Faculty of Medicine

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MUSCULOSKELETAL CHARACTERISTICS AMONG DIABETIC AND NON-DIABETIC PATIENTS ATTENDED AT CRP

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Bachelor of Science in Physiotherapy (B.Sc. PT)

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We the undersigned certify that we have carefully read & recommend to the Faculty of Medicine, University of Dhaka, for the acceptance of this dissertation entitled

MUSCULOSKELETAL CHARACTERISTICS AMONG DIABETIC AND NON-DIABETIC PATIENTS ATTENDED AT CRP

Submitted by **Jannatul Taslima Meem,** for the partial fulfillment of the requirement for the degree of Bachelor of Science in Physiotherapy (B.Sc. PT).

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Declaration

I declare that the work presented here is my own. All sources used have been cited appropriately. Any mistakes or inaccuracies are my own. I also declare that for any publication, presentation or dissemination of information of the study, I would be bound to take written consent from the Department of Physiotherapy, Bangladesh Health Professions Institute.

Signature: **Date:**

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List of acronyms

BHPI	Bangladesh Health Professions Institute.
BMRC	Bangladesh Medical and Research Council.
BMI	Body Mass Index
CRP	Centre for the Rehabilitation of the Paralysed.
CTS	Carpal Tunnel Syndrome
DM	Diabetes Mellitus.
HSC	Higher Secondary School Certificate
IDF	International Diabetes Federation
IRB	Institutional Review Board.
MSCs	Musculoskeletal Complains
OA	Osteoarthritis
RMSD	Rheumatic Musculoskeletal Disease
SSC	Secondary School Certificate
SPSS	Statistical Package for the Social Science.
YLD	Years lived with disability
WHO	World Health Organization.

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Abstract

Diabetes mellitus (DM) is a long-term metabolic condition which is going to be a huge burden on public health services and it is becoming more and more common worldwide in emerging nations. ***Purpose:*** A variety of musculoskeletal issues are associated with diabetes mellitus. Even people without diabetic mellitus in Bangladesh are experiencing numerous musculoskeletal problems. This study represents the musculoskeletal characteristics that affects the diabetic and non-diabetic individuals frequently. ***Objectives:*** This study was aimed to find out the musculoskeletal characteristics, behavioral risk factors and association of the musculoskeletal characteristics of diabetic and non-diabetic population. ***Methods:*** A descriptive type of cross sectional study of 230 participants was conducted where 68 participants were diabetic and 162 were non-diabetic. The sample was selected by using convenient sampling technique. Data was collected from the participants through face to face interview. ***Results:*** The study result shows that, among diabetic and non-diabetic participants 57.4% and 56.2% were female and highest number of participants, 26.5% diabetic and 27.2% non-diabetic participants correspondingly were in the age range of 31-40 and 41-50 years. Nearly half of the population 44.1% and 43.8% were housewife in occupation. The majority of diabetic and non-diabetic participants suffered musculoskeletal pain in shoulder 18.80% and 13.60%, lower back 46.40% and 54.60%, and knee 44.90% and 24.10%. Only few participants, 29.9% diabetic and 27.2% non-diabetic patient has experienced paresthesia or numbness. It was found that 38.85% diabetic and 28.50% non-diabetic patients had muscle weakness and the majority of participants, 83.60% and 78.50% patients were facing difficulties during movement. Only a few diabetic and non-diabetic participants experienced swelling 2.9% and 2.5%, joint stiffness 4.4% diabetic and also 2.5% and muscle wasting 1.5% and 1.2%. ***Conclusion:*** Musculoskeletal conditions affect both diabetes and non-diabetic people and cause pain, discomfort, and dysfunction. This effect also has an impact on the patient's quality of life. A multidisciplinary team strategy should be employed to treat the musculoskeletal issue of diabetic patients while also raising the standard of care for these patients.

Key word: Diabetes, musculoskeletal characteristics.

CHAPTER I: INTRODUCTION

1.1 Background

Diabetes mellitus (DM) is a long-term metabolic condition characterized by chronic hyperglycemia. It causes the body's blood sugar levels to rise as a result of decreased insulin secretion, decreased insulin action, or both. High glucose levels can harm connective tissue by affecting cell activity and altering extracellular matrix components (Mueller et al., 2016).

It is a serious public health issue that affects people all over the world. In 2017, 451 million people (aged 18 to 99) were predicted to have diabetes. By 2045, the population was predicted to reach 693 million (Cheong et al., 2018). If diabetes mellitus is not correctly managed, complications include stupor, coma, and, rarely, death from non-kenotic hyperosmolar syndrome may result. Diabetes mellitus management and treatment plans vary depending on the type of diabetes, although it can be challenging to group patients into a single category, especially for younger adults (Kharroubi, 2015).

Diabetes is going to be a huge burden on public health services and it is becoming more and more common worldwide in emerging nations. With about one-fourth of the world's population, South Asia, also known as the Indian subcontinent, is home to a wide variety of ethnic, linguistic, and religious groups. According to the countries in the area include India, Pakistan, Bangladesh, Nepal, Sri Lanka, Bhutan, and the Maldives. The types of diabetes might vary depending on how dependent they are on insulin (Jayawardena et al., 2014).

The different types of diabetes mellitus are type one (type 1) diabetes mellitus, type two (type 2) diabetes mellitus, gestational diabetes mellitus, and other types. Comparing diabetes mellitus type 1 and type 2, type 2 is the most frequent. Diabetes mellitus type 2 accounts for 90% to 95% of all cases. Insulin resistance diabetes is characterized by the body's inability to respond to insulin. It is mostly found in elderly persons, although it is becoming more common in children and young adults as obesity, inactivity, and fast food

become more prevalent. It is primarily caused by a family history of diabetes, being overweight, eating a poor diet, being inactive, and having a glucose problem. (International Diabetes Federation - What is diabetes, 2018). In the twenty-first century, diabetes epidemics are predicted to be most severe in developing nations. There are many people with diabetes in the workforce today, and it has a significant negative influence on both personal and societal productivity. The finances of both developed and developing countries may be significantly harmed by the socioeconomic effects of diabetes and its complications (Richard et al., 2014).

Diabetes was always thought to be a rare ailment, but due to population expansion, aging populations, urbanization, and rising rates of obesity and physical inactivity, the number of persons with diabetes is rising. The musculoskeletal system is one of the major consequences of diabetes mellitus (Richard et al., 2016). A variety of musculoskeletal (MS) problems have been associated with DM which can cause significant impairment (Mueller et al., 2016). Shoulder capsulitis (SC), limited joint mobility (LJM), trigger finger (TF), Dupuytren's contracture (DC), Charcot's foot (CF), carpal tunnel syndrome (CTS), osteoarthritis (OA), and other rare complications are some of common disorders occurs in people with diabetes. (Crispin et al., 2013).

The control of blood sugar levels is significantly influenced by the muscles. The muscles can absorb glucose from the blood with the aid of insulin, which lowers blood sugar levels. When there is insufficient insulin in the body, the blood's glucose cannot enter muscle cells to power them. The absence of glucose over time may cause muscle cells to atrophy (die), resulting in a reduction in muscular mass. Joint pain and a wide range of other musculoskeletal disorders can be brought on by the painful and disabling disease known as diabetes. Obesity, vascular disease, and diabetic neuropathy are a few of the illnesses that might produce these symptoms, but in many instances, the actual cause is unknown (Cieza et al., 2020)

Additionally, musculoskeletal difficulties are also common among non-diabetic elderly people. Aging has an impact on various facets of older people's lives as the global population of the elderly rises. Older people frequently lose body weight or skeletal muscle mass (Thomas, 2016). The largest muscular cross-sectional area typically occurs between

the ages of 20 and 30 for both men and women, and when strength peaks over the course of the lifespan. Beyond that, most muscle groups' strength starts to deteriorate, initially gradually and then more quickly after middle age. When there is a perceived loss of strength and endurance in middle age, most people first feel the effects of skeletal muscle aging. A person's physical performance and mobility limitations as they age, along with the higher accident rates encountered by people with muscle weakness and poor balance, are all directly related to strength loss in older people. According to a different study, motor unit losses and muscle fiber atrophy causes a 40–50% decline in muscle mass between the ages of 25 and 80 (Nordfeldt et al., 2017).

As people get older, increased bone fragility, loss of cartilage resilience, reduced ligament flexibility, loss of muscle strength, and fat redistribution all contribute to musculoskeletal tissues' inability to perform their usual activities (Freemont et al., 2017). Falls and osteoporosis are the leading causes of fractures in the elderly (Cheong et al., 2018). In fact, quadriceps weakness raises the risk of osteoarthritis in the knee and hip, as well as disease and treatment-related problems (Vlietstra et al., 2019).

According to recent research, motor deficits (which are common in individuals with both lower limb tendinopathies and hip or knee osteoarthritis) may potentially predispose to sarcopenia and contribute to its progression (Yoshimura et al., 2019). Furthermore, age-related comorbidities such as chronic obstructive pulmonary disease and congestive heart failure can impair movement, resulting in diminished muscle and tendon function, further propagating musculoskeletal system alterations (Grote et al., 2019).

1.2 Rationale

Diabetes is a dangerous condition that is one of the four non-communicable diseases listed by world leaders. Diabetes prevalence approximately quadrupled globally from 108 million people in 1980 to 422 million people in 2014, whereas the age-adjusted prevalence nearly doubled from 4.7% to 8.5% (World Health Organization, 2016). In 2014, diabetes affected 8.5% of adults aged 18 and up. Diabetes was the direct cause of 1.5 million fatalities in 2019, with 48% of diabetes-related deaths occurring before the age of 70. (World Health Organization, 2022).

Diabetes is a rapidly growing health problem that is a leading cause of death and disability. The majority of governments have given commitment to halt the rise of diabetes. However, it continues to be a severe health issue. Diabetes affects more than 422 million people worldwide. Furthermore, its frequency and incidence are increasing by the day (World Health Organization, 2018). Similarly the diabetes-related musculoskeletal complications are increasing day by day. MSDs in diabetic patient have frequently been disregarded and ignored. This ongoing disregard has hindered the vitally important process of health education in DM with relation to the joints and extremities. The typical diabetic people are unaware of these issues, which have a negative impact on quality of life in terms of health (Sarker et al., 2016).

Diabetic people are commonly affected by a variety of complications, including Cardiac, Renal, pulmonary, and Musculoskeletal (shoulder pain, frozen shoulder, hand syndrome, back pain, neck pain, osteoarthritis, elbow pain, epicondylitis, carpal tunnel syndrome, Dequerven tenosynovitis, leg and foot pain) (Roy, 2013). Diabetes mellitus is creating serious health problems in both developed and developing countries. It was once thought to be a rare occurrence in Bangladesh, but it has now become a major public health issue. As in the rest of the world, the problem of diabetes mellitus is growing in Bangladesh (World Health Organization, 2016).

According to the WHO, 7 million individuals in Bangladesh have diabetes, which translates to 70 million people. Unfortunately, the general public is still unaware of the true scope of the situation. There is also a lack of knowledge regarding present diabetes

prevention and treatment measures. Urban people's sedentary lifestyles, low socioeconomic position, nutritional imbalances, rural people's unsanitary lifestyles, eating habits, and lack of physical activity are all key variables in diabetes mellitus. They are, however, unaware of the issues. This problem is escalating in Bangladesh (Hossain et al., 2014).

On the other hand, as the population ages, it is anticipated that the prevalence of musculoskeletal diseases, which are a primary source of physical disability in the elderly, would dramatically increase. It has been demonstrated that physical function impairment in older persons has a bigger impact on level of disability and capacity to maintain independent living than either vision or hearing impairment (Marce et al., 2018). The goal of this study is to address these issues and provide a physiotherapy solution for a diabetic and non-diabetic patient with musculoskeletal issues.

Musculoskeletal disorders also account for the majority of rehabilitation needs worldwide. They account for almost two-thirds of all individuals who require rehabilitation care (WHO, 2022). In the treatment of diabetes mellitus, physical therapy is crucial. The physiotherapist plays a crucial role in assisting diabetic patients in leading lives with a higher quality of life because exercise is a fundamental component of managing diabetes (Kalra et al., 2017).

So, this research will also assist physiotherapists in being more aware of diabetic and non-diabetic patients' musculoskeletal issues in CRP. It will help make present physiotherapy practice for patients with musculoskeletal problems in CRP more comprehensive and effective. This research could provide a comprehensive picture of how common musculoskeletal problems are among diabetic and non-diabetic patients. In the treatment of musculoskeletal problems, physiotherapy is essential. As a result, physiotherapists working in this field will get benefit from it when providing treatment. This research will also be beneficial to other organizations operating in this field in terms of adding physiotherapy services in their programs in order to provide a more comprehensive treatment service. As a result, patient will get more benefits. Consequently, the research could create the way for physiotherapy careers in Bangladesh in the future.

1.3 Research Question

What are the musculoskeletal characteristics among diabetic and non- diabetic patients attended at CRP?

1.4 Objectives

1.4.1 General objective

- To find out the musculoskeletal characteristics among diabetic and non-diabetic patients.

1.4.2 Specific objectives

- To explore the socio-demographic characteristics of diabetic and non-diabetic patients.
- To determine the common area of musculoskeletal problems in different body region both in diabetic and non-diabetic patients.
- To understand the severity of musculoskeletal characteristics.
- To see how musculoskeletal problems interfering with diabetic and non-diabetic patient's life.
- To know the association of the musculoskeletal complain, behavioral risk factors with diabetes.

1.5 Conceptual framework

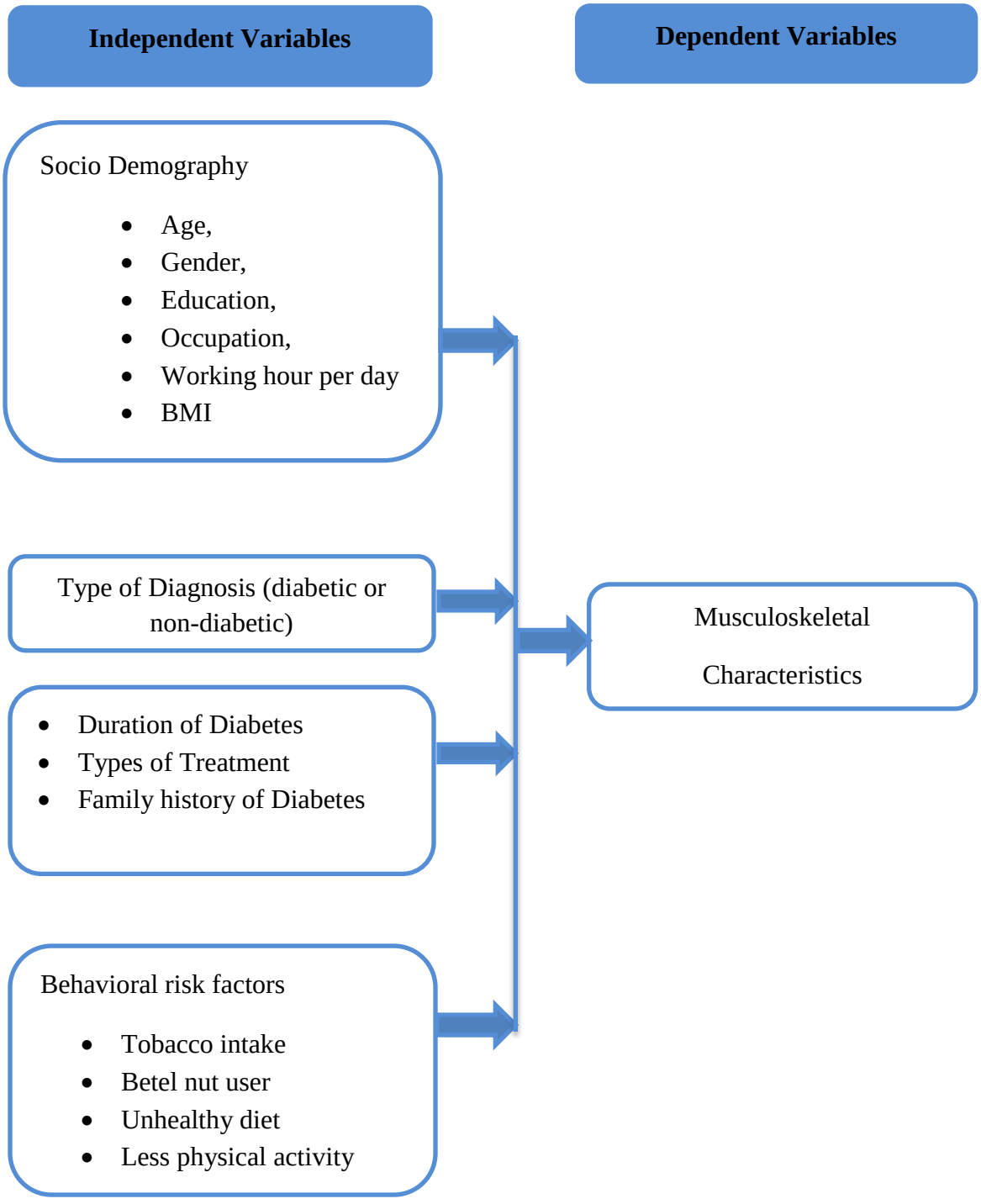


Figure-1.5: Conceptual framework

1.6 Operational definition

Diabetes

Diabetes is a chronic disease, when the pancreas does not produce enough insulin then it occurs, or when the body cannot use the insulin effectively then it produces. This leads to an increased concentration of blood glucose (WHO, 2016).

Musculoskeletal characteristics

Musculoskeletal disorders refer to a group of inflammatory and degenerative diseases that affect the muscles, tendons, ligaments, joints, peripheral nerves, and blood vessels that support them. Clinical syndromes such as tendon inflammation and related conditions (tenosynovitis, epicondylitis, bursitis), nerve compression disorders (carpal tunnel syndrome, sciatica), and osteoarthrosis, as well as less well standardized conditions such as myalgia, low back pain, and other regional pain syndromes not attributable to known pathology, are included. The low back, neck, shoulder, forearm, and hand are the most typically affected body parts, while the lower extremities has gotten increasing attention recently (Punnett et al. 2014).

