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Self reported Work related Musculoskeletal Disorders (MSDs) among Bank workers in Dhaka, Bangladesh.

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LIST OF ABBREVIATIONS

ADL   : Activity of Daily Livings

ATS   : Automated Training Ssystem

BFID   :

EI   : Ergonomic Intervention

HSE   : Health and Safety Executive

I E A : International Ergonomic Association

ILO   : International Labour Organization

LBP   : low back pain

MSDs : Musculoskeletal Disorders

MSI   : Musculoskeletal Injury

MSS   : Musculoskeletal Symptom

NIOSH : National Institute for Occupational Safety and Health

NMQ   : Nordic Musculoskeletal Disorders

UK   : United Kingdom

USA   : United States of America

VDT   : Visual Display Terminal

WHO   : World Health Organization

WHS   : Workplace Health and Safety

WMSDs: Work Related Musculoskeletal Disorders

WRLLDs: Work Related Lower Limb Disorders

WRULDs: Work Related Upper Limb Disorders

ABSTRACT

Introduction: Banking sector is the major sector contributing to the national economy. There are 56 Banks and 8693 Branches where around 2,00,000 employees are working. It is very important to know the prevalence and associated risk factors for occurring musculoskeletal disorders among bank workers.

 Study Design: This is a non experimental, cross sectional study, performed among 300 bank workers in Dhaka city of Bangladesh. Purposive sampling was used to collect data. Data collection tool was a Questionnaire consists of two parts, Part-I incorporated demographic information and some risk factors responsible for musculoskeletal disorders which obtained after an extensive literature search and Part-II consist of pre-validated standardized Nordic Musculoskeletal Questionnaire (NMQ). The gathered data were analyzed by SPSS software version 20 using descriptive statistics, chi-square test, Wald chi-square test and logistic regression.

Result: The annual prevalence of WMSDs among Bankers in Dhaka city is 69.3% where 51.7% were prevented of carrying out normal activities due to MSDs. The most affected part of body is lower back (39.7%), followed by neck (30.7%), Knees (17.7%), upper back (11.7%), Wrist/Hand (11.7%), Ankle (11%), Shoulder (9.7%), Elbow (9.7%) and Hip (7.7%). Lack of knowledge regarding ergonomic training, good working posture and physiotherapy management of MSDs were most significant (chi-square value 127.967, P=0.00) for MSDs. Here, gender has no association (P=.067) with MSDs but Age (P=.043), Working hour/week (P=.031), Job tenure (P= .001), BMI (P=.000), Stress (P=0.00) and Activity level maintaining abnormal working situation (P=.001) has strong association with MSDs.

Conclusion: Almost 70% prevalence of annual musculoskeletal disorders and more than 50% resulting disabilities by Bank workers in Dhaka city were found in this study. The significant risk factors responsible for the occurrence of musculoskeletal disorders includes age, increased BMI, increased working hour, longer job tenure, low Knowledge of Ergonomic training, low Knowledge of good working posture & low Knowledge of Physiotherapy management of WMSDs, higher psychosocial stress and higher level of activity maintaining abnormal working situation.

Key words: Work related Musculoskeletal Disorders, Bank worker, Dhaka,

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CHAPTER-1: INTRODUCTION AND LITERATURE REVIEWS

1.1 Background:

Work related Musculoskeletal Disorders (MSDs) are most common health issue in modern life. People are working for maintaining their life from dawn to dusk in different working environment. Some of these are good and ergonomically correct and some are not. In a third world country like Bangladesh which is going to be an emerging tiger in economic sector: it is necessary to know the health status of Bank workers whose are playing an important role for forwarding this country to a middle income country. According to a study by Siddikee, M. J. A., Parvin, S. and Hossain, M. S. (2013) banking sector is the major sector contributes to the national economy. The business of banking is expanding in Bangladesh and the activities of bank are being explored to serve the clients. Banks are among the most important sources of short term working capital for businesses and have become increasingly active in recent years in making long-term business loans (Rose & Hudgins, 2005). The main function of a commercial bank is to mobilize deposits and to provide loans to people and organizations to finance their consumptions and business activities. Thus banks encourage the flow of money to productive use and investment which accelerates the flow of economic growth (Ashraf, A. & Howlader, 2005). Shahid, Banerjee & Mamun (2004) state that the economy of Bangladesh has been growing gradually and as such it needs the support of a financial structure. Samina, Q.S. and Alam, R. (2011) state that Banking industry in Bangladesh up to now is leading the financial system. In Bangladesh there are 56 Banks and 8693 Branches (BFID, 2015).There are also 4 Non Scheduled Bank and 31 non-banking financial Institute (Bangladesh Bank, 2016). Whereas a report in 2007 shows there are

49 banks (with 6318 branches) of which there are 30 private commercial banks, 10 foreign commercial banks and 9 nationalized commercial and specialized banks. The banking sector employs about 110,000 people (Salauddin, A., Khanal, D. R. 2007) which can easily assumed that should cross the boundary of 2, 00,000 at present. So for this huge population an appropriate measure should be taken for prevention and treatment of WMSDs. Moreover there is no Government organization regarding Health and Safety issues for worker like National Institute for Occupational Safety and Health (NIOSH), USA.

1.2 Operational Definitions and Descriptions:

1.2.1 Definition of Musculoskeletal Disorders (MSDs):

According to The National Institute for Occupational Safety and Health (NIOSH, 2016) of USA, Musculoskeletal disorders (MSDs) are injuries or disorders of the muscles, nerves, tendons, joints, cartilage, an disorders of the nerves, tendons, muscles and supporting structures of the upper and lower limbs, neck, and lower back that are caused, precipitated or exacerbated by sudden exertion or prolonged exposure to physical factors such as repetition, force, vibration, or awkward posture. (This definition specifically excludes those conditions such as fractures, contusions, abrasions, and lacerations resulting from sudden physical contact of the body with external objects.)

Similarly, Queensland Government of Australia (2015) defined musculoskeletal disorders in the WHS (Workplace Health and Safety) Regulations, means an injury to, or a disease of, the musculoskeletal system, whether occurring suddenly or over time. It does not include an injury caused by crushing, entrapment (such as fractures and dislocations) or

cutting resulting from the mechanical operation of plant. They describe MSDs may include conditions such as:

- sprains and strains of muscles, ligaments and tendons

- back injuries, including damage to the muscles, tendons, ligaments, spinal discs, nerves, joints and bones

- joint and bone injuries or degeneration, including injuries to the shoulder, elbow, wrist, hip, knee, ankle, hands and feet

- nerve injuries or compression (e.g. carpal tunnel syndrome)

- muscular and vascular disorders as a result of hand-arm vibration

- soft tissue hernias

- chronic pain.

Queensland Government of Australia (2015) found that MSDs occur in two ways:

- gradual wear and tear to joints, ligaments, muscles and inter-vertebral discs caused by repeated or continuous use of the same body parts, including static body positions

- sudden damage caused by strenuous activity, or unexpected movements such as when loads being handled move or change position suddenly.

Injuries can also occur due to a combination of these mechanisms, for example, body tissue that has been weakened by cumulative damage may be vulnerable to sudden injury by lower forces.

1.2.1.1: Signs and symptoms of Musculoskeletal Disorders:

Recognizing the early signs and symptoms of Musculoskeletal Injury (MSI) is critical so that corrective measures can be implemented to avoid further damage and rehabilitative

treatment can be provided if necessary. The risk of work-related injuries can be reduced by education and by well designed job tasks that minimize physical demands.

Signs and symptoms of an injury can appear suddenly or gradually. According to National Library of Canada (2002) sign of MSDs can be observed, such as: redness, swelling, loss of range of movement, difficulty moving a particular body part & loss of strength. A symptom can be felt but cannot be observed, such as: pain (may include eyestrain and headaches), tenderness, numbness, tingling, burning feeling & cold sensation.

1.2.2: Concept of bank

Bank is the financial institution that deals with money and money worth instruments. A bank is a financial intermediary that accepts deposits and channels those deposits into lending activities, either directly or through capital markets. "Bank, an institution that deals in money and its substitutes and provides other money related services. In its role as a financial intermediary, a bank accepts deposits and makes loans. It derives a profit from the difference between the costs (including interest payments) of attracting and servicing deposits and the income it receives through interest charged to borrowers or earned through securities. Many banks provide related services such as financial management and products such as mutual funds and credit cards. Some bank liabilities also serve as money—that is, as generally accepted means of payment and exchange." – Encyclopaedia Britanica (2016). "Banking means the accepting, for the purpose of lending or investment, of deposits of money from the public, repayable on demand or otherwise, and withdraw able by cheque, draft, order or otherwise" – According to Section 5(b) of Banking Regulation Act, 1949. A bank is an establishment which makes

to individuals such advances of money as may be required and safely made, and to which individuals entrust money when not required by them for use.

1.3: The Global Burden of MSDS

Working can have a positive influence on our lives such as income provision and social benefits but the dark side of it is the negative effect on workers' mental, physical and psychosocial state of health (Chen, 2005). The case of MSD, particularly low back pain (LBP) tends to cause a more severe negative effect leading to incapacity as well as physical pain or discomfort for the worker. The World Health Organization [WHO] and the International Labour Organization [ILO] place the prevalence of work-related LBP at 37% of the total global burden (Punnett, *et al*. 2005) equating to 818,000 disability adjusted life years lost. Although men were identified as having a higher global prevalence this could be as a result of men generally being involved in physically demanding jobs than female workers.

According to Government statistics of Great Britain's Health and Safety Executive (HSE) (2015), Work Related Musculoskeletal Disorders (WRMSDs) in Great Britain have shown a consistent downward trend over the last number of years. It is not possible to understand fully why there is a downward trend but WRMSDs still remain one of the major causes of occupational ill-health. It is possible that greater awareness of the scale of the problem has led to changes to work patterns, work design or general changes in workers attitudes and behaviors as a result of organizational cultural change may have exerted downward pressure on the overall scale of the problem. However to date WRMSDs in Great Britain remains an ill health related condition that places significant burdens on employers and employees accounting for 44% of all work related ill-health.

The latest estimates from the Labour Force Survey (2015) show that in Great Britain,

- The total number of WRMSDs cases (prevalence) in 2014/15 was 553,000 out of a total of 1,243,000 for all work related illnesses, 44% of the total.

- The number of new cases of WRMSDs (incidence) in 2014/15 was 169,000, an incidence rate of 530 cases per 100,000 people. The estimated number and rate fell in the ten years to 2011/12. The level in 2014/15 was similar to those in 2011/12 and 2013/14 (no data was collected in 2012/13).

- An estimated 9.5 million working days were lost due to WRMSDs, an average of 17 days lost for each case. This represents 40% of all days lost due to work related ill-health in 2014/15. Agriculture; construction; health and social care; and transportation and storage industries all show elevated rates of musculoskeletal disorders.

- By occupation elevated rates of musculoskeletal disorders are seen in occupations that are common across the above industries (such as health and caring occupations; skilled agricultural and construction trades; and postal workers), and also in some occupations common across other industries (such as manufacturing and public administration and defense).

According to a study done by Health and Safety Executive (2015), an estimated 9,466,000 working days were lost due to WRMSDs, an average of 17.1 days lost for each case. However, whilst the number of days lost is significantly lower than days lost in 2001/02, there has been no significant change over the last five years. WRMSDs represent 40% of all days lost due to work related ill health in Great Britain in 2014/15. Within the total number of 9,466,000 days lost due to WRMSDs, WRULDs account for

around 43% of days lost at 4,112,000, with back disorders around 31% of days lost at 2,857,000 days and WRLLDs 25% at 2,396,000 days. According to the data released by the Bureau of Labor Statistics on Workplace Injuries and Illnesses of 2010, it was reported that there were 2.9 million work-related injuries in the United States (Bureau of Labor Statistics, 2011). A general estimation by Leigh (2011) of the economic implications of WMSD found that the total costs of nonfatal injuries and illnesses from 2007 were approximately $46 billion dollars. Upper extremity WMSD was estimated to cost the United States $2 billion annually (Bureau of Labor Statistics, 2011). There is no study about this in Bangladesh but this pattern of high WMSD incidence rates is not limited to United States and UKs as it has been seen to be a global issue.

1.4: Justification and significance of Research

Most of the studies in Bangladesh among Bank workers, they focus on either back pain (Emdad, M.A.T.2012) or neck pain (Islam, M.S. 2012). But there is no study found with prevalence of WMSDs among Bank Workers in Bangladesh. Emdad, M.A.T. (2012) did a study regarding Prevalence of Low Back Pain among the Bank Workers at some selected Bank in Savar Bangladesh and found significance. Similarly, Islam, M.S. (2012) did a study regarding Prevalence of neck pain among Bank Workers, Savar, Bangladesh and found significant. Moreover both of this study did not adopt a pre validated questionnaire. Not only this, banking sector plays an important role for the upgrading the economic status of this country, where it is necessary to give them a good working environment of free from work related diseases. So the researcher chooses to do a study regarding prevalence of MSDs among Bank Worker and find out the reason and solution

for this. The information provided by this study can be used to stress the need for primary prevention thereby promoting health in the banking industry.

1.5: Aim and Objectives

The aim of the current study is to investigate the prevalence of self-reported perceived work related musculoskeletal disorders amongst Bank Worker in Dhaka, Bangladesh using a questionnaire consist of two part where Part-I is based on custom develop demographic information on the basis of reviewed literature and in Part-II based on the pre-validated standardized Nordic Musculoskeletal Questionnaire.

The specific objectives are:

- To determine from the quantitative data whether there is any significant Correlation between the demographic Characteristics included causes found in literature review (age, sex, BMI, Stress, work load, self perceived mental and Physical health) of Bank worker and prevalence of perceived WMSDs.

- To investigate association between ergonomic training and prevalence of perceived WMSDs.

- To investigate the relationship between knowledge (about good working posture, Ergonomic training and knowledge about Physiotherapy management for WMSD) and prevalence of perceived WMSDs.

- To find out most affected body part due to work related MSDs.

1.6: Literature Review

1.6.1: Method and materials for searching

- Literature searches by means of the computer based

  - ➢ Hinari data base

  - ➢ Biomed Central,

  - ➢ Pub med Central databases

- In addition to the Cochrane database were to recognize important literature close to musculoskeletal disorders/ Work related musculoskeletal disorders/ Musculoskeletal Symptoms or strain and Bank worker. There were no limitations on the year of publication for any of the searches. The search strategy was repetitive in the whole time of the study and was aimed at retrieving references linking to musculoskeletal disorders. Search terms used included Incidence of musculoskeletal disorders/ Work related musculoskeletal disorders/ Musculoskeletal Symptoms or strain, physiotherapy in musculoskeletal disorders/ Work related musculoskeletal disorders/ Musculoskeletal Symptoms or strain, valid questionnaire for musculoskeletal disorders/ Work related musculoskeletal disorders/ Musculoskeletal Symptoms or strain, Causes and management of musculoskeletal disorders/ Work related musculoskeletal disorders/ Musculoskeletal Symptoms or strain and Musculoskeletal disorders among bank workers/ Bankers. In addition, the reference lists of articles recognized through the above process were also searched to find out any further pertinent literature.

- Eligibility criterion was put as English language and the title and abstract fields were included in the search.

1.6.2: Risk Factors for WMSD

On the basis of a number of some critical reviews of the literature (Burdorf, 1992; Winkel and Mathiassen, 1994; Hagberg et al., 1995; NIOSH,1997; Punnett and Bergqvist,1997) many types of musculoskeletal disorders have substantial work-related component. This is especially true where there is a high level of exposure and where there are combinations of adverse conditions, e.g. lifting loads with the arms outstretched at a high frequency is stressful for the shoulder region. There is strong evidence that low back disorders are associated with lifting, high exertion and awkward back postures (e.g. Punnett et al.,1991; Marras et al.,1993). Studies using objective measures to quantify work exposures, worker by worker, generally show stronger relationships than studies which used less precise methods such as job titles applied to many workers in a group. For example, a recent study using an extensive sequence of both psychosocial and biomechanical exposure measures found that both types of variables were important, independent contributors to the reporting of low back pain in the automobile assembly industry. Specifically, peak and cumulative forces on the spine, peak forces on the hands, trunk postures, and perceptions of a poor work social environment, low decision latitude, good co-worker support, job satisfaction and high physical demands were all important, independent risk factors for reporting low back pain (Kerr, 1998; Norman et al., 1998). This study provided consistent evidence of an association between workplace biomechanical factors and LBP and independent, though less consistent contributions for psychosocial factors. These observations were different from those reported by Bigos, et al., (1991) who found that only job dissatisfaction was significant. However, their

estimates of physical demands were done only at a group level or by job title. Whole body vibration has also been found to be strongly related to low back pain.

For the neck and shoulder there is strong evidence that non-neutral posture, especially overhead work, as well as high forces and high frequency movements are associated with development of disorders in the region. For the arm, combinations of forceful actions awkward postures and high frequency movements are associated with the development of carpal tunnel syndrome and tendinitis. These findings typically come from industrial work activities. There is also a growing recognition that office tasks, especially those associated with Visual Display Terminal (VDT) can lead to musculoskeletal disorders. Disorders of the hand and wrist appear to be related to long term use of the keyboard; the mechanism appears to be repetitive finger motion and sustained muscle activity in the forearm. For many body areas there is good to strong evidence that work exposures are associated with the development of injury and that the relative risk of certain work exposures is high; this was true for shoulder and hand/wrist tendinitis, low back pain, carpal tunnel syndrome, hypothenar hammer syndrome, tension neck syndrome as well as localized musculoskeletal symptoms i.e. pain. Plausible biological mechanisms for these risk factors to result in disorders of the musculoskeletal system have been proposed. Our best evidence points to a complex interaction of physical, psychosocial and individual factors in the production of musculoskeletal disorders at work.

It should be noted that while the literature is clear on the main risk factors for injury, details of mechanism of injury and injury threshold values are often unclear. For example, epidemiological studies have indicated that increasing time using a visual display terminal (VDT) leads to increasing risk of developing musculoskeletal disorders

of the shoulders and arm (Punnett and Bergqvist, 1997). It has also recently been epidemiologically documented that cumulative compressive force on the spine is an independent risk factor for LBP (Kerr, 1998; Norman et al., 1998). However, it is not possible to reduce the time using VDT to zero; data must still be entered .Nor is it possible to reduce cumulative compression on the spine to zero. The spine is in some level of compression while just sitting or standing. Until there is a better understanding of tolerable durations or rates of working with VDTs or loading the low back and, in general, how time-related factors cause tissue damage it is difficult to understand exactly how long term VDT use elevates injury risk, and it is difficult to produce effective mice, keyboards, work schedules or job designs.

