

CHARACTERISTICS OF BILATERAL KNEE OSTEOARTHRITIS

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

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BHPI, CRP, Savar, Dhaka-1343



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

CHARACTERISTICS OF BILATERAL KNEE OSTEOARTHRITIS

Submitted by **Chinmoy Barua**, for partial fulfillment of the requirements 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 source used have been cited appropriately. Any mistakes or inaccuracies are my own. I also declare that for any publication, presentation or dissemination of the study. I would be bound to take written consent from my supervisor.

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Acronyms

ADL	Activity of Daily Living
BHPI	Bangladesh Health Professions Institute
BMI	Body Mass Index
CRP	Centre for Rehabilitation for the Paralyzed
NSAIDs	Non Steroidal Anti-Inflammatory Drugs
OA	Osteoarthritis
SPSS	Statistical Package for the Social Sciences
WHO	World Health Organization
NPRS	Numerical pain rating scale

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Abstract

Purpose: To explore the characteristics of bilateral knee osteoarthritis. *Objective:* To determine the age range of the patients; to compare the gender; to determine Body weight; to explore the severity of pain; to find out the history of surgery; to find out the history of trauma among the patients affected by knee OA. *Methodology:* A quantitative cross-sectional study design was chosen to accomplish the objectives of the study. Thirty-six subjects were selected through simple random sampling technique from the outpatient's musculoskeletal department of CRP. A structural questionnaire was used for collecting data from the participants. *Results:* The mean age of the participant was 57.44 (± 10). The result of the study demonstrates that n=19 (52.8%) female are affected by OA where as n=17 (47.2%) are male. Among the participants n=12(33.3%) subjects had obesity, n=18 (50%) subject had overweight and n=6(16.7%) subject had normal weight. Among 36 participants moderate types of pain at knee n=19(52.8%) where as n=13(36.1%) patients have severe pain and n=4(11.1%) patient have mild pain. The finding also reflects that Obese patient have experienced more pain comparing to those who are normal in weight and overweight. *Conclusion:* The vulnerable age range to develop OA knee is over 40 and obviously obesity is one of the key issues to develop OA. Health education and promotion and perform regular exercise can prevent obesity, thus it can also prevent OA. So, life style and ergonomic modification can help a lot to minimize the symptoms of knee OA.

1.1 Background

Knee osteoarthritis is a degenerative disease of knee joint. It is more common in people older than 40 years. It is a multifactorial disease with both genetic and environmental determinants. There is a strong association between BMI and osteoarthritis of the knee joint (Manek et al., 2003). Body mass index associated with onset and progression of the knee OA. Excess body weight, expressed as increased body mass index is linked with osteoarthritis risk, especially in weight bearing joint (Ding et al., 2005).

Osteoarthritis of the knee is a leading cause disability in people age over 65 and its impact on the public health is substantial (Guiccionne et al., 1994). The risk of osteoarthritis increases with increasing BMI. A recent population survey conducted in the UK found that being overweight before 40 increased risk of knee osteoarthritis in women (Dawson et al., 2003). Another survey conducted in Canada reports that high BMI is a significant predictor of fast cartilage volume loss (Raynauld et al., 2005). A population based case control study in Sweden found that overweight at any time was related to knee osteoarthritis (Holmberg et al., 2005). In Saudi Arabia a cross-sectional study showed that excess weight was strongly associated with knee OA in women, with a weaker link for men (Al-Arfaj, 2002). Another study showed that for every two units increase in body weight index, the odd ratio for developing radiographic knee osteoarthritis increase by the factor 1.36 (Hart & Spector., 1993).

In the Asia-Pacific region knee osteoarthritis is one of the most prevalent rheumatic disorders. Identification of risk factors is very important for development of strategies for primary and secondary prevention of knee osteoarthritis (Haq et al., 2010). The development of osteoarthritis is determined by age, genetic predisposition, previous injury, chronic stress across the joint, and abnormal mechanical forces caused primarily by obesity (Foley et al., 2003).

Obesity or high BMI has been frequently identified as one of the primary risk factors for knee osteoarthritis. As a consequence of both the ageing population and the

increased prevalence of obesity, estimates suggest a doubling in prevalence of knee osteoarthritis between 2000 and 2020 (Felson, 2009). In Bangladesh, there is no real statistics that how many patients are affected by osteoarthritis. But, one statistics give a general indication to the prevalence of osteoarthritis and that is 10,392,681 people are affected by osteoarthritis in 2004 (Statistics by Country Osteoarthritis, 2005). This encouraged me to know about characteristics of knee joint osteoarthritis in Bangladesh.

1.2Rationale

Knee OA is the most common form of osteoarthritis and the pain associated with OA is a major cause of activity limitation, functional disability and reduced health-related quality of life (Hochberg, 2007). Physical therapy plays an important role not only in the management of OA but also to prevent the disease as well as to reduce activity limitation, functional disability and to improve quality of life.

For that researcher interested to conduct this research to find out new things. If the characteristics of OA is find out that means the vulnerable age group of OA, the group of people are affected by OA, Body type of the OA patient, aggravating factors of OA, clinical representation of knee OA and outcome of physiotherapeutic treatment in Knee OA, As a Physiotherapist it will help to diagnose Knee OA easily and will give details information to the patient about knee OA so that people can modify their life style regarding OA at knee and we can provide better treatment as well as essential advice to the patients. As a health professional it improves our knowledge. Research makes the profession strongest. So there is no alternative option to do research as a professional to develop the profession.

1.3 Research question

What are the characteristics of bilateral Knee Osteoarthritis?

1.4 Study objectives

1.4.1 General objective

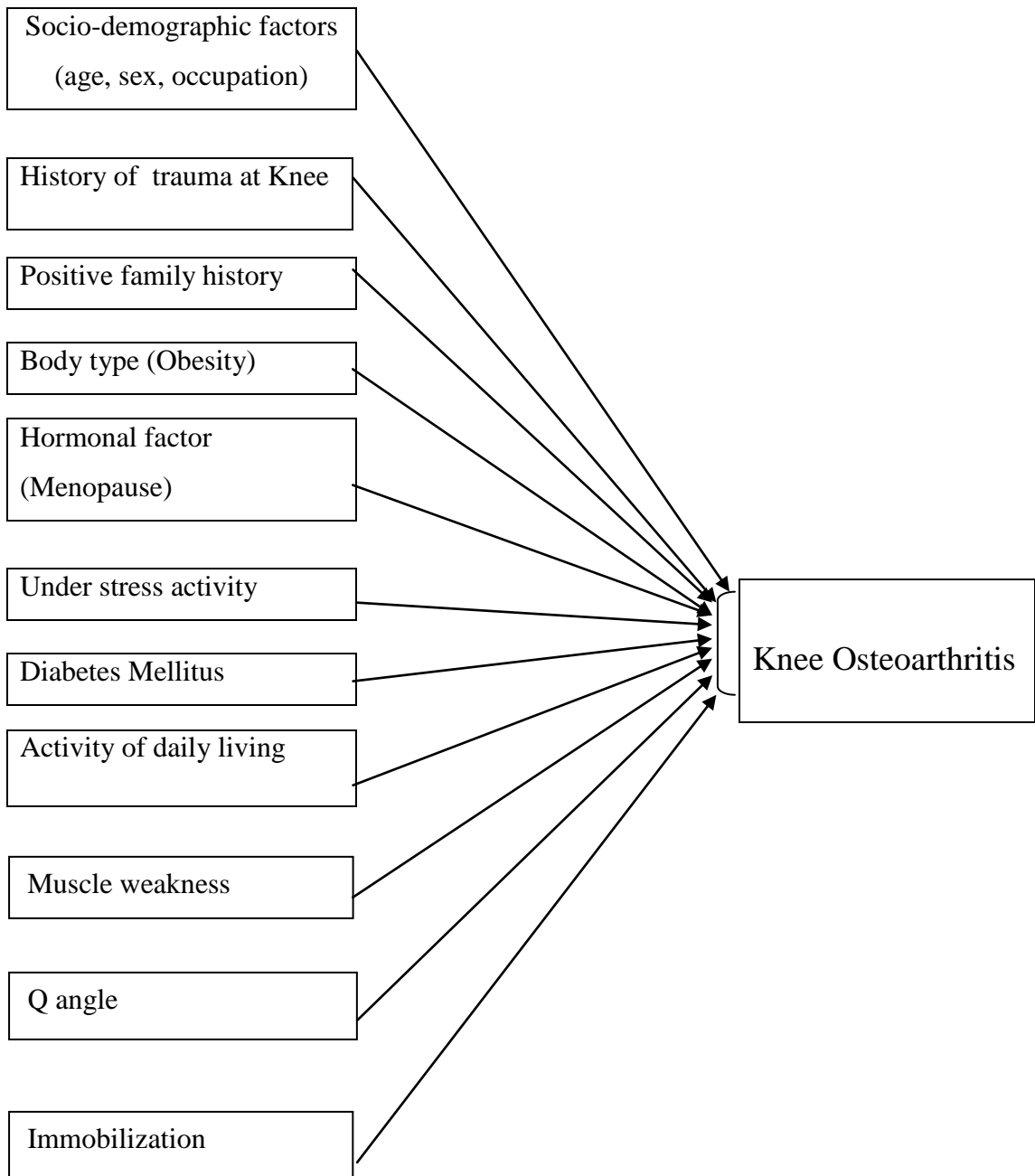
To determine the characteristics of bilateral Knee Osteoarthritis.