CHAPTER II: LITERATURE REVIEW

Musculoskeletal conditions encompasses more than 150 conditions affect people's locomotor systems and are classified as. They range from short-term injuries like fractures, sprains, and strains to long-term disorders like chronic pain and incapacity. Pain (often persistent) and limits in mobility, dexterity, and general level of functioning describe musculoskeletal diseases, limiting people's capacity to work. The common symptoms of musculoskeletal diseases are pain (often persistent) and limits in mobility, dexterity, and general level of functioning, which impair people's capacity to work. Conditions that affect the joints, such as osteoarthritis, rheumatoid arthritis, psoriatic arthritis, gout, and ankylosing spondylitis; the bones, such as osteoporosis, osteopenia and associated fragility fractures, traumatic fractures; the muscles, such as sarcopenia; the spine, such as back and neck pain; multiple body areas or systems, such as regional and widespread pain disorders and inflammatory diseases such as systemic lupus erythematosus. (WHO, 2022)

Musculoskeletal disorders affect people of all ages and frequently result in disability, impairment, or handicap. They are a group of disorders that produce pain or discomfort in the bones, joints, muscles, or surrounding structures, and they can be acute, chronic, localized, or diffuse in nature. Musculoskeletal indications or symptoms, such as limited motion or discomfort in a joint or extremity, affect around 33% of adults in the United States. Musculoskeletal complaints were the most common type of health symptoms in one research of Detroit residents who kept note of daily health symptoms in a journal. Musculoskeletal problems are more common as people get older, with the majority of people aged 75 and up suffering from some sort of musculoskeletal disorder, particularly arthritis (Felson, 2016).

At this time, the world's population is aging at a never-before-seen rate. In the first decade of the twenty-first century, population aging has become a significant demographic trend on a global scale. Just after 2010, older people's numbers and proportions start to climb quickly in most developed and many developing countries. As of midyear 2008, there were 506 million people worldwide who were 65 or older, or roughly 7% of the world's

population. According to projections, there will be 1.3 billion elderly adults in the world by 2040, or 14% of the entire population. Throughout the year, the elder population of the world increased by an average of 870,000 persons per month. Projections 10 years hence predict that the annual net increase will be on the order of 23 million, an average net monthly gain of 1.9 million people (Kinsella et al., 2015). By 2050, 2 billion individuals will be 60 years of age or older, with around 70% of elderly people residing in developing countries (World Health Organization, 2016).

Musculoskeletal problems are long-term, debilitating, and expensive. People of various ages, cultures, and ethnic groups are affected. For adults over the age of 18, these disorders are the major cause of disability and loss of function, as well as activity limitation and impairment. These illnesses impact roughly one in every two persons in the United States, and they cause the most lost workdays and medical bed days of any medical condition (Smith et al., 2013).

According to a recent examination of Global Burden of Disease (GBD) data, roughly 1.71 billion individuals worldwide suffer from musculoskeletal disorders. While the prevalence of musculoskeletal disorders varies by age and diagnosis, they affect people of all ages all over the world. In terms of population, high-income nations are the most affected (441 million), followed by countries in the WHO Western Pacific Region (427 million) and South-East Asia Region (369 million). With roughly 149 million YLDs, musculoskeletal diseases are the leading cause of years lived with disability (YLDs) worldwide, accounting for 17% of all YLDs (Cieza et al., 2020).

Diabetes mellitus affects 422 million people worldwide, compared to 108 million in 1980. Diabetes mellitus prevalence has risen to 8.5 percent among those over the age of 18. Diabetes is becoming more common in middle-income and low-income countries. Diabetes includes a number of consequences, including blindness, kidney failure, heart attack, stroke, and limp amputation, all of which increase mortality and morbidity. In 2016, 1.6 million people died from diabetes, with another 2.2 million dying from complications. The majority of those who died were under the age of 70. Diabetes was named the 7th biggest cause of mortality by the World Health Organization in 2016. (WHO, 2018).

The global prevalence of diabetics 6 was predicted to be 415 million in 2015, and it is expected to climb to over 642 million by 2040, with Asians being the most impacted. The International Diabetes Federation (IDF) projected 14.2 million diabetic patients in Africa in 2015, excluding around 67 percent of those who were not diagnosed, and this number is expected to climb to 34.2 million by 2040. (Kaka et al., 2019).

According to another statistics, 29.1 million people have diabetes, with 1.7 million new cases diagnosed each year. Diabetes affects around 387 million adults worldwide, with the figure expected to rise to 592 million by 2035. Given that more than 86 million Americans, or 37 percent of the adult population, are at risk for diabetes, the prevalence of diabetes and related causes is predicted to more than quadruple in the next 25 years (Balk et al., 2015). As a result, diabetes will become a severe health problem that will worsen with time and become a social burden. Diabetes is increasingly becoming a global public health issue (Wang et al., 2014)

Diabetes mellitus is a serious problem in South Asian countries (particularly India, Pakistan, Sri Lanka, Bangladesh, Nepal, Bhutan, and the Maldives). With great variation, the overall prevalence is growing. Many factors, ranging from socioeconomic status to diagnosis status, are responsible for the heterogeneity. In India, especially in South India, the prevalence of type 2 diabetes is higher. In Tamil nadu, Maharashtra, Jharkhand, and Chandigarh, respectively, the prevalence rates were 10%, 8.4%, 5.3 percent, and 13.6 percent. If extrapolated using the data collected from the states, the prevalence of type 2 diabetes in India in the future year will be projected. Based on the information shown above, it is estimated that 120.9 million individuals in South Asia would have diabetes by 2030. This will affect twice as many people as in North America or Europe, and the prevalence rate of diabetes in South Asia is higher than in other ethnic groups in the United States (Gujral et al, 2013).

Diabetes mellitus is divided into four categories, based on the cause: diabetes type 1, diabetes type 2, gestational diabetes and other particular forms. Insulin shortage causes type 1 diabetes mellitus. Diabetes mellitus type 2 is caused by insulin resistance and

relative insulin insufficiency. During pregnancy, women might develop gestational diabetes. One of the following criteria must be met in order to diagnose diabetes:

(1) A fasting plasma glucose of 126 mg/dl or higher

(2) A sign and symptom of diabetes such as polyuria, polydipsia, and unexplained weight loss plus a causal plasma glucose of 200mg/dl or higher

(3) A 2-hour plasma glucose of 200 during an oral glucose tolerance test using 75g of glucose.

Diabetes mellitus type 2 affects the majority of elderly people. Diabetes can go untreated for years without causing any signs or symptoms. Physical inactivity is the key factor that raises the chance of developing the condition. On a global scale, the rise in diabetes patients is linked to an increase in physical activity. The main contributors to diabetes and physical inactivity include financial growth, growing age, modernization and urbanization, food modification, and changes in other lifestyle behaviors (International Diabetes Federation - What is diabetes, 2018).

Diabetes mellitus may be accompanied by a variety of musculoskeletal symptoms, either clinical or subclinical, which are correlated with the severity and control of the disease and have an impact on the quality of life of the patient. It is linked with a wide range of personal, psychological, social, and occupational variables (Gerrits et al., 2015). It can affect many organs and systems in a long-term, irreversible way. Although the exact cause of diabetes-related musculoskeletal disorders is unknown, evidence suggests that hyperglycemia accelerates non-enzymatic glycosylation and abnormal collagen deposition in periarticular connective tissues, altering the structural matrix and mechanical properties of these tissues and leading to diffuse arthro-fibrosis. 2-3 (Aydeniz et al., 2018).

Diabetes mellitus (DM) is one of the world's top seven causes of death. It affects several organs, including the brain system, kidneys, and eyes. In other words, DM is associated with a number of well-known consequences that demand physicians and patients' prompt attention. Muscles, bones, joints, and the surrounding connective tissues make up the musculoskeletal system, which accounts for 60–70% of body mass. The musculoskeletal

system, on the other hand, is frequently overlooked or underappreciated. Many diabetic people experience musculoskeletal symptoms that cause significant morbidity in their lives. Poor diagnosis and management of musculoskeletal issues results in a more sedentary lifestyle, poorer blood sugar control, earlier onset of DM complications, and, as a result, a lower quality of life. Diabetic patients can avoid long-term morbidity by detecting musculoskeletal issues early. Age and DM duration were found to be risk factors for musculoskeletal symptoms in a few studies (Fatemi et al., 2015).

Diabetes mellitus is connected with a number of musculoskeletal problems, which have become more common in recent years and have a substantial impact on patients' quality of life. Diabetic cheiro-arthropathy, adhesive capsulitis of the shoulder, carpal tunnel syndrome, Dupuytren's contracture, hyperostosis, osteoarthritis, hyperuricaemia, and other musculoskeletal diseases have all been linked to diabetes (Antony, 2017). The following rheumatologic manifestations of diabetes mellitus include: limited joint mobility, diabetic hand syndrome (diabetic cheiroarthropathy), adhesive capsulitis (frozen shoulder, periarthritis), trigger finger (flexon tenosynovitis), dupuytren's contractures, osteoporosis, diffuse idiopathic skeletal hyperostosis (DISH), neuropathies, neuropathic arthritis (Charcot joints, diabetic osteoarthropathy) (Serban et. al., 2017).

It is estimated that more than 50% of diabetic patients will suffer from chronic disability. Some factors that contribute to chronic disability in diabetic patients include vascular complications, in addition to predisposing conditions, such as obesity and low physical activity. It was reported that patients with type 2 diabetes had greater impairments in mobility and more difficulties performing basic activities of daily living (ADL) than similarly aged non-diabetic persons (Attar et al., 2014).

A nationwide Danish National Health Survey was done by Rehling et al. (2019) on 109,218 participants of 40 years of age or older to investigate the associations between diabetes and musculoskeletal pain, osteoarthritis, osteoporosis, and rheumatoid arthritis. Where the average age of the 9,238 diabetic participants was 65.6±11.0 (mean±SD); 55.6% were men. The average age of the 99,980 participants without diabetes was 59.2±11.8, with 46.7% of men. Back/lower back pain (OR 1.2 (CI 95% 1.1-1.2), $p<0.001$), limb pain ($p<0.001$), shoulder/neck pain ($p<0.001$), osteoarthritis ($p<0.001$), osteoporosis ($p<0.01$), and

rheumatoid arthritis, Physical exercise was linked to less pain in diabetic patients (e.g., back/lower back pain ($p<0.001$) and they found diabetes was linked to an increased risk of musculoskeletal pain. Diabetes was also linked to an increased risk of osteoarthritis, osteoporosis, and rheumatoid arthritis. Osteoarthritis was the most common condition among diabetes patients.

A study on one hundred and fifty-seven diabetes patients (83.5%) and 66 prediabetes patients (52.8%) showed, at least one of the musculoskeletal symptoms ($P = 0.0001$) in their study entitled, Musculoskeletal manifestations in diabetic versus prediabetes patients. In decreasing order, knee osteoarthritis, CTS, and rotator cuff tendinitis were the most prevalent musculoskeletal manifestations. However, diabetes patients had considerably higher musculoskeletal symptoms in the shoulder ($P = 0.015$) and knee ($P = 0.0001$) joints than prediabetes. Knee osteoarthritis was the most frequent DMMM in our sample, followed by CTS and rotator cuff tendonitis. In prediabetes patients, the same pattern was seen (Fatemi et al., 2015).

Louati et al. (2015) had done a systematic literature review and meta-analysis. They included cohort, case–control and cross-sectional studies to assess the prevalence of OA among patients with DM and DM among patients with OA. From the 299 publications, they included 49 studies in the analysis, including 28 cross-sectional studies, 11 cohort studies and 10 case–control studies. The result of 5788 patients with DM, the mean OA prevalence was 29.5±1.2%. For 645 089 patients with OA, the prevalence of DM was 14.4 ±0.1%. The risk of OA was greater in the DM than non-DM population.

In Bangladesh, Sultana et al. (2015) also done a study on type 2 diabetics patient. The goal of the study was to see how common musculoskeletal diseases and their associated factors were among type 2 diabetics. A total of 1800 type 2 diabetic patients from BIRDEM and BIHS Hospital were screened in a cross-sectional study. The subjects were 52.6(11.7) years old on average (95%, CI-52.1, 53.2) and 55% (n=990) were male. Diabetes had been present for 10 years on average (95% CI-10.15, 10.8). The study subjects (both sexes) had a prevalence of musculoskeletal problems of 77.8% (n=1400) (95% CI-75.88, 79.72). Monthly family income, systolic and diastolic blood pressure, fasting blood sugar, and random blood sugar all showed significant mean differences ($p<0.001$). Respondents

changed their lifestyle for activity of daily living because of musculoskeletal diseases (62.8% (n=1130)). According to their study, almost eight out of ten diabetics have musculoskeletal problems, such as discomfort, strange sensations, and muscular cramps. The main risk factors for MSDs are high family income, high blood pressure, high blood sugar, depression, and obesity.

Some tools are used to assess the musculoskeletal condition of an individual. Among them one is Cornell Musculoskeletal Discomfort Questionnaire (CMDQ). It was developed to determine the level of musculoskeletal discomfort experienced by office workers as a result of their ergonomic position. Professor Haig and colleagues created the Cornell MSDs measuring tool (CMDQ) as a data gathering instrument for MSDs. This tool, which is designed for men and women in standing and sitting, assesses 12 organs of the body (neck, shoulders, upper back, upper arms, lower back, forearms, wrists, hips, thighs, knees, and lower back and leg) in self-report form in three stages:

(1) frequency of discomfort,

(2) discomfort intensity, and

(3) impact on adjusted operating power.

The Persian version of the CMDQ is a useful tool for assessing MSDs in Iranian employees and can be used as part of routine health-care ergonomics and MSD prevention. Kashani has accepted the Persian version of the questionnaire, which has a valid accreditation from Cornell University's Ergonomics Laboratory. Cronbach's alpha coefficient was 0.986 when the questionnaire's reliability was assessed utilizing the tool's internal consistency. The reliability of each element of the Cornell questionnaire was calculated as 0.955, 0.961, and 0.96, respectively, for the existence of pain and discomfort, degree of pain and discomfort, and pain influence on working power (Kurd et al., 2017)

Another assessment tool is Visual Analogue Scale (VAS). Visual Analogue Scale (VAS) is one of the pain rating scales used for the first time in 1921 by Hayes and Patterson. It is frequently used to determine the severity or occurrence of different symptoms in epidemiologic and clinical research. For instance, the level of pain that a patient experiences can be anywhere along a continuum, from none to extremely high levels. The

patient sees this spectrum as continuous rather than in discontinuous jumps as would be implied by the categories of none, mild, moderate, and severe. The VAS was developed in order to capture this notion of an underlying continuity. The pain VAS is a one-dimensional way to evaluate how much pain a person is experiencing. It can also be used to assess the degree of pain in patients with similar diseases (Delgado et al., 2018).

CHAPTER III: METHODOLOGY

3.1 Study Design

The goal of this study was to explore the musculoskeletal characteristics among diabetes and non-diabetic patients. For this reason, a cross-sectional study design is chosen as a quantitative research model. The cross sectional study methodology was chosen because it allowed for the identification of the defined musculoskeletal characteristics among diabetes and non-diabetic patients at a certain moment in time. The results of a cross-sectional study can be easily linked to those of diverse features. Quantitative research, on the other hand, allows for the employment of a large number of participants and thereby collects data objectively. Data is converted to numbers for statistical analysis in order to make conclusions. This research was conducted utilizing a quantitative study design and a cross-sectional prospective survey. The survey methodology was chosen as an efficient means to collect data to meet the study's goals.

3.2 Study area

The musculoskeletal unit of CRP, Savar was chosen as a venue for the research to gather an appropriate sample. As this was an overview of, musculoskeletal characteristics among both diabetes and non-diabetic patients. Because there has the availability of the desired sample, the Musculoskeletal Unit of CRP was the most suited location.

3.3 Study population

The study populations were both diabetic and non-diabetic patient who come to Outdoor, Musculoskeletal Unit of CRP to receive treatment.

3.4 Sample size

Sample size for this study was calculated by the following equation:

$$n = \frac{(z^2 pq)}{d^2}$$

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

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

$z\ (1-\alpha/2) = 1.96$

p= proportion of the target population estimated 50%,

p (Prevalence) =0.5

q=1-p

=1-0.5

= 0.5

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

$$n = \frac{(z^2 pq)}{d^2}$$

$$= \frac{(1.96)^2}{(.05)^2} \times 0.5 \times 0.5$$

= 384.16

The actual sample size was around 384 according to this sample size calculation formula, but because of a time constraint, only 230 sample from the population were used for this investigation. They were chosen from the study's population based on the study's inclusion and exclusion criteria.

3.5 Sampling procedure

Due to time constraints, the study was conducted utilizing convenient sampling technique, which were the easiest, cheapest, and fastest method of sample selection. The researcher utilized this method to get samples that met the study's criteria. Participants were chosen with care because they possessed certain traits that allowed for a thorough examination of the research objectives. Because it was impossible to research the entire population in the time available, 230 people were chosen for the study based on inclusion and exclusion criteria. The participant was chosen using some inclusion criteria.

3.6 Selection Criteria:

3.6.1 Inclusive criteria:

- People who are willing to participate
- Studies involving adults aged 18 and up who are diabetic or non-diabetic have a prevalence of musculoskeletal disorders. (Kaka et al., 2018)

3.6.2 Exclusion criteria:

- The patients who are not interested in the study (Kaka et al., 2018)
- Subject who was pregnant (for female subjects) and had undergone surgery at least three months before (Sultana et al., 2015)
- Patients having a history of central or peripheral nervous system disease, end-stage renal disease, and thyroid diseases (Majjad et al., 2018).

3.7 Method of data collection

3.7.1 Data collection tools & instruments

Data was collected using a structured questionnaire. The structured questionnaire was made using Cornell Musculoskeletal Discomfort Questionnaire (CMDQ), Visual Analogue Scale (VAS) and a demographic information table. Other necessary materials at the time included a pen, pencil, white paper, and a clip board. To ask the participants during interviews, the English questionnaires were translated into Bengali. The researcher had obtained written agreement from each volunteer participant using a Bengali consent form.