1.6.3: Ergonomic Interventions

Ergonomic interventions are one of many proposed interventions for treatment and prevention of WMSD. Ergonomics is defined by the International Ergonomics Association as "the scientific discipline concerned with the understanding of the interactions among humans and other elements of a system, and the profession that applies theoretical principles, data and methods to design in order to optimize human well being and overall system" (I E A, 2000). Ergonomic interventions (EI) involve adjusting a workers' environment, behavior, and other long-term educational approaches to treat and prevent further damage due to WMSD. EI works to limit muscle tension, promote blood flow and nutrient circulation as these physiological processes may be neglected during the workday, due to exclusive focus on productivity. EI also utilizes educational tools, behavior modifications, brief stretches and exercises to treat and prevent the chronic nature of WMSD. It is thought that through the implementation of an educational

work ergonomics program, workers will be intrinsically motivated to alter postures and behaviors (Robertson et al. 2009). EI takes a different approach than traditional therapeutic interventions as it targets habits that are developed due to occupation-specific repetitive motions (Rappaport 2010). EI aims to go beyond the surface causes of WMSD, to the less visible factors that may contribute to the development of WMSD, like workstation design and postures. EI goes beyond simply providing adjustable equipment as it has been found that the availability of adjustable office furniture alone is not enough to prevent chronic musculoskeletal injuries (Robertson et al. 2009). It is a combination of adjustable equipment with proper ergonomic education that increases the likelihood that workers ergonomically adjust their workspace (Robertson et al. 2009). EI also utilizes educational tools, behavior modifications, brief stretches and exercises to treat and prevent the chronic nature of WMSD.

WMSDs are now recognized to have multiple risk factors spanning the individual, the interpersonal, the physical environment and the organization of work. Investigators from different disciplinary backgrounds, each with their own taxonomy, have approached interventions in a variety of ways. Researcher shall use the terms, engineering, administrative and behavioral interventions. Of course in any situation, multiple interventions may be made simultaneously or sequentially. The review papers by Goldenhar and Schulte, 1994; Grant et al., 1995 and Zwerling et al., 1997, include many examples of interventions.

Engineering interventions are engineered or physical manipulations of hazards or routes of exposure to physical hazards (Robert, N., Richard, W. 1998). Typical examples may be the provision of lift tables to prevent lifting from ground level, or adjustable office

equipment. Administrative interventions concentrate on changing the duties or the design of the job such as the introduction of job rotation, enlargement, work cells, or policies, for example requiring at least two persons to lift patients in a hospital (Robert, N., Richard, W. 1998).

Behavioral interventions focus on the individual worker's behaviors or capacity. A behavioral (or personal) intervention may focus on increasing fitness or strength, on stress reduction workshops, on improving work methods. Requiring the use of personal protective equipment is a further option and is commonly used in safety and industrial hygiene.

Let us take the example of one task undertaken by custodial staff. Emptying mop buckets full of water into a sink is a high risk activity because of the magnitude of the risk factors; high trunk loads and lifting from floor level. In addition, because of the sometimes cramped situations in custodial closets, it is likely that twisted and laterally bent postures are simultaneously present. The presence of high spinal loads and non-optimal postures to support them is central to assessing the task as high risk despite the relatively low frequency of lifting.

Engineering changes would modify the custodian's job of emptying mop buckets, perhaps by installing floor level drains to allow the bucket to be tipped rather than lifted (this will likely not solve the problem as the work is still performed in a bent over posture), adding a drain valve or tap, designing a bucket that holds much less water or installing a powered lift to empty the bucket (unlikely in this situation but common in industrial settings). Note that some of these eliminate the risk factors (emptying with a tap or the powered emptying) while others reduce the risk factors (the smaller bucket).

Administrative changes for emptying the mop bucket could include designating the job "nonessential" to the job and having a co-worker perform it, requiring that full mop buckets be emptied by two people, only performing the task alternate weeks or requiring that mop buckets only be filled half full of water. As with engineering changes, some of these may be effective in reducing the risk to the given worker (having a co-worker perform the task) but the risk may now accrue to another worker.

Behavioral and personal changes operate by attempting to reduce the hazardous effects of the risk factor by training in correct technique (back schools) or improving the capacity of the worker (fitness and exercise programs or stress management programs). Personal Protective Equipment is intended to work by putting a barrier in place between the hazard and the person (padded gloves if the hand is used as a hammer or holds vibrating tools). Some approaches, such as back belts, are suggested as combining a number of these strategies. The main difficulty with administrative and behavioral changes and personal protective equipment is that they may not be adhered to or used; a rush job will likely mean that the worker cannot wait for a co-worker to help, does not tighten or wear the back belt, or cannot use the educational information on proper manual handling in their workplace. Due to a change in the worker or the supervisor, the administrative control may be forgotten. Engineering changes, on the other hand, tend to be more permanent, affect all workers on that job and are unlikely to be bypassed under time pressure. For these reasons engineering changes are usually recommended as a first approach and administrative controls are recommended only if job design changes cannot be instituted or further risk reduction is required. The last resort should be behavioral and personal protective equipment changes.

1.6.4: Ergonomic Training

Ergonomic and didactic aspects are rather important in automated training systems (ATS). Ergonomics considers the intensification of all forms of teaching. Under conditions of normal, optimum intensity of teaching there is no physical, intellectual, or nervous overload; natural human labor and perceived requirements are satisfied (Robert, N., Richard, W. 1998). Moreover, working time, energy, and strength are spent rationally; work capacity and health are maintained; there is no monotony or fatigue. To intensify a participant's training it is necessary for a system of didactic methods, techniques, and facilities to be developed; the most effective forms and conditions of organizing a participant's activity to   be determined; training methods and techniques to be acquired by Ergonomist. An intensification of pedagogical activity involves providing the most favorable working conditions, decreasing fatigue, assisting in opening creative abilities, and increasing efficiency. Training systems should be designed to intensify the educational process, the Ergonomist's and the participant's individual activities (an increase of the Ergonomist's qualifications and the participant's erudition), and collective activity. The following tasks are the basic components of ATS (Robert, N., Richard, W.1998):- a) to create a methodology of multi terminal directory systems, operation software for information systems with user's terminals; b) to develop materials on mathematical modeling of communication; c) to analyze parameters of survivability; d) to create mathematical model algorithms of both structural analysis and synthesis; e) to develop a program complex, which consists of an automated training system, an encyclopedia, a toolkit for realizing practical employment and laboratory work, a manual for designing and analyzing communication.

1.6.4.1: Didactic and Ergonomic Components

As the project is designed to automate research and to create new models of training (which are necessary for long-distance education), the didactic and ergonomic aspects are very important. In this paper estimating the efficiency of ATS and new software is considered (Robert, N., Richard, W. 1998). The training system should offer an opportunity in a dialogue mode to change ways of displaying information on the screen, to create various models, to register the characteristics of work pace. This creates preconditions that allow researching individual features of a person (memory, recognition, attention) at work in laboratory conditions as close as possible to real ones. The use of computers brings new elements to traditional lecturing (Robert, N., Richard, W. 1998), namely, visual presentation of information on screens in a form convenient for recognition; audio and visual images that are easy to remember, assist thinking and creating certain associations in participants; the possibility to repeatedly refer to lecture material with the help of various indexes and references; the possibility to receive hard copies of lecture material. The comparison of the evaluation of the efficiency of the training system can be based on either training according to a standard model or training with the help of another automated system in which the way of presenting material and the form of interaction between the participants and ergonomist essentially differ.

1.6.5: Posture

Good posture is required to ensure the neck and spine does not carry more weight than necessary. Sustained awkward postures may place unnecessary strain on back and neck which may lead to pain or injury. E.g. for every inch (2.5cm) the head moves forward, the pressure on the spine increases as if the head weighed an extra 4.5kg. Setting up your workstation properly encourages good posture and minimizes risk of discomfort and injury (Office Ergonomic Guideline. 2013).
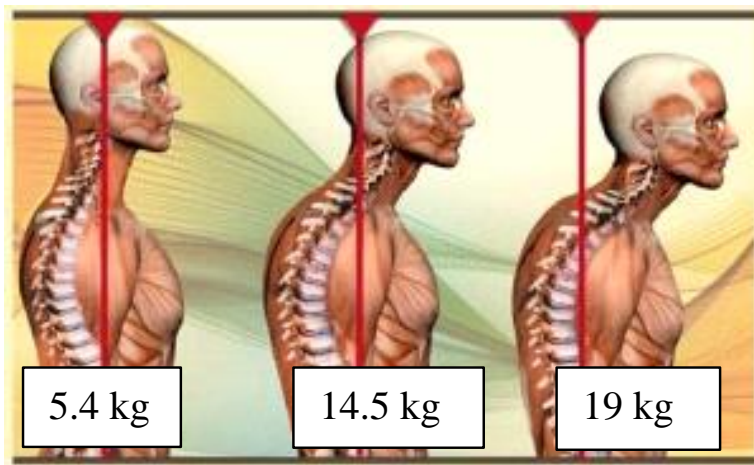
Figure: 1 shows increasing weight of head resulting excess pressure on Spine due to moving forward of Head in every Inch (adopted from Office Ergonomic Guideline., 2013).

Setting up your workstation properly encourages good posture and minimizes risk of discomfort and injury. Adjust your chair to achieve comfortable working posture as shown below: Elements include: - Chair height, Back rest, Lumbar support, -Arm rests, - Seat pan/depth & Stable base (Office Ergonomic Guideline. 2013).

Good computer posture

Natural tilted position of the head, helps reduce tension in the back of the neck

Swing-up keyboard shelf is somewhere to rest the arms, and provides relaxation and sufficient distance from the screen

Backrest should be adapted to the back and support the lumbar region

Computer screen should be positioned 18 and 24 inches (46 and 61 cm) away, at just below eye level

30 degrees

1. Lower arms should rest on the desktop in a relaxed position

2. Seat should tilt forward by approximately two degrees; the seat depth should be positioned correctly: the thighs should not be in contact with the front edge of the seat

3. Lower leg should be vertical to the floor, the thigh horizontal

4. Desks and scholastic furniture should be height adjustable

Figure: 2 representing good working posture on a desk (Adopted from Dr. Tom McNulty's Back and Body Health Centre, 2016).

Adjust your monitor to achieve a comfortable posture. This can be achieved through: - Appropriate distance - consider your vision, font size and screen resolution. - Height and Location – monitor directly in front with top of monitor at eye level.
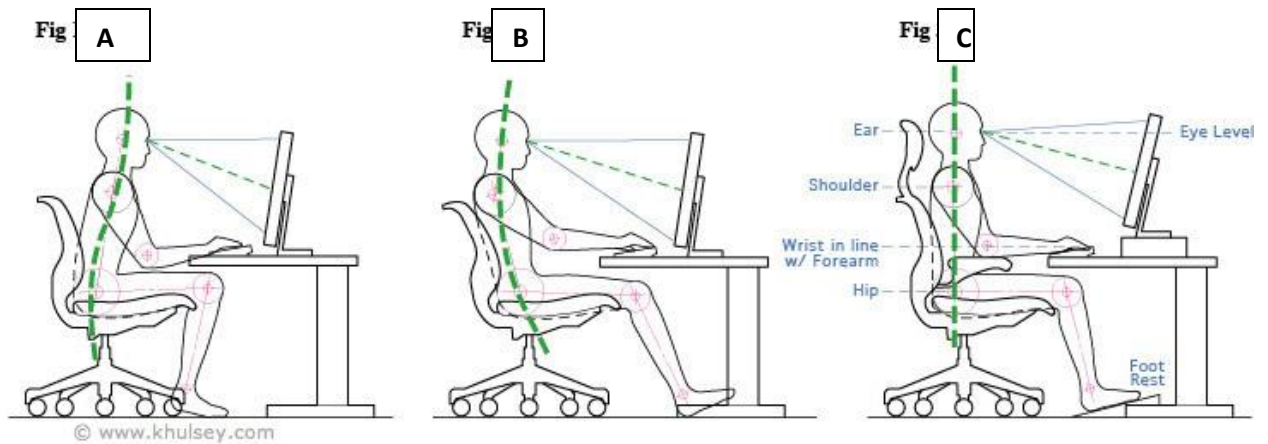
Figure: 3 shows different good and bad working posture (Adopted from Workstation sitting and Posture, 2011).

Posture and the placement relationship of chair, desk, keyboard, mouse, drawing tablet, and monitor(s) play an important role in how much fatigue you will feel at the end of a long work day (Workstation sitting and Posture, 2011).

The first two examples (**Fig. A & B**) show the classic mistakes people make in their seating position. **Fig.A** known as the "slump" puts tremendous strain on your lower back as your spine must carry all of the weight of your upper torso. This strain on your lower back can be further aggravated by tucking your feet under your chair (Workstation sitting and Posture, 2011). The reclining position (shown in **Fig. B**) puts strain on both your neck and lower back, especially if your chair does not have proper lumbar support. Both of these positions also give you a poor viewing angle of the monitor and negatively affect your arm and wrist position in relation to the desk and keyboard (Workstation sitting and Posture, 2011). In last example (**Fig. C**) shows proper alignment between your head, torso, legs, and arms. Your upper body should be in perfect vertical alignment and your forearms should be as horizontal as possible to avoid wrist strain. Additionally, you want

to be looking directly at the monitor to reduce side glare from the reflective surface of the screen although good flat panel monitors give off very little glare (Workstation sitting and Posture, 2011).

According to The University of British Columbia's Office Ergonomic Representative training, (2014) Monitor Height should maintain top line of the text ~ eye level. Line of sight: 15 degrees below the horizontal. *Bi/Tri focal users: Place the monitor so that the head is straight when viewing the monitor (or use reading glasses) Figure- 4.
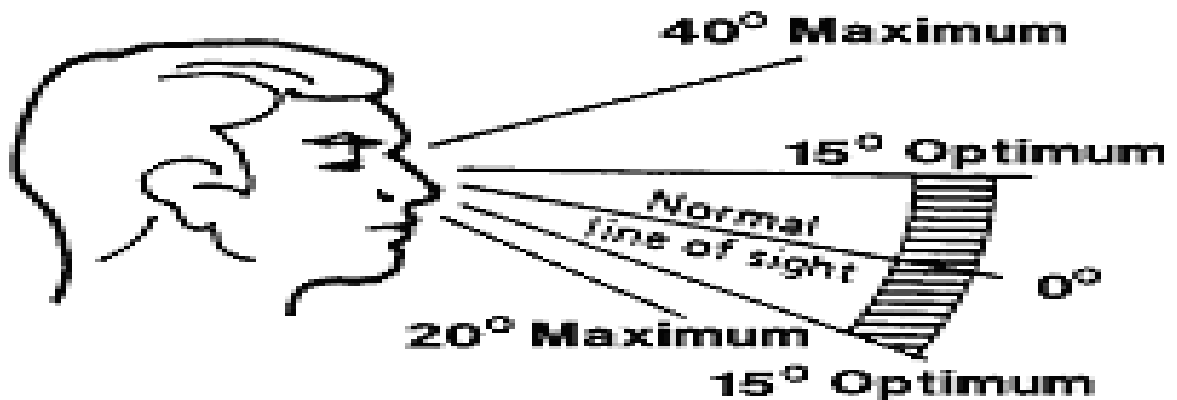
Figure- 4 shows the height of monitor and eye angle (Adopted from Office Ergonomic Representative training. 2014).

It also helps to have your chair's seat bottom have a slight forward tilt and to use an ergonomic footrest to keep the upper portion of your legs parallel to the ground.

Invest in a top quality chair with arms, headrest and lumbar support. The two chairs that I would highly recommend are the Freedom or Liberty chair from a company called Human Scale and the Aeron Chair from Herman Miller. Both chairs are great looking and come with all of the necessary adjustments to fit your body (Workstation sitting and Posture, 2011).
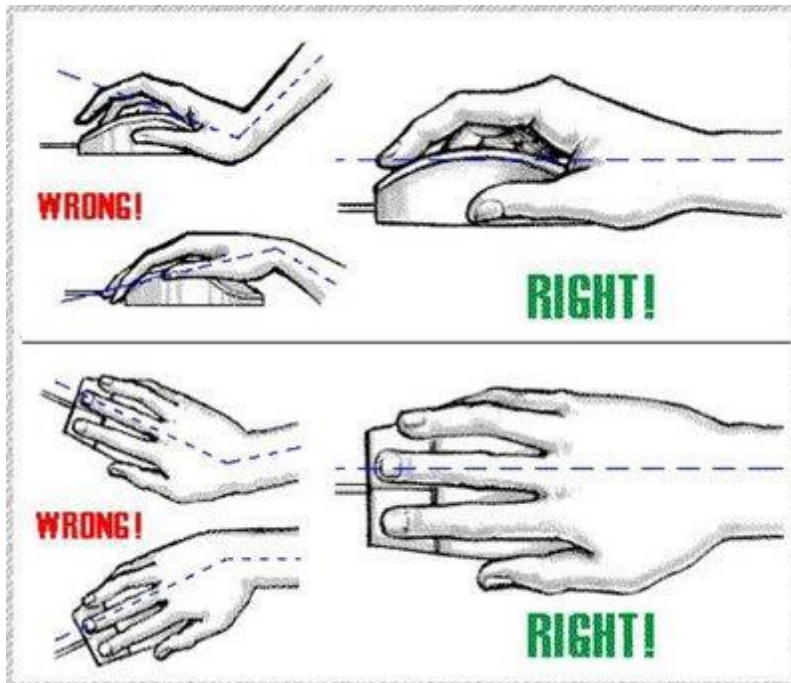
Figure: 5 Shows proper way of using mouse to reduce WMSDs (Adopted from Office Ergonomic Representative training. 2014).

1.6.6: Physiotherapy Intervention in WMSDs:

According to Marmot, M. (2010) Occupational health physiotherapists have a role in proactively promoting health and wellbeing in the work environment. This allows workers to avoid sickness and injury as well as the potential secondary health consequences of sickness absence or even unemployment. There is an another study by UK's Department of Health (2006) which claim that Physiotherapists are clinically effective and cost effective at managing and treating patients with musculoskeletal disorders (MSDs). In this study they found that there are over 200 types of MSDs, 1 in 4 UK adults affected by chronic MSDs, Low back pain is reported by 80% of people at some time in their life and Patients with MSDs are the largest patient population group treated by physiotherapists. According to a study of UK's Department of Health (2008)

Rapid access to musculoskeletal physiotherapists can reduce the amount of time people are off sick and is vital in preventing a new acute problem becoming chronic and long lasting. Patients with MSDs are the largest patient population group treated by physiotherapists. In 2010/11 in England, physiotherapy outpatient services managed 1.9 million adults with a first appointment and 4.8 million follow up appointments for MSDs (Department of Health, 2016).