1.4.2 Specific objectives

- To determine the age range of the patient affected by Osteoarthritis at knee joint.
- To compare the gender affected by knee Osteoarthritis.
- To identify the Educational status of the patient with knee Osteoarthritis.
- To determine Body weight of knee osteoarthritis patients.
- To identify the history of surgery at knee joint.
- To find out the history of trauma among the patients affected by knee OA.
- To explore the severity of pain in patients with Osteoarthritis.

1.5 List of variables

Independent variable **Dependent variable**



1.6 Operational Definitions

Body mass index (BMI)

According to the World Health Organization, Body Mass Index (BMI) is a simple index of weight for height that is commonly used to classify underweight, overweight and obesity in adults. It is defined as the weight in kilograms divided by the square of the height in meters (kg/m²). For example, an adult who weight 70kg and whose weight is 1.75m will have a BMI of 22.9.

$$\text{BMI} = 70\text{kg}/(1.75 \text{ m}^2)=70/3.06 = 22.9$$

Risk Factor

A risk factor is something that increases your chances of getting a disease. Sometimes, this risk comes from something you do. For example, smoking increases your chances of developing colon cancer. Therefore, smoking is a risk factor for colon cancer.

Osteoarthritis

A type of arthritis marked by progressive cartilage deterioration in synovial joints and vertebrae. It is degenerative joint disease characterized by destruction of articular cartilage.

Activities of daily living (ADL)

The essential functional activities, those have to be done independently from morning to evening.

Osteoarthritis is a degenerative joint disease, occurring primarily in older persons, characterized by erosion of the articular cartilage, hypertrophy of bone at the margin (i.e., osteophytes), subchondral sclerosis, and a range of biochemical and morphologic alteration of the synovial membrane and joint capsule. Pathologic changes in the late stage of OA include softening, ulceration and focal disintegration of the articular cartilage, synovial inflammation also can occur (Kornat et al., 2006).

Osteoarthritis of the knee is a most common rheumatological disease. This disease characterized by pain, stiffness and decrease range of motion (Mangione et al., 1996). In the elderly people, knee osteoarthritis is a common form of arthritis. It is one of the leading causes of disability and has a formidable societal and public health impact (Guccione et al., 1994). Thirty three percent of person with 63-93 yrs age are affected by osteoarthritis of the knee which often limit the ability to perform normal activities of daily living (Deyle et al., 2000). Different epidemiological studies have shown the prevalence of osteoarthritis of the knee increased with age and age is regarded as one of the main causative factors of osteoarthritis (Bagge et al., 1991).

The main clinical feature of osteoarthritis is pain. Severe aching pain on weight bearing joint due to stress on the synovial membrane and bone surface. Throbbing pain occurs at night due to inflammation. Sometime pain referred distally and sharp stabbing pain comes if there is a loose body within the joint. The pain is caused by microfractures of the subchondral bone and medullary hypertension with bone angina of subchondral bone causes pain at the joint, osteophytes causes stretching of nerve endings in the periosteum as well as ligamentum stretch also causes pain. Inflammation of joint capsule and synovium and its distention causes pain. Due to internal pathology of the joint periarticular muscle spasm occur and which also one of the cause of pain (Aigner and Kim, 2002).

Typical clinical Signs of Osteoarthritis

- Patient over age of 40(often over 60).
- Pain mainly related to movement and weight bearing which is relieved by rest.
- Usually only one or few joint painful.
- Restricted movement due to capsular thickening, blocking by osteophytes.
- Palpable, sometime audible, coarse crepitus (rough articular surface).
- Bony swelling around joint margins.
- Deformity without instability.
- Joint line or periarticular tenderness.
- Muscle weakness and wasting.
- No or only mild sinovitis (effusion, increased warmth).

Many risk factors and their association with knee osteoarthritis have been reported in several cross-sectional and retrospective studies. They have shown that important risk factor include age, obesity, previous knee injury, selected physical activities, the presence of hand osteoarthritis and the family history of the disease.

Obesity is the most important risk factor associated with the incidence of radiographic knee osteoarthritis (RKOA). Obesity is a risk factor for both the development and progression of knee osteoarthritis (Sowers & Karvonen-Gutierrez, 2010).

There is considerable evidence indicating that genetic factors play an important role in the determination of knee osteoarthritis. Twin studies have estimated that up to 65% of the population variance of osteoarthritis is attributed to genetic factors (Spector et al., 1996). Similarly, Obesity or high body mass index (BMI) has a strong genetic basis.

Age is a strong risk factor for knee osteoarthritis. Knee structure are changes with increasing age are increase in cartilage defect severity and prevalence, cartilage thinning and increase in bone size with inconsistent change in cartilage volume (Ding et al., 2005).

A case control study found that increased levels of regular physical activity throughout the life lead to an increased risk of knee osteoarthritis later in life.

Previous knee injury was associated with an increased risk of knee OA. Additionally, the most injury caused through participation in physical activity (Sutton, et al., 2001). Lohmander et al.(2004) reported that patient who had undergo total menisectomy with obesity (BMI \geq 30kg/m²) had greater likelihood of knee osteoarthritis than those with a BMI <25kg/m².

The body mass index (BMI) has been recognized worldwide as an effective method of quantifying obesity by the world health organization. It is a simple and cost effective method of assessment that can be used with great benefit everywhere. It is defined as the weight in kilograms divided by the square of the height in meters (kg/m²). For example, an adult who weight 70kg and whose weight is 1.75m will have a BMI of 22.9.

$$\text{BMI} = 70\text{kg}/(1.75 \text{ m}^2)=70/3.06 = 22.9$$

For adults

- Underweight: BMI < 18.5
- Normal : BMI 18.5-24.9
- Overweight: BMI 25-29.9
- Obesity: BMI 30-39.9
- Extreme obesity: BMI \geq 40

The BMI can be used as a measure to help us understand the possible complication that can occur in different patients. This is especially important for the prevention of complication. Obesity leads to numerous complications that affect virtually every system and organ of the human body.

A survey by Mokdad et al. (2003) reported that individuals classified with extreme obesity (BMI>40) were 7 times more likely than people with normal body weight to be diagnosed with diabetes and 6 times more likely to have hypertension. Knowledge of this of this fact can helps the therapist to focus on preventing complication and ensure better health for the patient.

Kenchaiah et al. (2002) have reported that individuals who are only “slightly” overweight face an increased risk of heart failure, independent of other risk factors

associated with obesity. They also noted that each 1-unit increment of BMI was associated with a 5% increased risk of heart failure in men and a 7% increased risk for women.

Kurth et al. (2002) have demonstrated that obese men faced an increased incidence of stroke compared with men of normal weight. They also reported that each unit increase in BMI was associated with a 6% increase in the incidence of all stroke.

De Michele et al. (2002) identify obesity is an independent risk factor for increased carotid intima-media thickness, that is a marker of coronary artery disease and stroke. Women with highest BMI had an increased incidence in carotid artery thickening compared with women who had lower BMI. They concluded that high value of BMI is significant and independent predictor of carotid wall thickness.

Other recent studies by Sinha et al. (2002) and Singhal et al. (2002) have also highlighted correlation between high BMI levels and an increased risk of venous thromboembolism, long QT syndrome in obese African-American women and arterial stiffness among obese children and adolescents. These findings make us realize the importance of BMI in identifying patients who are at risk for various complications arising out of obesity.

Obesity has been established as a major risk factor for diabetes, cardiovascular diseases, musculoskeletal condition such as osteoarthritis (OA) and low back pain which are associated with restricted mobility, physical impairments and disability. Obesity increases the risk of disability among people with and without self-reported arthritis (Anandacoomarasamy et al., 2008).

A large number of studies support a cross-sectional link between obesity and knee OA. How obesity causes knee osteoarthritis has been the subject of considerable debate. Two major theories have been proposed to explain this association. They are biomechanical mechanism and metabolic or systemic mechanism.

The knee joint is exposed to high compressive and shear forces during weight bearing. Compressive loads can exceed three times body weight during walking and six times

body weight during stair climbing in healthy-weight individuals (Schipplein & Andriacchi, 1991). As body weight increases, same time the loads also increase. This loading occurs disproportionately across the medial compartment of the tibial plateau (Hurwitz et al., 1998). A varus knee alignment is a mediating factor that may predispose a person to medial compartment knee OA (Sharma et al., 2010). In obese knee OA individuals, added body weight supported by the skeletal system lead to a varus knee alignment and BMI is correlated with the severity of the malalignment (Gibson et al., 2010).