3.7.2 Data collection procedure

The data collector stated at the start of the questionnaire that the participant had the opportunity to refuse to answer any question. They had the option to leave the study at any point. The study's goal was also explained by the researcher to all participants. Participants were assured that none of their personal information will be shared. Using a written consent form, the researchers obtained written approval from each volunteer participant. Following the participants' consent, a standard questionnaire was utilized to identify the musculoskeletal complain and gather demographic data. The Bangla format was used to ask the questions.

Face to face interview and questions were used to conduct the interview. The physical environment was closely considered. To ensure proper focus during the interview, distracting stimuli were removed. Interviewees were asked questions alone as much as possible with their cooperation, as close family can sometimes lead them in their answers. Face-to-face interviews can also be used to describe population characteristics. During the conversation, face-to-face interviews were used to find particular data that represents the population descriptively. The questions were sometimes described in the native language, depending on the participants' understanding level, so that the patients could comprehend and answer the questions correctly. To avoid inaccuracies, the researcher collected all of the data himself.

3.7.3 Field test

A field test was conducted with three participants in the Outpatient Musculoskeletal Unit, CRP, prior to data collection. The questionnaire was translated into Bengali in order to make it more practical. This test was conducted to identify any issues with the questionnaires as well as the data gathering technique. This test also allowed the researcher to double-check the language and understandability of the questions.

3.8 Data analysis

The data was analyzed using descriptive statistics. Methods for characterizing a group of findings in terms of its most noteworthy properties are referred to as descriptive statistics. Statistical Package for the Social Science (SPSS) version 26 is used to examine the data. The variables were organized into a list, and the researcher created a computer-based data definition record file with an ordered list of variables. The researcher named the variables in SPSS's variable view and defined the data types, values, decimal, label alignment, and measurement level. The next step was to clean fresh data files and review the inputted data set to confirm that all data from the questionnaire sheet to the SPSS data view had been appropriately transcribed. The raw data is then prepared for SPSS analysis.Data is analyzed using descriptive statistics, percentages are produced, and tables, bar graphs, and pie charts are used to illustrate the information. The bar graph and pie charts are decorated using Microsoft Office Excel 2013. The survey's findings were based on quantitative data. A lot of data is obtained with this survey. All of the findings provided useful information about musculoskeletal characteristics among diabetic and non-diabetic individuals. Chi-Square was used to determine the relationship between the various variables.

3.9 Ethical consideration

An oral dissertation presentation was given in front of members of Bangladesh Health Professions Institute's Institutional Review Board (IRB) (BHPI). The research proposal was then presented to the Institutional Review Board (IRB) for approval. The researcher also follows the World Health Organization (WHO) and Bangladesh Medical and Research Council (BMRC) guidelines. The ethical review board approved this study. Then the researcher had to get permission from the Head of the Physiotherapy Department, CRP, Savar, to conduct the study. The Head of the Physiotherapy Department then gave permission for data to be collected at the outpatient musculoskeletal unit, CRP. The goal of the research and the consent form were explained to interested subjects verbally in Bengali over the course of this investigation. The participants were informed that their participation in the study was entirely voluntary, and that they had the opportunity to withdraw or stop at any time without hesitation or danger. They were also assured of privacy. Their personal information, such as their name and address, may be used in presentations or writings, but their personal identity will not be revealed in the study. The participants were informed that the information will be gathered through a written questionnaire. The permission form and questionnaire were also reviewed by the supervisor. For this study, permission was obtained from each and every participant during the interview, as well as signatures on a written consent form from those who were interested. The participants were given information regarding their position in the study. The purpose of the study and the methods involved in the study were explained to the participant. They were also told that they might leave the study at any time if they so desired. Participants were also informed that while the information they gave might be published, their names and addresses would not be utilized in the research effort. The research information is only discussed with the supervisor and will not be shared with anyone else. After the research endeavor is over, these materials will be disposed away. Although the study's findings may have no direct impact on them, physiotherapy professionals may profit from it in the future. Participants were also told that the study would not expose them to any danger

3.10 Rigor of the study

A rigorous manner was maintained to conduct the study. The investigation was carried out ethically and methodically. It was made sure that participants weren't influenced by experience during the data collecting. Whether they had a good or bad impression, the answer was accepted. No important questions were omitted or avoided, and no leading questions were posed. The supervisor carefully coded the participant data and verified it to make sure there were no mistakes. The information was handled completely in confidence. The outcome in the results section was not affected by displaying any personal interpretation. The research supervisor double-checked each element of the study.

CHAPTER IV: RESULTS

Data were analyzed using descriptive statistics, percentages were generated, and bar graphs, pie charts, and tables were used to illustrate the information.

4.1 Diabetic & non-diabetic status

Among the 230 participants, 29.6% (n=68) participants were diabetic and 70.4% (n=162) participants were non diabetic.

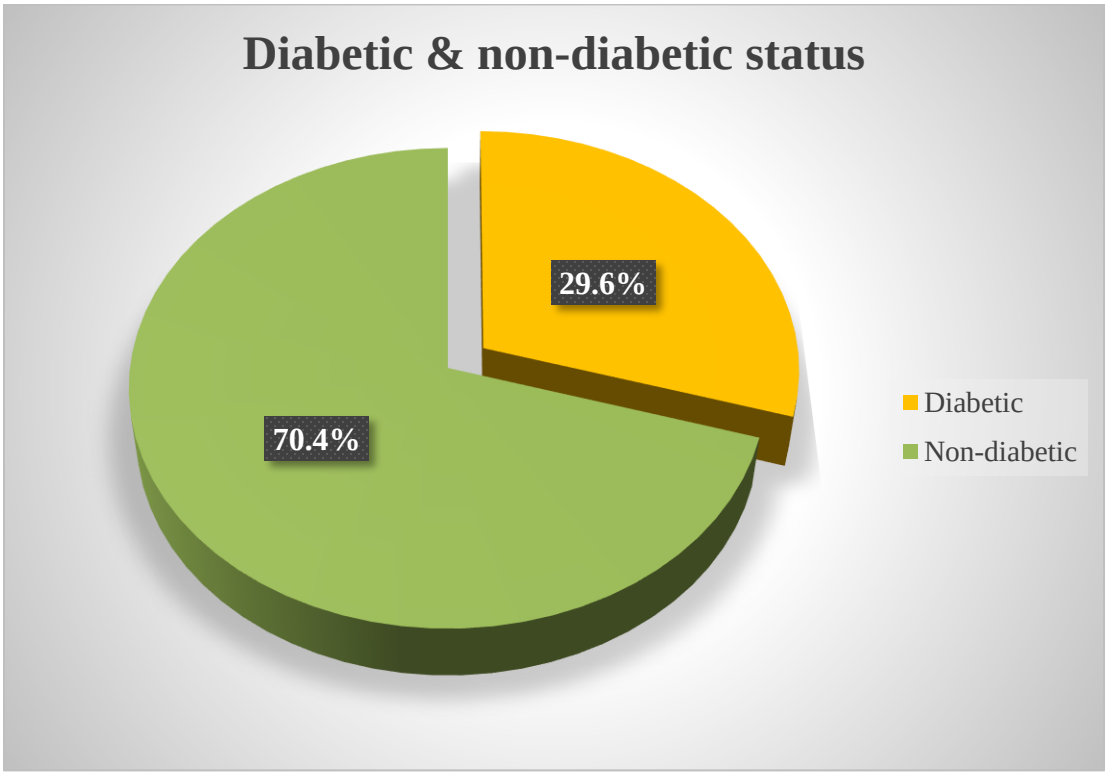


Figure-4.1: Diabetic & non-diabetic status of participants.

Table-4.1: Socio demographical information of diabetic and non-diabetic participants.

Socio demographical information					
Variables	Categories	Diabetic		Non-diabetic	
Age Range		Frequency (n=68)	Percent	Frequency (n=162)	Percent
	20-30 years	1	1.5	37	22.8
	31-40 years	**18**	**26.5**	30	18.5
	41-50 years	17	25.0	**44**	**27.2**
	51-60 years	17	25.0	33	20.4
	> 60 years	15	22.1	18	11.1
Gender					
	Female	**39**	**57.4**	**91**	**56.2**
	Male	29	42.6	71	43.8
Marital status					
	Married	**56**	**82.4**	**117**	**72.2**
	Unmarried	2	2.9	29	17.9
	Divorced	2	2.9	4	2.5
	Separated	2	2.9	2	1.2
	Widow	6	8.8	10	6.2
Living area					
	Urban	18	26.5	58	35.8
	Semi-urban	**37**	**54.4**	**81**	**50.0**
	Rural	13	19.1	23	14.2
Educational level					
	Illiterate	1	1.5	4	2.5
	Primary	17	25.0	37	22.8
	Secondary school certificate (SSC)	19	27.9	**53**	**32.7**
	Higher school certificate (HSC)	**20**	**29.4**	51	31.5
	Graduate	9	13.2	16	9.9
	Masters or above	2	2.9	1	.6

Table-4.1: Socio demographical information of diabetic and non-diabetic participants.

Socio demographical information					
Variables	Categories	Diabetic		Non-diabetic	
Occupation		Frequency (n=68)	Percent	Frequency (n=162)	Percent
	Govt. Service holder	1	1.5	2	1.2
	Private Service Holder	9	13.2	15	9.3
	Housewife	**30**	**44.1**	**71**	**43.8**
	Day Labor	3	4.4	13	8.0
	Businessman	11	16.2	19	11.7
	Garments worker	4	5.9	7	4.3
	Unemployed	6	8.8	6	3.7
	Student	0	0	19	11.7
	Others	4	5.9	10	6.2
Working hour per day					
	1-3 hours	11	16.2	17	10.5
	4-6 hours	21	30.9	**68**	**42.0**
	7-9 hours	**28**	**41.2**	58	35.8
	10-12 hours	8	11.8	17	10.5
	>12 hours	0	0	2	1.2
BMI					
	Below 18.5	0	0	6	3.7
	18.5-24.9	28	44.1	65	43.8
	25-29.9	**32**	**47.1**	**74**	**45.7**
	30-34.9	8	8.8	17	6.8

4.2 Age range

The study was conducted on 230 participants. In the study, only 1.5% (n=1) of diabetic and 22.8% (n=37) non diabetic participants were between the ages of 20-30 years, highest number of diabetic participants 26.5% (n=18) and 18.5% (n=30) non-diabetic participants were between the ages of 31-40 years, 25% (n=17) diabetic and highest number of non-diabetic 27.2% (n=44) were between the ages of 41-50 years. Correspondingly, 25% (n=17) and 20.4% (n=33) were between the ages of 51-60 years, 22.1% (n=15) and 11.1% (n=18) of the participants were aged >60 years.

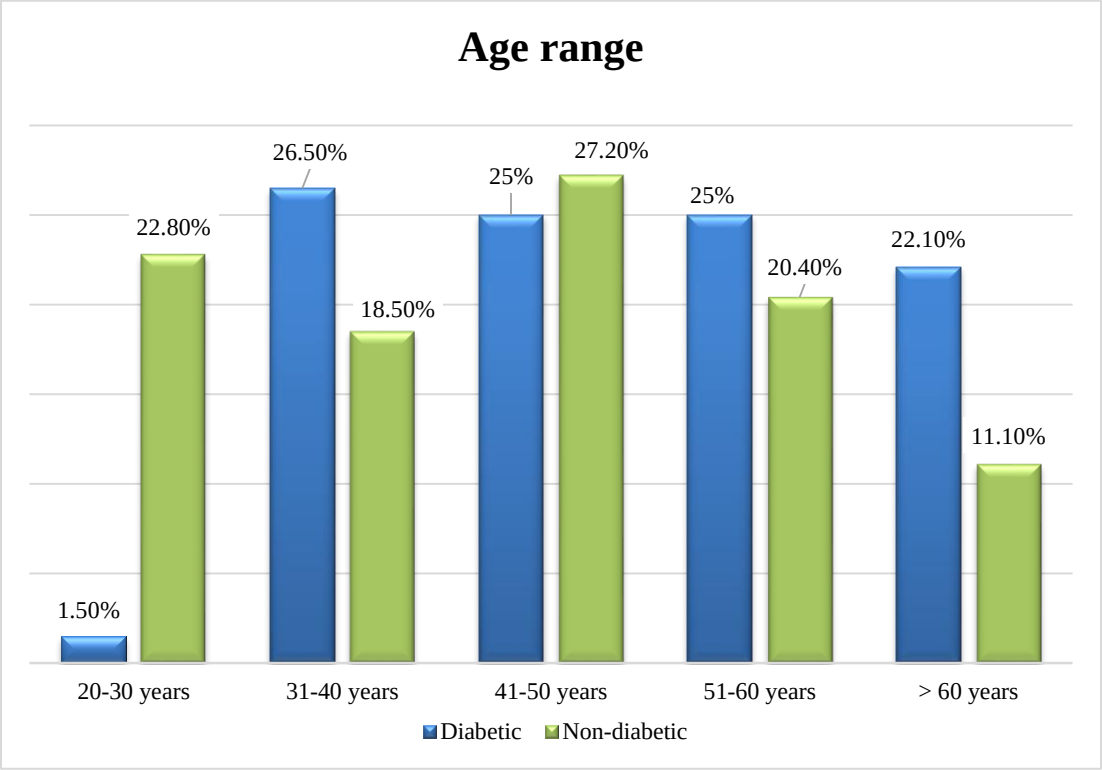


Figure-4.2: Age range of participants.

4.3 Gender

Among 68 diabetic participants, 57.40% (n=39) participants were female and 42.60% (n=29) male participants were male. Among 182 non-diabetic patient 56.20% (n=91) were female and 43.80% (n=71) were male.

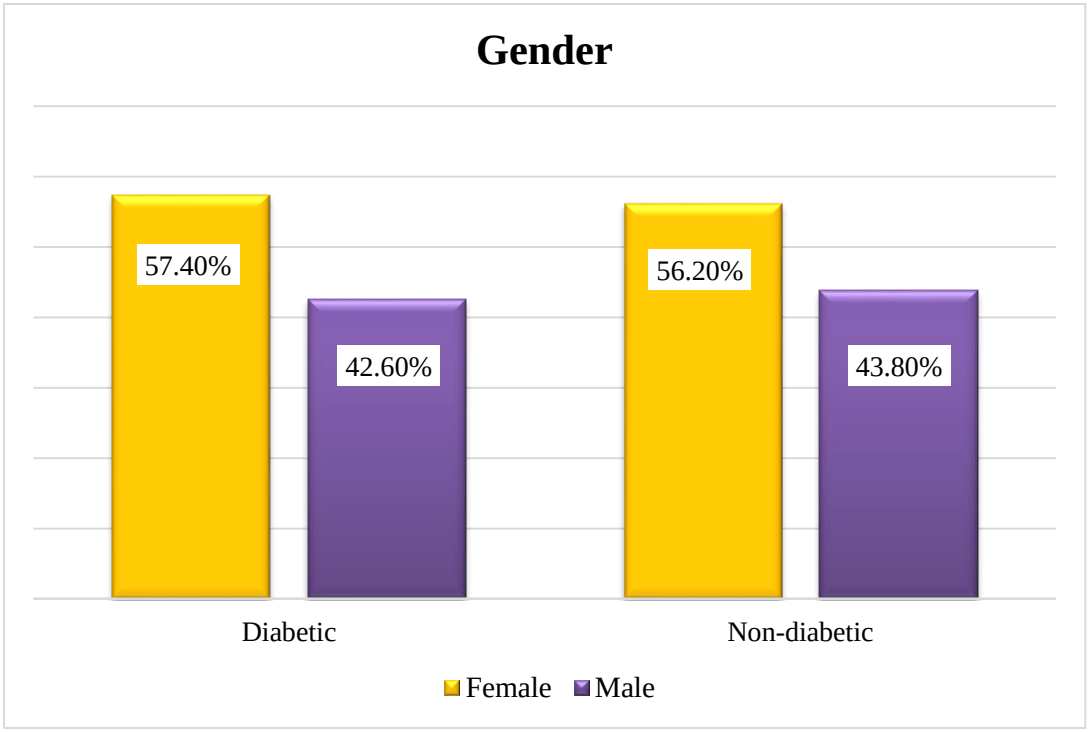


Figure-4.3: Gender of participants.

4.4 Marital status

From total 230 diabetic and non-diabetic participants, highest number of participants 82.40% (n=56) and 72.20% (n=117) were married, 2.9% (n=2) and 17.9% (n=29) participants were unmarried, 2.90% (n=2) and 2.50% (n=4) were divorced, 2.90% (n=2) and 1.2% (n=2) were separated, 8.80% (n=6) and 6.2% (n=10) were widow.

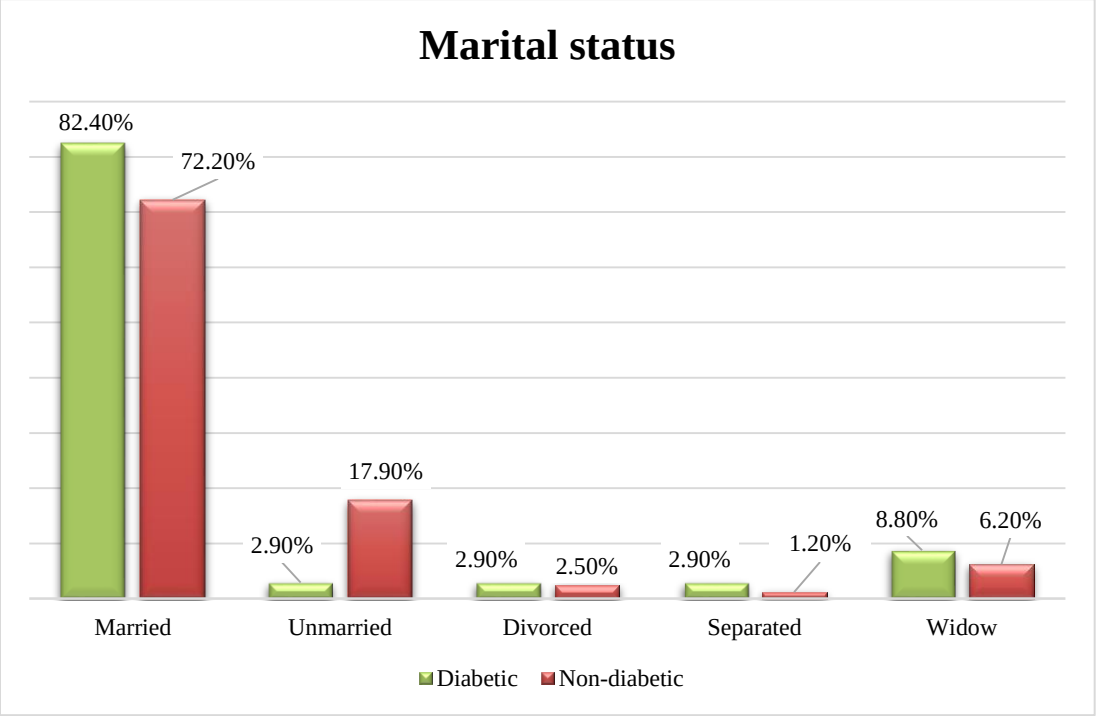


Figure-4.4: Marital status of participants.