Currently, treatment of WMSDs consists of traditional therapeutic modalities that include and are not limited to strength-building exercises, electrical stimulation, hot and cold modalities, and injections. It is thought that these modalities reduce pain, inflammation, increase/maintain strength, and promote tissue healing (Poitras & Brosseau 2008). However there is contradictory evidence on the efficacy of these modalities. Several evidence-based studies have found high efficacy of therapeutic exercises as a treatment protocol for WMSDs, but there are contradictory studies that found insufficient evidence supporting the use of therapeutic exercises (Novak, 2004; Ludewig & Borstad, 2002; Indahl, 2004). There are a limited number of studies showing that transcutaneous electrical nerve stimulation (TENS) is effective in reducing pain and muscle spasms with pain reduction being temporary to short-term at best (Brosseau et al., 2002; Poitras & Brosseau, 2008). Studies evaluating the efficacy of hot and cold modalities are limited and of those limited number of studies, the evidence supporting the use of hot and cold packs were considered not strong (French et al. 2006).

The duties of a physical therapy aide includes cleaning and organizing exam rooms, observing and taking notes on patient progress and responses, instruct therapeutic

exercises, clerical duties, and performing ultrasound and electrical stimulation therapy (Sylvia, E.K. et al. 2013).

The trained physical therapist travels to the patient's workplace to evaluate the components of a workstation. By taking precise measurements and making close observations, the physical therapist performs an ergonomic assessment, developed in collaboration with Organization. After the assessment is finished, the physical therapist makes ergonomics changes to the patient's workstation (Sylvia, E.K. et al. 2013).

1.6.7: Stress in work place

Stress at work is an increasingly common feature of modern life (Cooper, C. 1998). It is a feedback of an individual towards his/her environment (Piko, 2006). An individual could experience stress if he/she perceives negatively towards his/her work environment. According to Cooper, C. (1998), work stress can be defined as the non-specific response of the body to any demands made upon it. It is considered to be an internal state or reaction to anything we consciously or unconsciously perceive as a threat, either real or imagined (Clark and Watson, 1991). On the other hand, Robbins (2001) define stress as a dynamic condition in which the individual is confronted with an opportunity, constraint, or demand related to what he or she desire and for which the outcome is perceived to be both uncertain and important.

CHAPTER-2: METHODOLOGY

2.1: Research methodology

This chapter represents the theoretical frameworks and analytical tools working to address the research objectives. Data requirements and data collection techniques employed are also discussed in this chapter. The aim of this chapter is to explore the research design according to the nature of this research purpose. The research philosophy is first introduced. Based on this philosophy, the research methodology and methods were discussed. Following that, the research strategy is put forward. In this chapter, the current study contends that both positivism and Phenomenological philosophies are suitable for the research. To be consistent with these philosophies, the deductive research approach was adopted. As for the research strategy, case of Bank workers was employed. So as to analyze the case, primary data were collected to analyze and discuss. For primary data collection, self reported questionnaire survey method was implemented.

2.2: Research Philosophy

There are two widely acknowledged schools of thoughts underpinning research philosophies: Positivism and phenomenology. Gill and Johnson (2002) defined positivism as an approach that emphasizes the use of methods that are presumed to be used in the natural and social sciences. Phenomenology is a study of how things appear to people according to their personal experiences. Saunders et al. (2009) in their study found that the research philosophy of any researcher depends on the way the individual thinks about the development of knowledge. They argue that the positivist approach is based on the assumption that the world consists of social reality that can be observed objectively and analyzed statistically to produce law-like generalization. This is an optimistic, moral commitment to a realm of ideas felt to have a universal validity, located in a world that is

independent of local human concerns. With the positivist approach, human action is seen to be a result of external stimuli that can be analyzed into cause-and-effect relationships.

The phenomenological approach is a descriptive, interpretative approach to research based on the premise that the social world is too complex for scientific study. This approach as explained by Creswell (1994) is the approach in which human experiences are examined through detailed descriptions of the people being studied.

Both Positivism and Phenomenological philosophies were adopted for the purpose of the current study since the whole process of this research reflects the empirical study of positivism and phenomenological. The research adopts both approaches in the way that there is an emphasis on a relatively structured methodology with questionnaire survey to analyze the prevalence of self-reported perceived musculoskeletal disorders (MSD) amongst Bank workers in Dhaka, Bangladesh.

A pre-validated standardized Nordic Musculoskeletal Questionnaire with a custom developed demographic based Supplementary Questionnaire. This is to ascertain from the quantitative data whether there are any statistically significant correlations on the basis of the fundamental prevalence of WRMSDs amongst this cohort.

2.3: Research Approach

Cooper and Schindler (1998) emphasize that argument allows us to explain, interpret, defend, challenge, and explore meaning. The two types of argument of great importance to research are deduction and induction. In consistent with the positivist philosophy, the current research adopts the deductive approach. The deductive approach according to Cooper and Schindler is a form of inference that purports to be conclusive, thus the

conclusion must necessarily follow from the reasons given. These reasons are said to imply the conclusion and to represent a proof. Deductive research is a study in which a conceptual and theoretical structure is developed and then tested by empirical observation; thus particular instances are deduced from general inferences. Therefore, the deductive method is referred to as moving from the general to the particular. Inductive argument on the other hand, is radically different. There is no such strength of relationship between reasons and conclusions in induction. To induce is to draw conclusion from one or more particular facts or pieces of evidence. Here, the conclusion explains the facts, and the facts support the conclusion.

The current study draws upon a relevant literature on musculoskeletal disorders and a discussion of the prevalence rate of MSDs with particular reference to types of research methodologies employed for the findings of these studies and the conclusions drawn from the results and understanding of these concepts helped to establish an analytical framework for the current study.

2.4: The Research Strategy

Robson (2002) identified three traditional research strategies in scientific enquiry as: experiment, survey, and case study. Experiment strategy is a classical form of research, which is mostly used in the natural sciences, although it features strongly in much social science research, particularly psychology. By survey, the researcher can obtain information in standard form from groups. Usually questionnaire or interview is employed. The survey method, according to Saunders et al. (2009) is a popular and common strategy in social sciences. Case studies according to Cooper and Schindler (1998) place more emphasis on a full contextual analysis of fewer events or conditions

and their relationships. Eisenhardt (1989:534) refers to the case study as "a research study, which focuses on understanding the dynamics present within single setting". The purpose of the case study method according to Zikmund (2000) is to obtain information from one or a few situations that are similar to the researcher's problem situation. Robson (1993) defines case study as the development of detailed, intensive knowledge about a single case or multiple cases.

A survey method is the research strategy adopted in the current study since the author wishes to gain understanding of the context of the research and the process being enacted. A survey method was adopted to administer 300 questionnaires from population of Bank workers working in Dhaka. The method was adopted to obtain the relevant data, which would allow the researcher to investigate the prevalence self-reported perceived MSDs amongst Bank workers in Dhaka using the pre-validated standardized Nordic Musculoskeletal Questionnaire included custom developed demographic based Supplementary Questionnaire based on extensive literature review. Data on the various influences on musculoskeletal disorders were captured for the purpose of the current study.

2.5: Study Design

A non-experimental, Observational type of cross sectional design was chosen for the study. The focal point of this study was to identifying the prevalence and associated risk factors. It was conducted at one time point to estimate the prevalence of the participants self-reported musculoskeletal Disorders identifying & associating risk factors also identified which is informative for planning. This study gave a snapshot of the prevalence & associated risk factors of self-reported musculoskeletal symptoms of Bank Workers.

According to the following definition the study design was a cross sectional study under the nature of Descriptive study of quantitative methods.

The defining feature of a cross-sectional study is that it can compare different population groups at a single point in time. Think of it in terms of taking a snapshot. Findings are drawn from whatever fits into the frame. The benefit of a cross-sectional study design is that it allows researchers to compare many different variables at the same time. We could, for example, look at age, gender, income and educational level in relation to walking and cholesterol levels, with little or no additional cost (Ebling Library , 2016).

2.6: Study Site

Geographically this study was conducted across the Dhaka city, the Capital of Bangladesh which has a rich multicultural population of 12 043 977 which is 8.36% of total population of Bangladesh according to National census in 2011 (Population and Housing census, 2011). In terms of Bank workers it is very difficult to serve such a huge customer with less resort and for this reason the number of Branches of Bank is increasing day by day.

2.7: Study setting

The study was conducted to different Banks of Dhaka city. The name of Banks did not mentioned in this study due to unwillingness of the bank authority. But in this study all variety of Banks included like International, Private and Public Bank to know the picture of MSDs among Bank workers. There was 300 Bank workers participated to this study for that reason researcher needs to visit 35 branches of different bank of Dhaka city.

The need for researchers to collect some   data to answer their research questions cannot be overemphasized. After the researcher has decided the information require for the study, s/he has to decide on the kind of data collection method to use. However, the choice of data collection method will depend upon judgment of which data is needed for a particular research problem. Campbell and Stanley (1963); Craig and Douglas (2000) argue that one important aspect of data collection method to adopt is to identify the unit of analysis. The current study having identified the crucial importance of musculoskeletal disorders amongst Bank Workers where data collected from these cohorts are to be analyzed and interpreted, have ensured that the suitable data collection method is adopted in this study.

Due to the nature of the data being sought an extensive review of pre-validated questionnaires was thoroughly undertaken. The conclusion drawn was to use the following two pre-existing industry approved standardized questionnaires, without any modifications and a supplementary demographic questionnaire developed by the researcher based on other study findings being suitable for general studies on MSD and not intended for used for clinical diagnosis purposes:

2.8: Study Participants:

Bank workers from 35 branches of different Banks of Dhaka city. Out of 344 potential sample 300 completed full part of Questionnaire which is 87.20% response rate.

2.9: Sampling Method

In most studies study population will be a finite one that consists of elements which conform to some designated set of specifications. These specifications provide clear guidance as to which elements are to be included in the population and which are to be

excluded (Kenneth, N.R. 2005). In order to prepare a suitable description of a population it is essential to distinguish between the population for which the results are ideally required, the desired target population, and the population which is actually studied, the defined target population. An ideal situation, in which the researcher had complete control over the research environment, would lead to both of these populations containing the same elements. In this study the population is Bank workers in Dhaka city. A sample is a finite part of a statistical population whose properties are studied to gain information about the whole (Webster, 1985). When dealing with people, it can be defined as a set of respondents (people) selected from a larger population for the purpose of a survey.

The use of samples in educational research is usually followed by the calculation of sample estimates with the aim of either (a) estimating the values of population parameters from sample statistics, or (b) testing statistical hypotheses about population parameters. These two aims require that the researcher has some knowledge of the accuracy of the values of sample statistics as estimates of the relevant population parameters. The accuracy of these estimates may generally be derived from statistical theory – provided that probability sampling has been employed. Probability sampling requires that each member of the defined target population has a known, and non-zero, chance of being selected into the sample. In contrast, the stability of sample estimates based on non-probability sampling cannot be discovered from the internal evidence of a single sample. That is, it is not possible to determine whether a non-probability sample is likely to provide very accurate or very inaccurate estimates of population parameters. Consequently, these types of samples are not appropriate for dealing objectively with issues concerning either the estimation of population parameters or the testing of

hypotheses. The use of non-probability samples is sometimes carried out with the (usually implied) justification that estimates derived from the sample may be linked to some hypothetical universe of elements rather than to a real population. This justification may lead to research results which are not meaningful if the gap between the hypothetical universe and any relevant real population is too large. In this study researcher choose Convenience sampling of non probability type. According to Kenneth, N.R. (2005) a sample of convenience is the terminology used to describe a sample in which elements have been selected from the target population on the basis of their accessibility or convenience to the researcher.

The main assumption associated with convenience sampling is that the members of the target population are homogeneous. That is, that there would be no difference in the research results obtained from a random sample, a nearby sample, a co-operative sample, or a sample gathered in some inaccessible part of the population (Kenneth, N.R. 2005).

There are two types of sampling procedure are in research, one is random sampling another is no-random sampling. Random sampling is administered to avoid sampling bias.

2.10. Sample size Determinant

Researcher selected 300 participants for his study. There was some research of musculoskeletal symptoms among Bank workers in Bangladesh. Islam, M. S., (2012) used 100 sample size in his study about prevalence of Neck Pain among Bank workers in Savar, Bangladesh. In another project by Emdad M.A.T., (2012) regarding prevalence of Low Bak Pain among Bank workers in Savar, Bangladesh and used 100 sample size due

to short time. As there is no relevant study found in Bangladesh so researcher used 33.8% prevalence on the basis of Sulaiman, S.K. et al. (2015) who did a study about MSDs and associated disabilities among bank workers in a district of India. The standard formula of sample size calculation where Confidence Interval is 95% is:

$$n = \frac{z^2pq}{d^2} = \frac{(1.96)^2 \times (0.338\ ) \times (1 - 0.338\ )}{(0.05\ )^2} = 343.60 = 344$$

n= the desired sample size (eventual sample size).

z= 1.96 which corresponds to the 95% confidence level.

p= proportion of the target population estimated 33.8%=0.338, (Sulaiman, S.K. et al. 2015).

q= (1-p).

d= degree of accuracy set at 5%= 0.05.

By calculation it is found that the sample size should be 344 but due to limitation of time and unavailability of the responded due to busy nature of their work leads reluctant to participate in any study, the feasible sample size was 300. Moreover, resources like manpower and logistic support were less for this study because of no financial or other logistic and manpower support from other organization for this reason, researcher arranged to collect 300 samples for this study.

2.11: Questionnaire Selection / Pilot Study

It is considered good research protocol to conduct a pilot study in order to validate the process by allowing both the researcher to identify any elements that may present challenged but fundamentally review clarity, ease and average time completion of

questions (Fink, 1995; Cargan, 2007; Lynch, 2013). The initial pilot of thirty (30) was considered highly beneficial and endorsed the researcher's views that language and trust issues could be addressed by simple, transparent dialogue with the cohort. This then allowed the research to progress with the collection of an additional two hundred and seventy (270) responses. As part of the study the researcher sought to review and trial a pilot of the Questionnaire consist of two part; Part-I describe Demographic information included some risk factors collected by reviews of literature and in Part-II derived from standardized and pre-validated NMQ. These provided an additional dimension of data that could allow further hypotheses to be formulated based on tentative results.

In the pilot study researcher identified that it is not necessary to provide the entire participant a Bengali version of questionnaire because, we are using almost all the English terminology used in this questionnaire in our daily life. For example we used different English words like joint, muscle, numbness, paralysis, disability, tense, nervous, tired, fitness, physical, mental etc. Even we forget the Bengali meanings of some of these words like joint, fitness, stiffness etc. Moreover, bankers are all well educated and overcome different test for getting jobs. So they all are eligible to fill up the English version of questionnaire instead of Bengali version by themselves.

The NMQ was not modified in order to retain its principal of being a standardized questionnaire for comparing common musculoskeletal complaints for use in epidemiological studies (Kuorinka, et al. 1987) and was explicitly not intended for clinical diagnosis (Crawford, 2007) which formed an important consideration in our study. With the demographic information researcher took some question regarding general health status, self perceive opinion on physical fitness. Researcher took questions

regarding tiredness in physically and mentally at the end of a working day to identify bank workers level of tiredness and which is more. Researcher took question regarding knowledge about ergonomic training because this an important risk factor for occurrences of musculoskeletal disorders found in different reviews of literature (Norashikin, M. et al. 2010; Robertson, M.M., O'Neill, M.J. 2003; Bayeh & Smith, 1999; Robertson & O'Neill, 1999; Sauter, Schleifer, & Knutson, 1991). In part-I there is a question regarding knowledge of Physiotherapy management of Musculoskeletal Disorders which is important because, if a participant experience physiotherapy service than definitely he/she will get advice to maintain good working posture and other predisposing factor of MSDs which will impact on WMSDs. Researcher took a question regarding good working posture because it is an important cause of WMSDs (CCOHS, 2016). To analysis stress level researcher took question on the basis of Zafir, M.M et al (2011) study regarding ergonomic and work stress issues in banking sector in Malaysia. Some of the question has to omit for the getting response from the Bank which are create conflict to organization and for that reason authority of Bank will not allow their employees to answer these questions. So, to analyze bank workers stress level, researcher allocates five questions on the basis of Zafir, M.M et al (2011) study. There is a question adopted by researcher regarding level of activity and it consists of six questions which are causing WMSDs. These are working in the same position for long time, performing same task over and over, bending and twisting in an awkward way, repetitive movement of upper limb, work scheduling and carrying heavy work load (National Library of Canada, 2002). Moreover, according to a study of Sommerich, C.M. et al. (1993) found that awkward or static postures, heavy work, direct load bearing, repetitive arm movements, working with

hands above shoulder height, and lack of rest are predisposing factors for occurring WMSDs. For showing support of this question in questionnaire researcher want to mention Yu, I., Wong T. (1996) study whose Showed in their study about MSDs among VDU workers in a Honk Kong bank and found that personal attributes, working posture, repetitive movements and work station design were associated with musculoskeletal complain.

2.12: Inclusion criteria

    1. The workers who performing their job with a variety of position in different bank included public, private and international bank for at least 8 hours a day;

    2. Any age, gender or ethnicity.

2.13: Exclusions Criteria:

Participants would be excluded if they met any of the following criteria-

    1. Participants suffering from disease affecting the musculoskeletal system such as Rheumatoid Arthritis (RA), Osteoarthritis (OA) & other connective tissue disorders.

    2. Having any previous surgery, Trauma and Accident which causing MSDs.

    3. Subjects who had cancer problem- this problem causes a general sense of discomfort, Pain with neck Muscle twitches and cramps. These sign symptoms are similar as neck pain symptoms

    4. Any history of known active infection e.g. TB spine

    5. Having weakness and paralysis.

    6. Pregnant woman

2.14: Ethical Consideration

Approval of the thesis proposal- 'Self reported Work related Musculoskeletal Disorders (MSDs) among Bank workers in Dhaka' by The Institutional Review Boards (IRB) of Bangladesh Health Professional Institute (BHPI) has been taken as the principal investigator by getting reviewed thesis proposal, Questionnaire and consent form. Ethical approval had been taken before conducting the study. Strict confidentiality has been maintained before any discussion about the questionnaire with the Bank workers and only handed over with prior willingness for being a participant with signed consent form. Then all data was promptly filed in order to maintain confidentiality and avoiding cross contamination as prescribed by Balmer, (2001). Moreover researcher did not mentioned the names of bank and branches due to got request from the Bank authority showed support that this will decrease their image. As this is not the objective of the researcher so researcher avoids mentioning names of bank and branches in this study.

