A Brief Survey on the Prevalence of Arthritic Diseases in Different Age Groups

By

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Bachelor of Pharmacy (Hons)

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Declaration

It is hereby declared that

1. The thesis submitted is my/our own original work while completing degree at Brac University.

2. The thesis does not contain material previously published or written by a third party, except where this is appropriately cited through full and accurate referencing.

3. The thesis does not contain material which has been accepted, or submitted, for any other degree or diploma at a university or other institution.

4. I/We have acknowledged all main sources of help.

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Approval

The project titled "A Brief Survey on the Prevalence of Arthritic Diseases in Different Age Groups" submitted by Ataur Rahman (15146036) of Spring, 2015 has been accepted as satisfactory in partial fulfillment of the requirement for the degree of Bachelor of Pharmacy (Hons) on 30th September, 2019.

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Ethics Statement

There was no ethical issue related to this study.

Abstract

Nowadays, arthritic diseases have become one of the major causes of morbidity and mortality. It has been seen from various studies that people are more frequently getting affected by different types of arthritic diseases like osteoarthritis, rheumatoid arthritis, gout etc. We developed our study to understand the general scenario of arthritic diseases in our country. It was found that male-female percentage of arthritic diseases was 54% and 46% respectively. Most participants were found to be suffering from osteoarthritis. There were rheumatoid arthritis and gout patients of 21% and 25% respectively. 33% of affected patient's parent had at least one type of arthritic disease. Common treatment practices in Bangladesh involved medicines, exercise, pain relief medications and physiotherapy. Doctors commonly suggest maintaining weight, avoiding oily foods, exercising regularly and avoiding lifting heavy weight.

Keywords: Arthritis; Anti-inflammatory drugs; Joint and back pain; Physiotherapy; Obesity.

Dedication

Dedicated to my loving mother.

Acknowledgement

Firstly, I would like to thank almighty Allah for giving me the opportunity to study and enter into the vast realm of knowledge. Without his kindness and pity it would not have been possible to complete this thesis properly in time.

Then, I would like to acknowledge my project supervisor, **Dr. Md. Abu Bakar** sir for helping me throughout this project. Without his help and kind guidance I would never be able to perform this study. He always helped me to understand many things that I had no idea about before. He also helped me choose my study topic. My supervisor was always there to clear out difficult topics that I did not understand and show me the way ahead. I am proud to be his thesis student.

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List of Acronyms

RA   Rheumatoid arthritis

OA   Osteoarthritis

RP   Raynaud's phenomenon

AS   Ankylosing spondylitis

DMARD   Disease modifying anti-rheumatic drugs

NSAID   Non-steroidal anti-rheumatic drugs

NHANES   National health and nutrition examination survey

MHC   Major histocompatibility complex

HLA   Human leukocyte antigen

MRI   Magnetic resonance imaging

ESR   Erythrocyte sedimentation rate

PRP   Primary Raynaud's Phenomenon

SRP   Secondary Raynaud's Phenomenon

RF   Rheumatoid Factor

Chapter 1

Introduction

1.1 Background of the Study

Joints of human body are composed of various tissues namely cartilage, calcified cartilage, bone, synovial, ligament etc. This tissues involve in the movement by interaction with each other (Burr, 2004). Arthritis is a physiological condition involving the degeneration, inability of movement or pain of the joints connecting two bones. The major types of arthritis include rheumatoid arthritis, osteoarthritis, gout etc. Arthritic diseases are very common in today's world. To illustrate, osteoarthritis, which is considered the fourth leading cause of disability have its presence in about 10% of world's population (Jahan, Sima, Khalil, Sohel, & Kawsar, 2018). About 22% of adults of United States have clinically proven and diagnosed arthritic diseases and among them rheumatoid and osteoarthritis were the most common types (Senftleber et al., 2017). The development of arthritic diseases depend on factors such as genetic and occupational causes (Deane & Holers, 2019; Yucesoy, Charles, Baker, & Burchfiel, 2015). The treatment of arthritic diseases depends upon the type and condition of the disease. Treatment includes drug, physical or other kinds of therapy.

1.2 Healthy Joint Anatomy

Human joints consist of various distinctive parts such as synovial cavity, posterior cruciate ligament, anterior cruciate ligament, intrapatellar fat pad, patella, prepatellar bursa, superpatellar bursa.

There are 3 classes of joints,

Fibrous joints- This joint resembles to the bones that are attached together by fibrous connective tissue also with collagen fibres. They do not contain synovial cavity/fluid.

Cartilaginous joints- These joints hold bones by cartilage without the presence of synovial fluid

Synovial joints- These joints consist of synovial cavity and a fluid inside them called the synovial fluid which is secreted by synovial membrane.
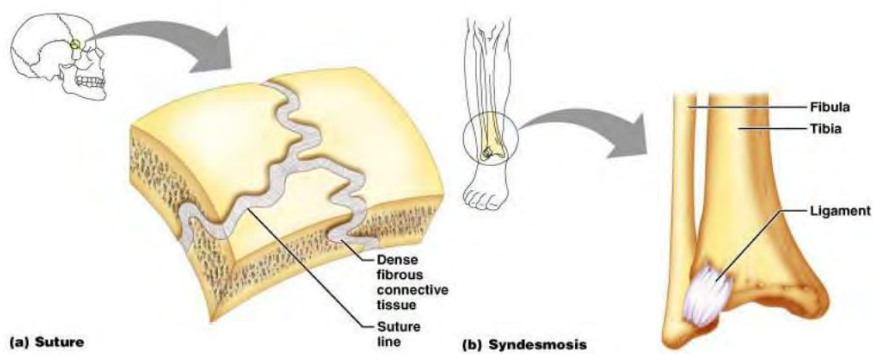
Figure 1: Fibrous joints