4.5 Living area

The bar chart showed that among the 230 diabetic and non-diabetic participants, it was found that half of population 54.40% (n=81) and 50% (n=81) lived in semi-urban area, 26.50% (n=18) and 35.8% (n=58) lived in urban area, 19.10% (n=13) and 14.2 (n=23) lived in rural area.

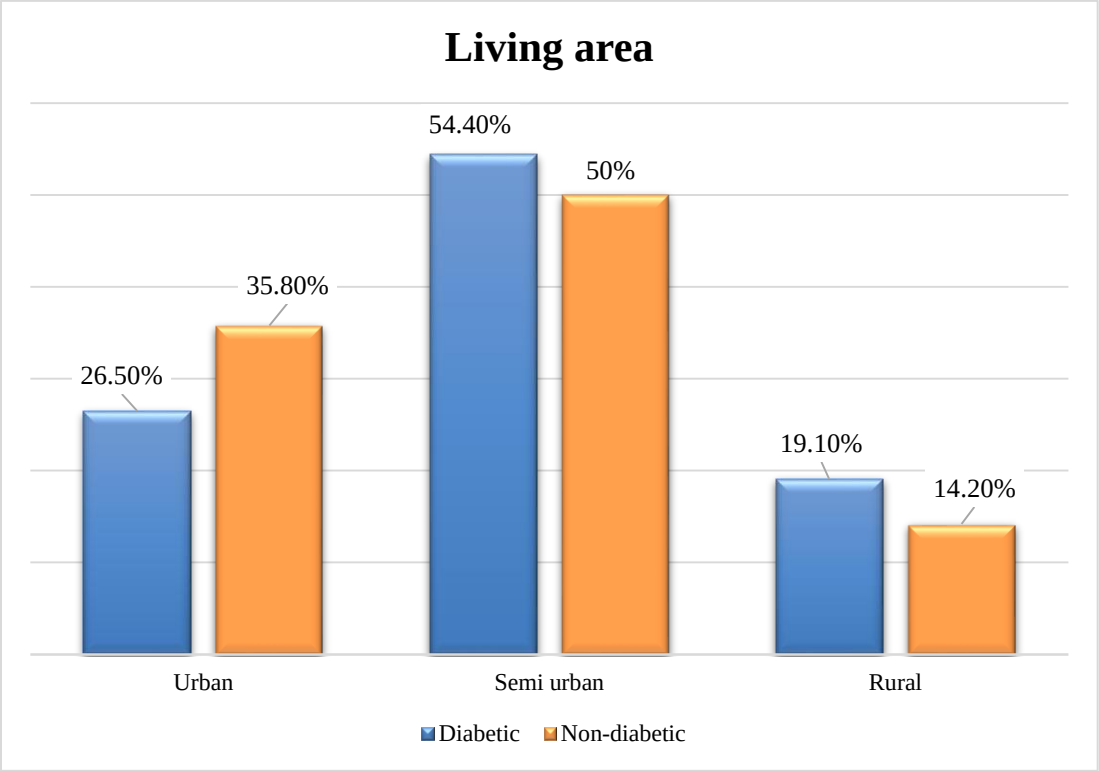


Figure-4.5: Living area of participants.

4.6 Educational level

Among the 230 participants 2.2% (n=5) participants were no formal schooling / Illiterate, 23% (n=54) participants were primary passed, 31.3% (n=72) participants were SSC completed, 30.9% (n=71) participants completed HSC level, 10.9% (n=25) participants have graduate completed and 1.3% (n=3) participants have Master's degree completed.

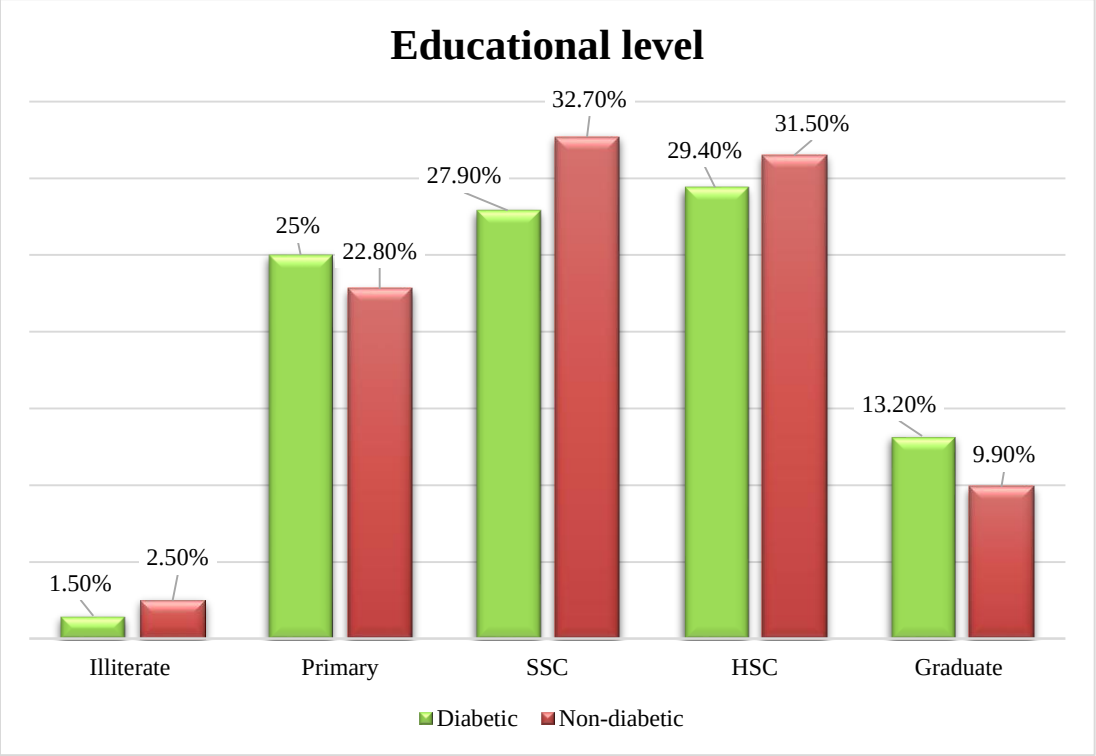


Table-4.6: Education level of participants.

4.7 Occupation

Among the participants, a highest number of respondents 43% (n=101) found those were housewife, 1.3% (n=3) participant's occupation were Govt. service holder, 10.4% (n=24) participant's occupation were Private service holder, 13% (n=30) respondents were businessman, 7% (n=26) were day labor, 8.3% (n=19) were student and 2.2% (n=5) participants had found without any job and 9.1% (n=21) were retired and had others professions. (Wood worker, farmer, tailor, nurse, teacher).

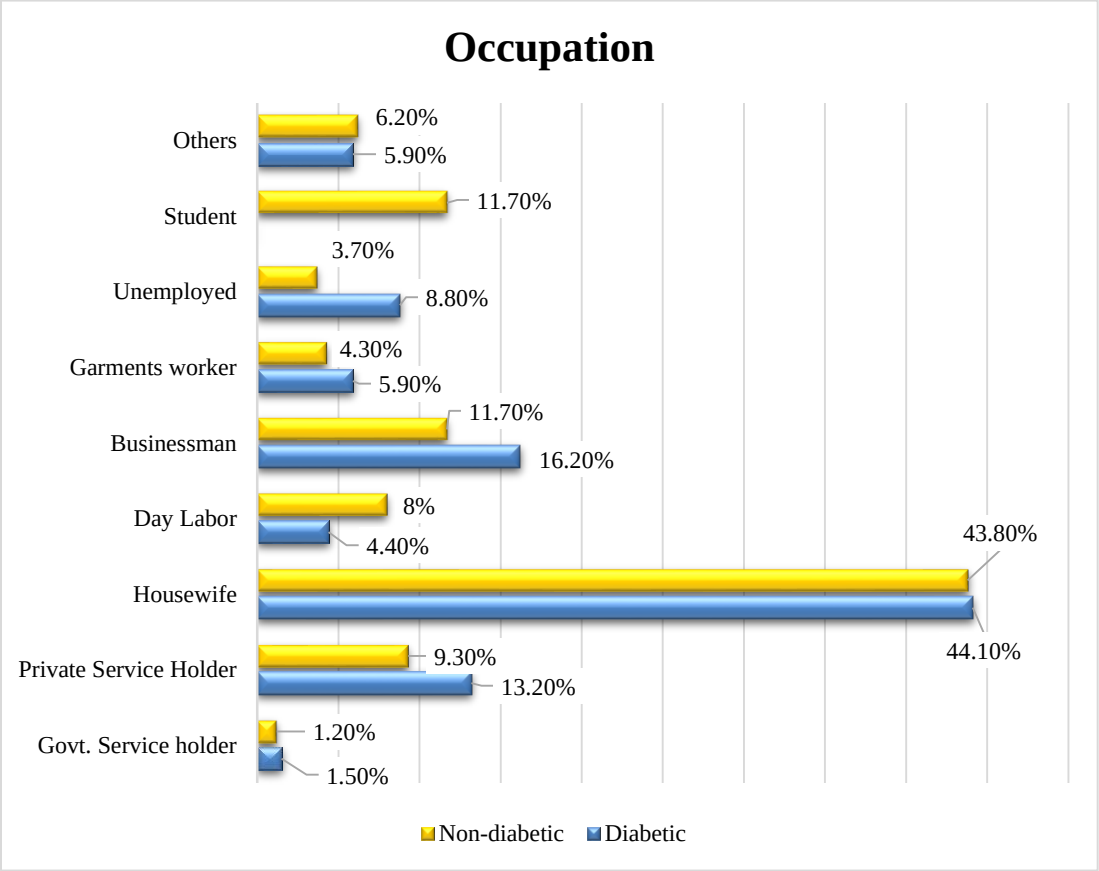


Table-4.7: Occupation of participants.

4.8 Working hours in a day

The bar graph shows, near about half of the diabetic participants (n=68), 41.20% (n=28) works 7-9 hours in a day, 16.20% (n=11) patient works 1-3 hours, 30.90% (n=21) patients works 4-6 hours and 11.80% (n=8) patient works 10-12 hours in a day.

One the other hand near about half of the non-diabetic participants (n=162), 42% (n=68) patients work 4-6 hours a day, 10.50% (n=17) patient works 1-3 hours, 35.80% (n=58) patients works 7-9 hours, 10.50% (n=17) patient works 10-12 hours and 1.20% (n=2) patient works >12 hours in a day. Working hours in a day was showed in (Figure).

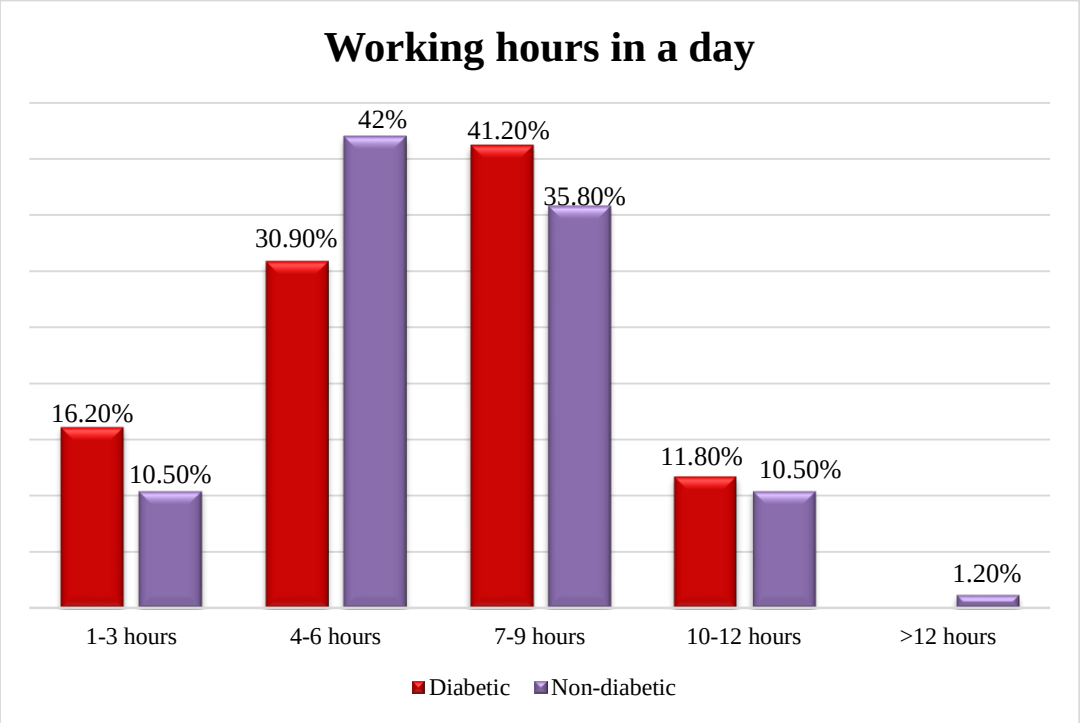


Figure-4.8: Working hour per day of participants.

4.9 Body Mass Index (BMI)

BMI ranges 18.5 to 24.9, which is considered normal or healthy weight. If BMI is between 25.0 and 29.9, it is considered as overweight. If BMI is 30.0 or more, it is considered as obese.

Among the 68 diabetic participants 47.10% (n=32) participants were overweight, 44.10% (n=28) participants were normal weight and 8.80% (n=8) participant were with obesity. Among 162 non-diabetic participants, 3.70% (n=6) were under weight, 45.70% (n=74) participants were overweight, 43.80% (n=65) participants were normal weight and 6.80% (n=17) participant were with obesity.

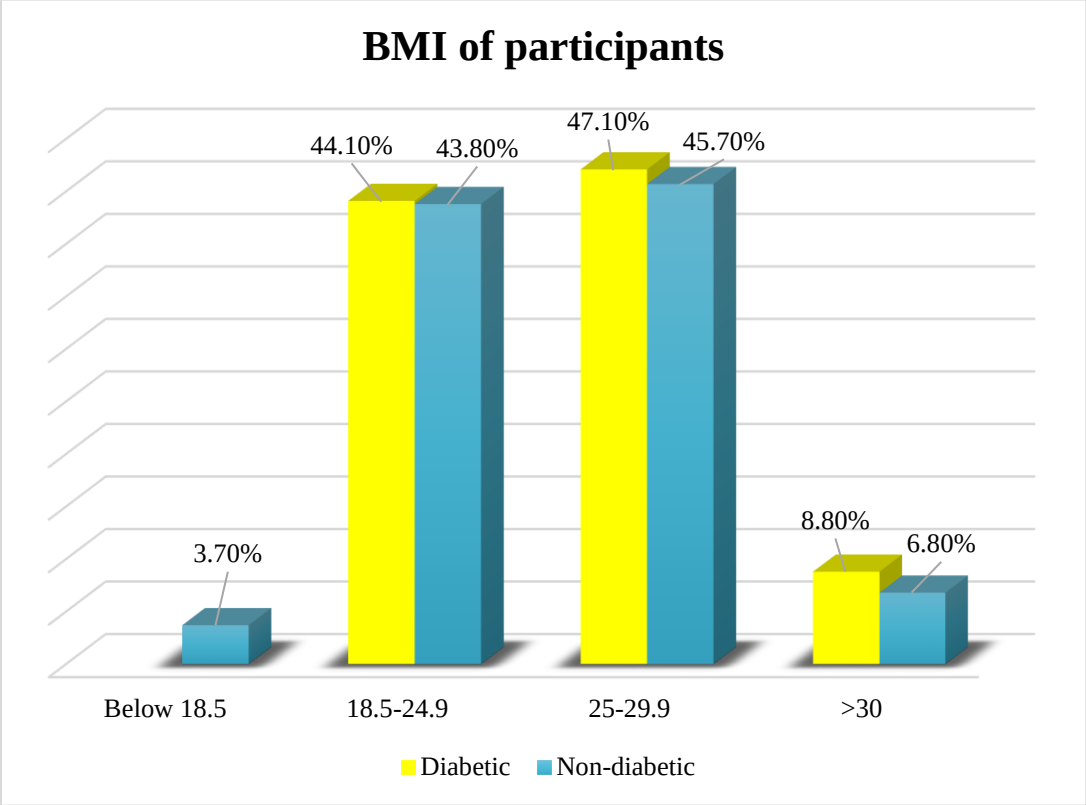


Figure-4.9: BMI of participants.

4.10 Duration of Diabetes Mellitus suffering

From the 68 data of diabetic participants it was found that 13.20% (n=9) were found those suffered from 0-1 years age range with diabetes. It was found that a majority number of participants 50% (n=34) are suffered with diabetes from 2-5 years, 29.40% (n=20) suffered with diabetes from 6-10 years and only 7.40% (n=5) of the participants found who were suffering with diabetes more than 10 years.