2.7 Instrument for Data Collection

For the purpose of this study a combination of two self-administered forms were used for the purposes of answering the core question and addressing the objectives of this study. A standardized and pre-validated questionnaire using a simple tick method was carefully selected due to time limitations of the cohort. As all the Banker are doing their activities in English language and all are at least have Graduation degree for working as Banker and in Researcher's Pilot study English version of Questionnaire did not created any problem so the Researcher keep the Questionnaire in English Version. Moreover, during fill up the self reported questionnaire if the participant unable to understand anything researcher always helped them to make understand of their queries.

The choice of self-administered or assisted form completion was considered suitable for this descriptive method of data gathering and it was felt that being confidential would yield greater results and thus be more accurate (Cargan, 2007). No notes were taken other than direct responses to the questions which remained in English therefore no transcribed notes were deemed necessary (Conradson, 2005)

2.8 Method of Data Collection

This will be gathered utilizing a semi structured health-based questionnaire across a convenient sample field. The most suitable questionnaire after an extensive review consistently referred to the Nordic Musculoskeletal Questionnaire [NMQ] which is viewed as a standardized quantitative tool for epidemiological analysis of the perception of MSD symptoms (Dawson, *et al.* 2009) and is suitable in both an occupational health and ergonomic framework and is not intended for clinical diagnosis which is consistent with the research requirements as prevalence is required, not diagnosis. Based on dichotomous questions this lends itself to ease of completion by subjects. This suitability (Malhotra and Peterson, 2006) met with the objectives of the study and it was determined this would be used. Variations of the NMQ were also reviewed and subsequently excluded for various factors normally pertaining to time constraints and complexity for the cohort to understand such as the modified Portuguese version (De Barros, *et al*. 2003) used in the last significant paper published on the topic (Chen, *et al*. 2005) or the 19 page Dutch version.

CHAPTER-3: ANALYSIS OF RESULT AND FINDINGS

3.1. Data Analysis

This chapter focuses on the findings from the analysis of the primary research conducted with the result of the analysis presented and discussed. Three hundred and forty four (344) questionnaires were administered of which 300 were received, representing 87.20% response rate. Saunders *et al.* (2003) suggested that response rate for face-to-face interviews were 75% making this accurate. This study, employed self reported questionnaire administration, hence the response rate is within the acceptable limit. The Statistical Package for Social Sciences [SPSS] Version-20 was adopted to analyze the primary data which is widely recommended as the preferred analytical tool according to Ghauri and Gronhaug (2005). The use of Chi-square statistical tool was employed in this study to analyze the various categorized and continuous data into Age, Gender, BMI, Designation, Job tenure, Amount of time spent per week, General Health condition, physical fitness nowadays, tiredness at the end of working day physically and mentally, Knowledge about ergonomic training, Knowledge of Physiotherapy management of MSDs, Knowledge about working posture, Psychological status, Level of activity in working causes MSDs. Standardized pre-validated Nordic Musculoskeletal Questionnaire was also analyzed. Mean, Standard Deviation, Chi-Square test, t-test and Wald Chi-square test was used to analyzed data. Significance was set at $\alpha=0.05$ level (two tailed).

3.2: Result

The result section is demonstrated with the Demographic characteristics, Prevalence of musculoskeletal symptoms in last 12 months, most commonly affected body parts in last 12 months, normal activities disruption in last 12 months, affected body part in last 7

days and associations of MSDs with demographic characteristics included predisposing factors are also presented in this section.

3.3: Socio-Demographic characteristics of the study population

Table-1 represents the demographic characteristics of the study population. There are 300 Bank workers participate in this study. Researcher compare Frequency distribution of different Variables like Age, Designation, Working hour, job tenure, Knowledge of Ergonomic Training, Physiotherapy and good working Posture, Stress, BMI, Activity level, MSDs with Sex. Here Age was categorized as <=30, 31-35, 41-45, 46-50, 51-55, 55+. Designation was putted tick by participant on entry, mid and top level. Working hours were categorized as <45, 45-50 and >50. There were three questions in questionnaire regarding knowledge of Ergonomic training, Knowledge of Physiotherapy Management for MSDs and Knowledge of good working posture and the answer was yes /no on close ended questionnaire. Researcher took three questions together on the heading of Knowledge and categorized it as 'No', 'Medium' and 'high' on the basis of answer given by participant. If any participant has knowledge of all three issues than his/her score is 'High' and if the participant has knowledge about one or two issues than his/her score is 'Medium' and if the participant answer all the three question NO than his/her category is 'NO'. To identify stress level there was five sub questions in questionnaire number-17. If any participant answer all the question no or one sub question yes than that participant fall in the category of 'No/less stress', similarly, if there was total two or three answer Yes than he/she fall in the category of 'Medium' and lastly, if any participant answer Yes to any four or five question out of five than that participant's category is 'high' Stress level.

Variables	Categories of Variables	Sex		
		Male	Female	Total
Age	<=30	13	17	30
	31-35	51	21	72
	36-40	62	18	80
	41-45	33	13	46
	46-50	39	9	48
	51-55	7	2	9
	55+	15	0	15
Designation	Entry level	33	22	55
	Mid-level	125	41	166
	Top level	62	17	79
Working hour(per week)	<45	99	27	126
	45-50	91	48	139
	>50	30	5	35
Job tenure	1-5 year	45	22	67
	5-15 year	104	38	142
	>15 year	71	20	91
Knowledge of Erg. Train., PT & Posture	No	128	55	183
	Medium	35	7	42
	High	57	18	75
Stress	No/Less stress	33	2	35
	Medium stress	149	53	202
	High stress	38	25	63
BMI	Underweight	2	0	2
	Normal	53	22	75
	Overweight	134	40	174
	Obesity	31	18	49
Activity level	Low	52	13	65
	Medium	156	59	215
	High	12	8	20
MSDs	Yes	146	62	208
	No	74	18	92

Table 1 represents demographic characteristics of the study population. There were 300 bank worker and most of them were male (73.33%) & only 26.67% were female. Among them 61% have had no knowledge about ergonomic training, physiotherapy management and good working posture. [Er- Ergonomic, PT- Physiotherapy].

According to Department of Health & Human Services (2016), BMI is categorized as

underweight (below 18.5), Normal (18.5-24.9), Overweight (25-29.9) and Obese (30 and

above) and researcher followed that. In Questionnaire number-18, there were 6 sub questions. Researcher categorized level of activity in working causes MSDs as if any participant answer YES on two or less question than he/she fall in the category of 'Low', Similarly if there was 3-4 answer is yes than fall in the category of 'Medium', and lastly, if there was 5-6 answer was Yes than he/she fall in the category of 'High' Activity level.

Table-2: Self perceived health status of respondent

Self perceived health status of respondent				
Category of Health Status	Frequency	Percent	Valid Percent	Cumulative Percent
good	66	22.0	22.0	22.0
reasonably good	122	40.7	40.7	62.7
not good	85	28.3	28.3	91.0
poor	27	9.0	9.0	100.0
Total	300	100.0	100.0	
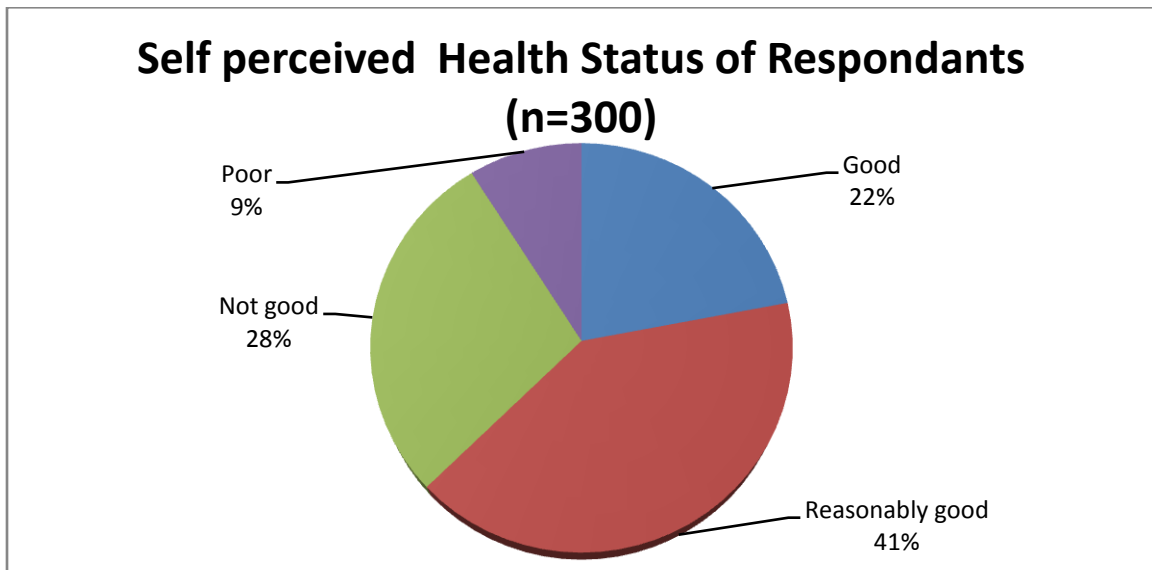
Figure-6 Shows 40.7% (122) Bank workers feel that their health status is reasonably good, 28.3% (85) perceived not good, 22% (66) think good and 9% (27) mentioned that their health status is Poor.

Table-3: Self perceived physical fitness of respondent

Self perceived physical fitness of respondent				
	Frequency	Percent	Valid Percent	Cumulative Percent
good	75	25.0	25.0	25.0
reasonably good	90	30.0	30.0	55.0
not too bad	106	35.3	35.3	90.3
poor	29	9.7	9.7	100.0
Total	300	100.0	100.0	
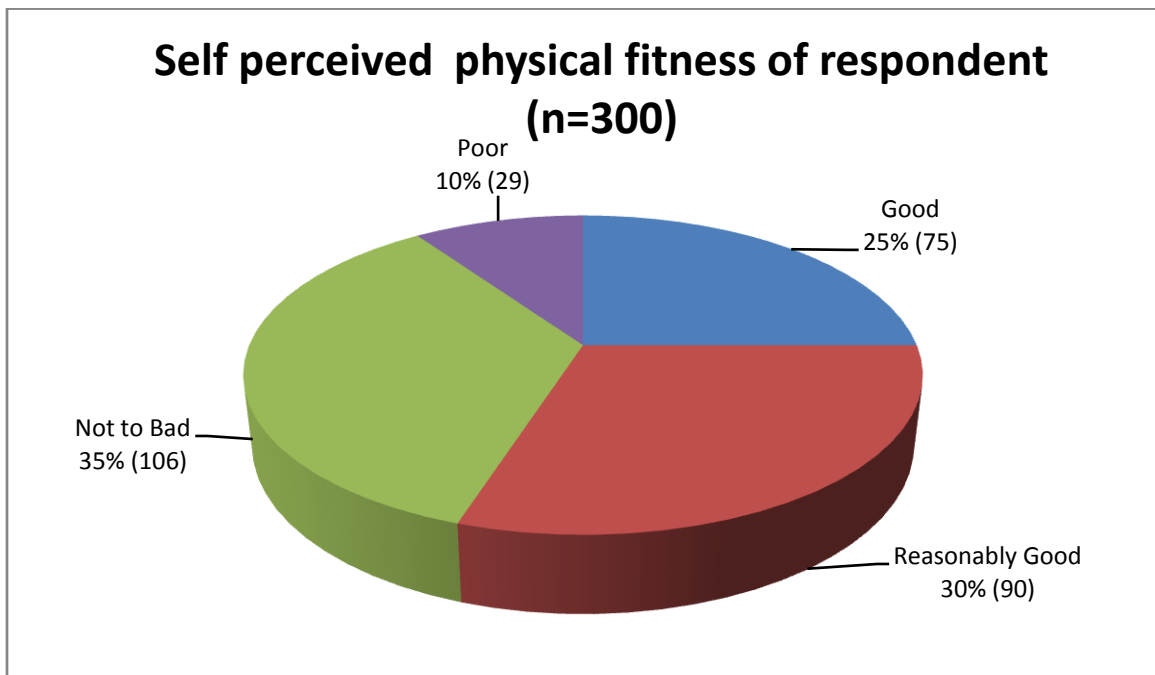
Figure-7 Shows 35% (106) Bank workers feel that their Physical fitness is reasonably not too bad, 30% (90) perceived reasonably good, 25% (75) think good and 10% (29) mentioned that their Physical fitness is Poor.

Table-4: Self perceived physical tiredness at the end of the day of respondent

Self perceived physical tiredness at the end of the day of respondent				
	Frequency	Percent	Valid Percent	Cumulative Percent
Not tired	120	40.0	40.0	40.0
a bit tired	78	26.0	26.0	66.0
rather tired	74	24.7	24.7	90.7
very tired	28	9.3	9.3	100.0
Total	300	100.0	100.0	
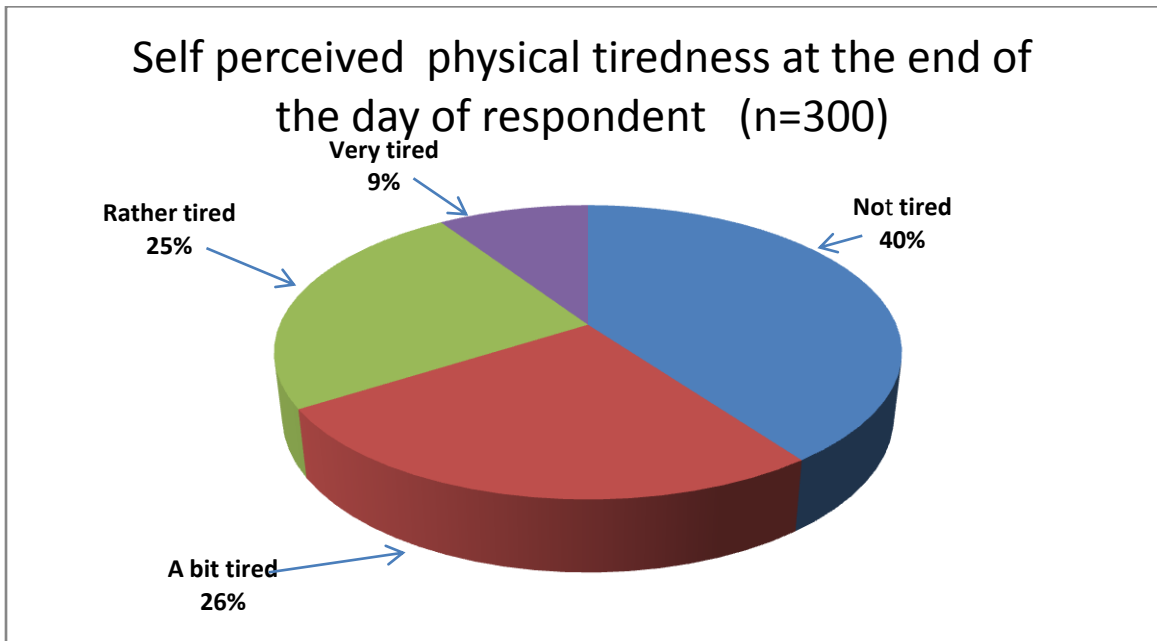
Figure-8 Shows 40% (120) Bank workers feel that they were not tired physically at the end of the day, 26% (78) perceived a bit tired, 25% (75) think rather tired and 9% (28) mentioned that they feel very tired physically at the end of the day.

Table-5: Self perceived mental tiredness at the end of the day of respondent

Self perceived mental tiredness at the end of the day of respondent				
Category of Tiredness	Frequency	Percent	Valid Percent	Cumulative Percent
Not tired	40	13.33	13.3	13.3
a bit tired	82	27.33	27.3	40.7
rather tired	117	39.0	39.0	79.7
very tired	61	20.33	20.3	100.0
Total	300	100.0	100.0	
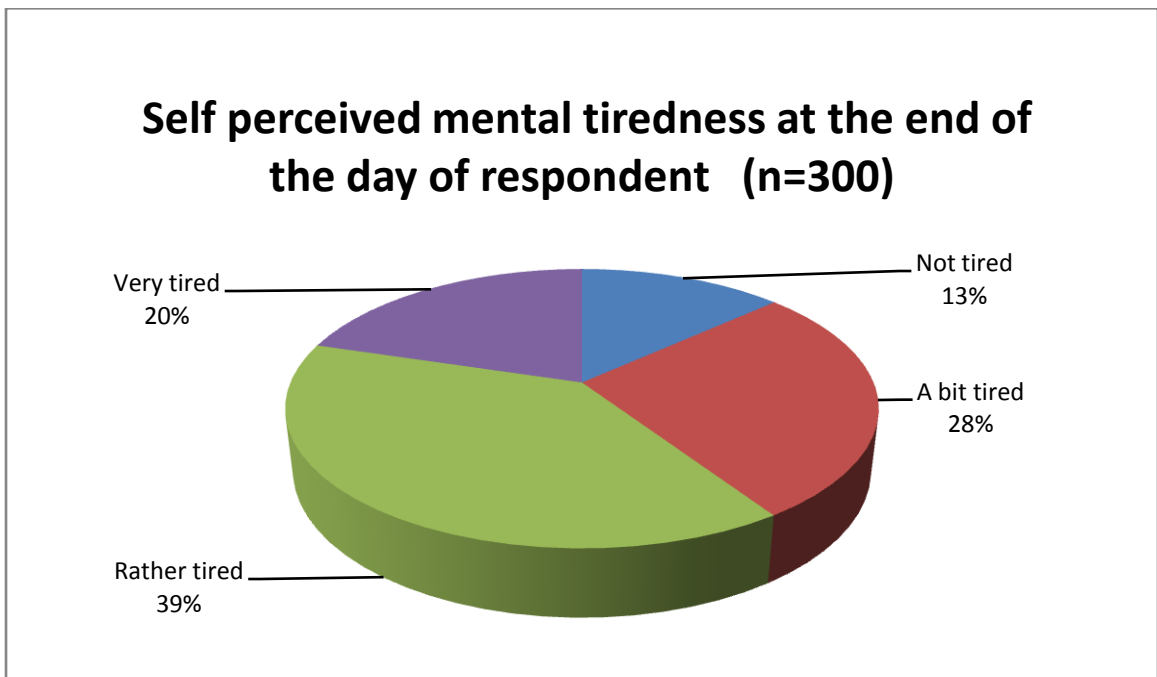
Figure-9 Shows 39% (117) Bank workers feel that they were RATHER TIRED Mentally at the end of the day, 28% (82) perceived A BIT TIRED, 20% (61) think VEERY TIRED and 13% (40) mentioned that they feel NOT TIRED Mentally at the end of the day.