Up to 76% of obese individuals have an existing varus alignment at knee OA onset or will develop a varus alignment with disease progression (Felson et al., 2004). Moreover, obesity will exacerbate disease progression significantly faster in knee OA patients with varus alignments versus valgus alignments (Sharma et al., 2010), because valgus aligned knees experience less disease progression (Gibson et al., 2010).

Muscles and muscle forces play a large role in the distribution of loads across the joint (Sowers & Karvonen-Gutierrez, 2010). Obesity may result in quadriceps weakness relative to body mass which presents a potential mechanism. Obese individuals exhibit lower levels of limb strength and power measures than non-obese individuals, per unit of body weight. The quadriceps muscle has a major shock absorbing role in knee and if weakened, may result in increased stress on the articular cartilage leading to progressive degeneration of the joint (Segalet et al., 2011).

Besides the biomechanical effect there also seems to be a systemic metabolic effect of obesity that influences the onset or progression of osteoarthritis. The metabolic theory proposes that some metabolic factors are correlated with obesity adversely affect cartilage and other joint structure, suggesting that obesity acts indirectly to increase risk of osteoarthritis of the knee. Leptin, a small polypeptide that regulates food intake and energy expenditure at the hypothalamic level, may provide the metabolic link between obesity and osteoarthritis. Plasma level of leptin strongly associated with fat mass and level fall after weight loss (Friedman & Halaas, 1998). As obesity and osteoarthritis are both associated with genetic predispositions, these two dispositions may be linked. However, Manek et al. (2003) could not detect a shared genetic pathway between BMI and knee osteoarthritis.

There is available evidence suggesting a likely relationship between increased BMI and a variety of pain conditions, the question remains as to why and how these relationships emerge. Mechanisms by which this link is hypothesized to develop generally include mechanical, structural, metabolic, and behavioral changes. Most likely, a combination of factors is responsible for the relationship and these factors may contribute differently depending on the particular disorder. In terms of mechanical-structural factors, several researchers have noted that obesity results in serious postural changes that affect loading on individual joints, and thus increased weight may result in long-term adverse effects on bones and joints . Other hypothesized mechanical-structural hypotheses include increased loading, joint misalignment (Felson et al., 2004), structural changes (Ding et al.,2005), and decreased ambulation and conditioning (Yamakawa et al., 2004) that result from overweight/obesity.

Metabolic factors have also been suggested as a possible link between overweight/obesity and pain disorders. Overweight/obese individuals have an increased risk of various metabolic disorders, thus they have increased vulnerability to the neuropathic disorders associated with conditions such as diabetes (Lean, 2000).

A large number of articles suggest overweight/obesity is a risk factor for development of certain pain conditions, equally possible is that pain could be a risk factor for weight gain. For example, individuals who experience ongoing pain may reduce their activity levels and, as a result, experience weight gain and eventual deconditioning, which may have the unwanted result of actually increasing pain. Specific lifestyle and psychosocial factors such as diet, activity level, health status, and smoking status may all provide shared pathways through which both obesity and pain develop. However, any one of these factors alone is likely not a sufficient explanation for the relationships found between overweight/obesity and pain disorders. In some conditions, such as knee OA, mechanical-structural factors are more likely to play a larger role in understanding the cause-effect relationship between BMI and disease than other factors (such as metabolic and inflammatory effects of adiposity) because the effect of these on OA development in obese individuals is currently less well understood (Powell et al., 2005).

There is limited understanding of how being overweight and/or obese is related to the pain associated with osteoarthritis, especially knee osteoarthritis. As reviewed by Janke et al. (2007), there have been numerous mechanical-structural factors that have been proposed as mechanisms to explain the pain/obesity relationship. These include increased loading, joint misalignment or changes in bone and joint structures (Felson et al., 2004).

Weight loss is a logical step in treatment for obese knee OA patients. Weight loss has been shown to result in clinically significant pain reduction and function improvement. A systematic review and meta-analysis found that weight reduction significantly improved disability in obese knee osteoarthritis patients and also showed clinical efficacy on pain reduction (Christensen et al., 2007). More recently a study showed that for every 1 kg of weight loss, the peak knee load was diminished by 2.2 kg at a given walking speed, providing evidence to suggest that weight loss could be therapeutic for osteoarthritis patients in terms of reducing mechanical stress on the knee. The Ottawa Panel found that physical activity and diet together was more beneficial than either physical activity or diet alone (Brosseau et al., 2011). Another study showed that massive weight loss helps to decrease pain and improve function in obese patient with knee osteoarthritis (Richette et al., 2010).

Treatment of knee arthritis should begin with the most basic steps and progress to the more involved, possibly including surgery. Not all treatments are appropriate for every patient, and he/she should have a discussion with doctor to determine which treatments are appropriate for him/her. Some treatment options are like weight Loss which is probably one of the most important, yet least commonly performed treatments. The less weight the joint has to carry, the less painful activities will be. Activity Modification which limiting certain activities may be necessary, and learning new exercise methods may be helpful; Walking Aids that is use of a cane or a single crutch is the hand opposite the affected knee will help decrease the demand placed on the arthritic joint; Physical Therapy like strengthening of the muscles around the knee joint may help decrease the burden on the knee. Preventing atrophy of the muscles is an important part of maintaining functional use of the knee. Some anti-Inflammatory Medications these are anti-inflammatory pain medications

(NSAIDs) are prescription and nonprescription drugs that help treat pain and inflammation; Cortisone Injections may help to decrease inflammation and reduce pain within a joint; Synvisc may be effective against pain in some patients with knee arthritis and may delay the need for knee replacement surgery; Joint Supplements (Glucosamine) mainly Glucosamine appears to be safe and might be effective for treatment of knee arthritis, but research into these supplements has been limited; Knee Arthroscopy exactly how effective knee arthroscopy is for treatment of arthritis is debatable. For some specific symptoms, it may be helpful then knee Osteotomy-while most patients are not good candidates for this alternative to knee replacement, it can be effective for young patients with limited arthritis; Total Knee Replacement Surgery and by this procedure, the cartilage is removed and a metal & plastic implant is placed in the knee and lastly artial Knee Replacement Surgery is also called a unicompartmental knee replacement; this is replacement of one part of the knee. It is a surgical option for the treatment of limited knee arthritis (Cluett, 2011).

3.1 Study design

The purpose of the study was to find out the characteristics of bilateral knee osteoarthritis. Cross sectional study was selected for conduct the study. A cross sectional study is a descriptive study in which disease and exposure status is measured simultaneously in a given population. The most important advantage of cross-sectional studies is that in general they are quick and cheap (Bailey, 1997).

3.2 Study site

Musculoskeletal unit of the Centre for the Rehabilitation of the Paralysed (CRP) – Savar was selected as the study site.

3.3 Study area

The study conducted on musculoskeletal area.

3.4 Study population and sample population

All patients with knee osteoarthritis in Bangladesh were the target population and sample population were those who came to CRP to receive treatment.

3.4.1 Sampling procedure

The study was conducted by using the convenience sampling methods because it is the easiest, cheapest and quicker method of sample selection. It was be easy to get those subjects according to the criteria concerned with the study purpose through the convenience sampling procedure.

3.4.2 Inclusion criteria

- Patients with knee osteoarthritis who were attending in CRP for treatment.
- Bilateral Knee osteoarthritis that was confirmed or diagnosed by x-ray or MRI.
- All male and female were same priorities.

3.4.3 Exclusion criteria

- Patients with knee osteoarthritis and other serious associated diseases.
- Unilateral knee osteoarthritis.
- Subject who were unconscious, cognitive problem.

3.5 Sample size

The equation of sample size calculation are given below-

$$n = \left\{ \frac{Z(1 - \frac{\alpha}{2})}{d} \right\}^2 \times pq$$

Here,

$$Z(1 - \frac{\alpha}{2}) = 1.96$$

P= 0.25 (Here P=Prevalence and P=25%)

q= 1-p

$$= 1 - 0.25$$

= 0.75

d= 0.05

According to this equation the sample should be more than 288 people but due to lack of opportunity the study was conducted with 36 patients attending at physiotherapy department selected randomly.

3.6. Data collection methods and tools

The participant had the right to refuse to answer of any question during completing questionnaire. They could withdraw from the study at any time. Participants were ensured that any personal information would not be published anywhere and permission took from each participant by using a written consent form. After getting consent from the participants, a questionnaire was used to identify the characteristics of bilateral knee osteoarthritis.

Data were collected by direct interview using the questionnaire. The questions were divided into three sections which almost covered all issues including age, sex, occupation, marital status, educational level, residential area, height, weight, past history of knee injury, history of surgery, severity of knee pain and BMI. Beside this

weight machine, height tap, scale, calculator, pen, mobile etc.would be used as the materials of data collection.Height was measured in centimeters in standing position using a height tap, with shoes and socks removed, using a wall-mounted height tap and assured that subject's legs were straight, arms and shoulders were relaxed.