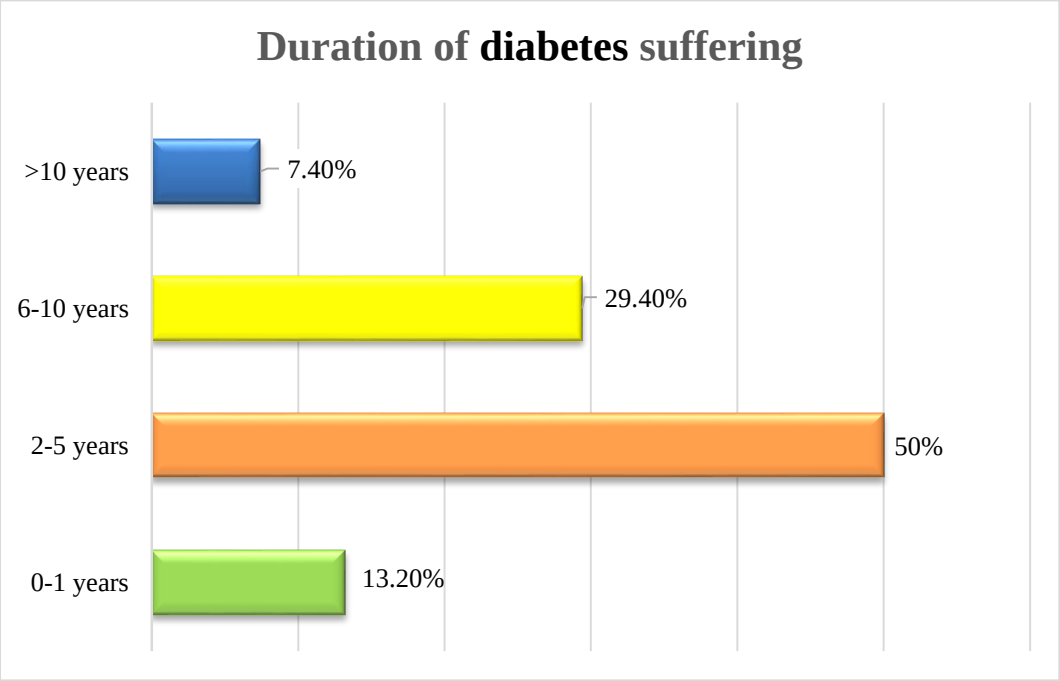


Figure-4.10: Duration of diabetes suffering.

4.10.1 Treatment taken for diabetes management

Among 68 diabetic patient, 10.3% (n=7) participant do only food control, 5.9% (n=4) participants take only medication, 47.1% (32) the majority of participants do food maintenance and take medication, 16.2% (n=11) participants take insulin, 13.2% (n=9) participants do food maintenance, physical exercise and take medication to control diabetes.

Treatment taken for diabetes management

	Frequency	Percent
Only food control	7	10.3
Only medication	4	5.9
Food maintenance and medication	32	47.1
Insulin	11	16.2
Nothing	5	7.4
Food maintenance, physical exercise and medication	9	13.2
Total	68	100

Table 4.10.1: Treatment taken for diabetes management

4.10.2 Family history of diabetes

Among 68 diabetic patient, 60.3% (n=41) participants had family history of diabetes and 39.7% (n=27) participants did not have any family history of diabetes.

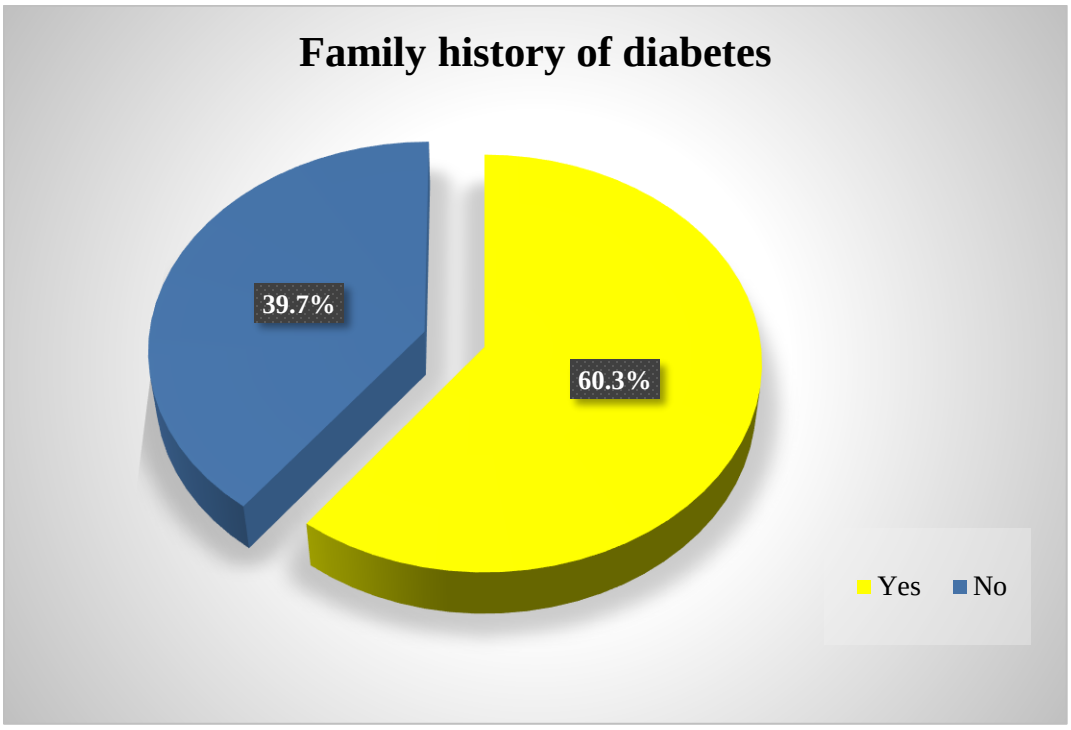


Figure-4.10.2: Family history of diabetes.

4.11 Behavioral Risk factors

Table-4.11: shows that, among diabetic and non-diabetic patient, tobacco intake: only 8.8% (n=6) and 17.9% (n=29) participants intake tobacco daily, 17.6% (n=12) and 13.6% (n=22) participants intake occasionally, more than half of population 60.3% (n=41) in diabetic and 64.8% (n=105) in non-diabetic participants had never intake tobacco who are mostly female and 13.2% (n=9) and 3.7% (n=6) participants had stopped in taking tobacco.

Betel nut intake: 19.1% (n=13) diabetic and 14.2% (n=23) non-diabetic participants intake betel nut daily, 32.4% (n=22) and 34% (n=55) participants intake occasionally, 36.8% (n=25) and 48.8% (n=79) participants had never intake betel nut and 11.8% (n=8) and 3.1% (n=5) participants had stopped in taking betel nuts.

Unhealthy diet (junk food): 14.7% (n=10) and 19.1% (n=31) participants eats junk food daily, most of the participants 67.6% (n=46) and 69.1% (n=112) eats occasionally, 7.4% (n=5) and 5.6% (n=9) participants had never eaten junk foods and 10.3% (n=7) and 6.2 (n=10) participants had stopped eating junk foods; Fruits & vegetable intake per week: most of the diabetic 27.9% (n=19) and non-diabetic 35.8% (n=58) eats fruits and vegetables 3-4 days per week, 8.8% (n=6) and 15.4% (n=25) participants eats 1-2 days, 16.2% (n=11) and 26.5% (n=43) participants eats 2-3 days, 25% (n=17) and 8.6% (n=14) participants eats 4-5 days, 16.2% (n=11) and 10.5% (n=17) participants eat 5-6 days, 5.9% (n=4) and 3.1% (n=5) participants eats 6-7 days per week.

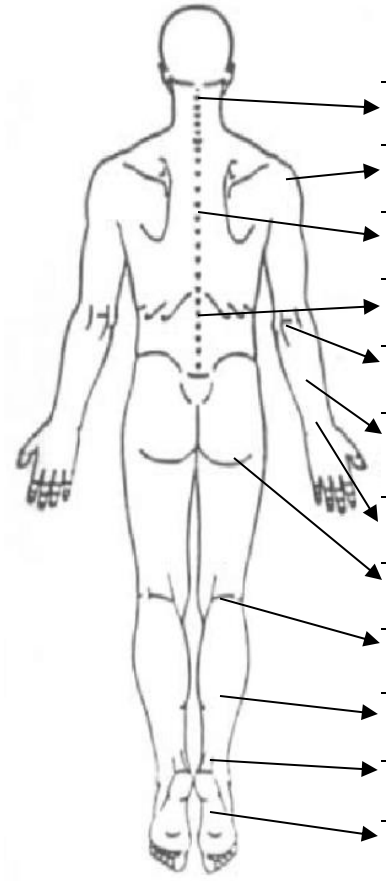
Exercise status: Most of the diabetic 55.9% (n=38) and non-diabetic 82.7 (n=134) participants do not exercise. Only 44.1% (n=30) diabetic and 17.3% (n=28) non-diabetic participants do exercise; Exercise per week: only 3.1% (n=5) non-diabetic participants do exercise <50 minutes per week, 5.9% (n=4) diabetic and 6.8% (n=11) non-diabetic do exercise 50-100 minutes per week, 27.6% (n=12) and 2.5% (n=40 participants do exercise 100-150 minutes per week, 16.2% (n=11) and 3.1% (n=5) do 150-200 minutes per week and only 4.4% (n=3) diabetic and 2.5% (n=4) non-diabetic no exercise >200 minutes per week.

Table-4.11: Behavioral Risk factors of diabetic and non-diabetic participants.

Behavioral risk factors					
Variables	Categories	Diabetic		Non-diabetic	
Tobacco intake (smoking)		Frequency (n=68)	Percent	Frequency (n=162)	Percent
	Daily	6	8.8	29	17.9
	Occasionally	12	17.6	22	13.6
	Never	**41**	**60.3**	**105**	**64.8**
	Stopped	9	13.2	6	3.7
Betel nut intake					
	Daily	13	19.1	23	14.2
	Occasionally	22	32.4	55	34.0
	Never	**25**	**36.8**	**79**	**48.8**
	Stopped	8	11.8	5	3.1
Unhealthy diet:					
i. junk food					
	Daily	10	14.7	31	19.1
	Occasionally	**46**	**67.6**	**112**	**69.1**
	Never	5	7.4	9	5.6
	Stopped	7	10.3	10	6.2
ii. fruits & vegetable intake/week					
	1-2 days	6	8.8	25	15.4
	2-3 days	11	16.2	43	26.5
	3-4 days	**19**	**27.9**	**58**	**35.8**
	4-5 days	17	25.0	14	8.6
	5-6 days	11	16.2	17	10.5
	6-7 days	4	5.9	5	3.1
Exercise status					
	Yes	30	44.1	28	17.3
	No	**38**	**55.9**	**134**	**82.7**
Exercise per week					
	<50 Minutes	0	0	5	3.1
	50-100 Minutes	4	5.9	**11**	**6.8**
	100-150 Minutes	**12**	**17.6**	4	2.5
	150-200 Minutes	11	16.2	5	3.1
	>200 Minutes	3	4.4	4	2.5

4.12 Body location of pain

The table shows that among the diabetic and non-diabetic participants, it was found that limited number 7.35% (n=5) and 13.6% (n=22) has neck pain. 26.47% (n=18) and 13.6% (n=22) has shoulder pain. Among the participants, a few number 2.9% (n=2) diabetic patient only has elbow pain. 2.9% (n=2) diabetic and 3.7% (n=6) has suffered by forearm pain. On the other hand, 2.9% (n=2) and 2.5% (n=4) patient has wrist pain. Only 1.4% (n=1) diabetic patient has thumb pain. 4.9% (n=8) non-diabetic has upper back pain but the majority of participant suffered with lower back pain 46.4% (n=32) diabetic and 54.3% (n=88) non-diabetic patient. Among all participants 44.9% (n=31) diabetic, 24.1% (n=39) non-diabetic were suffering with knee pain.



	Diabetic		Non-diabetic	
	Frequency	Percent	Frequency	Percent
Neck	3	7.35	**22**	**13.60**
Shoulder	**13**	**26.47**	**22**	**13.60**
Upper Back	0	0	8	4.90
Lower Back	**32**	**46.40**	**88**	**54.30**
Elbow	2	2.90	0	0
Forearm	2	2.90	6	3.70
Wrist	3	4.30	4	2.50
Hip	1	1.40	6	3.70
Knee	**31**	**44.90**	**39**	**24.10**
Lower leg	0	0	2	1.20
Ankle	1	1.40	3	1.90
Foot	2	2.90	7	4.30

Table-4.12: Body location of pain among diabetic and non-diabetic patients.

4.12.1 Severity of pain

According to Visual Analogue Scale (VAS), 0-3 is considered as mild pain, 4-6 is considered as moderate pain, 7-10 is considered as severe pain. Among the 230 participants it was found that nearly half of them 49% (n=34) diabetic and 57% (n=92) non diabetic patient has moderate level of pain. Among the participants, 23.9% (n=16) diabetic and also 31.6% (n=53) non diabetic patient has mild type of pain and 26.9% (n=18) diabetic and 20.8% (n=17) no diabetic patient has severe level of pain.

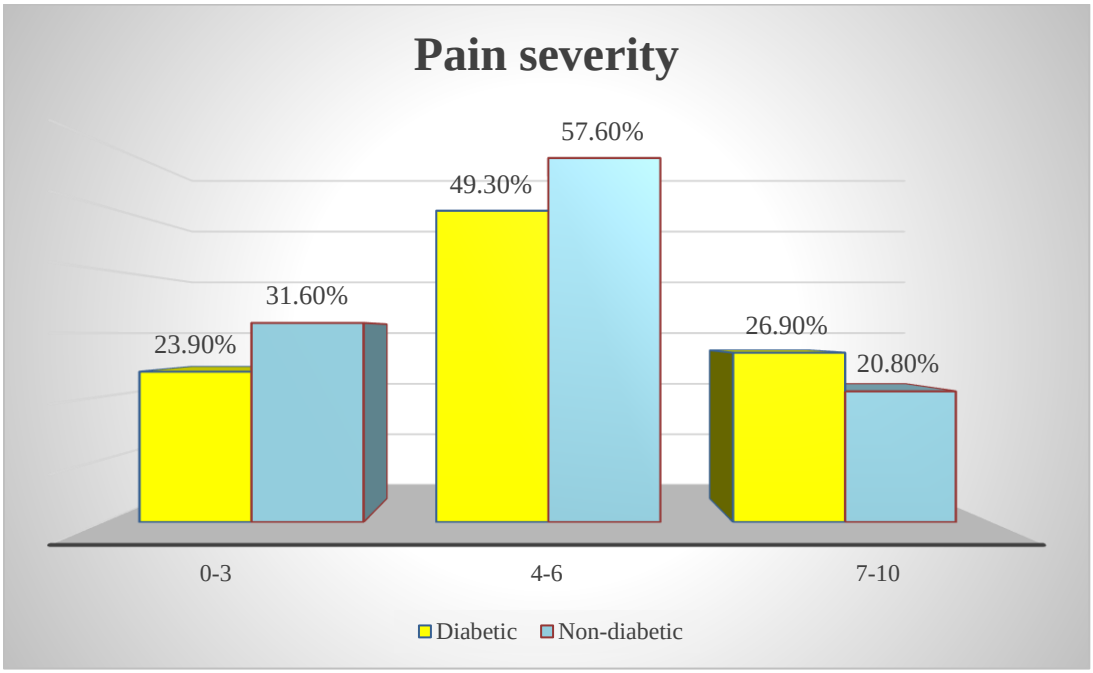


Figure-4.12.1: Severity of pain among diabetic and non-diabetic patients

4.13 Paresthesia or numbness

Among the 230 participants it was found that 29.9% (n=20) diabetic and 27.2% (n=43) non diabetic patient has experienced paresthesia or numbness. The majority of participant, 70.1% (n=47) diabetic and also 72.8% (n=115) non diabetic patient has not experienced paresthesia or numbness.

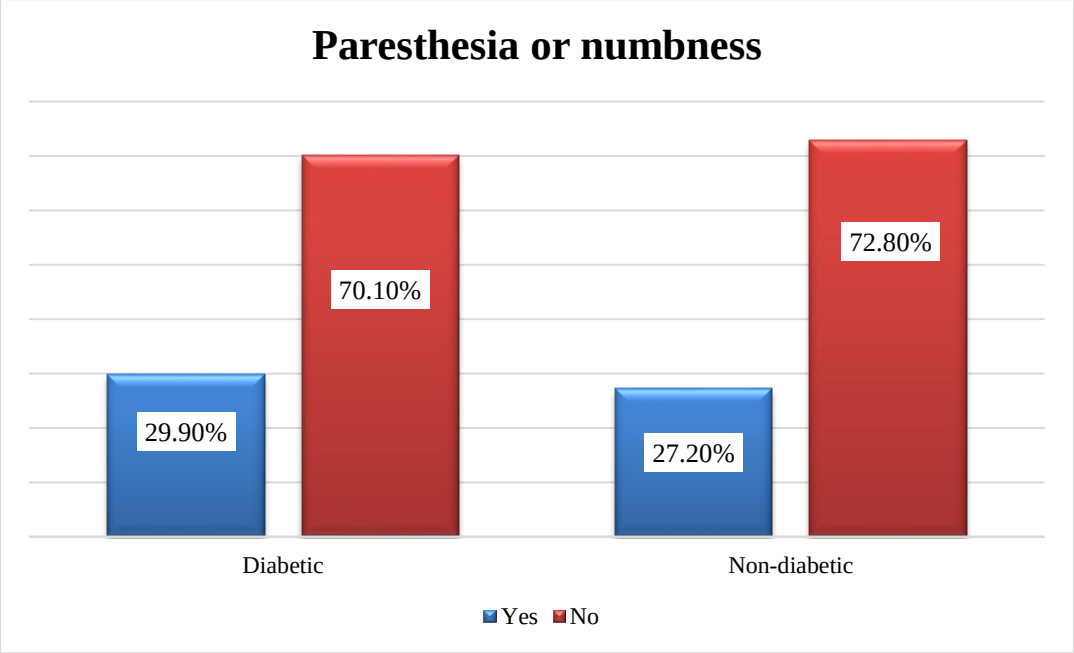


Figure-4.13: Paresthesia or numbness among diabetic and non-diabetic patients

4.13.1 Area of Paresthesia

Among the 68 diabetic patients and 162 non-diabetic patient, participants has paresthesia on: 8.80% (n=6) and 4.30% (n=7) right upper limb, 1.50% (n=1) and 2.50% (n=4) left upper limb, 10.30% (n=7) and 8.60% (n=14) on right lower limb, 8.80% (n=6) and 6.20% (n=10) on left lower limb, 1.5% (n=1) and 6.20% on both lower limb. But only 0.60% (n=1) non-diabetic patient has paresthesia on both upper limb.