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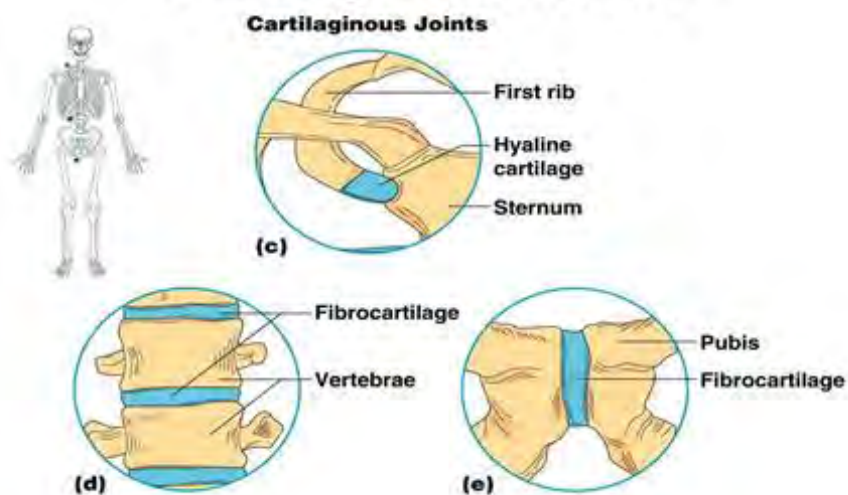
Figure 2: Cartilaginous Joints
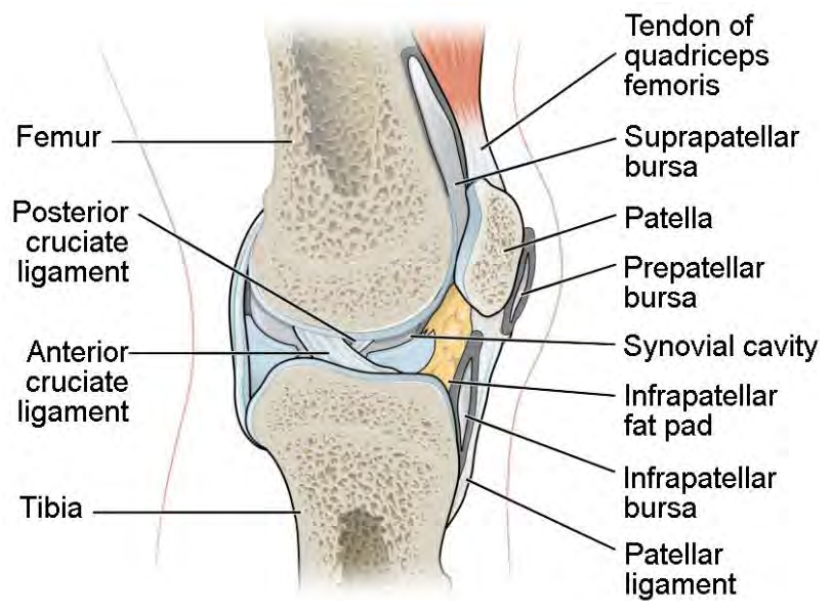
Figure 3: Synovial joint

1.3 Rheumatoid arthritis

This is a type of arthritis that is a chronic and systemic autoimmune disease that promptly targets the synovial type of joints, which results in functional limitations and pain. This is the most common type of arthritic disease. It is considered as one of the most significant cause of morbidity and mortality (Littlejohn & Monrad, 2018). The persistent synovial inflammation results in the destruction of polyarticular joint and leads to disability. In united states, rheumatoid arthritis is 1% of disease incidence and male to female ratio is 1:3 (Berman, Bucher, Koyfman, & Long, 2018). Worldwide prevalence of rheumatoid arthritis is ranged from 0.4% to 1.3% (Sacks, Luo, & Helmick, 2010).

Rheumatoid arthritis can also involve multiple other organ systems namely pulmonary, ocular, cardiovascular and cutaneous systems (Deane & Holers, 2019). It is now concluded by established research that the rheumatoid arthritis related autoimmunity and inflammation is developed and present further before the first onset of inflammatory arthritis which is termed as Pre-RA (Gerlag et al., 2012). Treatment strategy for rheumatoid arthritis included the pyramid approach. Which consist of bed rest, disease modifying anti rheumatic drugs

(DMARDs) and non-steroidal anti-inflammatory drugs (NSAIDs) (Burmester & Pope, 2017).

1.3.1 Symptoms and Complications Involved With RA

Typically, Patients affected with rheumatoid arthritis or inflammatory arthritis have gradually increasing pain in their joints for several weeks to several months and morning stiffness for more than 1 hour. The pain seem to be decreased with exercise (Berman et al., 2018). The metacarpal joints, carpal joint, proximal interphalangeal joints and metacarsal joints are mostly affected in the order of decreasing incidence. Physical examination reveals pain/tenderness and swelling of the joints. If it is involving of large joints such as knee joint then it would show joint effusions (Littlejohn & Monrad, 2018).

1.3.2 Risk Factors of RA

Studies represent that genetic heritance is 65% influential in the development of rheumatoid arthritis. Almost near to half of the genetic component of susceptibility account for genes that are with HLA locus, majorly HLA-DRB1 which lead to association with more disease severity. For women the risk is more in ratio of 2-3 times than men as estrogenic hormone in women have stimulatory effect on the immune system (Littlejohn & Monrad, 2018).

Risk factors other than genetic susceptibility includes obesity, periodontal disease, smoking, gut microbe and infections (Littlejohn & Monrad, 2018). People who take low amount of fish in their diet have proven to have involvement in development disease (Rosell, Wesley, Rydin, Klareskog, & Alfredsson, 2009). Poor oral hygiene has also shown contribution in disease development (H. H. Chen et al., 2013). Cigarette smoking has proven to be the a reason for more disease severity also being a contributing factor (K.G. et al., 1997).