Table-6: Comparison between Self perceived physical versus mental tiredness at the end of the day of respondent

Comparison between Self perceived physical versus mental tiredness at the end of the day of respondent		
Category of Tiredness	Physical Tiredness	Mental Tiredness
Not tired	(40%) n=120	13.33% n=40
a bit tired	(26%) n =78	27.33% n=82
rather tired	(24.7%) n=74	39% n=117
very tired	(9.3%) n=28	20.3% n=61
Total	100% n=300	100.0 n=300
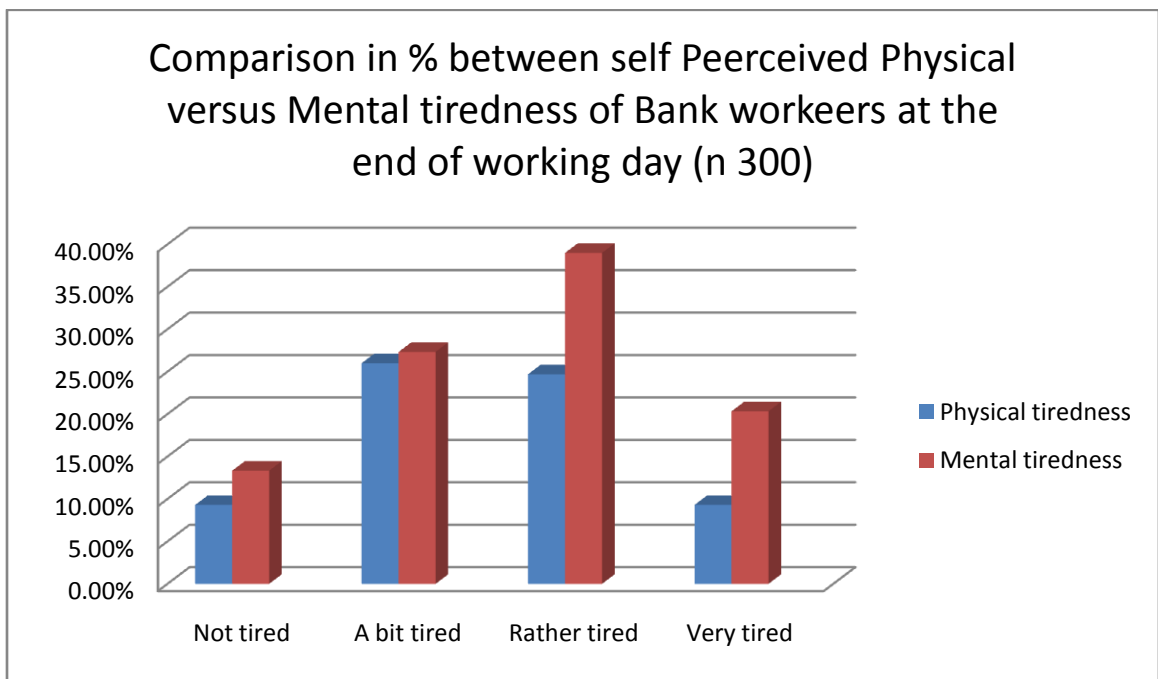
Figure-10 shows Bank workers were tired mentally in compare to physical work

Table: 7- Descriptive statistics of demographic characteristics of the respondents (n=300)

Mean, Standard Deviation of Age height, weight, BMI and working hour.

Variables	Minimum		Maximum		Mean		Standard deviation	
	Male	Female	Male	Female	Male	Female	Male	Female
Age	25	25	64	51	40.85	37.26	8.06	6.96
Height(inch)	54	60	72	67	66.14	63.22	2.83	1.80
Weight (lb)	69.96	99	198	191.4	165.6	156.07	19.06	20.87
BMI	11.29	18.7	36.69	34.55	26.68	27.43	3.34	3.40
Working hour(per week)	10	40	70	55	48.20	48.30	5.55	2.82
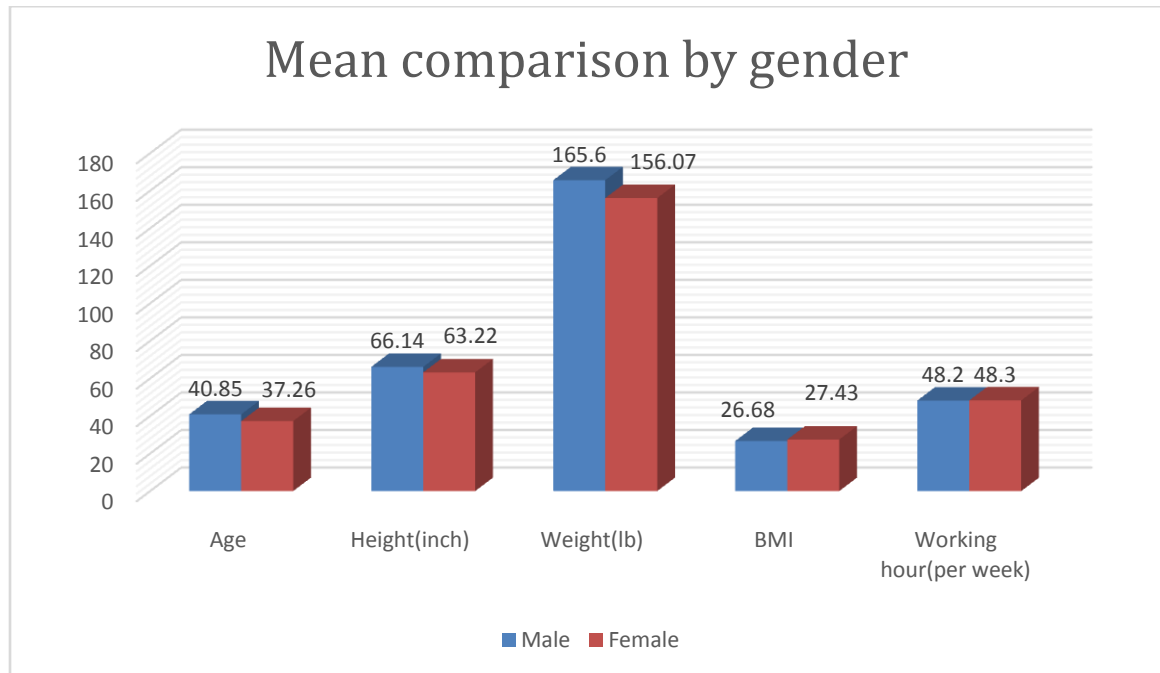
Figure-11 shows mean comparison by Gender with Age, Height, Weight, BMI, Working hour.

Table-8: Consolidated View of Data from indicating baseline characterizes of WRMSDs among Bank worker on the analysis of Standardized Nordic Musculoskeletal Questionnaire

Percentage of Body Part Injury by Period (*n*=300)	Have you in the last 12m been affected by pain, discomfort or numbness		During the last 12m have you been prevented from doing something because of the pain		During the past 7 days have you been troubled by pain associated with this part	
	Yes	No	Yes	No	Yes	No
Neck	92(30.7%)	208(69.3%)	15(5%)	285(95%)	39(13%)	261(87%)
Shoulder	29(9.7%)	271(90.3%)	9(3%)	291(97%)	9(3%)	291(97%)
Elbow	29(9.7%)	271(90.3%)	15(5%)	285(95%)	14(4.7%)	286(95.3%)
Wrist(s) / Hand(s)	35(11.7%)	265(88.3%)	12(4%)	288(96%)	12(4%)	288(96%)
Upper Back	35(11.7%)	265(88.3%)	18(6%)	282(94%)	18(6%)	282(94%)
Lower Back	119(39.7%)	181(60.3%)	70(23.3%)	230(76.7%)	79(26.3%)	221(73.7%)
Hip(s) / Thigh(s)	23(7.7%)	277(92.3%)	6(2%)	294(98%)	6(2%)	294(98%)
Knee(s)	53(17.7%)	247(82.3%)	32(10.7%)	268(89.3%)	33(11%)	267(89%)
Ankle(s) / Foot or Feet	33(11%)	267(89%)	13(4.3%)	287(95.7%)	15(5%)	285(95%)

Distribution of MSDs in different body part (NMQ)

Percentages of WMSDs (n=300)

	Neck	Shoulder	Elbow	Wrist/hand	Upperback	Lower back	Hip/Thigh	Knee	Ankle/Feet
12 month trouble	30.70%	9.70%	9.70%	11.70%	11.70%	39.70%	7.70%	17.70%	11%
Annual trouble preventing ADL	5%	3%	5%	4%	6%	23.30%	2%	11%	4.30%
7 day trouble	13%	3%	4.70%	4%	6%	26.30%	2%	11%	5%
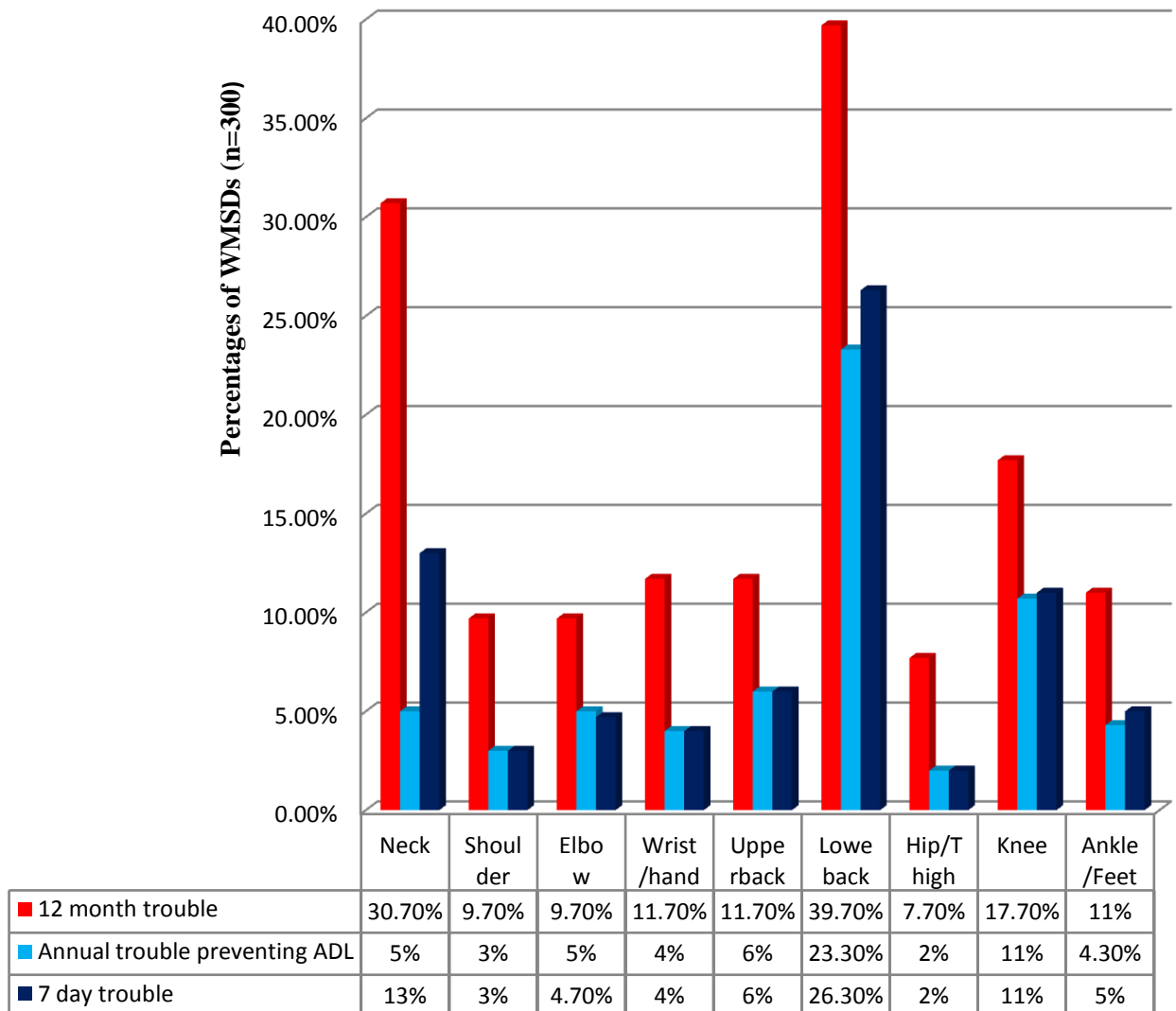
Figure-12 shows comparison of self perceived WRMSDs by different body part among Bank workers during last 12 month, any disruption of normal activities during last 12 month due to MSDs and trouble during last 7 day according to Standardized Nordic Musculoskeletal Questionnaire (NMQ). Lower Back trouble seems most common 119 (39.7%) during last 12 month, 70(23.3%) causing trouble in ADL during last 12 month and 79(26.3%) causing trouble during last 7 days among other body part. [ADL= Activity of Daily Livings]

Table-9: Effect of Ergonomic training on WRMSDs

Ergonomic training and WMSDs of the respondent				
		disease status WMSDs of the respondent		Total
		no	yes	
Knowledge of ergonomic training	no	29 (13.12%)	192 (86.87%)	221(73.66%)
	yes	63 (79.74%)	16 (20.25%)	79(26.33%)
Total		92 (30.66%)	208 (69.33%)	300(100%)
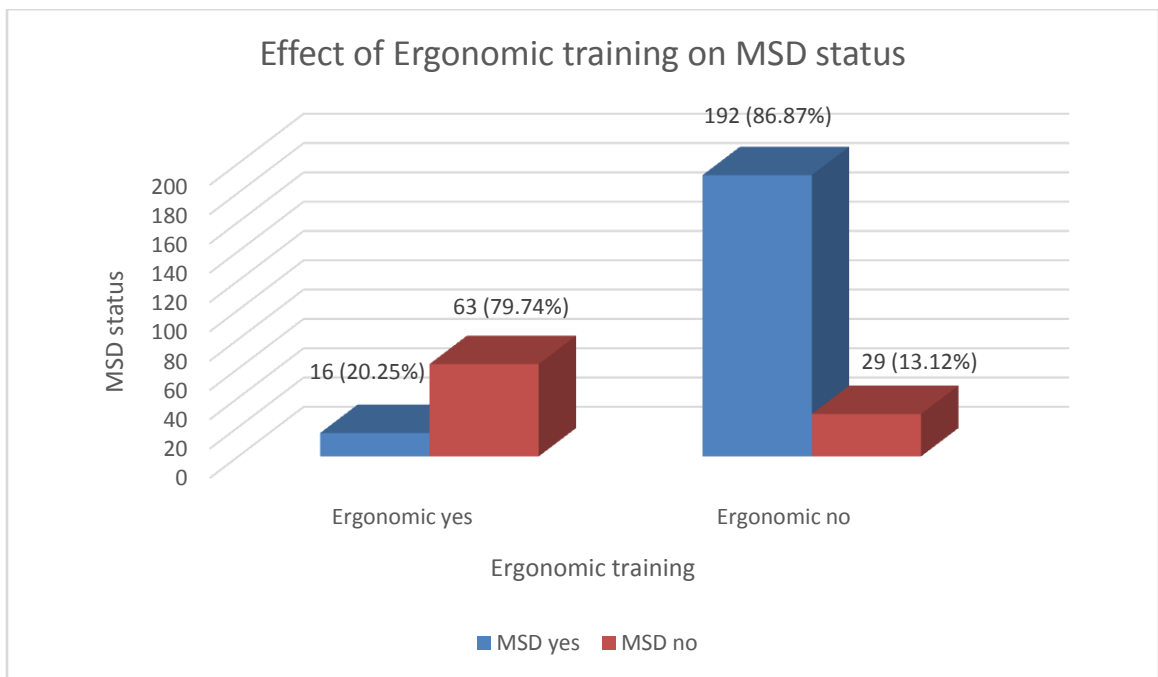
Figure-13 shows those who have knowledge about ergonomic training had less WRMSDs and those who don't have the knowledge about ergonomic training posses more WRMSDs.

Table-10: Effect of good working posture on WRMSDs

Knowledge of good working posture & disease status (WMSDs) of the respondent (Cross tabulation)				
		WMSDs of the respondent		Total
		no	yes	
Knowledge of good working posture	no	24 (12.56%)	167 (87.43%)	191 (63.66%)
	yes	68 (62.38%)	41 (37.61%)	109 (36.33%)
Total		92 (30.66%)	208 (69.33%)	300 (100%)
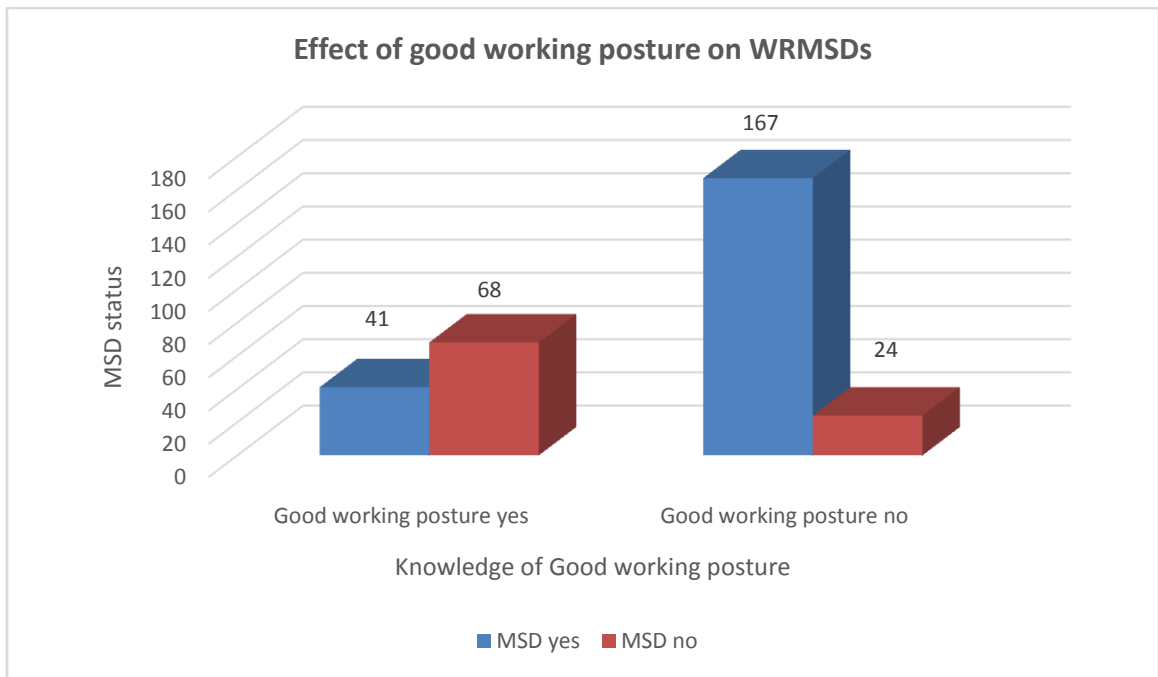
Figure-14 shows those who have knowledge about good working posture had less WRMSDs and those who don't have the knowledge about good working posture posses more WRMSDs.