Weight was measured in kilograms using an analog weight measurement machine with the light indoor clothes, with shoes removed and emptied pockets. Before measuring weight the scale was set at zero reading. Then subject was instructed for step on the scale platform, with both feet on the platform and with arm hanging naturally at side. Then the weight value recorded immediately. Each measured was performed twice. After collecting the height and weight, BMI (body mass index) was calculated as weight in kilograms divided by height in meters squared

3.7 Data management and analysis

Data was analyzed with the software named Statistical Package for Social Sciences (SPSS) Version 16.0. Data were numerically coded and captured in Microsoft Excel, using an SPSS 16.0 version software program. Microsoft Office Excel 2007 was used to decorate the bar graph charts.

3.8 Rigor

This study was conducted in systematic way. All the steps of research were followed sequentially. During data collection avoided influencing the whole process by own perspectives, values and biases and never influenced the participants by own perceptions during data collection. A trustful relationship with participants was always maintained and the documents were kept confidential. Biasness had been avoided during data analysis and data was analyzed by the scientific way of SPSS.

3.9 Ethical considerations

A research proposal was submitted to the physiotherapy department of BHPI for approval and the proposal was approved by the faculty members and gave permission initially from the supervisor of the research project and from the course coordinator before conducting the study. The necessary information has been approved by the ethical committee of CRP and was permitted to do this research. Also the necessary

permission was taken from the in-charge of the rehabilitation division of CRP. The participants were explained about the purpose and goal of the study before collecting data from the participants. Pseudonyms were used in the notes, transcripts and throughout the study. It was ensured to the participants that the entire field notes, transcripts and all the necessary information was kept in a locker to maintain confidentiality and all information was destroyed after completion of the study. The participants were also assured that their comments will not affect them about any bad thing.

3.10 Limitations

There were a number of limitations and barriers in this research project which had affected the accuracy of the study, these are as follow:

- First of all, time of the study was very short which had a great deal of impact on the study. If enough time was available knowledge on the thesis could be extended.
- The samples were collected only from the CRP musculoskeletal unit and the sample size was too small, so the result of the study could not be generalized to the whole population of Bangladesh. `
- This study has provided for the first time data on the characteristics of bilateral knee osteoarthritis. No research has been done before on this topic. So there was little evidence to support the result of this project in the context in Bangladesh.
- A convenience sampling was used that was not reflecting the wider population under study. Prevalence was identified by a questionnaire, and the validity and reliability of this method may be questionable. However, a questionnaire might be the only feasible method of assessing in large populations.
- The research project was done by an undergraduate student and it was first research project for him. So the researcher had limited experience with techniques and strategies in terms of the practical aspects of research. As it was the first survey of the researcher so might be there were some mistakes that overlooked by the supervisor and the honorable teacher.

The study was conducted on 36 participants of knee osteoarthritis. Out of the participant the mean age of the participants was 57.44 (± 10) years. The range is 42 with minimum age 40 years and maximum 84 years. Among the participants the higher number of the participants was at the 50 years and the numbers were 4 (11.1%). The number of ≤ 60 years were 25 (69.04%) and >60 were 11 (30.6%). The most vulnerable age group is 51-60 years (Table-1).

Age group

Age Group	Number	Percentage(%)
40-50 years	11	30.6
51-60 years	14	38.8
61-70 years	8	22.2
71-80 years	2	5.6
81-90 years	1	2.8
Total	36	100

Table-1: Age group of the participants

Gender

Female were predominantly higher than male. Out of 36 participants 19 (52.8%) were female and 17 (47.2%) were male. The study showed that female participants were more vulnerable than male participants.

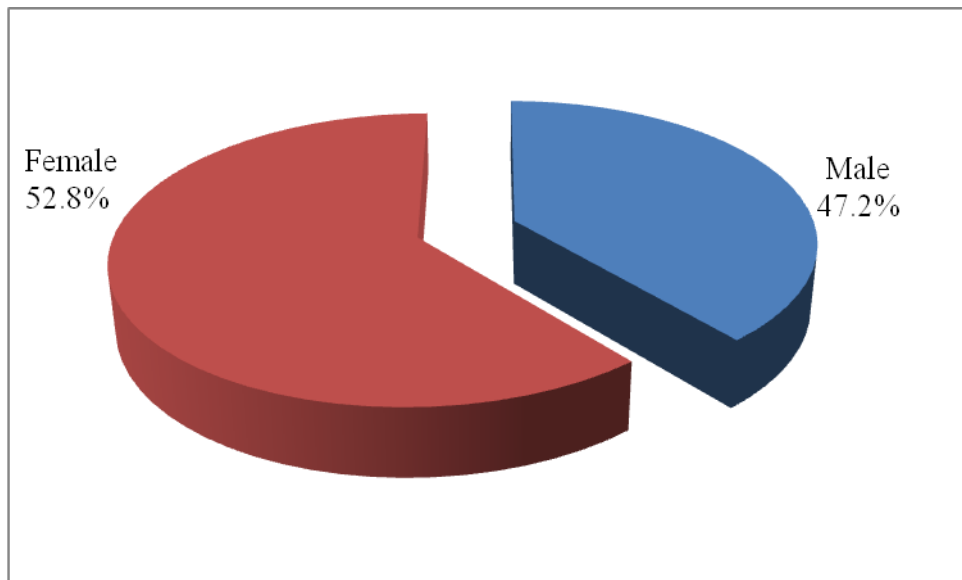


Figure - 1: Gender of the participants

Educational Status

Among the 36 participants, 5 (13.9%) participants had no formal schooling, 18 (50%) participants completed primary education, 8 (22.2%) participants completed SSC, 2 (5.6%) participants completed HSC, 2 (5.6%) participants completed Masters Degree and 1 (2.8%) participant others completed (Figure-2).

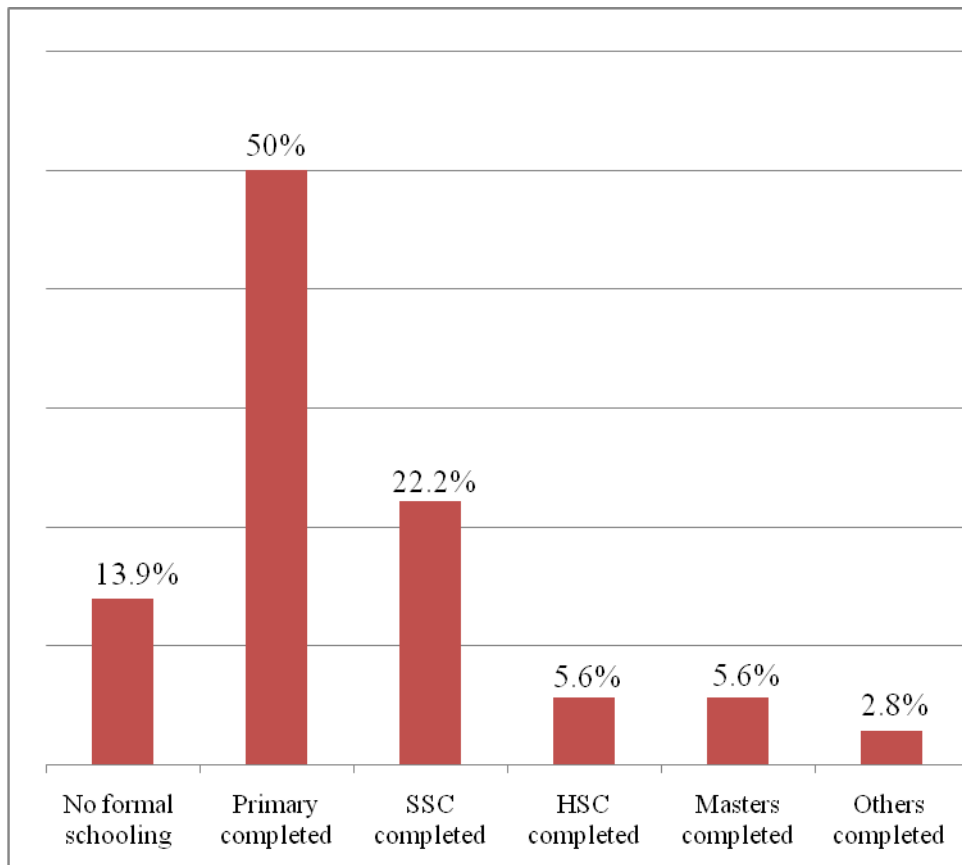


Figure -2: Educational Status of the participants

Living area

In this study greater number of participants 30(83.3%) lived in rural area than urban area 6 (16.7%) as shown in Figure-3.