1.3.3 Pathogenesis of RA

As study suggests, RA can be present in a person years before showing the symptoms and signs of inflammatory arthritis. For example, the disease may be developing inside the patient and the patient might have no idea about it. This presence of autoimmune system and inflammation can be noted as Pre-RA (Deane & Holers, 2019).

The primary target for autoimmunity in rheumatoid arthritis is the synovium. Synovium is the cellular lining of joints. Adaptive and innate, both the immune systems contribute to starting and progressive development of rheumatoid arthritis. The Th1 and Th17 subset of T-Cell involve in greater number in the lining of the joints. The suddenly activated antigen presenting cells intermingle with the T-cells and B-cells in the lymph nodes and increase cytokine and chemokine generation, lymphocyte differentiation and formation of antibodies. These T cells and B cells move towards the synovial joints. These then interact with the residing macrophages, dendritic cells, osteoclasts and synoviocytes. Thus there is an additional presence of inflammatory cells in the joint spacing. For this, generation of inflammatory cytokines (Tumor necrosis factor alpha, Interlukin 1 and interlukin 6), degenerative enzymes, neoangiogenesis and synoviocyte hyperplasia. All of these together result in swollen, warm and tender joints which is known as synovitis. If untreated, this results in inflammatory destructive pannus that can destroy bones, articular structures, cartilage or even the bone. Thus it causes chronic joint pain and deformity of the joints (Littlejohn & Monrad, 2018).

1.4 Osteoarthritis

Among arthritic diseases, osteoarthritis is the most common type as it affects greater than 25% of population aging over 18 years (D. Chen et al., 2017). It is defined as "a heterogeneous group of conditions that lead to joint symptoms and signs which are associated

with defective integrity of articular cartilage, in addition to related changes in the underlying bone at the joint margins" by the American College of Rheumatology (Arden et al., 2014). The aetiology of osteoarthritis development includes heredity, joint injury, age and obesity.

The development of osteoarthritis can be seen in all ages due to any injury (sport or occupational) although it is mainly seen in elderly people. (D. Chen et al., 2017).

1.4.1 Symptoms and Complications Involved With Osteoarthritis

The symptom and complication of osteoarthritis is multi perspective. The symptoms to look for to determine osteoarthritis in human includes-

1. Chronic pain

2. Joint instability

3. Joint stiffness

4. Radiographic joint space narrowing (D. Chen et al., 2017).

Osteoarthritis comes with wide ranges of complications such as joint pain, difficulty in moving, trouble standing or sitting for a long time, chronic pain that is persistent for a long time, inability to lift weights etc.

1.4.2 Classifications of Osteoarthritis

In 1957, Kellgren and Lawrence developed a classification system to classify osteoarthritis based on radiological features of normal and affected bones (Arden et al., 2014). They divided it into five classes from zero to four. The following table shows the classification and the severity of osteoarthritis-

Table 1: Classification and severity of osteoarthritis.

Class	Severity
0	Not present
1	Doubtful presence
2	Very less
3	Medium
4	Extreme

Class 0 means that the person has no osteoarthritis. Class 1 is doubtful. Class 2 means the patient shown minimal amount of osteoarthritis development in them by the X-ray results. Class 3 defines the definite presence of osteoarthritis whereas class 4 is the indicating of severe osteoarthritis development.

The below figure depicts the radiological images of the corresponding classes of osteoarthritis. We can see that with increasing severity the synovial gap is decreasing. This shows the decrease of synovial fluid and increasing friction between the joints. This causes erosion and results in pain while trying to move.
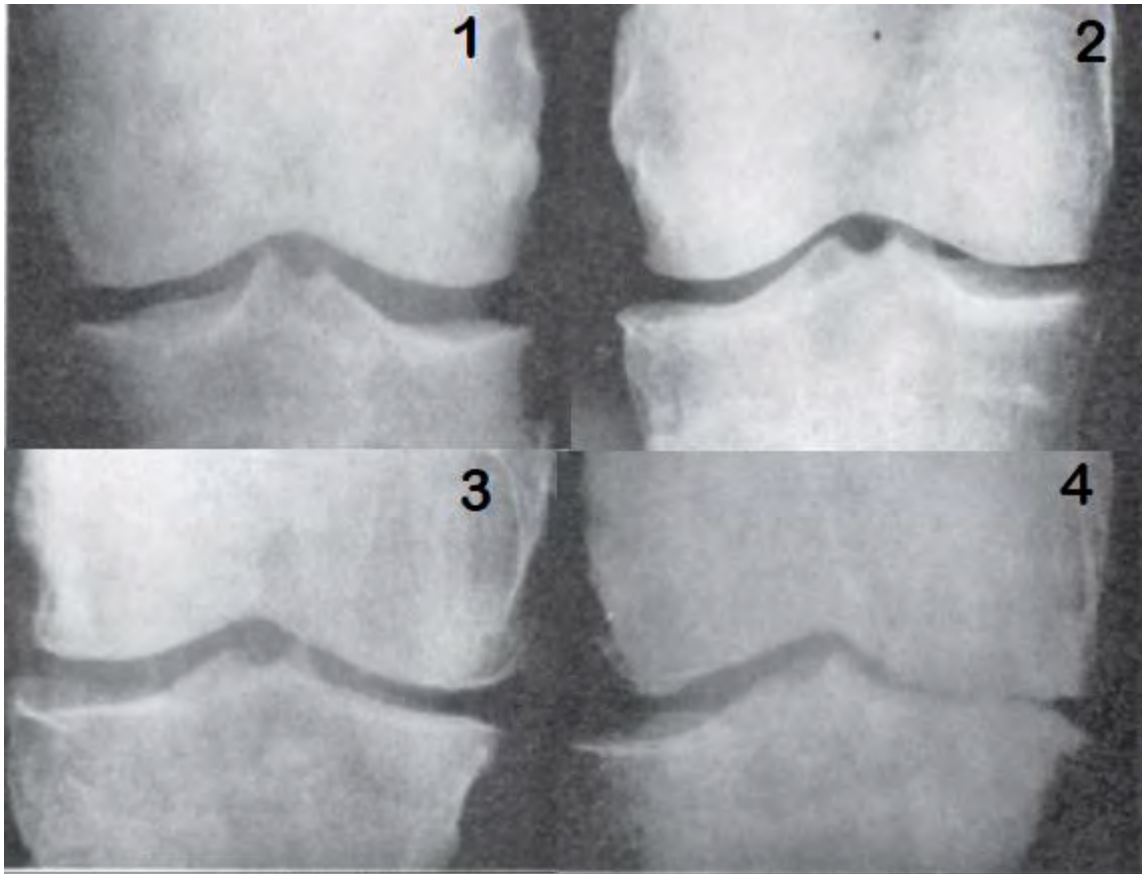
Figure 4: Radiological images of different grades of osteoarthritis (Arden et al., 2014).