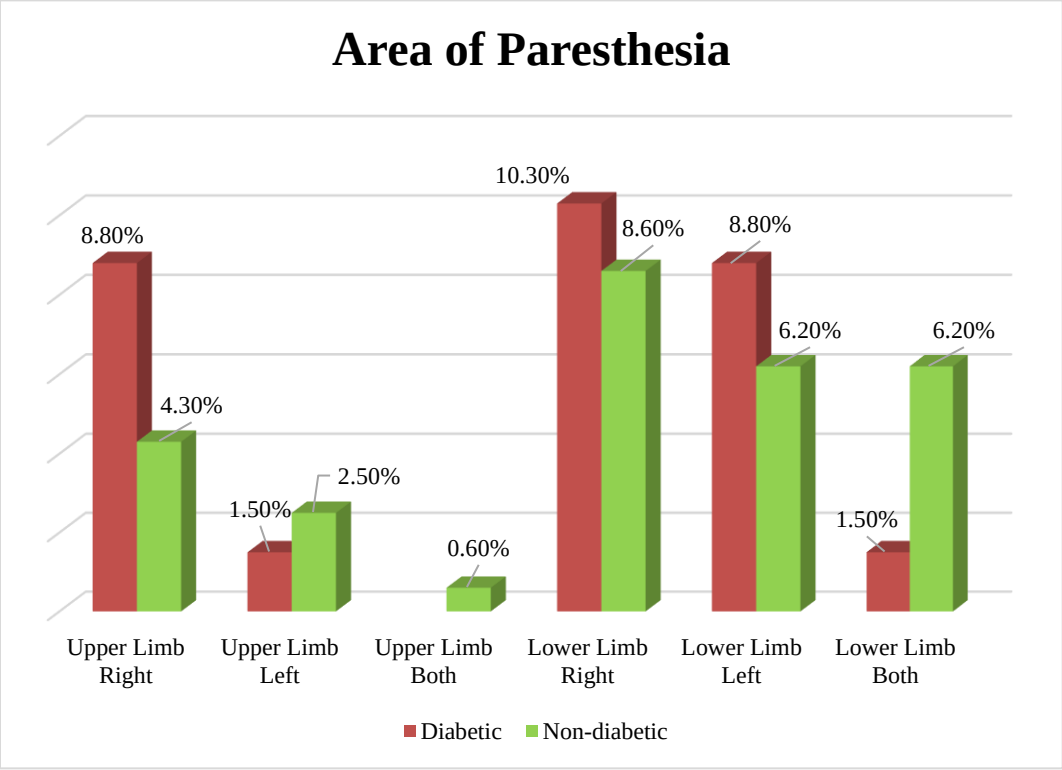


Figure-4.13.1: Area of Paresthesia or numbness among diabetic patients.

4.14 Muscle weakness

From the bar chart, it was found that 38.85% (n=26) diabetic and 28.50% (n=46) non-diabetic patients were getting less strength in muscle. The majority of participant, 61.20% (n=42) diabetic and also 71.50% (n=116) non-diabetic patients were not getting less strength in muscle.

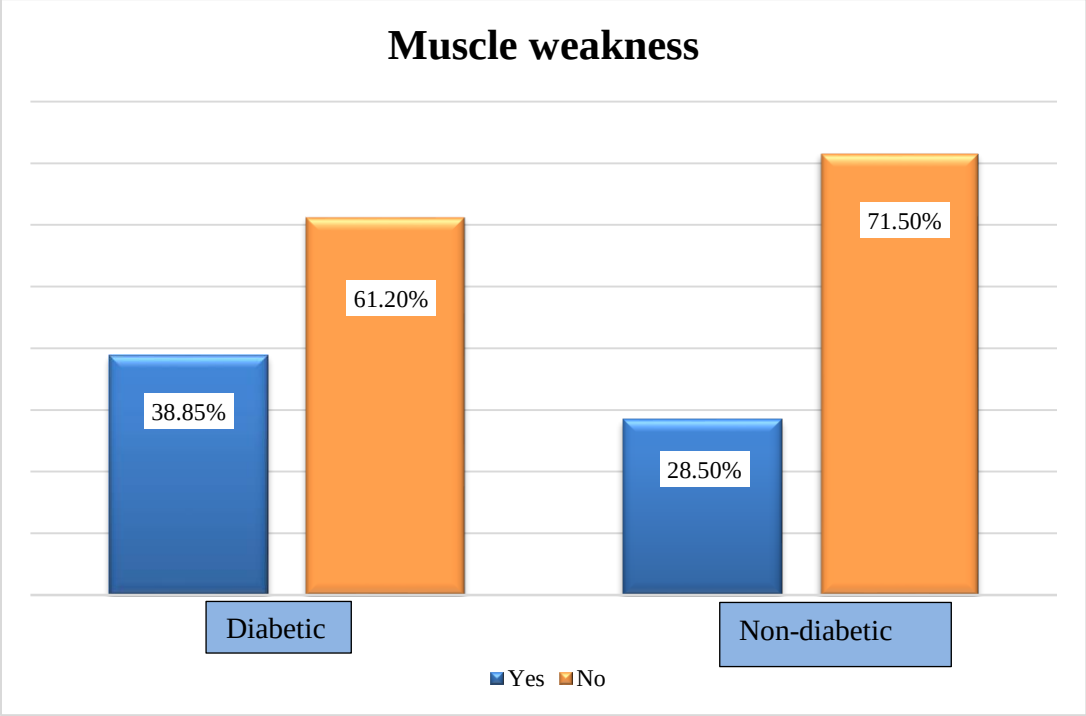


Figure-4.14: Muscle weakness among participants.

4.15 Movement difficulties

Among the 68 diabetic and 162 non-diabetic participants, it was found that the majority of participants, 82.40% (n=56) diabetic and 78.50% (n=128) non-diabetic patients were facing difficulties during movement. 17.60% (n=12) diabetic and also 21% (n=34) non-diabetic patients were not facing difficulties during movement.

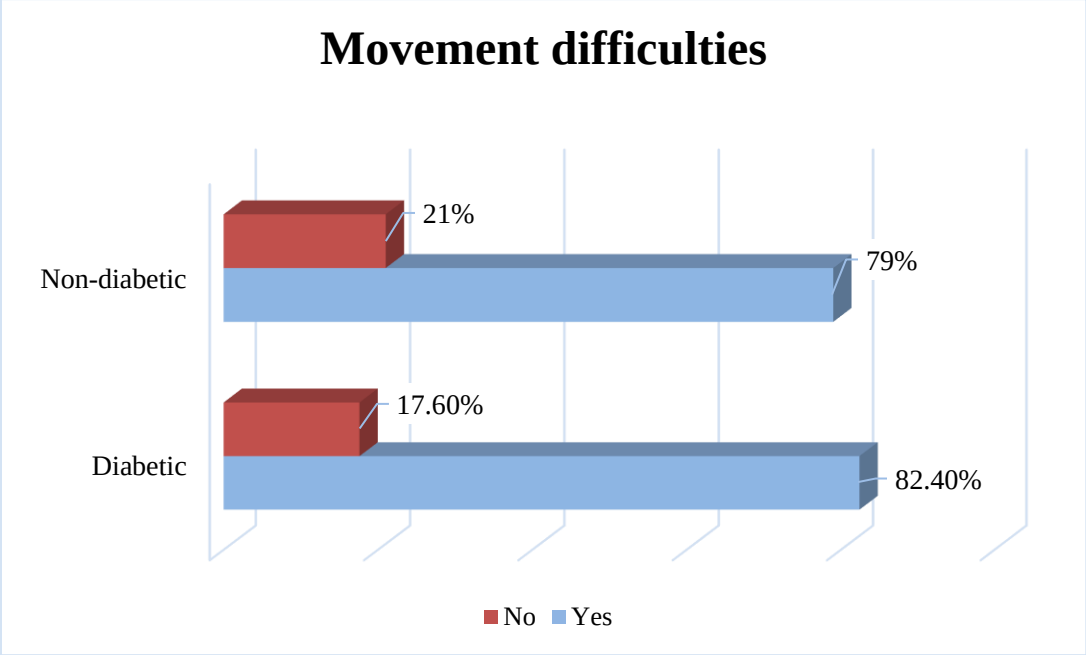


Figure-4.15: Movement difficulties among diabetic and non-diabetic patients.

4.16 Other problems

Among the 68 diabetic and 162 non-diabetic participants, total 6 diabetic and 10 non-diabetic patient has other problems. 2.9% (n=2) diabetic and 2.5% (n=4) non-diabetic patients were suffering from swelling. 4.4% (n=3) diabetic and also 2.5% (n=4) non-diabetic patients were suffering from joint stiffness. 1.5% (n=1) diabetic and 1.2% (n=2) non-diabetic patient had muscle wasting.

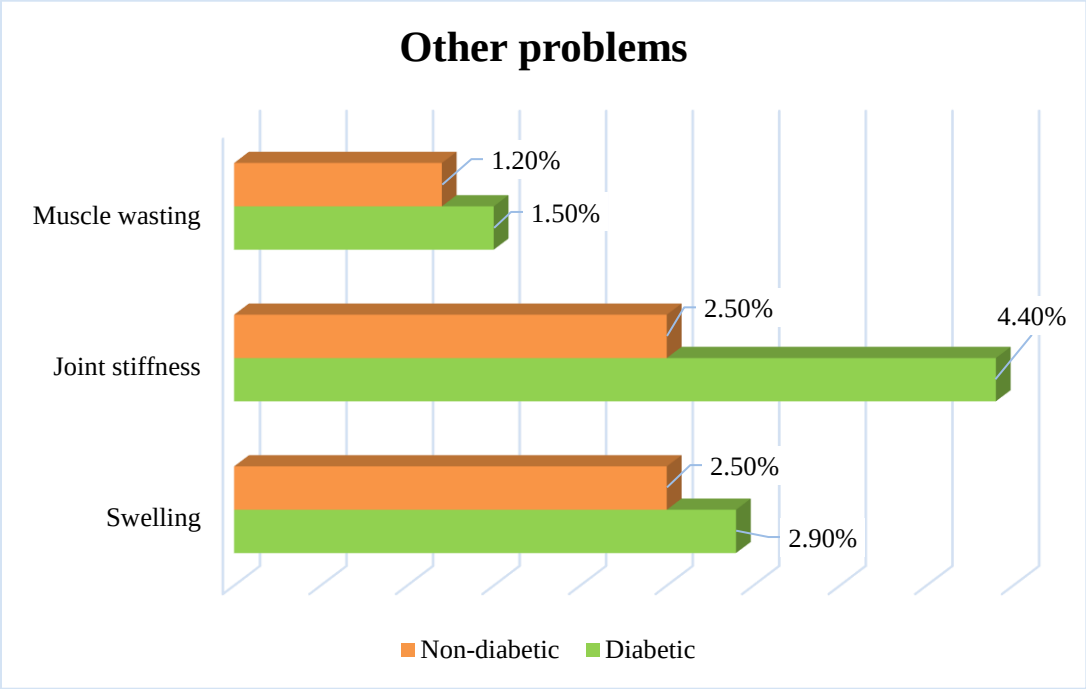


Figure-4.16: Other problems among diabetic and non-diabetic patients.

4.17 Diabetic foot problems

Among the 68 diabetic patients, 10 (14.7%) participant were experiencing foot problem such as foot swelling and foot rash. 7.4% (n=5) participants were experiencing foot problem for 1-3 month, 1.5% (n=1) was experiencing foot problem for 3-6 month, 4.4% (n=3) were experiencing foot problem for 6-12 month and 1.5% (n=1) was experiencing foot problem for >12 month.

Duration of foot problem			
		Frequency	Percent
Foot problem	Foot swelling	6	8.8
	Foot Rash	4	5.9
Duration of foot problem	1-3 month	5	7.4
	3-6 month	1	1.5
	6-12 month	3	4.4
	>12 month	1	1.5
Total		10	14.7

Table-4.17: Duration of diabetic foot problems.

4.18 Cornell Musculoskeletal Discomfort Questionnaire (CMDQ)

Cornell Musculoskeletal Discomfort Questionnaire						
	Variables	Categories	Diabetic		Non-diabetic	
i.	Experiencing ache, pain, discomfort during the last work week		Frequency (n=68)	Percent	Frequency (n=162)	Percent
		1-2 times last week	1	1.5	56	34.6
		3-4 times last week	20	29.4	**59**	**36.4**
		Once every day	**21**	**30.9**	15	9.3
		Several times every day	8	11.8	32	19.8
ii.	Severity of ache, pain, discomfort during the last work week					
		Slightly uncomfortable	16	23.5	50	30.8
		Moderately uncomfortable	**36**	**52.9**	**88**	**54.3**
		Very uncomfortable	16	23.5	24	14.8
iii.	Ache, pain, discomfort interfering with ability to work					
		Not at all	11	16.2	40	24.7
		Slightly interfered	**40**	**58.8**	**96**	**59.3**
		Substantially interfered	17	25.0	26	16.0

Table-4.18: Cornell Musculoskeletal Discomfort Questionnaire (CMDQ).

4.19 Diagnosed musculoskeletal problems

In between 68 diabetic and 162 non diabetic participants, most of the diabetic participants 17.6% (n=12) were diagnosed with knee osteoarthritis where 6.8% (n=11) nondiabetic patient diagnosed with the same condition. In diabetic patient 10.3% (n=7) participants were correspondingly diagnosed with frozen shoulder, spondylosis and spondylolisthesis. On the other hand, 11.7% (n=19) and 11.1% (n=18) non diabetic patient were diagnosed with PLID and spondylosis condition, 9.3% (n=15) with frozen shoulder.

Diagnosed musculoskeletal problems				
	Diabetic		Non-diabetic	
	Frequency	Percent	Frequency	Percent
PCID	3	4.4	9	5.6
Cervical radiculopathy	1	1.5	6	3.7
Cervical rib	0	0	1	.6
Frozen Shoulder	**7**	**10.3**	15	9.3
Supraspinatus Tendinitis	2	2.9	2	1.2
Tennis Elbow	3	4.4	3	1.9
Carpal tunnel syndrome	1	1.5	1	.6
Thoracic pain	1	1.5	3	1.9
Spondylosis	**7**	**10.3**	**18**	**11.1**
Spondylolisthesis	**7**	**10.3**	6	3.7
PLID	2	2.9	**19**	**11.7**
Rheumatoid arthritis	1	1.5	6	3.7
Mechanical LBP	2	2.9	12	7.4
LBP with radiculopathy	3	4.4	15	9.3
Scoliosis	1	1.5	0	0
Thigh pain	0	0	2	1.2
Knee Osteoarthritis	**12**	**17.6**	11	6.8
Ligament injury	0	0	4	2.5
Knee pain	4	5.9	4	2.5
Post Fracture	1	1.5	7	4.3
Ankle sprain	3	4.4	3	1.9
Heel spur	1	1.5	1	.6
Plantar fasciitis	1	1.5	4	2.5
Undiagnosed	5	7.4	9	5.6
Total	68	100	162	100

Table-4.19: Diagnosed musculoskeletal problems of participants

4.20: Association between Socio-demographic variables and diabetes mellitus.

Table-4.20: Association between Socio-demographic variables and diabetes mellitus.

Variables	Categories	Diabetic		Pearson's Chi-square	P value
		Yes	No		
Age Range	20-40 years	19	67		
	41-60 years	34	77	19.919	**0.001***
	> 60 years	15	18		
Gender					
	Female	39	91	0.027	0.493
	Male	29	71		
BMI					
	<25	28	71	7.363	**0.008***
	>25	40	91		

*P<0.05, P value <0.05 indicates significant association

4.20.1 Association between Age range and diabetes mellitus:

In Table-4.20: this study found an association in between age range and diabetic mellitus among the participants. The Chi-Square value of this association was 19.919 and P value was 0.001 ($p<0.05$) which is highly significant.

4.20.2 Association between Gender and diabetes mellitus:

In Table-4.20: this study found no association in between gender and diabetic mellitus among the participants. The Chi-Square value of this association was 0.027 and P value was 0.493. This was not significant. Significant value was $P<0.05$.

4.20.3 Association between BMI and diabetic diabetes mellitus:

In Table-4.20: this study found an association in between BMI and diabetic mellitus among the participants. The Chi-Square value of this association was 7.363 and P value was 0.008. $P<0.05$ is significant.

4.21: Association between behavioral risk factors and diabetes mellitus.

Table-4.21: Association between behavioral risk factors and diabetes mellitus.

Variables	Categories	Diabetic		Pearson's Chi-square	P value
		Yes	No		
Smoking	Daily	6	29		
	Occasionally	13	22	8.390	**0.039***
	Never	27	65		
	Stopped	8	6		
Unhealthy diet (junk food)	Daily	10	31		
	Occasionally	46	112	1.898	0.594
	Never	5	9		
	Stopped	7	10		
Betel nut	Daily	13	23		
	Occasionally	22	55	8.685	**0.034***
	Never	25	79		
	Stopped	8	5		
Exercise Status	Yes	29	28		
				16.529	**.000***
	No	39	134		

*P<0.05, P value <0.05 indicates significant association

4.21.1 Association between smoking and diabetes mellitus:

In Table-4.21: this study found an association in between smoking and diabetic mellitus among the participants. The Chi-Square value of this association was 8.390 and P value was 0.039. P<0.05 is significant.

4.21.2 Association between unhealthy diet and diabetic mellitus:

In Table-4.21: this study found no association in between unhealthy diet and diabetic mellitus among the participants. The Chi-Square value of this association was 1.898 and P value was 0.594. This was not significant. Significant value was $P<0.05$.