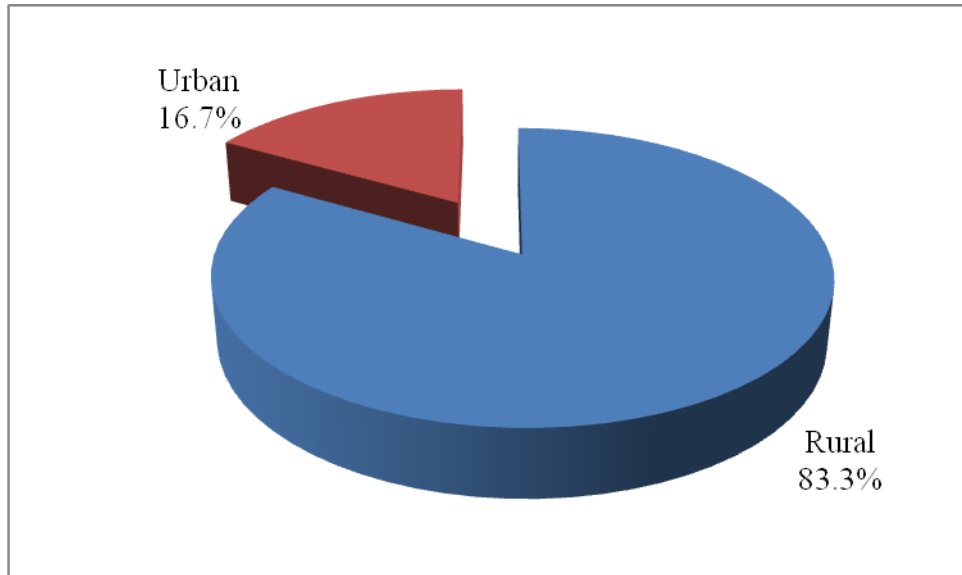


Figure-3: Living area of the participants

BMI

Among the 36 participants, 6 (16.7%) participant were normal weight, 18 (50%) participant were overweight and 12 (33.3%) participant were obese.

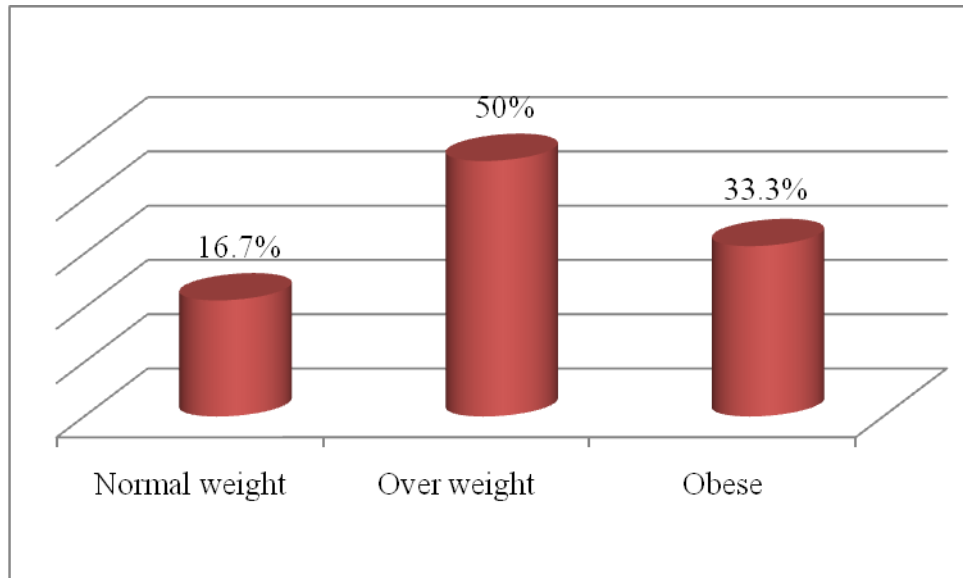


Figure-4: BMI distribution across 36 cases with knee OA showing high percentage of cases that is overweight or obese

Gender of the participant and Level of BMI Cross tabulation

In study it was found that among the 36 participants 50% (n=18) participants were overweight and 33.3% (n=12) were obese. Among overweight participants, 38.9% (7) were female and 61.1% (11) were male. Among obese persons 83.3% (10) were female and 16.7% (2) were male.

		Level of BMI			Total
		Normal weight	Over weight	Obese	
Gender	Female	2	7	10	19
	Male	4	11	2	17
Total		6	18	12	36

Table-2: Gender of the participant and Level of BMI Cross tabulation

Prevalence of obesity by age and sex

Prevalence of obesity was 33.3%, with 66.7% were ≥ 50 Years old and 33.3% were < 50 Years old, 83.3% of whom were females and 16.7% were males. Prevalence of obesity by age and sex was presented on Table-3.

	Number	Percentage (%)
Age		
<50 Years	4	33.3%
≥ 50 Years	8	66.7%
Sex		
Male	2	16.7%
Female	10	83.3%

Table-3: Prevalence of obesity by age and sex.

History of trauma

Among the 36 participants, 80.6% (n=29) participants had no history of trauma and 19.4% (n=7) participants had history of trauma in knee joint.

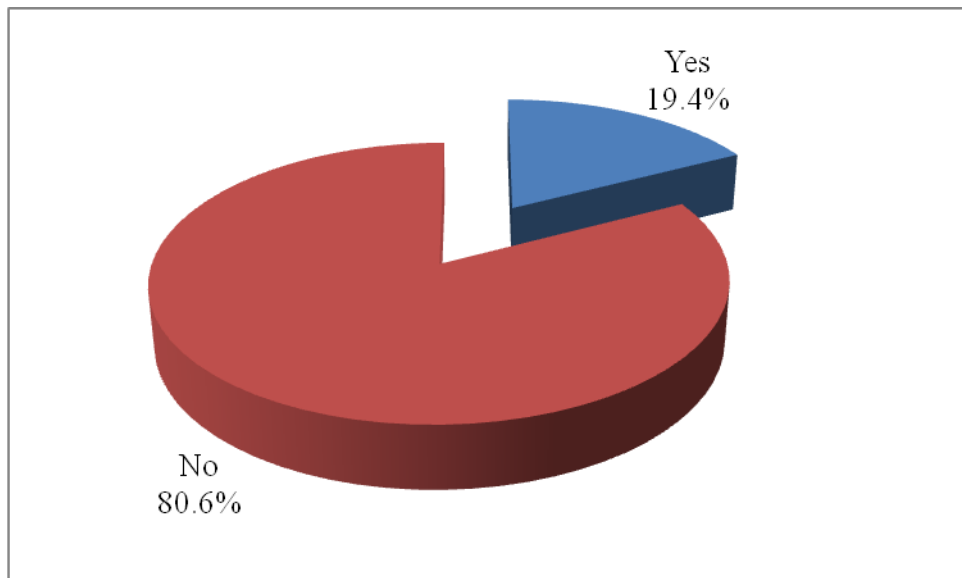


Figure-5: History of trauma in knee joint

History of surgery at knee joint

Result showed that among 36 participant, 97.2% (n=35) participants had no history of surgery and 2.8% (1) participant had history of surgery at knee joint.

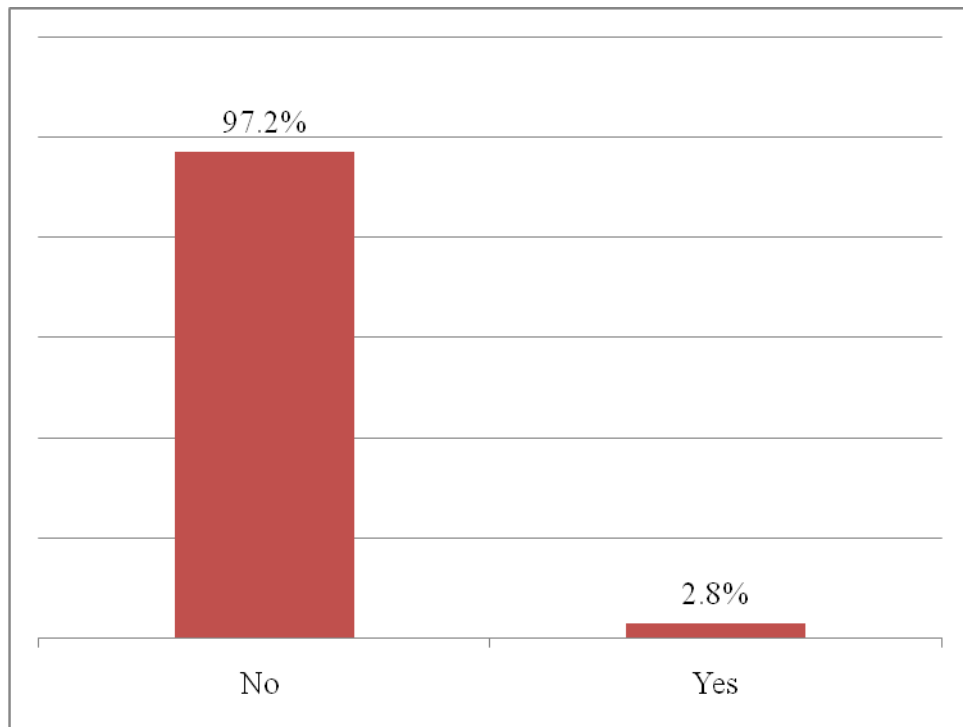


Figure-6: History of surgery at knee joint

Severity of pain on NPR scale

The severity of pain in NPR scale was in between 1-4 (mild pain) was 11.1% (n=4), 5-7 (moderate pain) was 52.8% (n=19) and 8-10 (severe pain) was 36.1% (n=13).