1.4.3 Risk Factors of Osteoarthritis

Aging: Aging is the top most influential factor of osteoarthritis. Most people over the age of 65 have shown changes in bone structure in radiographic studies. Along with cartilage, aged people get affected in other joint tissues namely synovial tissue, subchondral bone and also muscles (D. T. Felson, Anderson, Naimark, Kannel, & Meenan, 1989; Jordan et al., 2009). Studies show mitochondrial function alteration as aging cells present increased oxidative stress. (D. Chen et al., 2017)

Obesity: The involvement of obesity with osteoarthritis is well recognized from a long time (David T. Felson, 1996). It has been seen that patients who are obese are more prone to develop osteoarthritis and develop the disease earlier. The most common cause of osteoarthritis is the biomechanical load presented on the knee joint. Obesity causes systemic

inflammation causing the release of adipose tissue derived cytokines namely adipokines (Fain, 2010).

Sport Injury: Sport injury, to be more specific, an injury of knee increases the risk of development of osteoarthritis fourfold (D. Chen et al., 2017). 41% to 51% of people participating in a study who had previous knee injury developed osteoarthritis in later years (E.M., 2005).

Inflammation: It has been established by studies the presence of low grade chronic inflammation in OA development and progression of disease. For patients having OA, the full synovial joint consisting of the cartilage, synovium, subchondral bone takes part in the inflammation process (Malfait, 2016).

Genetic Predisposition: From many family studies, genetic predisposition of osteoarthritis has been found (Sinkov, Cymet, & Baltimore, 2003).

1.4.4 Pathogenesis of Osteoarthritis

The main cause of development of osteoarthritis is still unknown. The assumption goes by as the excessive loading or imbalance of loading causes a damage that progresses in a slow manner. Changes occur in the osteoarthritic joint cartilages in terms of biochemically, metabolically and cellular. This leads to destruction or degeneration of articular cartilages and softening of them which lead to the formation of osteophytes. Thus initiation of pain and deformation occurs. The weakening of the collagen network causes a raise in the water content in the bones. This raise in water content prevents the excess hydrophilic proteoglycans from attracting to much liquid. The analysis of collagen in osteoarthritic patient's joint shows decreased collagen IX type content. This type of collagen is responsible for the sticking together of type II collagen fibres. Thus the gluing capability is decreased and type II collagen fibres do not stick together. (Sinkov et al., 2003)

1.5 Gout

Gouty arthritis is a heterogeneous disease which develops from the deposition and accumulation of purine metabolism end products, namely monosodium urate crystals in the tissues. This deposition causes the immune system to attack the joints having identifying the crystals as foreign body. Thus there is a sudden pain and inflammation and pain that a patient feels. This pain generation is called flare ups (Teng, Nair, & Saag, 2006). It is one of the common form of arthritis. 5.1 million People in the US have reported to have complained about gout to their physician according to the National Health and Nutrition Examination Survey in 2005 (NHANES III). For men aged greater than 40 years, it is the most common inflammatory joint disease (Roubenoff et al., 1991).

The severity and incidence of gout is increasing day by day. Several study suggests that there has been a three times increase in gouty arthritis over 20 years observed at 2006 in UK. The same indications has been found in a study operated in New Zealand (Klemp, Stansfield, Castle, & Robertson, 1997).

1.5.1 Risk factors of gouty arthritis

The risk factors of gouty arthritis can be classified into two types, avoidable and non-modifiable.

Non-modifiable risk factors consist of genetic predisposition, renal diseases of the end stage, a major organ transplantation and most influentially being a male or postmenopausal female. This prevalence grows over aging. Studies suggest that for people under the age of 45 it is 1.8 per 1000 people and for over the age of 65 it is 30.8 per 1000 people (Smith, 2009). Another important factor that increases the risk is raised serum urate levels. However, a determined influence is the condition called hypertension.

Avoidable risk factors of gouty arthritis include eating red meat, sea food and foods that have high fructose corn syrup. Drinking alcohol is also a reason for gout attacks. The guanosine content in beer is responsible for the flares.

There are certain drugs that are prescribed to organ transplant patients, namely thiazide diuretics and cyclosporine. These drugs have the tendency to precipitation of uric acid and generation of gouty attacks. However, low dose aspirin that is administer for cardioprotection is also responsible for gout attacks (Smith, 2009).

Figure 5: Gout in toe (image from myoclonic)

1.5.2 Pathogenesis of Gouty arthritis

Gout is clearly associated with hyperuricaemia. This hyperuricaemia can be of two origins.