Table-11: **Relationship between Physiotherapy management of MSDs and WRMSDs**.

Knowledge of Physio Management of MSDs and disease status (MSDs) of the respondent (Cross tabulation)				Total
		disease status of the respondent		Total
		no	yes	
Knowledge of Physio Management about MSDs	no	28 (13.27%)	183 (86.72%)	211(70.33%)
	yes	64 (71.91%)	25 (28.08%)	89(29.66%)
Total		92(30.66%)	208 (69,33%)	300(100%)

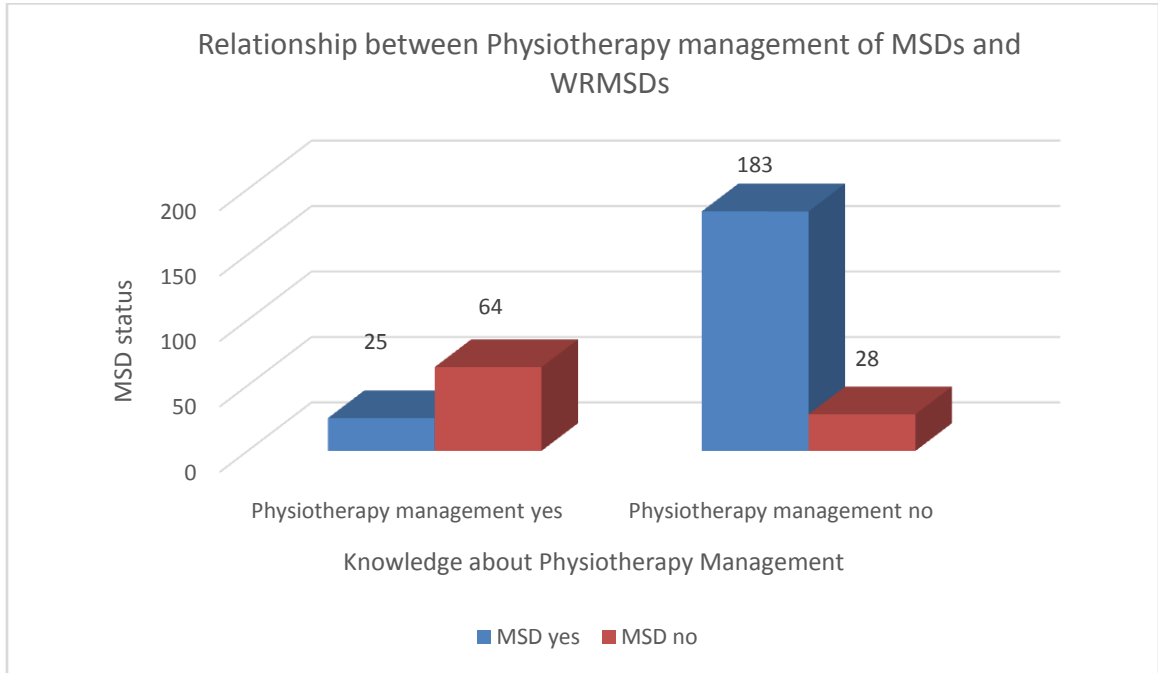**Figure-15** shows those who have knowledge about Physiotherapy management of MSDs had less WRMSDs and those who don't have the knowledge Physiotherapy management of MSDs posses more WRMSDs.

Table: 12 Shows Different Parameter of stress and its distribution to Population.

Cross table of Different Parameter of stress and its distribution to Population (n-300)					
Parameter of Stress		Frequency	Percent	Valid Percent	Cumulative Percent
	no	129	43.0	43.0	43.0
Do you often feel tense?	yes	171	57.0	57.0	100.0
	Total	300	100.0	100.0	
	no	243	81.0	81.0	81.0
Do you often feel nervous?	yes	57	19.0	19.0	100.0
	Total	300	100.0	100.0	
	no	209	69.7	69.7	69.7
Do you often feel flustered?	yes	91	30.3	30.3	100.0
	Total	300	100.0	100.0	
	no	75	25.0	25.0	25.0
Often very tired after work	yes	225	75.0	75.0	100.0
	Total	300	100.0	100.0	
Regularly feeling tiredness after getting up in morning.	no	183	61.0	61.0	61.0
	yes	117	39.0	39.0	100.0
	Total	300	100.0	100.0	

Table: 13 Shows Activities in working causes MSDs and distribution of population

Cross table of Activities in working causes MSDs and distribution of population (n-300).					
Activities in working causes MSDs		Frequency	Percent	Valid Percent	Cumulative Percent
	no	69	23.0	23.0	23.0
working in the same position for a long time	yes	231	77.0	77.0	100.0
	Total	300	100.0	100.0	
	no	53	17.7	17.7	17.7
performing same task over and over	yes	247	82.3	82.3	100.0
	Total	300	100.0	100.0	
	no	176	58.7	58.7	58.7
bending and twisting in a awkward way	yes	124	41.3	41.3	100.0
	Total	300	100.0	100.0	
	no	155	51.7	51.7	51.7
repetitive movement of upper limb	yes	145	48.3	48.3	100.0
	Total	300	100.0	100.0	
work scheduling (Overtime, Irregular shift etc)	no	272	90.7	90.7	90.7
	yes	28	9.3	9.3	100.0
	Total	300	100.0	100.0	
	no	271	90.3	90.3	90.3
carry heavy work load	yes	29	9.7	9.7	100.0
	Total	300	100.0	100.0	

Table 14: Association of MSD with socio-demographic and related variables (n-300).

Variables	Category of Variables	Annual prevalence of MSDs			Chi-square (χ2) value	P-value
		Yes (%)	No (%)	Total		
Sex	Male	146 (66.4%)	74 (33.6%)	220(73.33%)	3.422	.067
	Female	62 (77.5%)	18 (22.5%)	80(26.66%)		
Age	<=30	16 (53.3%)	14 (46.7%)	30(10%)	10.911	.043
	31-35	45 (62.5%)	27 (37.6%)	72(24%)		
	36-40	54 (67.5%)	26 (32.2%)	80(26.6%)		
	41-45	35 (76.1%)	11(23.9%)	46(15.3%)		
	46-50	38 (79.2%)	10 (20.8%)	48(16%)		
	51-55	7 (77.8%)	2(22.2%)	9(3%)		
	55+	13 (86.7%)	2(13.3%)	15(5%)		
Working hour(per week)	<45	77 (61.1%)	49(38.9%)	126(42%)	6.978	.031
	45-50	104 (74.8%)	35(25.2%)	139(46.33%)		
	>50	27 (77.1%)	8(22.9%)	35(11.67%)		
Job tenure	1-5 year	36 (53.7%)	31(46.3%)	67(22.33%)	15.068	.001
	5-15 year	97 (68.3%)	45(31.7%)	142(47.33%)		
	>15 year	75 (82.4%)	16(17.6%)	91(30.34%)		
Knowledge of Er.Tr. Post. & PT.	No	161(88%)	22(12%)	183(61%)	127.967	0.000
	Medium	34 (81%)	8(19%)	42(14%)		
	High	13 (17.3%)	62 (82.7%)	75(25%)		
Stress	No/Less stress	8 (22.9%)	27 (77.1%)	35(11.66%)	53.099	.000
	Med. stress	141 (69.8%)	61 (30.2%)	202(67.33%)		
	High stress	59 (93.7%)	4 (6.3%)	63(21.01%)		
BMI	Under Wt.	1 (50%)	1 (50%)	2(.67%)	33.711	.000
	Normal	33 (44%)	42 (56%)	75(25%)		
	Over Wt.	131 (75.3%)	43 (24.7%)	174(56%)		
	Obesity	43 (87.8%)	6 (12.2%)	49(16.33%)		
Activity level	Low	33 (50.8%)	32 (49.2%)	65(21.66%)	14.590	.001
	Medium	158 (73.5%)	57 (26.5%)	215(71.66%)		
	High	17 (85%)	3 (15%)	20(6.68%)		

From the above table researcher found that Age, Working hour (per week), Job tenure, Knowledge of Ergonomic Training, Posture & PT., Stress, BMI, Activity level have significant association on the presence of MSD in last 12 months except the variable sex.

Table 15: T-test between those who have MSD and those who don't

Variable	Mean difference between those who have MSD and those who don't	t	df	P-value
Age	4.835	4.614	298	.000
BMI	2.3369	5.305	298	.000

From these T test between those who have MSD and those who don't have MSD researcher found that Age and BMI variable are significant i.e. age has an effect on occurring MSD and also BMI has the same kind of effect on occurring MSD.
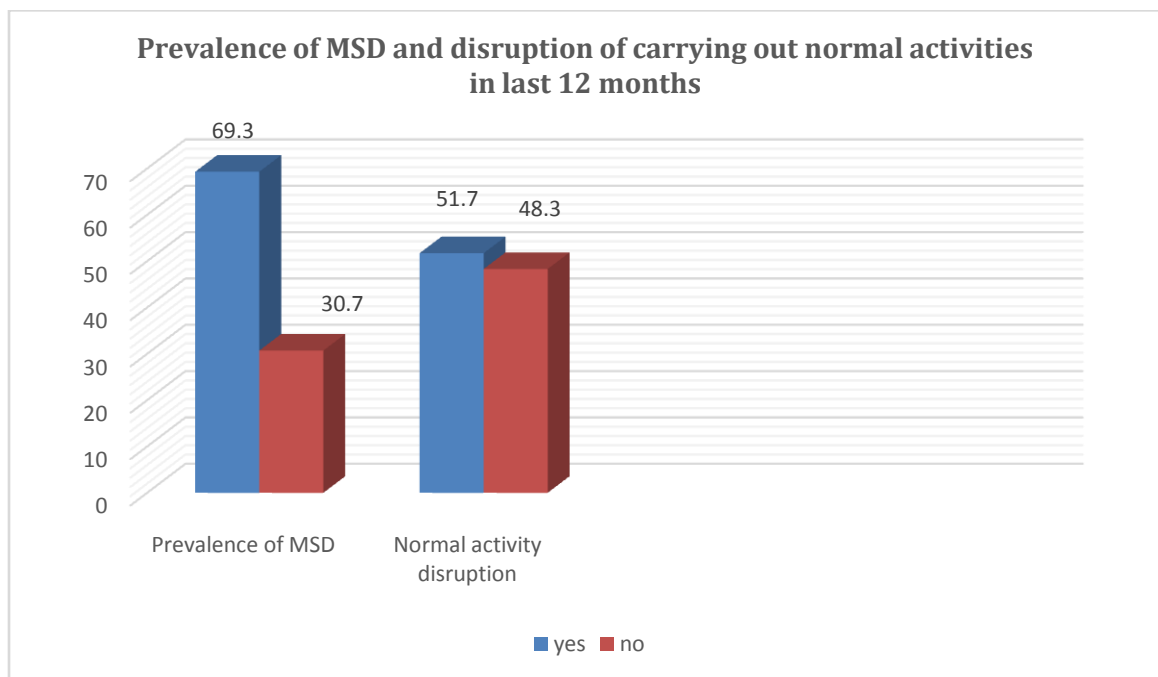

Figure-16 shows prevalence of WRMSDs is 69.3% (208 respondent of 300 reported that they have trouble in body part during last 12 month) where 51.7% were prevented to carry out normal activities due to MSDs during last 12 months by following pre validated Standardized Nordic Musculoskeletal Questionnaire.

Table 16: Logistic regression analysis

Parameter		B	Odd ratio (e^B)	Std. Error	Hypothesis Test		
					Wald Chi-Square	df	Sig.
(Intercept)		-7.276		2.8869	6.352	1	.012
Sex	Male	-.924	.39	.4989	3.427	1	.064
	Female	0^a		.	.	.	.
Work load (Hour/week)	Low	-.381	.68	.6300	.366	1	.005
	Medium	.222	1.25	.6480	.118	1	.002
	High	0^a		.	.	.	.
Job tenure	1-5 year	-.641	.53	1.0632	.363	1	.017
	5-15 year	-.197	.82	.7748	.065	1	.049
	>15 year	0^a		.	.	.	.
Knowledge Of Erg Trai, Good Posture & PT mgt of MSD	No	3.724	41.42	.5159	52.093	1	.000
	Medium	4.046	57.16	.6716	36.302	1	.000
	High	0^a		.	.	.	.
Stress	Low	-2.229	.11	.8178	7.430	1	.006
	Medium	-.282	.75	.6517	.187	1	.666
	High	0^a		.	.	.	.
Activity Level	Low	-.276	.76	.8557	.104	1	.047
	Medium	-.219	.75	.8069	.073	1	.160
	High	0^a		.	.	.	.
Age		.102	1.11	.0577	3.154	1	.036
BMI		.111	1.12	.0660	2.820	1	.093

*dependent variable: MSD   1=yes 0=no [PT=Physiotherapy, Erg Trai=Ergonomic Training, mgt=Management]

To know which variables are responsible for MSD, Researcher has run a logistic regression model where dependent variable is MSD which has two levels either one has MSD or not   and the independent variables are Sex, Activity level, Job tenure, Knowledge (of Ergonomic training, Good working posture and Physiotherapy treatment

of MSDs), Stress, Work load (hours/week), Activity level in working causes MSDs, age and BMI.

Among them the most significant variables are work load (hours/week), job tenure, knowledge (of Ergonomic training; Good working posture and Physiotherapy treatment of MSDs) and age. From the analysis Researcher found that the odds of having MSD for female are higher than the male. Also, those who have high work load (hours/week) have higher odds of having MSD.

Those who are working 1-5 year have lower odds of having MSD than who are working more than 15 years. Now, the Knowledge (of Ergonomic training; Good working posture and Physiotherapy treatment of MSDs) is the most significant variable.

This study shows that those people who have little knowledge (of Ergonomic training; Good working posture and Physiotherapy treatment of MSDs) have higher odds of having MSD than those who have high knowledge. Also, those who have higher stress, those who are highly active (which causes WMSDs) have higher odds of having MSD. And, if age and BMI increases the odds of having MSD also increases.

Having all these result, Researcher can conclude that, heavy work load, low knowledge high stress, and older age are the mostly responsible for MSDs.

CHAPTER-4: DISCUSSION

The main aim of this study was to identify the prevalence of WMSDs among Bank Workers in Dhaka city. In this study researcher found that the prevalence of WMSDs among Bankers in Dhaka city is 69.3% where 51.7% were prevented of carrying out normal activities (Figure-11). The most affected part of body is lower back (39.7%), followed by neck (30.7%), Knees (17.7%), upper back (11.7%), Wrist/Hand (11.7%), Ankle (11%), Shoulder (9.7%), Elbow (9.7%), Hip (7.7%). Samaei, S.I. et al. (2016) did a study about MSDs among office worker and found annual prevalence is 60.4 percent which is quite similar to this study (69.3%). Similarly A study of Loghmani, A. et al. (2013) indicate that the prevalence of MSD's among bank workers ranges from 60% to 80%, indicating that they have a high susceptibility to these kinds of injuries. Whereas, Sulaiman, S.K. et al. (2015) did a study in India among bank workers regarding WMSDs and found   annual prevalence of the MSD was 33.8%, with a disability rate of 8.5%. In their study the body region mostly affected was the lower back (51.8%) followed by the neck (48.2%), shoulder (40.2%) and upper back (39.6%). In terms of disability, they found the same pattern was noted with rates for the lower back, neck, shoulder and upper back being 18.9%, 13.4%, 11.6% and 9.1% respectively. Among these two studies the prevalence is higher in this study but individual's body part is lower which may be a reason of geographical difference. In Sulaiman's study it was not mentioned that does his participant had training about Ergonomic because it reduces WMSDs (Norashikin, M. et al. 2010; Bayeh & Smith, 1999; Robertson & O'Neill, 1999; Sauter, Schleifer, & Knutson, 1991). But Emdad, M.A.T. (2012) did a study about prevalence of Low Back Pain amobg Bank workers in Savar, Bangladesh and found 44% suffered for low back pain which is quite similar to this study (40%).

A cross-sectional observational study done by Akrouf, Q.A.S. et al. (2010) assessed the pattern of musculoskeletal disorder (MSDs) suffered by bank office workers in Kuwait. A self-administered validated questionnaire was used that included the Nordic musculoskeletal questionnaire and 12-item general health questionnaire (GHQ12). Of 750 employees, 80% suffered at least 1 episode of MSD during the previous year which is higher in compare to present study (69.3%) and 42% suffered at least 1 disabling episode which is lower in compare to current study (51.7%). The most affected body parts were the neck (53.5%), lower back (51.1%), shoulders (49.2%) and upper back (38.4%) which is quite higher to present study. These differences are may be the geographical reason.

On the other hand, Islam, M.S. (2012) did a study in Savar, Bangladesh regarding prevalence of Neck pain among bankers and found 45.7% which is higher in compare to this study (30.7%). But the limitation of that study was that they took a small (35) sample size and the sampling procedure was purposive. Naqvi M et al.(2013) did a study regarding association of prolong sitting with common MSDs among private and public sector bankers in Pakistan and found 44.6% government employees were suffering from shoulder pain, while 36.9% private sector bankers having this problem. But in this study researcher took public, private and international bankers and found only 9.7% respondent were suffered for shoulder pain. Maduagwu et al., (2014) did a study regarding Prevalence and Patterns of Work-related Musculoskeletal Disorders among Bankers in Maiduguri, Northeast Nigeria and found 71.68% of the respondents reported WMSDs in at least one region of the body in the previous 12 months which is fairly similar to this study (69.3%). A study on bank workers in Hong Kong (Yu, I., Wong T. 1996) found a

prevalence of 31.4%, 30.6%, 16.5%, 14.9% and 6.6% for MSDs in neck, back, shoulder, hand and wrist, and arm, respectively which has relatively similar to this study and there is some difference which may be due to geographical factor. The authors found a significant relationship between repetitive movements and MSDs in neck and shoulder.