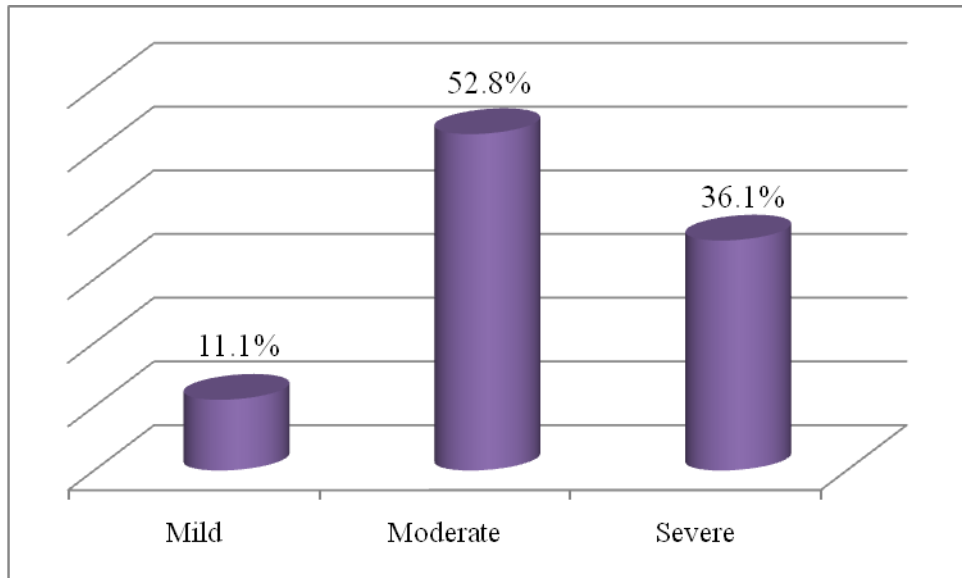


Figure-7: Severity of pain in NPR scale

Body weight categories and pain score

Table 3 shows that those with higher BMI reported more pain than those with lower BMI. Average pain score was 6.25 among the obese patients and among the overweight patients was 5.84.

Category of body weight	Average pain score in NPRscale
Normal weight	6.16
Overweight	5.84
Obese	6.25

Table-4: Body weight categories and pain score

The study found that among 36 knee OA patients, 50% (BMI 25-29.9 kg/m²) were overweight which is under risk of being obese and 33.3% (BMI \geq 30 kg/m²) were obese. At this level, obesity prevalence in musculoskeletal department at CRP was higher than that in France (7%), United Kingdom (9%) and United States (20.9%) (Laurier et al., 1992). Hedley et al. (2004) in the National Health Assessment and Nutrition Examination Survey for 1999 through 2002 found that about 65% of American adults were overweight or obese: 30% were overweight and 35% were obese. The huge difference of the prevalence of overweight with America because it was overall prevalence of overweight among Americans compared with the results of this study which covered the small area of Bangladesh. On the other hand, the prevalence of obesity rate is nearly similar to this study.

This study showed that about 66.7% obese who were equal or greater than fifty years old and 33.3% obese who were less than fifty years old. It indicates that prevalence of obesity increase with age. A study found that for males, the prevalence of obesity increased with age and peak at age 40-49 years and for the females, the prevalence of obesity also increase with age but peak at 50-59 years (Rao & Scott, 1984). Another study was done in 14 provinces in China in population of age 35-85 shows the highest total prevalence of obesity 13.94% (Chen et al., 2005). So Obesity prevalence rates were also higher in adults with the age. This may be due to increased sedentary lifestyle with age accompanied by a change in body composition leading to higher lean body mass proportion.

The results also showed that the prevalence of obesity was higher in females 83.3% as compared to 16.7% in males. Ministry of Health Malaysia (1996) also showed that the prevalence of obesity was significantly higher in females 13.8% as compared to 9.6% in males. Similar result estimated in Pakistan where 18.8% male and 25.5% female. Another study of Health survey for England 2006 found that 23.7% men and 24.2% women were obese (BMI \geq 30) (WHO, 2005).

There are a number of cross-sectional studies demonstrating increasing frequency of severe pain with increasing BMI. This study also showed that those with higher BMI reported more pain than those with lower BMI. Average pain score in obese patients was higher than overweight patients. Mark (2007) also found that higher body mass index was associated with more pain. Anderson et al. (2003) reported that a significant relationship between knee pain and BMI. This study also found BMIs and knee pain were related, such that having a higher body mass was associated with more pain. In a British population-based study of individuals over the age of 50 without knee pain, those who were obese were nearly three times more likely than those of normal weight to develop severe knee pain in a subsequent 3-year period (Jinks et al., 2006).

In this study 19.4% patients have past history of trauma at knee joint and on the other hand A study about Joint injury in young adult and risk for subsequent knee and hip OA by Allan C. Gelber, Marc C. Hochberg, Lucy A. Mead, Nae-Yuh Wang, Fredrick M. Wigley, and Michael J. Klag. In their study, Over a median follow-up of 36 years, 141 participants reported joint injuries (knee alone [n = 111], hip alone [n = 16], or knee and hip [n = 14]) and 96 developed osteoarthritis (knee alone [n = 64], hip alone [n = 27], or knee and hip [n = 5]). The cumulative incidence of knee osteoarthritis by 65 years of age was 13.9% in participants who had a knee injury during adolescence and young adulthood and 6.0% in those who did not (P = 0.0045) (relative risk, 2.95 [95% CI, 1.35 to 6.45]) (Gelber et al., 2000).

The severity of pain among the participants was 11.1% patient's pain was mild, 52.8% patient's pain was moderate and 36.1% patient's pain was severe in NPR scale. A study about Incidence of musculoskeletal pain and rheumatic disorders in a Bangladeshi rural community by Syed Atiqul Haque, John Darmawan and Md. Nazrul Islam shows that among 440 participants 32 (7.3%) were suffering from mild pain, 232 (52.6%) were suffering from moderate pain and 176 (40.1%) were suffering from severe pain (Haque et al., 2008).

CHAPTER-VI: CONCLUSION AND RECOMENDATIONS

6.1 Conclusion

From the study it can be concluded that the most vulnerable age range is 51 to 60 for knee OA. Body weight, past histories of trauma, residential area, educational statuses are the aggravating factors to develop knee OA. There is a relation between high body mass index and knee osteoarthritis. Obesity is a major risk factor for OA, but it is a modifiable risk factor. The result shows that almost 80% of the bilateral knee osteoarthritis patients were overweight and obese. And those with higher BMI reported more pain than those with lower BMI. Weight gain increases the load on the knee, causing joint pain and the avoidance of daily activities. So, weight loss is associated with decreased pain. Clearly we need programs aimed at decreasing obesity and overweight that helps to prevent knee osteoarthritis and also helps to reduce pain in knee OA patients. Government and also authorities of CRP need to plan about the awareness program in different area of our country as well as in CRP for preventing the obesity and controlling the musculoskeletal disorder.

6.2 Recommendations

Like other countries, knee osteoarthritis patients are likely to be an upcoming burden for Bangladesh. For this reason, it is important to develop research based evidence of physiotherapy practice in this area. Physiotherapist's practice which is evidence based in all aspect of health care. There are few studies on musculoskeletal area in the knee region. These cannot cover all aspect of the vast area. So, it is recommended that the next generation of physiotherapy members continue study regarding this area, this may involve-use of large sample size and participants form different districts of Bangladesh. Conduct research on other musculoskeletal problems on knee area where physiotherapist can work. So it is very important to conduct such type research in this area.