1) Overproduction: The increased concentration of urinary urate over the range of 1000 mg/day indicated overproduction. Overproduction can be due to any genetic defect regarding the metabolism of purine nucleotides. Other reasons include over active ATP synthesis and diseases that cause in increased cell turnover. Overproduction is responsible for 10-15% of gout patients. (Teng et al., 2006)

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2) Underexcretion: Underexcretion is determined by the less urate in urine under the value of 330mg/day. This is responsible for 85-90% of gout patients. For this there is an increase in the serum urate levels in order to maintain a steady equilibrium with the excretion rate. This could be resulted from less urate filtration and enhanced reabsorption or decreased secretion. (Teng et al., 2006)

In both the cases there is increased blood urate levels which cause to deposition and accumulation into the joints that eventually result inflammation and cause pain and swelling.

1.6 Ankylosing Spondylitis

Ankylosing spondylitis (AS) is an arthritic disease beginning before the age of 40. AS has male prevalence and roughly of 0.5% in the United States disease prevalence. It is categorized as a debilitating spinal arthritic condition (Reveille & Weisman, 2013). AS affected patient suffers from back pain and it is not easy to identify the reasons as the radiographic and inflammatory marker changes of AS occur very late (Golder & Schachna, 2013).

1.6.1 Risk Factors of Ankylosing Spondylitis

AS is one of the most common genetically influenced disease. Familial studies indicate 90% heredity and 63% monozygotic twin concordance. 90% of the total population of AS has the presence of major histocompatibility complex (MHC) class I allele human leukocyte antigen B27 (HLA-B27). Genetic predisposition with HLA-B27 has been well established. However, it has been more than 40 year since the linkage of HLA-B27 and MHC's association with the disease has been found, still, it is unclear how this results in the development of disease. (Smith, 2015).

1.6.2 Diagnosis of AS

The diagnosis of AS is considered to be difficult because the patient develops the disease even 7 years early before the clear symptoms show up. There are few approaches for the diagnosis such as X-ray, MRI and ultrasonography. There are also laboratory tests (Golder & Schachna, 2013).

First approach could be the X-ray imaging to find out any presence of irregularity in the backbone. To observe the sacroiliac joints a single x-ray of anteroposterior pelvis is done. It is apparent from the radiographic finding any changes for the early acute inflammation. In the X-ray erosions and squaring at the edge of the vertebral bodies to syndesmophyte formation and bony bridging is observed (Golder & Schachna, 2013).
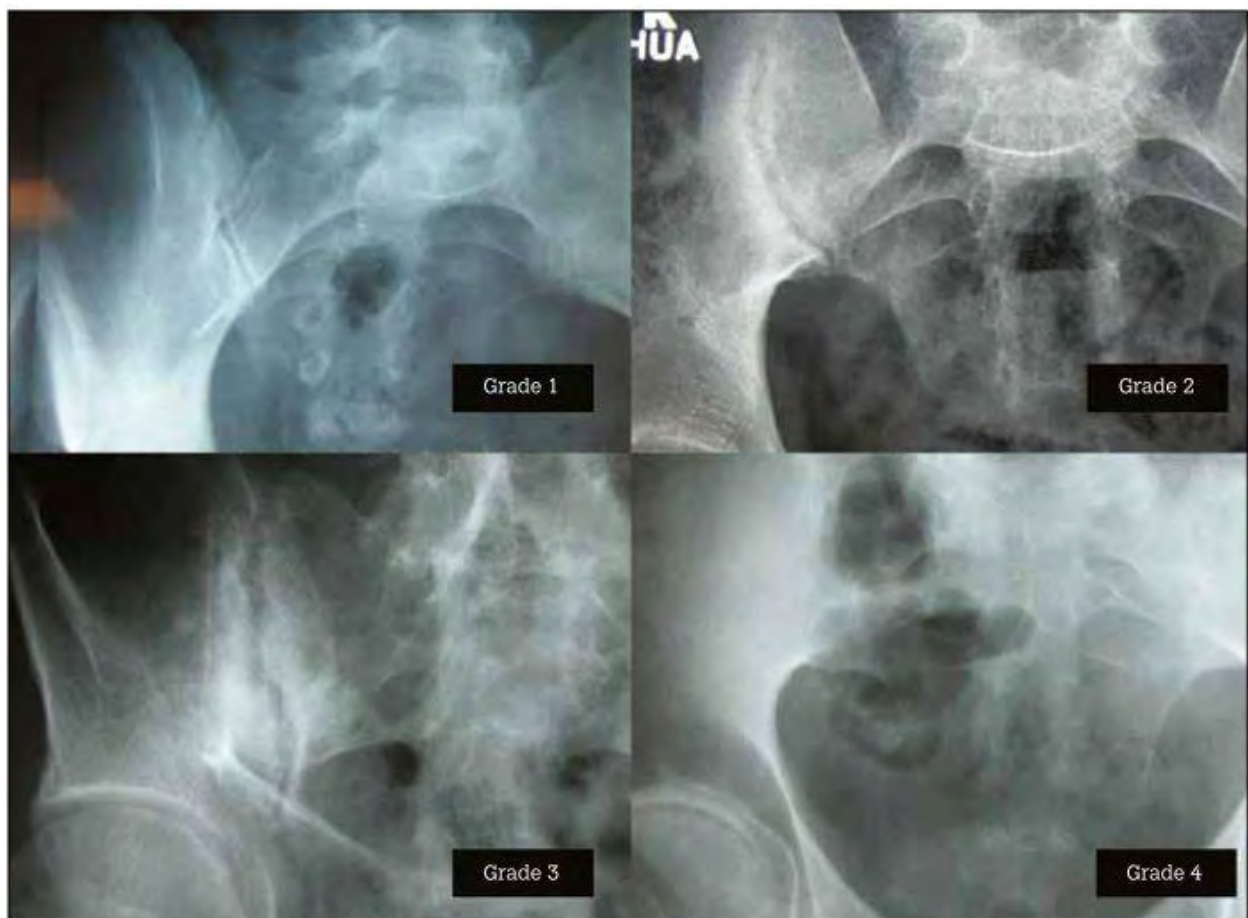

Figure 6: Radiographic grading of sacroiliac joints (Golder & Schachna, 2013)

The upper X-ray depicts the changes in sacroiliac joints from suspicious to advance AS. Grade 1 indicates suspicious changes but does not definitely identify AS. Grade 2 in the picture shows erosions in small localized areas. Grade 3 shows definite erosions, sclerosis and partial fusion. Grade 4 is showing complete fusion and observed in advanced AS (Golder & Schachna, 2013).