4.21.3 Association between betel nut intake and diabetic mellitus:

In Table-4.21: this study found an association in between betel nut intake and diabetic mellitus among the participants. The Chi-Square value of this association was 8.685 and P value was 0.034. $P<0.05$ is significant.

4.21.4 Association between exercise and diabetic mellitus:

In Table-4.21: this study found an association in between exercise and diabetic mellitus among the participants. The Chi-Square value of this association was 16.529 and P value was 0.000 ($P<0.05$) which is highly significant.

4.22: Association between pain area and diabetes mellitus.

Neck, shoulder, lower back and knee are the most commonly affected body areas in diabetic and non-diabetic participants.

Table-4.22: Association between pain area and diabetes mellitus.

Variables	Categories	Diabetic		Pearson's Chi-square	P value
		Yes	No		
Neck	Yes	5	22	4.156	**0.041***
	No	63	140		
Shoulder	Yes	18	22	5.539	**0.019***
	No	50	140		
Lower back	Yes	31	88	1.463	0.226
	No	37	74		
Knee	Yes	31	39	10.471	**0.001***
	No	37	123		

*P<0.05, P value <0.05 indicates significant association

4.22.1 Association between neck pain and diabetes mellitus:

In Table-4.22: The observed P-value for association of neck pain and having diabetes is 0.041. So the result is significant and it indicates there is association between neck pain and diabetes mellitus.

4.22.2 Association between shoulder pain and diabetes mellitus:

In Table-4.22: The observed P-value for association of shoulder pain and having diabetes is 0.019. So the result is significant and it indicates there is association between shoulder pain and diabetes mellitus.

4.22.3 Association between lower back pain and diabetic diabetes mellitus:

In Table-4.22: For association of lower back pain and having diabetes, P-value is 0.226 which is more than 0.05. So the result is not significant that indicates there is no association between lower back pain and having diabetes.

4.22.2 Association between knee pain and diabetes mellitus:

In Table-4.22: The observed P-value for association of knee pain and having diabetes is 0.001. So the result is highly significant and it indicates there is association between knee pain and diabetes mellitus.

4.23: Association of pain severity on VAS scale and diabetes mellitus.

Table-4.23: Association of pain severity on VAS scale and diabetes mellitus.

Variables	Categories	Diabetic		Pearson's Chi-square	P value
		Yes	No		
Pain severity on VAS Score					
	0-3 (mild pain)	16	53		
	4-6 (moderate pain)	34	92	53.100	**.042***
	7-10 (severe pain)	18	17		

*P<0.05, P value <0.05 indicates significant association

The observed P-value for association of pain severity and having diabetes is 0.042. So the result is significant and it indicates there is association between pain severity and diabetes mellitus.

4.24: Association musculoskeletal complains and diabetes mellitus.

Table-4.24: Association musculoskeletal complains and diabetes mellitus.

Variables	Categories	Diabetic		Pearson's Chi-square	P value
		Yes	No		
Movement difficulties	Yes	56	128	0.0739	0.390
	No	12	34		
Paresthesia/ Numbness	Yes	20	43	0.198	0.656
	No	48	119		
Muscle weakness	Yes	36	45	3.065	**0.001***
	No	32	117		

*P<0.05, P value <0.05 indicates significant association

4.24.1 Association between movement difficulties and diabetes mellitus:

In Table-4.24: For association of movement difficulties and having diabetes, P-value is 0.390 which is more than 0.05. So the result is not significant that indicates there is no association between movement difficulties and having diabetes.

4.24.2 Association between paresthesia/numbness and diabetes mellitus:

In Table-4.24: For association of paresthesia/numbness and having diabetes, P-value is 0.656 which is more than 0.05. So the result is not significant that indicates there is no association between movement difficulties and having diabetes.

4.24.3 Association between muscle weakness and diabetic diabetes mellitus:

In Table-4.24: The observed P-value for association of muscle weakness and having diabetes among the participants is 0.001. So the result is significant that indicates there is association between muscle weakness and having diabetes.

CHAPTER V: DISCUSSION

Although the underlying pathogenic mechanisms are still unclear, diabetes or chronic hyperglycemia may have diverse effects on the musculoskeletal system. In the current investigation, we demonstrated that, between the musculoskeletal traits of diabetics and those in the non-diabetic general population, there is a statistically significant difference. In this study, among 230 participant, 68 participants were diabetic and 162 participants were nondiabetic. But the frequency of musculoskeletal characteristics are high in diabetic than non-diabetics patients. Other studies have also reported a greater frequency of musculoskeletal syndromes in diabetic patients than in the general population (Mathew et al., 2014). Another study of Aydeniz et al. (2018) found that diabetes mellitus patients have a higher prevalence of specific upper body musculoskeletal diseases.

In our study, among total 230 respondents, most of them 50% (34) diabetic and 47.6% (77) of non-diabetic participants were in age range 41-60 years. Besides, the association between age range and having diabetes was found statistically significant where p value is 0.001 ($p<0.05$) and x^2 value is 19.919. According to Adeniyi et al. (2014), type 2 diabetes is more common in those between the ages of 30-64 years. Smith's et al., (2013) also suggested that adults over 40 are more at risk for developing type 2 diabetes. From 230 diabetic and non-diabetic participants more than half of the participants 57.4% (39) and 56.2% (91) were female and 42.6% (29) and 43.8% (71) were male. While there was no correlation between gender and having diabetes or not. A study from Norway indicated that diabetes women made up the majority of subjects across all age categories (overall, 50.1% versus 42.6%, $p<0.001$) but there was no significant difference between men and women in the prevalence (Hoff et al., 2015).

The majority of responses among the participants, 44.1% (30) diabetic and 43.8% (71) non-diabetic patients, were housewives. While working more than other occupations, housewives engage in less physical activity. It was discovered that among the people who exercise every day of the week, have less physical complications than who are not

exercising. Physically inactive people had a greater prevalence of chronic MSCs than active people did (Hoff et al., 2015).

More than half of population, 55.9% (40) diabetic and 52.5% (91) non-diabetic participant's BMI was >25 (over weight). It was discovered that BMI and having diabetes has an association, which was statistically highly significant ($x^2 = 7.363$, p=0.008) at the 5% significant level. Relationship between BMI and the prevalence of diabetes, and dyslipidemia. According to both surveys, a rise in BMI is typically linked to a significant rise in the prevalence of diabetes mellitus (p value 0.001 for all tests for a linear trend across BMI groups) (Bays et al., 2017).

There were a variety of behavioral risk factors among diabetic and non-diabetic participants, only 8.8% (6) and 17.9% (29) participants smokes daily, 17.6% (12) and 13.6% (22) participants smokes occasionally. Association found between smoking and having diabetes where p value is 0.039 ($p<0.05$) and x^2 value is 8.390 which was statistically significant. A study suggested that smoking is one of the causes of type 2 diabetes. In actuality, compared to non-smokers, cigarette smokers have a 30%–40% increased risk of type 2 diabetes. Smokers with diabetes are more prone than non-smokers to experience difficulties with insulin doses and maintaining their illness. Your risk of type 2 diabetes increases as you smoke more cigarettes. (Campagna et al., 2019).

In this study, most of the participant 67.6% (46) diabetic and 69.1% (112) non-diabetic participants eat junk food occasionally. Table-4.21 shows that association wasn't found between eating junk food and having diabetes where p value is 0.594 ($p < 0.05$) and x^2 value is 1.898 which was statistically not significant. However, Chichger et al., (2016) found that junk food has a lot of trans and saturated fats, which can increase blood levels of triglycerides, a form of fat. Triglyceride levels above a certain threshold raise the possibility of type 2 diabetes.

Among participants, 19.1% (13) diabetic and 14.2% (23) non-diabetic participant intakes betel nut daily, 32.4% (22) and 34% (55) participant intakes occasionally. Association found between betel nut intake and having diabetes where p value is 0.034 ($p<0.05$) and x^2 value is 8.865 which was statistically significant. According to a new population-based

study in Taiwan, chewing betel nuts is linked to an increased risk of type 2 diabetes mellitus, (T2DM). However, this analysis looked at prevalence data with odds ratios that were assessed to have weak associations and ranged from 1.29 to 1.41 (Tung et al., 2014).

Among diabetic and non-diabetic participants, only 44.1% (30) and 17.3% (28) were exercisers where 16.2% (11) diabetic and 3.1% (5) worked out 150-200 minutes a week which is recommended by WHO. It was discovered that 44.1% (30) patients who exercises had managed diabetes, which was statistically highly significant ($x^2 = 16.529$, p=0.000) at the 5% significant level. Exercise is therefore essential for managing diabetes and can improve quality of life for those who have it. Physical idleness can also speed up aging. Physical activity may have a beneficial impact on decreased musculoskeletal pain. Though it is unknown if exercise training reduces musculoskeletal discomfort in people with type 2 diabetes. Training for physical activity, however, may reduce chronic inflammation. As a result, fitness training may help treat type 2 DM and osteoarthritis as well as prevent type 2 DM (Pedersen et al., 2017).

In the current study, we found that both diabetic and non-diabetic patients have a higher prevalence of musculoskeletal pain in shoulder 26.47% (18) and 13.6% (22), lower back 46.4% (32) and 54.3% (88), knee 44.9% (31) and 24.1% (39), neck pain 7.35% (5) and 13.6% (22). Association found between neck, shoulder, knee pain and having diabetes where p value is correspondingly 0.041, 0.019. 0.001 ($p<0.05$) and x^2 value is 4.156, 5.539, 10.471 which were statistically significant. Shoulder, spine, and knees are the most common affected joints. It is found that older age, female gender, and overweight were significantly associated with musculoskeletal problems, the p value were 0.000, 0.03, 0.043 respectively. These findings were reported in previous study (Williams et al., 2016). Ten studies reported on the prevalence of shoulder pain among patients with DM is high. With total of 9,244 diabetic patients, the prevalence of shoulder disorders among the studies was 31.6% (95% CI 13.0–53.8) (kaka et al., 2018).

One the other hand, pain severity on VAS scale among diabetes and non-diabetes, nearly half of them 49% (34) diabetic and 57% (92) non diabetic patient had moderate level of pain. 23.9% (16) and 31.6% (53) had mild type of pain and 26.9% (18) and 20.8% (17) had severe level of pain. Table-4.23 shows that association found between pain severity and

having diabetes where p value is 0.042 ($p < 0.05$) and x^2 value is 53.100 which was statistically significant. Similarly, a study of Martínez-Alpuche et al. (2021) reported that patients with diabetes experienced pain that was substantially more intense than those without diabetes. The mean total pain score was 7.2 +/- 0.3 and 5.3 +/- 0.3 in the diabetic and non-diabetic individuals, respectively (P = 0.0002).

Participants in this study reported that the majority of them, 82.40% (56) diabetic and 78.50% (128) non-diabetic were experiencing movement difficulties, only 29.9% (20) and 27.2% (45) experienced paresthesia particularly in lower limbs, 38.85% (36) and 28.50% (45) were experiencing decreased muscle strength. Association wasn't found between movement difficulties, paresthesia and having diabetes where p value was correspondingly 0.390, 0.656 ($p<0.05$). Nevertheless, association between muscle weakness and having diabetes was found statistically highly significant ($x^2 = 3.065$, P=0.001) at 5% significant level.

In a study quite similar to this one, Douloumpakas et al. (2017) discovered that just 17.3% of the patients were symptom-free, whereas 82.6% of type 2 diabetes had particular musculoskeletal diseases. Patients with DM had a higher prevalence of chronic MSCs than people without DM.

Among 230 participants where 68 were diabetic and 162 were non diabetic participants, the most frequent diagnosed musculoskeletal problems were 10.3% (n=7) and 9.3% (n=15) frozen shoulder, 17.6% (n=12) and 6.8% (n=11) osteoarthritis. The most frequent MS disorders in this study were OA, observed 17.60% in diabetic. This association with DM can be partially explained by advanced age and high prevalence of overweight in this population (Pedersen et al., 2017). In another study, the frequency of MS disorders in DM was 34.4%. The most common MS complications were OA and hand disorders. The association between diabetes and frozen shoulder is also well established. In our study, Frozen shoulder was found 10.30% and in non-diabetic 9.3%. Prior studies reported variable prevalence rates of frozen shoulder ranging between 11% and 19% in patients with diabetes, compared with 2% to 3% of age-matched controls non-diabetic group (Majjad et al., 2018).

5.1 Limitation of the study

There were some situational limitations and barriers while considering the study.

- Sample size (n=230) was limited and was not sufficient enough for the analysis to generalize the wider population of this condition.
- The study was done on both diabetic and non-diabetic groups, so the sample size has been calculated assuming the prevalence of 50%
- As it was not a diabetes specialized hospital, we couldn't differentiate the type of diabetes and couldn't measure level of blood sugar.
- The study was conducted at a selected hospital, which was not a diabetes specialized hospital so it can't represent the related musculoskeletal criteria of all diabetic and non-diabetic patients in Bangladesh.
- The study was greatly impacted by the lack of time and resources available.

CHAPTER VI: CONCLUSION AND RECOMMENDATION

6.1 Conclusion

The results established that that both diabetic and non-diabetic patients have a significant prevalence of musculoskeletal problems, with the shoulder, knee and lower back being the most commonly affected areas. To improve the variations in the studies, methodological quality and homogeneity are required by researchers. Subsequent studies could compare the prevalence of MSDs, related type of diabetes, gender and research related to the spine and lower limbs.

There is also a need for physiotherapists and related re-habilitation professionals to assess the outcome of their interventions for this population. This will improve the activities of daily living, functional activities and quality of life of these individuals. There is also relevance for clinicians and policy makers to be aware of the high prevalence of MSDs among patients with diabetes and the importance of early identification and intervention to prevent disability.

6.2 Recommendation

The researcher made the following suggestions to certain authorities and persons:

- For further research, the analyzer strongly recommended to include equal number of diabetic and non-diabetic patients to ensure the generalize ability of this study.
- As this study only focuses on the identification of musculoskeletal characteristics only, so additional research is recommended to treat these issues.
- The study period was limited in duration, it should be performed over a longer period of time subsequently.
- In future, the sample size should be large to produce more trustworthy and meaningful results.
- The investigator took the participants only from one selected hospital of Savar for this analysis. To summarize the findings, sample should be gathered from various clinics, hospitals, institutes and groups throughout Bangladesh.

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APPENDIX

সম্মতি পত্র বাংলা

(অংশগ্রহনকারীকে পড়ে শোনাতে হবে)

আসালামুআলাইকুম/নমস্কার,

আমার নাম জান্নাতুল তাসলিমা মীম, আমি ঢাকা বিশ্ববিদ্যালয়ের অধীনে বাংলাদেশ হেলথ প্রফেশনস ইনস্টিটিউট (বিএইচপিআই) থেকে ব্যাচেলর অফ সায়েন্সের ফিজিওথেরাপি ডিগ্রির আংশিক পরিপূর্ণতার জন্য "সিআরপিতে উপস্থিত ডায়াবেটিক এবং নন-ডায়াবেটিক রোগীদের অস্থি ও মাংসপেশী সংক্রান্ত বৈশিষ্ট্য" এই শিরোনামে গবেষণাটি পরিচালনা করছি। আমি এক্ষেত্রে আমি ডায়াবেটিক এবং নন-ডায়াবেটিক রোগীদের মধ্যে পেশী সংক্রান্ত সমস্যা সম্পর্কে কিছু ব্যক্তিগত এবং অন্যান্য সম্পর্কিত তথ্য জানতে চাই। আপনাকে কিছু প্রশ্নের উত্তর দিতে হবে যা এই ফর্মে উল্লেখ করা হয়েছে। এটি প্রায় ১৫-২০ মিনিট সময় নেবে।

আমি আপনাকে অনুগত করছি যে,এটা আমার অধ্যয়নের অংশ এবং যা অন্যকোনো উদ্দেশ্যে ব্যবহার হবে না। এই গবেষনায় আপনার অংশগ্রহণ বর্তমান ও ভবিষ্যৎ চিকিৎসায় কোন প্রকার প্রভাব ফেলবেনা। আপনি যে সব তথ্য প্রদান করবেন তার গোপনীয়তা বজায় থাকবে এবং আপনার প্রতিবেদনের ঘটনা প্রবাহে এটা নিশ্চিত করা হবে যে এই তথ্যের উৎস অপ্রকাষিত থাকবে।

এই অধ্যয়নে আপনার অংশগ্রহন স্বেচ্ছাপ্রণোদীত এবং আপনি যে কোন সময় এই অধ্যয়ন থেকে কোন নেতিবাচক ফলাফল ছাড়াই নিজেকে প্রত্যাহার করতে পারবেন। এছাড়াও কোন নির্দিষ্ট প্রশ্ন অপছন্দ হলে উত্তর না দেয়ার এবং সাক্ষাৎকারের সময় কোন উত্তর না দিতে চাওয়ার অধিকারও আপনার আছে।

এই অধ্যয়নে অংশগ্রহণকারী হিসেবে যদি আপনার কোন প্রশ্ন থাকে তাহলে আপনি আমাকে অথবা /এবং ফাবিহা আলম, সহকারী অধ্যাপক, ফিজিওথেরাপি বিভাগ, বিএইচপিআই, সিআরপি, সাভার ,ঢাকা-১৩৪৩-তে যোগাযোগ করতে পারেন।

সাক্ষাৎকার শুরু করার আগে আপনার কি কোন প্রশ্ন আছে?

আমি আপনার অনুমতি নিয়ে এই সাক্ষাৎকার শুরু করতে যাচ্ছি।

হ্যাঁ... ☐

না... ☐

অংশগ্রহনকারীর স্বাক্ষর.....

তথ্য সংগ্রহের তারিখ:.....

CONSENT FORM

(Please read out to the participant)

Dear Participant,

My name is Jannatul Taslima Meem, I am conducting this study for partial fulfillment of Bachelor of Science in Physiotherapy degree, titled "**Musculoskeletal characteristics among diabetic and non-diabetic patients attended at CRP**" from Bangladesh Health Professions Institute (BHPI), University of Dhaka. I would like to know about some personal and other related information about musculoskeletal problem among the diabetic and non-diabetic patients. You will have to answer some questions which are mention in this form. This will take approximately 15-20 minutes.

