type="checkbox"/>
<b>10 Wrists/hands</b> No Yes 1 <input type="checkbox"/> 2 <input type="checkbox"/> in the right wrist/hand 3 <input type="checkbox"/> in the left wrist/hand 4 <input type="checkbox"/> in both wrists/hands	<b>11 Wrists/hands</b> No Yes 1 <input type="checkbox"/> 2 <input type="checkbox"/> in the right wrist/hand 3 <input type="checkbox"/> in the left wrist/hand 4 <input type="checkbox"/> in both wrists/hands	<b>12 Wrists/hands (both/either)</b> No Yes 1 <input type="checkbox"/> 2 <input type="checkbox"/>
<b>13 Upper back</b> No Yes 1 <input type="checkbox"/> 2 <input type="checkbox"/>	<b>14 Upper back</b> No Yes 1 <input type="checkbox"/> 2 <input type="checkbox"/>	<b>15 Upper back</b> No Yes 1 <input type="checkbox"/> 2 <input type="checkbox"/>
<b>16 Lower back (small of the back)</b> No Yes 1 <input type="checkbox"/> 2 <input type="checkbox"/>	<b>17 Lower back</b> No Yes 1 <input type="checkbox"/> 2 <input type="checkbox"/>	<b>18 Lower back</b> No Yes 1 <input type="checkbox"/> 2 <input type="checkbox"/>
<b>19 One or both hips/thighs/buttocks</b> No Yes 1 <input type="checkbox"/> 2 <input type="checkbox"/>	<b>20 Hips/thighs/buttocks</b> No Yes 1 <input type="checkbox"/> 2 <input type="checkbox"/>	<b>21 Hips/thighs/buttocks</b> No Yes 1 <input type="checkbox"/> 2 <input type="checkbox"/>
<b>22 One or both knees</b> No Yes 1 <input type="checkbox"/> 2 <input type="checkbox"/>	<b>23 Knees</b> No Yes 1 <input type="checkbox"/> 2 <input type="checkbox"/>	<b>24 Knees</b> No Yes 1 <input type="checkbox"/> 2 <input type="checkbox"/>
<b>25 One or both ankles/feet</b> No Yes 1 <input type="checkbox"/> 2 <input type="checkbox"/>	<b>26 Ankles/feet</b> No Yes 1 <input type="checkbox"/> 2 <input type="checkbox"/>	<b>27 Ankles/feet</b> No Yes 1 <input type="checkbox"/> 2 <input type="checkbox"/>

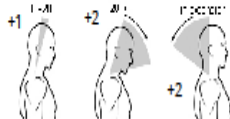
Figure 2 Musculoskeletal questionnaire

# Appendix 5(D)

## REBA (Rapid Entire Body Assessment)

### A. Neck, Trunk and Leg Analysis

#### Step 1: Locate Neck Position



Step 1a: Adjust...  
If neck is twisted: +1  
If neck is side bending: +1

Neck Score

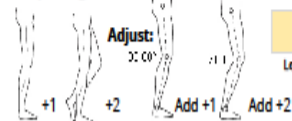
#### Step 2: Locate Trunk Position



Step 2a: Adjust...  
If trunk is twisted: +1  
If trunk is side bending: +1

Trunk Score

#### Step 3: Legs



Leg Score

#### Step 4: Look-up Posture Score in Table A

Using values from steps 1-3 above, Locate score in Table A

Posture Score A

#### Step 5: Add Force/Load Score

If load < 11 lbs.: +0  
If load 11 to 22 lbs.: +1  
If load > 22 lbs.: +2

Force / Load Score

#### Step 6: Score A, Find Row in Table C

Add values from steps 4 & 5 to obtain Score A. Find Row in Table C.

Score A

#### Scoring

1 = Negligible Risk  
2-3 = Low Risk. Change may be needed.  
4-7 = Medium Risk. Further Investigate. Change Soon.  
8-10 = High Risk. Investigate and Implement Change  
11+ = Very High Risk. Implement Change

### Scores

Table A	Neck												
	1			2			3			4			
Legs	1	2	3	4	1	2	3	4	1	2	3	4	
Trunk	1	1	2	3	4	1	2	3	4	1	3	5	6
Posture	2	2	3	1	5	3	4	5	6	1	5	6	7
Score	3	2	1	5	6	1	5	6	7	5	6	7	8
	4	3	5	6	7	5	6	7	8	6	7	8	9
	5	4	6	7	8	6	7	8	9	7	8	9	9

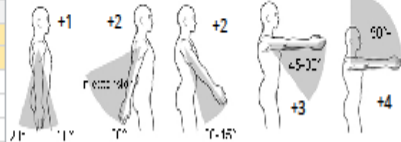
Table B	Lower Arm					
	1		2			
Wrist	1	2	3	1	2	3
Upper Arm Score	1	1	2	1	2	1
	2	1	2	1	2	1
	3	1	4	1	4	1
	4	4	5	5	6	7
	5	6	7	8	7	8
	6	7	8	8	8	9

Table C	Score B											
	1	2	3	4	5	6	7	8	9	10	11	12
1	1	1	1	2	1	1	4	5	6	7	7	7
2	1	2	2	1	4	4	5	6	6	7	7	8
3	1	2	1	1	4	5	6	7	7	8	8	8
4	1	4	4	4	5	6	7	8	8	9	9	9
5	4	4	4	5	6	7	8	8	9	9	9	9
6	6	6	6	7	8	8	9	9	10	10	10	10
7	7	7	7	8	9	9	9	10	10	11	11	11
8	8	8	8	9	10	10	10	10	11	11	11	11
9	9	9	9	10	10	10	11	11	11	12	12	12
10	10	10	10	11	11	11	11	12	12	12	12	12
11	11	11	11	11	12	12	12	12	12	12	12	12
12	12	12	12	12	12	12	12	12	12	12	12	12

Table C Score  + Activity Score  = REBA Score

### B. Arm and Wrist Analysis

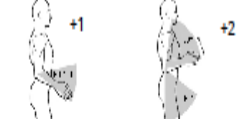
#### Step 7: Locate Upper Arm Position:



Step 7a: Adjust...  
If shoulder is raised: +1  
If upper arm is abducted: +1  
If arm is supported or person is leaning: -1

Upper Arm Score

#### Step 8: Locate Lower Arm Position:



Lower Arm Score

#### Step 9: Locate Wrist Position:



Wrist Score

Step 9a: Adjust...  
If wrist is bent from midline or twisted: Add +1

#### Step 10: Look-up Posture Score in Table B

Using values from steps 7-9 above, locate score in Table B

Posture Score B

#### Step 11: Add Coupling Score

Well fitting Handle and mid rang power grip, **good: +0**  
Acceptable but not ideal hand hold or coupling acceptable with another body part, **fair: +1**  
Hand hold not acceptable but possible, **poor: +2**  
No handles, awkward, unsafe with any body part, **Unacceptable: +3**

Coupling Score

#### Step 12: Score B, Find Column in Table C

Add values from steps 10 & 11 to obtain Score B. Find column in Table C and match with Score A in row from step 6 to obtain Table C Score.

Score B

#### Step 13: Activity Score

+1 1 or more body parts are held for longer than 1 minute (static)  
+1 Repeated small range actions (more than 4x per minute)  
+1 Action causes rapid large range changes in postures or unstable base