When X-ray is normal, it is preferable to do magnetic resonance imaging (MRI) scan if there is clinical suspicion about AS. From MRI, marrow edema at the sacroiliac joints or the vertebral corner is seen by fat suppressed short t1 recovery seen which indicates later development of bony sclerosis of the spine or sacroiliac joints. Ultrasonography is useful to detect enthesitis. It is used to understand the response to the therapy as well. (Golder & Schachna, 2013)

There are also some laboratory tests that are done for AS. Useful markers are Erythrocyte Sedimentation Rate (ESR) and C- reactive protein that indicate inflammation. These markers are elevated in 50-70% of AS patients (Golder & Schachna, 2013)

1.7 Raynaud's Phenomenon

Maurice Raynaud, in his 1862 thesis, describes the condition affecting a female patient who was 26-year-old: "Under the influence of a very moderate cold . . . she sees her fingers become ex-sanguine, completely insensible, and of a whitish yellow color. This phenomenon happens often without reason, lasts a variable time, and terminates by a period of very painful reaction, during which the circulation is re-established little by little and recurs to the normal state." After the name of Maurice Raynaud, the disease was named Raynaud syndrome or Raynaud's phenomenon. Patients showing Raynaud's phenomenon are classified into two categories, Primary Raynaud's Phenomenon (PRP) and Secondary Raynaud's Phenomenon

(SRP). PRP is when the patient shows the symptoms without no other disease or underlying condition and SRP is when there is another associated disease (Wigley & Flavahan, 2016).
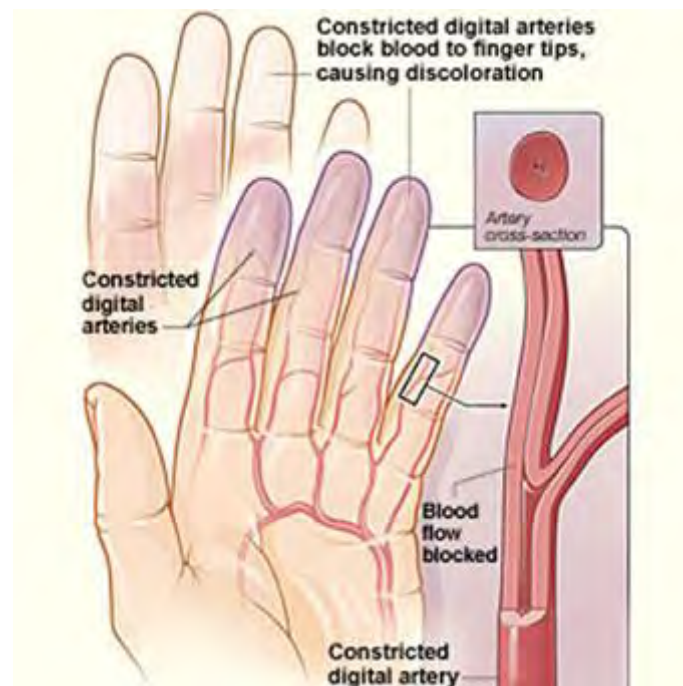

Figure 7: Raynaud's phenomenon (National Heart, Lung, and Blood Institute)

1.7.1 Epidemiology and Symptoms of RP

In case of RP, initial blanching of the skin is seen from the vasoplasm. It is followed by cyanosis which happens for deoxygenation of the static venous blood. Finally rubor is seen which produces what is called triphasic color change because of the hyperaemia after the return of the blood. This triphasic color change is not always seen and rubor is not always present. However, blanching can alone determine RP and can be helpful in terms of diagnosis of RP. This color change begins at the tip of the finger. It spreads to one or more phalanges. It also can spread to more fingers. The color changes are usually distinctive involving both volar and dorsal aspects. Also, there is a transient numbness on the fingertips. The vasospasm can become systemic involving nose, ear tongue and can be associated with other vasospastic disorders. For example- migraine, irritable bowel and microvascular chest pain (Wautrecht, 2017).

Figure 8: Raynaud's phenomenon (emedicinehealth.com)

1.8 Strategies for the management of arthritic diseases

As we have already mentioned, arthritic diseases consist of more than a 100 types of diseases. Among them, most common cases reported are of osteoarthritis, rheumatoid arthritis, gout, ankylosing spondylitis, lupus, Raynaud syndrome etc. As there are lot of types and the nature of these are varyingly different, the management strategies of these diseases are also different. It is evident that doctors prescribe a set of medications and also some exercises of physiotherapy to ease the condition. Also, surgery can also be done in the affected area. Furthermore, there are few lifestyle changes that need to be done for the management of disease. Smoking, drinking alcohol, taking high fatty meals, lifting high weight etc. are suggested to avoid by the doctors.

Chapter 2

Research Methodology

2.1 Research Objectives and Goals

The main objective of the research is to understand and determine the nature and similarity of different types of arthritis in different occupational subjects. The goal of the study was to find out age groups, occupation, treatment and management techniques, role of physiotherapy and heredity of arthritic patients in Bangladesh.