I would like to inform you that this is a purely academic study and will not be used for any other purpose. Your participation in the research will have no impact on your present or future treatment in this area. All information provided by you will be treated as confidential and in the event of any report or publication it will be ensured that the source of information remains anonymous.

Your participation in this study is voluntary and you may withdraw yourself at any time during this study without any negative consequences. You also have the right not to answer a particular question that you don't like or do not want to answer during interview.

If you have any query about the study or your right as a participant, you may contact with me and/or my research supervisor Fabiha Alam, Assistant Professor, Physiotherapy Department, BHPI, CRP, Savar, Dhaka.

So, may I have your consent to proceed with the interview or work?

Yes ☐

No ☐

Signature of the Participant:…….

Date of Data Collection:……..

প্রশ্নপত্র

রোগীর আইডি: ঠিকানা:

নাম: মোবাইল নম্বর:

বিভাগ ১: সামাজিক-ডেমোগ্রাফিক সংক্রান্ত তথ্য

প্রশ্ন নম্বর	প্রশ্ন/ তথ্য	প্রতিক্রিয়া/কোডিং প্রণালী
1.	বয়স:	..... বছর
2.	লিঙ্গ:	1. মহিলা 2. পুরুষ
3.	বৈবাহিক অবস্থা:	1. বিবাহিত 2. অবিবাহিত 3. তালাকপ্রাপ্ত 4. বিচ্ছিন্ন 5. বিধবা
4.	বসবাসের এলাকা:	1. শহুরে 2. আধা শহুরে 3. গ্রামীণ
5.	শিক্ষাগত অবস্থা:	1. নিরক্ষর 2. প্রাথমিক 3. মাধ্যমিক স্কুল সার্টিফিকেট 4. উচ্চ মাধ্যমিক সার্টিফিকেট 5. স্নাতক 6. মাস্টার্স বা তার উপরে 7. অন্যান্য:
6.	পেশা:	1. সরকারি চাকুরিজীবী 2. বেসরকারি চাকুরিজীবী 3. গৃহিণী 4. দিন শ্রম

		5. ব্যবসায়ী 6. গার্মেন্টস কর্মী 7. বেকার 8. অন্যান্য (নির্দিষ্ট করুন):
7.	আপনি দিনে কত ঘন্টা কাজ করেন?	1. 1-3 ঘন্টা 2. 4-6 ঘন্টা 3. 7-9 ঘন্টা 4. 10-12 ঘন্টা 5. >12 ঘন্টা
8.	বিএমআই	উচ্চতা: ওজন: বিএমআই:

ডায়াবেটিস সংক্রান্ত তথ্য (যদি রোগী ডায়াবেটিক হয়)

9.	আপনি কি ডায়াবেটিসে ভুগছেন?	1. হ্যাঁ 2. না
10.	ডায়াবেটিসে ভোগার সময়কাল কত?	1. 0-1 বছর 2. 2-5 বছর 3. 6-10 বছর 4. >10 বছর
11.	আপনি ডায়াবেটিসের জন্য কি ধরনের চিকিৎসা নিচ্ছেন?	1. শুধুমাত্র খাদ্য নিয়ন্ত্রণ 2. শুধুমাত্র ওষুধ 3. খাদ্য নিয়ন্ত্রণ এবং ওষুধ 4. শারীরিক ব্যায়াম 5. ইনসুলিন 6. কিছুই না 7. (3,4) এর সমন্বয়

12.	আপনার পরিবারের অন্য কারো কি ডায়াবেটিস আছে?	1. হ্যাঁ 2. না

আচরণগত ঝুঁকির কারণের ইতিহাস (তামাক)

13.	আপনি কি ধুমপান করেন?	1. দৈনিক 2. মাঝে মাঝে 3. কখনই না 4. ছেড়ে দিয়েছি

আচরণগত ঝুঁকির কারণের ইতিহাস (পান)

14.	আপনার পান খাওয়ার অভ্যাস আছে?	1. দৈনিক 2. মাঝে মাঝে 3. কখনই না 4. ছেড়ে দিয়েছি

আচরণগত ঝুঁকির কারণের ইতিহাস (অস্বাস্থ্যকর ডায়েট)

15.	(a)	প্রতি সপ্তাহে কত দিন আপনি ফল এবং সবজি খান?	
	(b)	আপনি কত ঘন ঘন জাঙ্ক ফুড খান?	1. দৈনিক 2. মাঝে মাঝে 3. কখনই না 4. ছেড়ে দিয়েছি

আচরণগত ঝুঁকির কারণগুলির ইতিহাস (কম শারীরিক কার্যকলাপ)

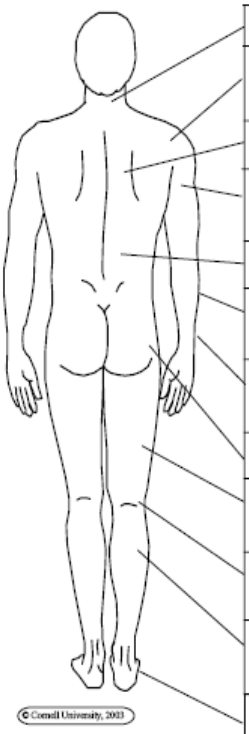
16.	(a)	আপনি কি ব্যায়াম করেন?	1. হ্যাঁ 2. না
	(b)	আপনি প্রতি সপ্তাহে কত দিন ব্যায়াম করেন?	
	(c)	প্রতিদিন ব্যায়ামের সময়কাল	

অধ্যায় ২: অস্থি ও মাংসপেশী সংক্রান্ত বৈশিষ্ট্য

(ব্যথা এবং প্যারেস্থেসিয়া সম্পর্কিত তথ্য)

প্রশ্ন নম্বর		**প্রশ্ন/ তথ্য**	**প্রতিক্রিয়া/কোডিং প্রণালী**
1.	(a)	ব্যাথার লোকেশন	(পরবর্তী পৃষ্ঠায় বডি চার্টে চিহ্নিত করুন)
	(b)	VAS স্কোর	←——————→
	(c)	আপনার ঝি ঝি ভাব বা অবসতা আছে কি?	1. হ্যাঁ 2. না
	(d)	ঝি ঝি ভাব এর এরিয়া	1. উপরের অঙ্গ ডান 2. উপরের অঙ্গ বাম 3. উপরের অঙ্গ উভয় 4. নিম্ন অঙ্গ ডান 5. নিম্ন অঙ্গ বাম 6. নিম্ন অঙ্গ উভয়

The diagram below shows the approximate position of the body parts referred to in the questionnaire. Please answer by marking the appropriate box.



		During the last work week how often did you experience ache, pain, discomfort in:					If you experienced ache, pain, discomfort, how uncomfortable was this?			If you experienced ache, pain, discomfort, did this interfere with your ability to work?		
		Never	1-2 times last week	3-4 times last week	Once every day	Several times every day	Slightly uncomfortable	Moderately uncomfortable	Very uncomfortable	Not at all	Slightly interfered	Substantially interfered
Neck		☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Shoulder	(Right)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
	(Left)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Upper Back		☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Upper Arm	(Right)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
	(Left)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Lower Back		☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Forearm	(Right)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
	(Left)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Wrist	(Right)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
	(Left)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Hip/Buttocks		☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Thigh	(Right)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
	(Left)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Knee	(Right)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
	(Left)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Lower Leg	(Right)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
	(Left)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Foot	(Right)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
	(Left)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

(পেশী সম্পর্কিত তথ্য)

প্রশ্ন নম্বর		প্রশ্ন/ তথ্য	প্রতিক্রিয়া/কোডিং প্রণালী
2.	(a)	আপনি কি পেশীতে কম শক্তি অনুভব করেন?	1. হ্যাঁ 2. না
	(b)	পেশী দুর্বলতার অবস্থান	1. উপরের অঙ্গ ডান 2. উপরের অঙ্গ বাম 3. উপরের অঙ্গ উভয় 4. নিম্ন অঙ্গ ডান 5. নিম্ন অঙ্গ বাম

			6. নিম্ন অঙ্গ উভয়

(মুভমেন্ট সম্পর্কিত তথ্য)

প্রশ্ন নম্বর		**প্রশ্ন/ তথ্য**	**প্রতিক্রিয়া/কোডিং প্রণালী**
3.	(a)	আপনি কি মুভমেন্টের সময় অসুবিধা অনুভব করেন?	1. হ্যাঁ 2. না
4.	(a)	আপনার কি হাড় ও মাংসপেশী সংক্রান্ত অন্য কোন সমস্যা আছে? (সমস্যাটি উল্লেখ করুন)	

(ডায়াবেটিক ফুট সম্পর্কিত তথ্য)

প্রশ্ন নম্বর		**প্রশ্ন/ তথ্য**	**প্রতিক্রিয়া/কোডিং প্রণালী**
5.	(a)	আপনার পায়ে কোন সমস্যা আছে?	1. হ্যাঁ 2. না
	(b)	পায়ে কি ধরনের সমস্যা?	
	(c)	পায়ের সমস্যার সময়কাল (দিন/মাস/বছর)	

(মেডিকেল রেকর্ড রিভিউ)

প্রশ্ন নম্বর	প্রশ্ন/ তথ্য	প্রতিক্রিয়া/কোডিং প্রণালী
6.	নির্ণয়কৃত অস্থি ও মাংসপেশীর সমস্যা	1. Frozen shoulder 2. Rheumatoid arthritis 3. Ankylosing spondylitis 4. Spondylosis 5. Spondylisthesis 6. PLID 7. PCID 8. Tennis Elbow 9. Carpal tunnel syndrome 10. Osteoarthritis…… 11. Post Fracture of ……..…….. 12. অন্যান্য:……

English Questionnaire

Patient ID: Address:

Name: Mobile number:

Section 1: Socio-Demographic Information

QN	Questions/ Information on	Responses/Coding category
1. 1	Age:	…… Years
2.	Gender:	1. Female 2. Male
3.	Marital status	1. Married 2. Unmarried 3. Divorced 4. Separated 5. Widow
4.	Living area:	1. Urban 2. Semi urban 3. Rural
4.	Educational status:	1. Illiterate 2. Primary 3. Secondary school certificate 4. Higher secondary certificate 5. Graduate 6. Masters or above 7. Others:
8.	Occupation:	1. Government Service holder 2. Private Service holder 3. Housewife 4. Day labor

		5. Businessman 6. Garments worker 7. Unemployed 8. Others (specify):
9.	How many hours do you work in a day?	1. 1-3 hours 2. 4-6 hours 3. 7-9 hours 4. 10-12 hours 5. >12 hours
6.	BMI	Height: Weight: BMI:

Diabetes-related information (If patient is diabetic)

7.	Are you suffering from diabetes?	1. Yes 2. No
1.	What is the duration of diabetes suffering?	1. 0-1 years 2. 2-5 years 3. 6-10 years 4. >10 years
5.	What type of treatment you are taking for diabetes?	1. Only food control 2. Food maintenance and medication 3. Only medication 4. Physical exercise 5. Insulin 6. Nothing 7. Combination of 1,2,4

8.	Does anyone else in your family have diabetes?	1. Yes 2. No

History of Behavioral Risk Factors (Tobacco)

13.	(a)	Do you Smoke?	1. Daily 2. Occasionally 3. Never 4. Stopped

History of Behavioral Risk Factors (Betel leaf)

14.	(a)	Are you habituate with betel nuts?	1. Daily 2. Occasionally 3. Never 4. Stopped

History of Behavioral Risk Factors (Unhealthy diet)

15.	(a)	How many days per week do you eat fruits and vegetables?	
	(b)	How often do you eat junk food?	1. Daily 2. Occasionally 3. Never 4. Stopped

History of Behavioral Risk Factors (Less physical activity)

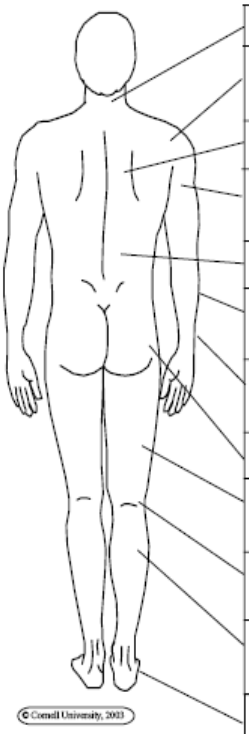
16.	(a)	Do you exercise?	1. Yes 2. No
	(b)	How many days per week do you exercise?	
	(c)	Duration of exercise per day	

Section 2: Musculoskeletal Characteristics

(Pain & paraesthesia related Information)

Question Number		**Questions/ Information on**	**Responses/Coding category**
1.	a.	Location of pain	(Mark on body chart on next page)
	b.	VAS Score	←——————→
	c.	Do you have Paraesthesia or numbness?	1. Yes 2. No
	d.	Area of paraesthesia	1. Upper limb right 2. Upper limb left 3. Upper limb both 4. Lower limb right 5. Lower limb left 6. Lower limb both

The diagram below shows the approximate position of the body parts referred to in the questionnaire. Please answer by marking the appropriate box.



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	(Left)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Upper Back		☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Upper Arm	(Right)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
	(Left)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Lower Back		☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Forearm	(Right)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
	(Left)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Wrist	(Right)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
	(Left)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Hip/Buttocks		☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Thigh	(Right)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
	(Left)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Knee	(Right)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
	(Left)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Lower Leg	(Right)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
	(Left)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Foot	(Right)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
	(Left)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

(Muscle related information)

Question Number		**Questions/ Information on**	**Responses/Coding category**
2.	(a)	Are you getting less strength in your muscle?	1. Yes 2. No
3.	(a)	Do you have muscle wasting?	1. Yes 2. No

(Movement Related Information)

Question Number		Questions/ Information on	Responses/Coding category
4.	(a)	Do you feel movement difficulties?	1. Yes 2. No
5.	(a)	Do you have any other problems ?	

(**Diabetic foot related information)**

Question Number		Questions/ Information on	Responses/Coding category
6.	(a)	Have you any foot problem?	1. Yes 2. No
	(b)	Type of foot problem	
	(c)	Duration of foot problem (Day/Month/Year)	

(Medical Record Review)

Question Number	Questions/ Information on	Responses/Coding category
7.	Diagnosed musculoskeletal problems	1. Frozen shoulder 2. Osteoarthritis……. 3. Rheumatoid arthritis 4. Ankylosing spondylitis 5. Spondylosis 6. Spondylisthesis 7. PLID 8. PCID 9. Tennis Elbow 10. Carpal tunnel syndrome 11. Post Fracture of ……..…….. 12. Others:……

Permission letter

March 12, 2022

Head of the Physiotherapy Department

Centre for the Rehabilitation of the Paralysed (CRP)

Chapain, Savar, Dhaka-1343.

Through: Head, Department of Physiotherapy, BHPI

Subject: Seeking permission for data collection of 4th year physiotherapy research project.

Sir,

With due respect and humble submission to state that I am Jannatul Taslima Meem, a student of 4th year B.Sc. in Physiotherapy at Bangladesh Health Professions Institute (BHPI). In 4th year course curriculum I have to a research project. The ethical committee has approved my research project entitled on "**Musculoskeletal characteristics among diabetic and non-diabetic patients attended at CRP**" under the supervision of Fabiha Alam, Lecturer, Physiotherapy Department, Bangladesh Health Professions Institute (BHPI). I have to collect data, for which I want your kind approval. I assure that anything of my study will not be harmful for my participants.

I therefore, pray and hope that you would be kind enough to grant my application and give me permission for data collection and oblige thereby.

Yours faithfully

Jannatul Taslima Meem

Jannatul Taslima Meem

4th year, B.Sc. in Physiotherapy

Roll: 10, Session: 2016-2017, ID No: 112160332

Bangladesh Health Professions Institute (BHPI)

CRP, Chapain, Savar, Dhaka-1343.

Forwarded
Fabiha
13.03.2022

Approved
13.03.22

MOHAMMAD ANWAR HOSSAIN
Senior Consultant &
Head of Physiotherapy Dept
Associate Professor, BHP
CRP, Savar, Dhaka-1343

Recommended
Shofiq
12.03.22

Md. Shofiqul Islam
Associate Professor & Head
Department of Physiotherapy
BHPI
Savar, Dhaka-1343

Rumana
7/3

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

Ref: CRP/BHPI/IRB/02/2022/553

Date: 20/02/2022

Jannatul Taslima Meem
4th Year B.Sc. in Physiotherapy
Session: 2016 – 2017
BHPI, CRP, Savar, Dhaka- 1343, Bangladesh

Subject: Approval of the research project proposal **"Musculoskeletal characteristics among diabetic and non-diabetic patients attended at CRP"** by ethics committee.

Dear Jannatul Taslima Meem,
Congratulations.
The Institutional Review Board (IRB) of BHPI has reviewed and discussed your application to conduct the above-mentioned dissertation, with yourself, as the principal investigator and Fabiha Alam as thesis supervisor. The Following documents have been reviewed and approved:

Sr. No.	Name of the Documents
1	Dissertation/thesis/research Proposal
2	Questionnaire (English & Bengali version)
3	Information sheet & consent form.

The purpose of the study is to gain in-depth insight and understanding about musculoskeletal characteristics among diabetic and non-diabetic patients. Since the study involves questionnaire that takes maximum 15-20 minutes and have no likelihood of any harm to the participants, the members of the Ethics committee approved the study to be conducted in the presented form at the meeting held at 09:00 AM on October 12, 2021 at BHPI (30th IRB Meeting).

The institutional Ethics committee 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. This Ethics committee is working accordance to Nuremberg Code 1947, World Medical Association Declaration of Helsinki, 1964 - 2013 and other applicable regulation.

Best regards,

Muhammad Millat Hossain
Assistant Professor, Dept. of Rehabilitation Science
Member Secretary, Institutional Review Board (IRB)
BHPI, CRP, Savar, Dhaka-1343, Bangladesh

CRP-Chapain, Savar, Dhaka-1343, Tel : 7745464-5, 7741404
E-mail : principal-bhpi@crp-bangladesh.org, Web: bhpi.edu.bd, www.crp-bangladesh.org