REFERENCES

- Al-Arfaj, A.S., (2002). Radiographic osteoarthritis and obesity. *Saudi Medical journal*, 23:938–42.
- Anandacoomarasamy, A., Caterson, I., Sambrook, P., Fransen, M., and March, L., (2008). The impact of obesity on the musculoskeletal system. *International journal of obesity*, 32:211-222.
- Andersen, R.E., Crespo, C.J., Bartlett, S.J., Bathon, J.M., and Fontaine., K.R., (2003). Relationship between Body Weight Gain and Significant Knee, Hip, and Back Pain in Older Americans. *Obesity research*, 11(10):1159-1162.
- Bagge, E, A., Eden, S., and Svanborg, A., (1991). Osteoarthritis in the elderly: clinical and radiological findings in 79 and 85 year olds. *Annals of the Rheumatic Diseases*, 50: 535-539.
- Bailey, D.M., (1997). *Research for the health professional- A practical guide*, 2nd ed., F.A. Davis Company: Philadelphia.
- Brosseau, L., Wells, G.A., Tugwell, P., Egan, M., Dubouloz, C., Casimiro, L., Bugnariu, N., Welch, V.A., Angelis, G.D., Francoeur, L., Milne, S., Loew, L., McEwan, J., Messier, S.P., Doucet, E., Kenny, G.P., Prud'homme, D., Lineker, S., Bell, M., Poitras, S.P., Li, J.X., Finestone, H.M., Laferrière, L., Haines-Wangda, A., Russell-Doreleyers, M., Lambert, K., Marshall, A.D., Cartizzone, M., and Teav, A., (2011). Ottawa panel evidence-based clinical practice guidelines for the management of osteoarthritis in adults who are obese or overweight. *Physical Therapy*, 91(6):843–861.
- Chen, J., Zhao, X.L., Wu, F., Cui, Y.L., and Hu, D.Y., (2005). Epidemiology of obesity and overweight and relation there to the prevalence of hypertension in 14 provinces/municipality in China. *Asia Pacific Journal of Clinical Nutrition*, 85(40):2830-4.
- Christensen, R., Bartels, E.M., Astrup, A., and Bliddal, H., (2007). Effect of weight reduction in obese patients diagnosed with knee osteoarthritis: a systematic review and meta-analysis. *Annals of the Rheumatic Diseases*, 66: 433–439.
- Cluett, J., (2011). *Knee Arthritis: Information about knee arthritis and available treatments*, Available: <http://orthopedics.about.com/cs/generalinfo1/a/knee_arthritis.htm> [accessed on 2 June 2013]

- Dawson, J., Juszczak, E., Thorogood, M., Marks, S-A., Dodd, C., and Fitzpatrick, R., (2003). An investigation of risk factors for symptomatic osteoarthritis of the knee in women using a life course approach. *Journal of epidemiol community health*, 57:823-830.
- De Michele, M., Panico, S., Iannuzzi, A., Celentano, E., Ciardullo, A.V., Galasso, R., Sacchetti, L., Zarrilli, F., Bond, M.G., and Rubba, P., (2002). Association of obesity and central fat distribution with carotid artery wall thickening in middle-aged women. *Stroke*, 33:2923-2928.
- Deyle, G., Henderson, N., Matekel, R., Ruder, M., Garber, M., and Allison, S., (2000). Effectiveness of Manual Therapy and Exercise in Osteoarthritis of the Knee. *Annals Internal Med*, 132(3):173-181.
- Ding, C., Cicuttini, F., Blizzard, L., Jones, G., (2005). Genetic mechanisms of knee osteoarthritis: A population-based longitudinal study. *Arthritis Research & Therapy*, doi: 10.1186/ar1835.
- Ding, C., Cicuttini, F., Scott, F., Cooley, H., and Jones, G., (2005) Knee Structural Alteration and BMI: A Cross-sectional Study. *Obesity research*, 13(2):350-361.
- Ding, C., Cicuttini, F., Scott, F., Cooley, H., and Jones, G., (2005). Association between age and knee structural change: a cross sectional MRI based study. *British medical journal*, 64:549–555.
- Felson, D.T., Goggins, J., Niu, J., Zhang, Y., and Hunter, D.J., (2004). The effect of body weight on progression of knee osteoarthritis is dependent on alignment. *Arthritis & rheumatism*, 50(12): 3904-3909.
- Felson, T.D., (2009). Developments in the clinical understanding of osteoarthritis. *Arthritis research and therapy*, 11:203.
- Foley, A., Halbert, J., Hewitt, T., and Crotty M., (2003). Does hydrotherapy improve strength and physical function in patients with osteoarthritis—a randomised controlled trial comparing a gym based and hydrotherapy based strengthening programme. *British medical journal*, 62:1162-1167.
- Friedman, J, M., and Halaas, J.L., (1998). Leptin and the regulation of body weight in mammals. *Nature*, 395: 763-770.
- Gelber, A.C., Hochberg, M.C., Mead, L.A., Wang, N., Wigley, F.M., and Klag, M.J., (1998). Joint injury in young Adults and Risk for Subsequent Knee and Hip

Osteoarthritis, Available: <<http://www.annals.orgg/content/133/5/321.full.pdf+html>> [accessed on 2 June 2013]

- Gibson, K., Sayers, S.P., and Minor, M.A., (2010). Measurement of varus/valgus alignment in obese individuals with knee osteoarthritis. *Arthritis Care & Research*, 62 (5): 690-696.
- Guccione, A. A., David T. Felson, D.T., Anderson, J.J., Anthony, J.M., Zhang, Y., Wilson, P.W.F., Kelly-Hayes, M., Wolf, P.A., Kreger, B. E., and Kannel, W.B., (1994). The Effects of Specific Medical Conditions on the Functional Limitations of Elders in the Framingham Study. *American journal of public health*, 84(3):351-358.
- Haq, S.A., Davatchi, F., Dahaghin, S., Islam, N., (2010). Development of a questionnaire for identification of the risk factor for osteoarthritis of the knee in developing countries: A pilot study in Iran and Bangladesh. *International journal of rheumatic diseases*, 13: 203-214.
- Haque, S.A., Darmawan, J., Islam, N., (2008). Incidence of musculoskeletal pain and rheumatic disorders in a Bangladeshi rural community: a who-aplar-copcord study, Available: <<http://www.onlinelibrary.wiley.com>> [accessed on 23 June 2013]
- Hart, D.J., Spector, T.D., (1993). The relationship of obesity, fat distribution and osteoarthritis in women in the general population: the Chingford Study. *Journal of Rheumatology*, 20:331-335.
- Hedley, A.A., Ogden, C.L., Johnson, C.L., Carroll, M.D, Curtin, L.R., and Flegal, K.M., (2004) Prevalence of overweight and obesity among US children, adolescents, and adults, 1999–2002. *Journal of America Medical Association*, 291:2847–2850.
- Hochberg, M.C., (2007). Quality measures in osteoarthritis. *Clinical and experimental rheumatology*, 25(47):102-106.
- Holmberg, S., Thelin, A., and Thelin, N., (2005). Knee osteoarthritis and body mass index: a population based case-control study. *Scandinavian Journal of Rheumatology*, 34:59–64.
- Hurwitz, D.E., Sumner, D.R., Andriacchi, T.P., and Sugar, D.A., (1998). Dynamic knee loads during gait predict proximal tibial bone distribution. *Journal of Biomechanics*, 31:423-430.

- Janke, E.A., Collins, A., Kozak, A.T., (2007). Overview of the relationships between pain and obesity: what do we know? Where do we go next? *Journal of Rehabilitation Research & Development*, 44:245–262.
- Jinks, c., Jordan, k., and Croft. P., (2006). Disabling knee pain – another consequence of obesity: Results from a prospective cohort study. *BioMed Central*, doi: 10.1186/1471-2458-6-258.
- Kenchaiah, S., Evans, J.C., Levy, D., Wilson, P.W.F., Benjamin, E.J., Larson, M.G., Kannel, W.B., and Vasan, R.S., (2002). Obesity and the risk of heart failure. *The New England journal of medicine*, 347(5):305-313.
- Kornaat, P.R., Bloem, J.L., Ceulemans, R.Y.T., Riyazi, N., Rosendaal, F.R., Nelissen, R.G., Carter, W.O., Graverand, M.P.H.L., and Kloppenburg, M., (2006). Osteoarthritis of the Knee: Association between Clinical Features and MR Imaging Findings. *Radiology*, 239(3):811-817.
- Kurth, T., Gaziano, J.M., Berger, K., Kase, C.S., Rexrode, K.M., Cook, N.R., Buring, J.E., and Manson, J.E., (2002). Body mass index and the risk of stroke in men. *Archives of Internal Medicine*, 162:2557-2562.
- Laurier, D., Guiquet, M., and Chau, N.P., (1992). Prevalence of obesity. A comparative study in France, the United Kingdom and the United States. *International Journal of Obesity Related Metabolic Disorder*, 16(8):565-72.
- Lean, M.E., (2000). Pathophysiology of obesity. *Proceedings of the Nutrition Society*, 59(3):331–36.
- Lohmander, L.S., Stenberg, A.O., Englund, M., and Roos, H., (2004). High Prevalence of Knee Osteoarthritis, Pain, and Functional Limitations in Female Soccer Players Twelve Years after Anterior Cruciate Ligament Injury. *Arthritis and Rheumatism*, 50 (10):3145-3152.
- Manek, N.J., Hart, D., Spector, T.D., and MacGregor, A.J., (2003). The Association of Body Mass Index and Osteoarthritis of the Knee Joint. *Arthritis and Rheumatism*, 48(4):1024-1029.
- Mangione, K.K., Axen, K., and Hass, F., (1996). Mechanical Unweighting Effects on Treadmill Exercise and Pain in elderly People with Osteoarthritis of the Knee. *Physical Therapy*, 76(4):387-393.
- Marks, R., (2007). Obesity Profiles with Knee Osteoarthritis: Correlation with Pain, Disability, Disease Progression. *Obesity*, 15(7):1867-1874.