2.2 Research Structure and Methods

The research was divided into three separate steps. Firstly, extensive literature review was done to understand the current scenario of arthritis in terms of diagnosis, treatment and management in the whole world. Also the pathophysiology and clinical features of 4 major types of arthritis- rheumatoid arthritis, osteoarthritis, gout and ankylosing spondylitis was studied from articles. Secondly, we identified few hospitals and clinics where arthritic patients go to seek treatment. For this National Institute of Traumatology and Orthopedic Hospital (NITOR) in Dhaka was chosen. Finally, a detailed questionnaire was prepared to get the overall information regarding patient's age, weight, height, genetic references, treatment choices, lifestyle changes etc.

A total of 70 patients was approached. Among them 24 was suffering from different types of arthritic diseases. Among these 13 were male and 11 were female.

2.3 Research Questionnaire

20 questions were selected for the questionnaire to the patients. Following is the list of questions-

RQ1: What is your gender?

RQ2: How old are you?

RQ3: How much do you weigh?

RQ4: What is your height?

RQ5: What is your occupation?

RQ6: Where do you live?

RQ7: Where did you grow up?

RQ8: How was the moisture of your living place?

RQ9: Does anyone in your family have arthritis?

RQ10: Which type of arthritis you are suffering from?

RQ11: From what age you are suffering from arthritis?

RQ12: Do you have any other disease?

RQ13: Which tests did your doctor give for diagnosis of disease?

RQ14: What are the troubles that you face for your sickness?

RQ15: What type of treatment are you taking for you sickness?

RQ16: Did your condition improve after the treatment?

RQ17: Do you go to physiotherapy centers for management of disease?

RQ18: Did you find physiotherapy helpful for the management of your condition?

RQ19: What are the suggestions that your doctor give you?

RQ20: Do you have any children?

RQ21: Did you have any accident affecting your bones or joints?

Chapter 3

Results and Discussion

In this study, there was a total of 24 participants having arthritic diseases was approached. The participants were introduced with the questions and based on the response the data was analyzed with Microsoft Excel 2013. Among the participants 13 were male and 11 were female. Percentage of male participants was found to be 54% and female were 46%.
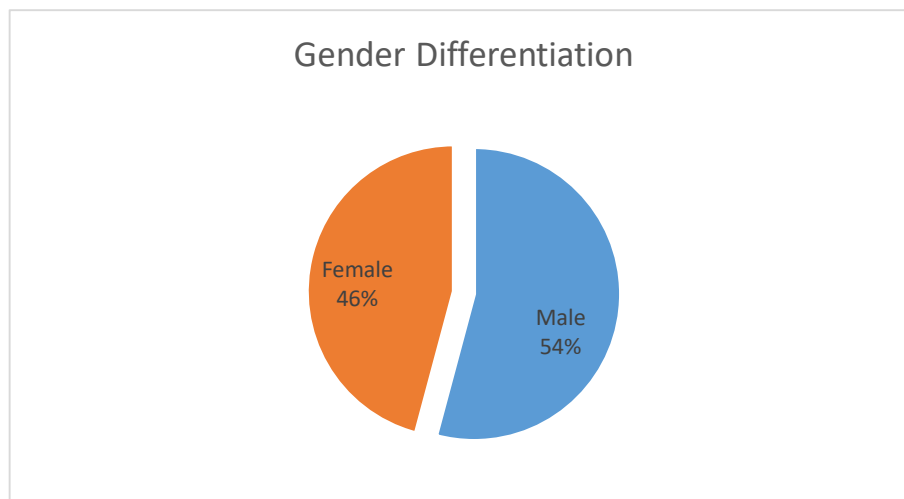

Figure 9: Gender differentiation of participants.

A variety age groups having arthritic diseases has been approached during the study. Number of patients below 18 years of age was none. 1 patient was between ages 19 to 30. 2 patient was between ages 31 to 40. A maximum number of 9 patient was found between ages 41 to 50. Furthermore, between ages 51 to 60 there were 6 patients. 3 patients was between ages 61 to 70. Finally, there were 3 patients above age 70. Here we can see that the mostly affected people are between ages 41 to 60. In percentage, 62.5% are between this age group. It conforms to our assumption that chances of disease development increases with age.
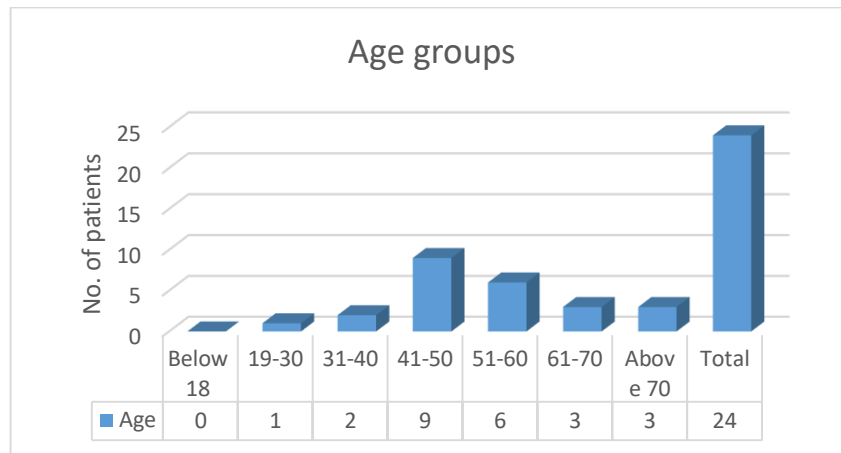
Figure 10: Age groups of participants.

Participants were asked about their height. From the results we can develop the following table.

Table 2: Height of participants.