In current study researcher found that self perceived mental tiredness is more in compare to physical tiredness at the end of a working day in four parameter of tiredness: not tired, a bit tired, rather tired and very tired. Here researcher found that in all parameter Bankers are more tired mentally (Figure-5) in compare to physical tiredness which may lead to Musculoskeletal Disorders. In addition, researcher found that there is an association between stress and MSDs (Chi Square test 53.099, P=.000). In favor of this finding different research articles support that musculoskeletal disorders have been found to manifest in individuals with higher psychosocial stress as psychosomatic disorder, as well as in individuals with excessive job stress (Zafir, M.M., Syed, S.A., Shaza, M.A., Norliza, A. T. 2011). According to Abledu, J.K., Abledu, G.K. (2012) psychological distress was positively associated with MSDs. An association between musculoskeletal disorders. Korhonen T. et al. (2003) found that psychosocial factors are associated with WMSDs. MORE SUPPORt of Psychology n msd.

In this study it is found that those who don't have knowledge regarding ergonomic training (73.66%, n=221) are affected by WMSDs (86.87%, n=192). On the other hand those who have knowledge about ergonomic training (26.33%, 79) are less suffered by WMSDs (20.25%, n=16). Moreover researcher found an association between knowledge of Ergonomic training, good working posture and Knowledge about physiotherapy treatment of WMSDs (P=.000). So, researcher concludes with a hypothesis that

'Ergonomic training, Knowledge about good working posture and Knowledge about Physiotherapy treatment of MMSD' reduces musculoskeletal disorders. There is another alarming issues that found in this study that is only 26.33% Bankers have the knowledge about Ergonomic training, 36.33% has knowledge about good working posture and 28.08% Bankers know about Physiotherapy treatment for MSDs . For the present study researcher allocate all kind of Bank like Private, Public and International Bank. According to Farheen, H., Raisa, M. (2015) there is great difference between local and foreign Banks in Bangladesh. In their study they found that foreign Banks provide Health and safety issues to their employees where local banks are far away from these issues. On the basis of this finding researcher hypothesized that if International bank excluded from his study than the scenario or snap shot regarding knowledge about physiotherapy treatment for MSD, knowledge about ergonomic training and knowledge about good working posture might shows more negative result. Norashikin, M. et al. (2010) did a study with office workers about effectiveness of ergonomic training for reduction of MSDs and found a significant improvement in workstation habits and the differences remained significant at the follow-up time point for keyboard, mouse, chair, and desk use. The largest reduction in the percentage of musculoskeletal disorders was in the neck region (-42.2%, 95% CI -60.0 to -24.4). After adjusting for baseline values, significant differences were found at the follow-up time point in the neck, right shoulder, right and left upper limbs, lower back, and right and left lower limbs. No significant differences were found for the days and episodes of sick leave or the psychological well-being among workers after the intervention. Robertson, M.M., O'Neill, M.J. (2003) in their study regarding effectiveness of Ergonomics training and found that following the

intervention, there was a significant increase in workers' office ergonomics knowledge and awareness. Self-reported work-related musculoskeletal disorders significantly decreased for the group who had a workplace change and received ergonomic training relative to a workplace change-only group and a no intervention control group. There are more research suggests that ergonomics training and workstation design can prevent or reduce musculoskeletal injuries in an office environment (e.g., Bayeh & Smith, 1999; Robertson & O'Neill, 1999; Sauter, Schleifer, & Knutson, 1991). Office ergonomics interventions contribute to enhanced worker health and well-being as well as to organizational effectiveness. When a successful office ergonomics intervention program is implemented, one of the many results is an increased ability for the worker to change their work environment, leading to enhanced individual effectiveness and the prevention of WMSDs and injuries (e.g., Aarås, Horge, Bjorset, Ro, & Walsoe, 2001; O'Neill, 1999; Sauter, Dainoff, & Smith, 1990). In literature reviews the importance of ergonomic training programs has been demonstrated by several researchers and practitioners (e.g., Brission, Montreuil, & Punnett, 1999; Green & Briggs, 1989; Verbeek, 1991). Whereas engineering controls such as workstation re-design or the use of adjustable furniture are frequently suggested (Verbeek, 1991), administrative controls such as training must also be used so that employees and management understand the need to change work habits when using office technology. Additionally, training can assist in ensuring that both managers and employees fully understand and participate in the ergonomics program (Kukkonen, Luopajarvi, & Riihimaki, 1983). Ergonomic Training helps employees to understand workstation setup and the use of proper postures to avoid work-related musculoskeletal discomforts (Brisson, et. al, 1999; Kukkonen, et al., 1983).Without

training, the presence of other administrative and engineering controls results in limited success. For example, Green and Briggs (1989) found that the availability of adjustable furniture alone did not prevent the onset of overuse injury. Workers who suffered injuries were using the same equipment as non-sufferers, but expressed greater discomfort with the new furniture. Sufferers adopted more awkward postures than non-sufferers, which could be attributed to inadequate knowledge. There are also many more studies have found that ergonomic factors correlate with musculoskeletal symptoms (Bernard 1994; Bonfiglioli 2006; Ortiz-Hernandez 2003; Szeto 2009; Werner 2005). Adjusting ergonomic factors (such as the design of workplace equipment or the work environment, or both) to reduce the physical and mental load on workers is likely to reduce the risk of workers developing WRULDs. For example, the use of a split keyboard has been found to reduce the severity of pain in computer users with MSDs (Tittiranonda 1999). Ergonomic training is also focused on modifying risk factors through education and empowerment of workers. Sylvia, E.K. et al. (2013) found that traditional therapeutic interventions provide only short-term pain relief for musculoskeletal disorders, prompting the need for a different approach. Ergonomic intervention was found to have promising results in treating WMSD.

In present study researcher found association between socio-demographic variable with MSDs. Here, gender has no association (P=.067) with MSDs but Age (P=.043), Working hour/week (P=.031), Job tenure (P= .001), BMI (P=.000) and Activity level (P=.001) has association with MSDs. To interprets the result researcher states that older age promote MSDs, increasing working hour also increases chance of MSDs, senior bank worker are

more suffers with MSDs, increased BMI that is Obesity can cause MSDs and Higher Activity level in different bad posture are producing MSDs. Researcher done a t-test between those who have MSD with who don't have among the age and BMI variable and found that Age (P=.000) and BMI (P=.000) variable are significant i.e. age has an effect on occurring MSD and also BMI has the same kind of effect on occurring MSD. To know which variables are responsible for MSD, Researcher has run a logistic regression model where dependent variable is MSD which has two levels either one has MSD or not and the independent variables are Sex, Activity level, Job tenure, Knowledge (of Ergonomic training, Good working posture and Physiotherapy treatment of MSDs), Stress, Work load, Activity, age and BMI. Among them the most significant variables are work load, job tenure, knowledge and age. From the analysis Researcher found that the odds of having MSD for female are higher than the male. In favor of this finding Lacerda E. M et al. (2005) showed that female bank workers are in higher risk of WMSDs than Male counterpart. Moreover there are several studies support that female bank workers are more vulnerable than their male counterpart in case of occurring WMSDs (Sulaiman, et al. 2015; Akrouf, et al. 2010).

In current study researcher found that those who have high work load (working hour/week) has higher odds of having MSD. But the study of Sulaiman, et al. (2015) showed that there was no significant correlation between MSDs and the number of hours spent per week at work. Whereas Talwar et al. (2009) finding are similar to current study who reported gradual increase in MSD symptoms as the number of hours spent at work increases.

In present study researcher found those who are working 1-5 year have lower odds of having MSD than who are working more than 15 years that is job tenure has a positive effect on MSDs. There is a study in favor of this finding (Sulaiman, S.K. et al. 2015) which indicate that longer job tenure influence the occurrence of MSD among bank workers in a district of India. An association between MSDs and longer job tenure has been reported by other researchers (Coury HJCG, 2002). Similar result were found by Abledu, J.K., Abledu, G.K. (2012) who revealed that more musculoskeletal symptoms were likely to be reported in individuals with more years of work in the bank. More supporting article found in the study of Samaei, S.I. et al. (2016) who stated that one unit increase in job tenure (years) the probability of incidence of MSDs gone up 17.2 percent.

 In present study researcher found that the Knowledge (of Ergonomic training; Good working posture and Physiotherapy treatment of MSDs) is a most significant variable. This study shows that those people who have little knowledge (of Ergonomic training; Good working posture and Physiotherapy treatment of MSDs) have higher odds of having MSD than those who have high knowledge. These findings prove that knowledge of ergonomic training, knowledge of good working posture and knowledge of Physiotherapy management regarding MSDs reduces the occurrence of WMSDs.

Researcher also found in present study that those who have higher stress have higher odds of having MSD. This finding is similar with the study of Sulaiman, S.K. et al. (2015) about MSDs among bankers , who demonstrate that Psychosocial stress were strongly correlate with MSD and associated disability, which might probably culminate to more occurrence of MSDs. There are more articles in favor of this finding which showed that musculoskeletal disorders have been found to manifest in individuals with

higher psychosocial stress as psychosomatic disorder, as well as in individuals with excessive job stress (Zafir, M.M., Syed, S.A., Shaza, M.A., Norliza, A. T. 2011; Abledu, J.K., Abledu, G.K. 2012; Korhonen T. et al. 2003). In current study researcher found that those who have higher activity level in different bad posture have higher odds of having MSD. And, if age and BMI increases the odds of having MSD also increases. BMI is a important risk factor for MSDs showed by Viester, L. et al. (2013) who described that 'for high BMI an increased 12-month prevalence of musculoskeletal symptoms was found (overweight: OR1.13, 95% CI: 1.08-1.19 and obesity: OR 1.28, 95% CI: 1.19-1.39)'.

Having all these result, Researcher can conclude that, heavy work load (hour/week), low knowledge (of Ergonomic training; Good working posture and Physiotherapy treatment of MSDs), high stress, and older age are the mostly responsible for MSDs.

CHAPTER-5: LIMITATIONS AND RECOMMENDATIONS

Sample of study was not taken randomly which is weak point for this study. This is because bank workers don't want to participate in a study due to it shortage of time, work overload, and their busyness in the desk. Also, information was sought subjectively, ergonomic evaluation such as job analysis and job site analysis were also not performed. So, for the future study it will be easier and the participant will take part in the study zestfully for the researcher, if an approval taken from the central Bank of Bangladesh named Bangladesh Bank which is the regulatory authority of all Banks in Bangladesh. Moreover, Psycho social questionnaire was not sufficient to analyze their psychosocial status which is due to accelerate the response of the participants. Future studies should involve larger sample size drawn through process of randomization to minimize bias and encourage generalization of findings, objective assessment of participants should be considered to minimize feedback bias and obtain accurate data. Further studies should also incorporate job analysis and job site analysis to identify and determine the exact ergonomic risk factors responsible for the occurrence of MSDs and the resulting disability. For the future study it is recommended that randomization control trial between ergonomic training versus control group who receive Placebo training/nothing can be done because it is found that ergonomic training has an effect on WMSDs. From this finding it is recommended that every bank should keep an Occupational Health Physiotherapist who can provide Training, Treatment, Prevent from WMSDs and take part in Rehabilitation including prevention from further injury. Because according to Marmot, M. (2010) Occupational health physiotherapists have a role in proactively promoting health and wellbeing in the work environment. This allows workers to avoid sickness and injury as well as the potential secondary health consequences of sickness

absence or even unemployment. There is an another study by UK's Department of Health (2006) which claim that Physiotherapists are clinically effective and cost effective at managing and treating patients with musculoskeletal disorders (MSDs). Moreover, according to a study of UK's Department of Health (2008) found that Rapid access to musculoskeletal physiotherapists can reduce the amount of time people are off sick and is vital in preventing a new acute problem becoming chronic and long lasting. So by considering these studies and the current prevalence of WMSDs in bank workers in Bangladesh, it is strongly recommended to create post for Physiotherapist in Health and Safety Department of Banking Sector in Bangladesh. Researchers also recommend to establishing a 'National Institute of Occupational Health and Safety' like other country which is necessary. Lastly, researcher is recommending arranging training for office/bank worker which is immediate solution for prevention of WMSDs. In support of this statement researcher want to focus on a study by Noorani, M. et al. (2015) regarding the effect of two kinds of training (oral lecture and e-mail) on body postures of bank staffs which showed that both training methods significantly affected the body posture of bank workers and this effect was larger using lecture for training.

CHAPTER-6: CONCLUSION

Almost 70% prevalence of annual musculoskeletal disorders and more than 50% resulting disabilities by Bank workers in Dhaka city were found in this study. The significant risk factors responsible for the occurrence of musculoskeletal disorders includes age, increased BMI, increased working hour, longer job tenure, low Knowledge of Ergonomic training, low Knowledge of good working posture & low Knowledge of Physiotherapy management of WMSDs, higher psychosocial stress and higher level of activity. This high prevalence calls for preliminary measures in the areas of ergonomics at work place to prevent or reduce such occurrence. In other words, taking into cognizance the sedentary nature of banking job, bankers should be well educated on safe measures as regards correct posture and ergonomics at their work places. For this purpose a long lasting and short lasting program for control of risk factors of job situations and permanent education for give awareness to individuals for take care of ergonomic principles is a crucial affairs and this is necessary for managers to create programs for work posture assessments and periodic examinations in work conditions and modification of wrong postures and designs of proper work stations in relation to individuals. They should also be advised on proper exercise programs to improve their general wellbeing and health. These will inadvertently improve quality of life and productivity. Moreover, one issue is shouted that in every bank there should have an Occupational Health Physiotherapist to minimize the risk of musculoskeletal disorders by proper assessment and providing training regarding ergonomics and good working posture. Not only this Occupational Health Physiotherapist can provide appropriate treatment and advice for musculoskeletal disorders and other Occupational health related problems.

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APPENDIXES
Appendix 1: Ethical approval letter

বাংলাদেশ হেল্থ প্রফেশন্স ইনস্টিটিউট (বিএইচপিআই)
Bangladesh Health Professions Institute (BHPI)
(The Academic Institute of CRP)

Ref. CRP-BHPI/IRB/03/16/008   Date: 12.03.2016

To
Abu Mohammad Musa
Part – II, M.Sc. in Physiotherapy
Session: 2013-2014, DU Reg. No.: 2256
BHPI, CRP, Savar, Dhaka-1343, Bangladesh

Subject: Approval of the thesis proposal – "Self reported Work related Musculoskeletal Disorders (MSDs) among Bank workers in Dhaka" by IRB of BHPI.

Dear Abu Mohammad Musa,

Congratulation!

The Institutional Review Board (IRB) of BHPI has reviewed and discussed your application on March 10, 2016 to conduct the above mentioned thesis, with yourself, as the Principal investigator. The Following documents have been reviewed and approved:

SL#	Name of the Documents
1	Thesis Proposal
2	Questionnaire
3	Information sheet & consent form.

Since the study involves answering a questionnaire that takes 15 to 20 minutes, have no likelihood of any harm to the participants rather possibility of benefit by knowing prevalence of Musculoskeletal Disorders (MSDs) from the information of Questionnaire, IRB has approved the study to be conducted in the presented form at the meeting held at 08:30 AM on March 10, 2016 at BHPI.

IRB expects to be informed about the progress of the study, any changes occurring in the course of the study, any revision in the protocol and patient information or informed consent and ask to be provided a copy of the final report. IRB of BHPI is working accordance to Nuremberg Code 1947, World Medical Association Declaration of Helsinki, 1964 - 2013 and other applicable regulation.

Best regards, .

S.M. Ferdous Alam
Assistant Professor
Dept. of MSc in Rehabilitation Science
Member Secretary, Institutional Review Board (IRB), BHPI.

সিআরপি-চাপাইন, সাভার, ঢাকা-১৩৪৩, বাংলাদেশ, ফোন ঃ ৭৭৪৫৪৬৪-৫, ৭৭৪১৪০৪ ফ্যাক্স ঃ ৭৭৪৫০৬৯
CRP-Chapain, Savar, Dhaka-1343, Tel : 7745464-5, 7741404, Fax : 7745069, E-mail : contact@crp-bangladesh.org, www.crp-bangladesh.org

Appendix 2: Institutional forwarding letter for data collection

বাংলাদেশ হেল্থ প্রফেশন্স ইনস্টিটিউট (বিএইচপিআই)
Bangladesh Health Professions Institute (BHPI)
(The Academic Institute of CRP)

Ref.   Date:........................

Date: 10/03/2016

To
The Manager,

....

Subject: Providing permission for data collection for MSc in Physiotherapy thesis.
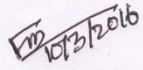
Dear Sir/Madam,

Greetings from Bangladesh Health Professions Institute (BHPI)!

As we know that Bangladesh Health Professions Institute (BHPI) – an academic institute of Centre for the Rehabilitation of the Paralysed (CRP) has been conducted MSc in Physiotherapy program under the Faculty of Medicine, University of Dhaka since 2013. This is a 2 year fulltime course .In final year students have to conduct a thesis project. Mr Abu Mohammad Musa is a student of Part II MSc in Physiotherapy program and currently doing a research project on *"Self reported Work related Musculoskeletal Disorders (MSDs) among Bank workers in Dhaka"* under honorable supervisor, Associate Professor Dr. Sheikh Abdul Kader [MBBS, MD (Neurology), FCPS (Medicine)], Department of Neurology, Bangabandhu Sheikh Mujib Medical University. The purpose of the study is to determine Prevalence of Work related Musculoskeletal Disorders (MSDs) among Bank Workers in Dhaka.

His project has been approved by the academic and ethical committees of BHPI. Now he needs to collect data for his study. We will appreciate if you kindly permit him to collect necessary information for his study.

Pleased do not hesitate to ask if you have any quires regarding any issues.