- Ministry of Health Malaysia (MOH), (1996). Report of the Second National Health and Morbidity Survey in Kuala Lumpur. *Asia Pacific Journal of Clinical Nutrition*, 16 (3):561-566.
- Mokdad, A.H., Ford, E.S., Bowman, B.A., Dietz, W.H., Vinicor, F., Bales, V.S., and Marks, J.S., (2003). Prevalence of obesity, diabetes, and obesity-related health risk factors, 2001. *Journal of the American Medical Association* 289:76-79.
- Niu, j., Zhang, Y. Q., Torner, J., Nevitt, M., Lewis, C. E., Aliabadi, P., Sack, B., Clancy, M., Sharma, L., and Felson, D. T., (2009). Is Obesity a Risk Factor for Progressive Radiographic Knee Osteoarthritis? *American College of Rheumatology*, 61(3):329-335.
- Powell, A., Teichtahl, A.J., Wluka, A.E., Cicuttini, F.M., (2005). Obesity: A preventable risk factor for large joint osteoarthritis which may act through biomechanical factors. *British Journal of Sports Medicine*, 39(1):4–5.
- Rao, J.N.K., and Scott, A.J., (1984). On Chi-squared tests for multiway contingency tables with cell proportions estimated from survey data. *Annals of Statistics*, 12:46-60.
- Raynauld, J.P., Pelletier, J.M., Berthiaume, M.J., Beaudoin, G., Denis Choquette, D., Haraoui, B., Tannenbaum, H., Meyer, J.M., Beary, J.F., Cline, G.A., and Pelletier, J.P., (2005). Long term evaluation of disease progression through the quantitative magnetic resonance imaging of symptomatic knee osteoarthritis patients: correlation with clinical symptoms and radiographic changes. *Arthritis research and therapy*, 8:21.
- Richette, P., Poitou, C., Garnero, P., Vicaut, E., Bouillot, J., Lacorte, J., Basdevant, A., Clément, K., Bardin, T., and Chevalier, X., (2010). Benefits of massive weight loss on symptoms, systemic inflammation and cartilage turnover in obese patients with knee osteoarthritis. *Annals of the Rheumatic Diseases*, 70: 139-144.
- Schipplein, O.D., and Andriacchi, T.P., (1991). Interaction between active and passive knee stabilizers. *Journal of Orthopaedic Research*, 9:113-119.
- Sharma, L., Song, J., Dunlop, D., Felson, D., Lewis, C.E., Segal, N., Torner, J., Cooke, T.D.V., Hietpas, J., Lynch, J., and Nevitt, M., (2010). Varus and valgus alignment and incident and progressive knee osteoarthritis. *Annals of the Rheumatic Diseases*, 69: 1940–1945.

- Singhal, A., Farooqi, I.S., Cole, T.J., O’Rahilly, S., Fewtrell, M., Kattenhorn, M., Lucas, A., and Deanfield, J., (2002). Influence of leptin on arterial distensibility: a novel link between obesity and cardiovascular disease? *Circulation*, 106:1919-1924.
- Sinha, R., Fisch, G., Teague, B., Tamborlane, W.V., Bamyas, B., Allen, K., Savoye, M., Rieger, V., Taksali, S., Barbetta, G., Sherwin, R.S., and Caprio, S., (2002). Prevalence of impaired glucose tolerance among children and adolescents with marked obesity. *The New England journal of medicine*, 346(11):802-810.
- Sowers, M.R., Karvonen-Gutierrez, C.A., (2010). The evolving role of obesity in knee osteoarthritis. *Curr Opin Rheumatol*, 22(5): 533–537.
- Spector, T.D., Cicuttini, F., Baker, J., Loughlin, J., and Hart, D., (1996). Genetic influences on osteoarthritis in women: a twin study. *British Medical Journal*, 312:940-4.
- Sutton, A.J., Muir, K.R., Mockett, S., and Fentem, P., (2001). A case-control study to investigate the relation between low and moderate levels of physical activity and osteoarthritis of the knee using data collected as part of the Allied Dunbar National Fitness Survey. *Annals of the Rheumatic Diseases*, 60:756–764.
- WHO (World Health Organization), (2004). Appropriate body-mass index for Asian populations and its implications for policy and intervention strategies, *The Lancet*, 363:157–63.
- Yamakawa, K., Tsai, C.K., Haig, A.J., Miner, J.A., Harris, M.J., (2004). Relationship between ambulation and obesity in older persons with and without low back pain. *International Journal of Obesity*, 28(1):137–43.

APPENDIX

Permission Letter

Date: 01-04-2013

To

The Head of the Department,

Physiotherapy Department,

Center for the Rehabilitation of the Paralyzed (CRP)

Savar, Dhaka-1343

Subject: Permission to collect data to conduct a research study.

Sir,

I respectfully to state that I am a student of 4th year B.Sc in physiotherapy at Bangladesh Health Professions Institute(B.H.P.I). In 4th year we have to do a research project and I have chosen a title that is "Influence of BMI among the person with knee osteoarthritis" and my supervisor is Mohammad Alamgir Chowdhury, Assistant professor, department of Physiotherapy. I would like to collect data at physiotherapy department of CRP in Saver. Data will be collected within 8.00 a.m. to 5.00 p.m.

I therefore pray and hope that you would be kind enough to give me permission to do this study successfully in your department.

Yours faithfully

Chinmoy Barua

Chinmoy Barua

Bachelor of Science in Physiotherapy (B.Sc PT)

CRP, Savar, Dhaka

Accepted. 070/13/03
[Signature]
Md. Sohrab Hossain
Assistant Professor Physiotherapy (BHP), CRP
Head, Dept. of Physiotherapy,
CRP Saver, Dhaka-1343

VERBAL CONSENT FORM
(Please read out to the participant)

Assalamualaikum/ Namasker, my name is ChinmoyBarua. I am conducting this study for partial fulfillment of Bachelor of Science in Physiotherapy degree, titled on “Characteristics of bilateral knee osteoarthritis” from Bangladesh Health Professions Institute (BHPI), University of Dhaka. I would like to know about some personal and other related information about BMI and knee osteoarthritis. This will take approximately 20-30 minutes.

I would like to inform you that this is a purely academic study and will not be used for any other purpose. I assure you that all data will be kept confidential and also the source of information will remain anonymous.

Your participation in this study is voluntary and you may withdraw yourself at any time during this study without any negative consequences.

Do you have any questions before I start?

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

YES

NO

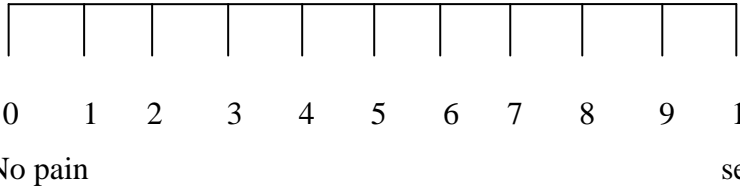
Signature of the participant _____

Signature of the researcher _____

Characteristics of bilateral knee osteoarthritis

Questionnaire

Interview Schedule		
Part- I: Personal details		
1.1	Name :	Date of Interview:
1.2	Address: Village/house no..... PO..... PS..... District.....	
Part- II: Socio-demographic Information		
2.1	Age	1 = (In year): Yrs
2.2	Gender	1 = Female 2 = Male
2.3	Marital status:	1 =Married 2 =Unmarried
2.5	Educational level?	1 =No formal Schooling 2 =Primary Completed 3 =SSC Completed 4 =HSC Completed 5= Graduate Completed 6 =Masters Completed 7 = Others Completed
2.6	Occupation?	
2.7	Residential Area	1 = Rural 2 = Urban

Part-III: Participant related Information (To be collected from Record/ Care provider/Clinical examination)		
QN	Questions	Responses/Answers
3.1	Patients height(m):	
3.2	Patients weight(kg):	
3.3	Onset of osteoarthritis?	1=<2yrs 2=2-5 yrs 3=>5yrs
3.4	Involvement of knee joint?	1 =Unilateral 2 =Bilateral
3.5	Have you got any trauma on your knee?	1=Yes 2=No
3.6	History of surgery at knee?	1=Yes 2=No
3.7	Severity of joint pain(Knee joint) in NPR scale 	
3.8	Patients BMI	1=Under weight (BMI<18.5) 2=Normal weight(BMI 18.5-24.9) 3=Over weight (25-29.9) 4=Obese(BMI ≥30)