With regards,

Firoz Ahmed Mamin
Course coordinator
MSc in Physiotherapy program

Firoz Ahmed Mamin
BSPT (DU), MSc in Clinical Neuroscience (London)
Assistant Professor
Department of Physiotherapy
BHPI, CRP-Savar, Dhaka

CRP-Chapain, সাভার, ঢাকা-১৩৪৩, বাংলাদেশ, ফোন ঃ ৭৭৪৫৪৬৪-৫, ৭৭৪১৪০৪ ফ্যাক্স ঃ ৭৭৪৫০৬৯ : 7745464-5, 7741404, Fax : 7745069, E-mail : contact@crp-bangladesh.org, www.crp-bangladesh.org

Appendix 3: Application for data collection

03/03/2016

To
The Manager,
……………………
……………………..
……………………..

Subject: Application for permission of data collection for Master's thesis at your reputed Bank.

Sir,

With due respect I would like to draw your kind attention that I am a student of M.Sc. in Physiotherapy program at Bangladesh Health Professions Institute (BHPI)- an academic institute of CRP under Faculty of Medicine of University of Dhaka (DU). This is a 2-year full-time course. I have to conduct a thesis entitled, "Self reported Work related Musculoskeletal Disorders (MSDs) among Bank workers in Dhaka" under honorable supervisor, Associate Professor Dr. Sheikh Abdul Kader [MBBS, MD (Neurology), FCPS (Medicine)], Department of Neurology, Bangabandhu Sheikh Mujib Medical University. The purpose of the study is to determine Prevalence of Work related Musculoskeletal Disorders (MSDs) among Bank Workers in Dhaka.

Data collection will require the employees of your reputed Bank. Data will be collected from March' 2016. A standardized and pre-validated Questionnaire (consist of two part where part-I consist of Demographic information and in part-II consist of Nordic Musculoskeletal Questionnaire) will be used that will take about 15 to 20 minutes including measurements of weight and height(if the employee don't know their weight & Height). Data collectors will receive informed consents from all participants. Any data collected will be kept confidential. Ethical approval is received from the Institutional Review Board (IRB) of Bangladesh Health Profession's Institute (BHPI).

Therefore I look forward to having your permission for data collection at your reputed Bank.

Sincerely yours,   Forwarded by

Abu Mohammad Musa   Dr. Sheikh Abdul Kader

Part – II, M.Sc. in Physiotherapy ,   MBBS, MD (Neurology), FCPS (Medicine);

Session: 2013-2014, DU Reg. No.: 2256   Associate Professor, Department of Neurology,

BHPI, CRP, Savar, Dhaka-1343, Bangladesh Bangabandhu Sheikh Mujib Medical University.

Dr. Abdul Kader Shaikh
MBBS, FCPS (Medicine), MD (Neurology) DU
Associate Professor
Department of Neurology
B S M Medical University
Shahbag, Dhaka.

Appendix 4: Informed Consent Statement

As a participant in the research project 'Self reported Musculoskeletal (MSDs) among Bank worker in Dhaka, Bangladesh I, Mr./Ms. _____, without any threat, intimidation, force or coercion freely and voluntarily undertake and consent to being a part of this study. The data being gathered is for the research for the University of Dhaka by Abu Mohammad Musa who is a student of M.Sc. in Physiotherapy within the Division of Faculty of Medicine under the direction and supervision of Dr. Md. Sheikh Abdul Kader [MBBS, MD (Neurology), FCPS (Medicine)], Associate Professor of Neurology in *Bangabandhu Sheikh Mujib Medical University* (*BSMMU*). The primary objective of the study is to ascertain whether there is a prevalence of musculoskeletal disorders amongst Bank workers in Dhaka. Participation on this study is completely voluntary and there are no financial inducements or Incentives offered or inferred. The study is conducted using pre-validated questionnaires and these remain completely anonymous. Data obtained will remain the intellectual property of the University of Dhaka. No data will be shared in primary form with any organisation although the consolidated results may be circulated to key stakeholders and may be published in selected peer reviewed journals. The researcher is at liberty to discuss any matters pertaining to the study but not authorised to issues a copy of the final research unless a request has been received by the University. If you have any concerns, complaints or issues relating to this study please discuss directly with the researcher (Cell Phone Number- +880 1552433899).

Thank you for your time and participation in this important study.

Participant's Sign with or without SEAL & Date	Interviewer's sign with date

Appendix 5: Questionnaire (English)

Questionnaire

Part-I:

1. Name: **2.** Age: **3.** Sex: 1.Male/2. Female

4. Weight: *Pound (1 KG = 2.2 lb.)*,   **5.** Height: *Inch,*

6. BMI: [Weight/ (height x height)] x 703*

7. Designation: 1. Entry Level/2. Mid Level/3. Top Level

8. Job Tenure: 1= 0-1 years   2= 1-5 years   3= 5-15 years   4= > 15 years

9. Amount of Time Spent at work per week:

10. How is your Health status in General?

        1=Good   2= reasonably good   3=Not to bad   4=Poor

11. How is to your opinion your physical fitness nowadays?

        1=Good   2= reasonably good   3=Not to bad   4=Poor

12. How tired are you normally at the end of a working day Physically?

        1=not tired   2= a bit tired   3=rather tired   4=very tired

13. How tired are you normally at the end of a working day mentally?

        1=not tired   2= a bit tired   3=rather tired   4=very tired

[* If your time is less than please keep it blank as researcher will calculate your BMI on the basis of height and weight.]

14. Do you have Knowledge about Ergonomic Training?   1=Yes, 2= No.

15. Do you have Knowledge about Physiotherapy management regarding Musculoskeletal disorder (Muscle and Joint related pain, aching, cramp, paresthesia, swelling, stiffness, weakness, tingling. restricted range of motion, numbness)?

　　　　1= Yes, 2= No.

16. Do you have knowledge about good working posture?　1= Yes, 2= No.

17. Do you often feel tense?　　　　　　　　　　　　　　　1. Yes
　　　　2. No

　- Do you often feel nervous?　　　　　　　　　　　　　1. Yes
　　　　2. No

- Do you often feel flustered?　　　　　　　　　　　　　1. Yes
　　　　2. No

- Are you often very tired after work?　　　　　　　　　1. Yes
　　　　2. No

- Do you regularly feel tired when getting up in the morning?　　1. Yes
　　　　2. No

18. Level of Activity:　1=working in the same position for long time (Standing, bend over, sitting etc)

　　　　　　　　　　　2= Performing the same task over and over

　　　　　　　　　　　3= Bending and twisting in an awkward way

　　　　　　　　　　　4= Repetitive movement of upper limb

　　　　　　　　　　　5=Work Scheduling (overtime, irregular shift, length of work day)
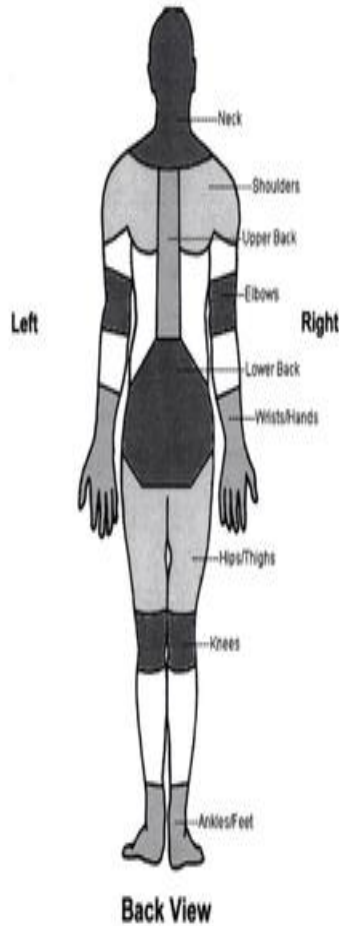
　　　　　　　　　　　6= Carry heavy load.

Part-II: Nordic Musculoskeletal Questionnaire

Mine: ___

Initial of first name: __   Initial of last name: __   Last 4 digits of social security number: __ __ __ __   Immediate Supervisor: _____   Date: __/__/__

Job Title: _____   Section: _____   Gender: M   F   Age: _____   Height: ___ ft. ___ in.   Weight: _____

How long have you been doing this job? _____ years _____ months   On average, how many hours do you work each week? _____

Back View

	To be answered by everyone		To be answered by those who have had trouble			
	Have you at any time during **the last 12 months** had trouble (ache, pain, discomfort, numbness) in:		Have you at any time during the **last 12 months been prevented from doing your normal work** (at home or away from home) because of the trouble?		Have you had trouble at any time during **the last 7 days?**	
Neck	☐ No	☐ Yes	☐ No	☐ Yes	☐ No	☐ Yes
Shoulders	☐ No	☐ Yes, right shoulder ☐ Yes, left shoulder ☐ Yes, both shoulders	☐ No	☐ Yes	☐ No	☐ Yes
Elbows	☐ No	☐ Yes, right elbow ☐ Yes, left elbow ☐ Yes, both elbows	☐ No	☐ Yes	☐ No	☐ Yes
Wrists/Hands	☐ No	☐ Yes, right wrist/hand ☐ Yes, left wrist/hand ☐ Yes, both wrists/hands	☐ No	☐ Yes	☐ No	☐ Yes
Upper Back	☐ No	☐ Yes	☐ No	☐ Yes	☐ No	☐ Yes
Lower Back (small of back)	☐ No	☐ Yes	☐ No	☐ Yes	☐ No	☐ Yes
One or Both Hips/Thighs	☐ No	☐ Yes	☐ No	☐ Yes	☐ No	☐ Yes
One or Both Knees	☐ No	☐ Yes	☐ No	☐ Yes	☐ No	☐ Yes
One or Both Ankles/Feet	☐ No	☐ Yes	☐ No	☐ Yes	☐ No	☐ Yes

*Based on the Nordic Questionnaire

Appendix 6: Questionnaire (Bengali)

প্রশ্নাবলী

অংশ-১:

১. নাম: ২. বয়স: ৩. লিঙ্গ: ছেলে / মেয়ে

৪. ওজন: পাউন্ড (১ কেজি = ২.২ পাউন্ড)   ৫. উচ্চতা:   ইঞ্চি

৬. বি,এম,আই: [ওজন/(উচ্চতা x উচ্চতা)] x ৭০৩*

৭. পদবী   ১. প্রাথমিক স্বর, ২. মধ্যম স্বর ৩. উচ্চ স্বর

৮. চাকুরির মেয়াদ: ১ = ০-১ বছর   ২ = ১-৫ বছর   ৩ = ৫-১৫ বছর   ৪ = > ১৫ বছর

৯. সপ্তাহে কত ঘন্টা কাজ করেন ?

১০. আপনার স্বাস্থ্যগত অবস্থা সাধারণত কেমন ?

        ১ = ভাল   ২ = মোটামুটি ভাল   ৩ = খারাপ না   ৪ = খারাপ

১১. বর্তমানে আপনার শারীরিক যোগ্যতা (physical fitness) সম্পর্কে মতামত কি ?

        ১ = ভাল   ২ = মোটামুটি ভাল   ৩ = খারাপ না   ৪ = খারাপ

১২. সারাদিন কাজের পর আপনি কতটুকু শারীরিক াবসাদ গ্রস্থ হন ?

        ১ = অবসাদ গ্রস্থ হইনা   ২ = অল্প অবসাদ গ্রস্থ ৩ = মোটামুটি অবসাদ গ্রস্থ   ৪ = খুব অবসাদ গ্রস্থ

১৩. সারাদিন কাজের পর আপনি কতটুকু মানসিক অবসাদ গ্রস্থ হন ?

        ১ = অবসাদ গ্রস্থ হইনা   ২ = অল্প অবসাদ গ্রস্থ ৩ = মোটামুটি অবসাদ গ্রস্থ   ৪ = খুব অবসাদ গ্রস্থ

[✳যদি আপনার সময় স্বল্প থাকে সেক্ষেত্রে বি,এম,আই, এর ঘরটি খালি রাখতে পারেন যা গবেষক উচ্চতা ও ওজনের সাহায্যে নির্ণয় করতে পারবেন।]

১৪. আপনার কি Ergonomic Training সম্পর্কে জ্ঞান / ব্যবহারিক দক্ষতা আছে ?   ১ = হ্যাঁ, ২ = না

১৫. আপনার কি Musculoskeletal disorder এ ফিজিওথেরাপি চিকিৎসা সম্পর্কে জ্ঞান / অবগত আছেন (পেশী

এবং সন্ধির ব্যথা, ধরা, খিঁচুনি, অসাড়তা, ফোলা, কঠিনতা, দুর্বলতা, রনন, সন্ধির চলন বাধাগ্রস্থ, অবশতা)? ১= হ্যাঁ,

২ = না

১৬. আপনার কি সঠিক working posture সম্পর্কে জ্ঞান আছে ?   ১ = হ্যাঁ, ২ = না

১৭. আপনি কি প্রায়ই উত্তেজনা / tense অনুভব করেন ?   ১ = হ্যাঁ,   ২ = না

 - আপনি কি প্রায়ই স্নায়বিক দূর্বলতায় ভুগেন ?   ১ = হ্যাঁ,   ২ = না

- আপনি কি প্রায়ই বিজ্জুব্ধ হন ?   ১ = হ্যাঁ,   ২ = না

- আপনি কি প্রায়ই কাজের পর খুবই অবসাদ হয়ে পড়েন ?   ১ = হ্যাঁ,   ২ = না

- আপনি কি প্রতিদিনই সকালে ঘুম থেকে উঠার পর অবসাদ অনুভব করেন ?   ১ = হ্যাঁ,   ২ = না

১৮. কাজের পরিমান: ১ = একই অবস্থানে অনেক্ষাণ কাজ করেন (দাড়ানো, সোজা, বসা ইত্যাদি)

                ২ = একই কাজ বার বার করেন

                ৩ = ঝুকে ও মোচড়িয়ে বেঢপ / অসুবিধাজনকভাবে

                ৪ = পূনরাবৃত্তিপূর্ণ হাতের নাড়াচাড়া

                ৫ = কর্ম সময় নির্ধারণ সম্পর্কিত (অধিকর্ম, অনিয়মিত স্থানান্তর দীর্ঘ কর্ম দিবসের ব্যপ্তি)

                ৬ = ভারী কাজ করা

অংশ-২:

নরডিক মাসকুলোস্কেলিটাল প্রশ্নাবলী

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

প্রতিটি প্রশ্নের জন্য একটি টিক চিহ্ন ব্যবহার করুন

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

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অংশগ্রহণকারীর নাম: বয়স: কোড নং:

বিগত ১২ মাসের মধ্যে, যে কোন সময়ে আপনি কি নিম্নে উল্লেখিত শরীরের অংশসমূহে কোন ধরনের সমস্যা বোধ করেছেন? (যেমন ঃ অবিরাম অস্বস্তিকর বেদনা, ব্যাথা, অস্বস্তি, অবশ)	বিগত ৭ দিনের মধ্যে আপনি কি কোন ধরণের সমস্যা বোধ করেছেন ?	উল্লেখিত সমস্যা সমূহের জন্য (অবিরাম অস্বস্তিকর বেদনা, ব্যাথা, অস্বস্তি, অবশ) বিগত ১২ মাসের মধ্যে আপনি কি আপনার স্বাভাবিক কার্যাবলী (যেমনঃ চাকুরি, গৃহস্থালির কাজ, শখ) থেকে বিরত থেকেছেন?

১.   ঘাড়
     না   হ্যাঁ
 ১ ☐   ২ ☐
	২. ঘাড়
	     না হ্যাঁ
	 ১ ☐ ২ ☐
		৩. ঘাড়
		     না হ্যাঁ
		 ১ ☐ ☐

৪.   কাঁধ সমূহ
 ১ না   হ্যাঁ
 ☐   ২ ☐ কাঁধে
      ৩ ☐ কাঁধে
      ৪ ☐ কাঁধে
	৫. কাঁধ সমূহ
	   না হ্যাঁ
	 ১ ☐ ২ ☐ কাঁধে
	      ৩ ☐ কাঁধে
	      ৪ ☐ কাঁধে
		৬. কাঁধ সমূহ (এক কাঁধ/ উভয় কাঁধ)
		     না হ্যাঁ
		 ১ ☐ ☐

৭.   কনুই সমূহ
 ১ না   হ্যাঁ
 ☐   ২ ☐ কনুইয়ে
      ৩ ☐ নুইয়ে
      ৪ ☐ কনুইয়ে
	৮. কনুইসমূহ
	   না হ্যাঁ
	 ১ ☐ ২ ☐ কনুইয়ে
	      ৩ ☐ নুইয়ে
	      ৪ ☐ কনুইয়ে
		৯. কনুইসমূহ (এক কনুই / উভয় কনুই)
		     না হ্যাঁ
		 ১ ☐ ২ ☐

১০.   কব্জিসমূহ / হাত সমূহ
    না   হ্যাঁ
 ১ ☐ ২ ☐ (কব্জি / হাত)
     ৩ ☐ কব্জি / হাত)
     ৪ ☐ কব্জি / উভয় হাত
	১১. কব্জি সমূহ / হাত সমূহ
	    না হ্যাঁ
	 ১ ☐ ২ ☐ কব্জি / হাত)
	     ৩ ☐ কব্জি / হাত)
	     ৪ ☐ কব্জি / উভয় হাত
		১২. কব্জি সমূহ/ হাত সমূহ (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 উরু অস্থিদ্বয়ের সংযোগ স্থল/ উরুদ্বয় / নিতম্ব (Hips/thigh/buttoks)
    না   হ্যাঁ
 ১ ☐   ☐
	২০. উরুঅস্থিদ্বয়ের সংযোগ স্থল/ উরু দ্বয় / নিতম্ব
	    না হ্যাঁ
	 ১ ☐ ২ ☐
		২১. উরু অস্থিদ্বয়ের সংযোগ স্থল/ উরুদ্বয় / নিতম্ব (Hips/thigh/buttoks)
		    না হ্যাঁ
		 ১ ☐ ☐

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/ পায়ের পাতা)
     না   হ্যাঁ
 ১ ☐   ☐
	২৬. গোড়ালির গাঁট/ পায়ের পাতা
	    না হ্যাঁ
	 ১ ☐ ☐
		২৭. গোড়ালির গাঁট/ পায়ের পাতা
		    না হ্যাঁ
		 ১ ☐ ☐

Appendix 7:

Work Schedule

Activities	May 15	June 15	July 15	Aug 15	Sep 15	Oct 15	Nov 15	Dec 15	Jan 16	Feb 16	Mar16	Apr 16
Topic Selection	■											
Planning & designing		■	■									
Literature Review		■	■	■	■	■	■	■	■	■	■	
Selection of Study area				■								
Instrument development					■							
Pretesting & Finalizing						■						
Data Collection							■	■				
Data Analysis									■			
Data Tabulation									■			
Report Writing									■	■		
Finalizing the Report										■	■	■
Final Submission											■	■