Height (in feet)	No. of patients
Below 5	2
5 to 5.2	8
5.3-5.5	5
5.6-5.8	6
5.8-5.10	2
5.11-6.0	1
Above 6	0

Here we can see the maximum number of 8 patients having arthritic diseases were on the range of 5 feet 0 inches to 5 feet 2 inches. However, there was no patient above 6 feet of height. From the date we see that most people affected are between the height ranges of 5 feet to 5 feet 2 inches.
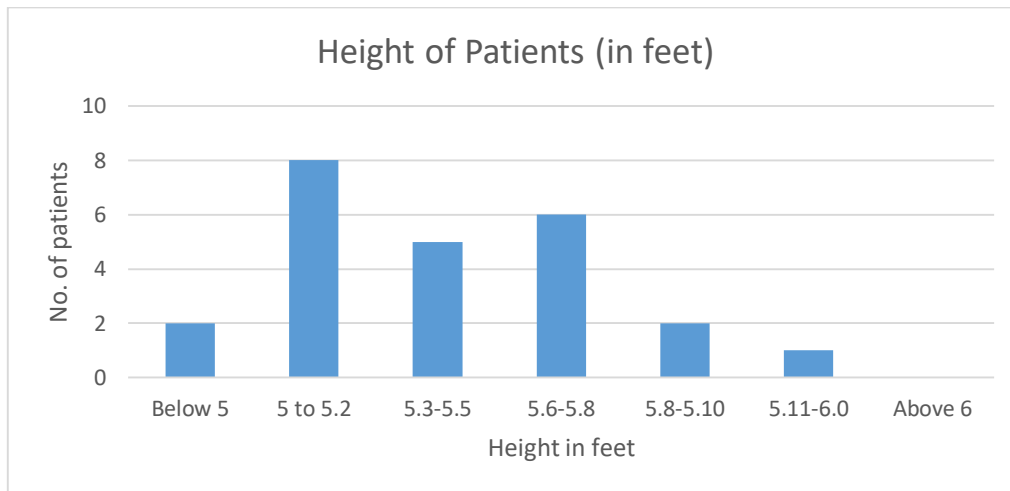
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Figure 11: Height of patients.

Patients were checked for their weight on a digital weighing machine. From the result we can develop the following table.

Table 3: Weight of patients.

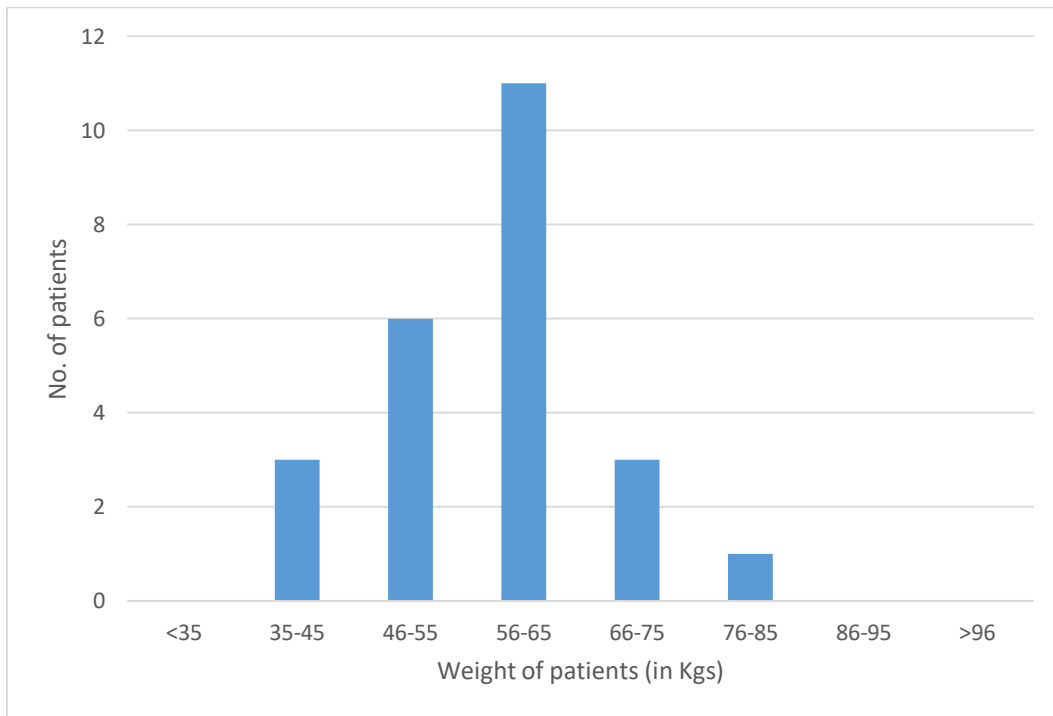| Weight (in KG)	Number of patients
<35	0
35-45	3
46-55	6
56-65	11
66-75	3
76-85	1
86-95	0
>96	0

Figure 12: Weight variation of patients.

From the analyzed data we can see that the highest number of patients (11) were found between the ranges of 56 to 65 kilograms. There were no patients below 35 kg weight and above 85 kg weight. 46% of the patients were between 56 to 65 kg weights.

A variety of patients with variety of occupation has been seen during the study. Occupations were categorized as laborer, service holder, teacher, athlete, student, housewife and retired. From the analyzed data we can find the following table. From our background study, we had assumed that the majorly affected group will be the laborers as they had to put too much pressure on their bones and muscle to earn their livelihood. However, we could not find any resemblance to this hypothesis to our findings. The percentage of service holder and housewife was same and the second major group was the laborers.

Occupation	No. of patients
Labourer	5
Pvt. & Govt. service professionals	7
Teacher	2
Athlete	0
Student	1
Housewife	7
Retired	2

Maximum of 7 patients are found to be housewives and service holders. It was seen that most housewives participating in the study was affected by osteoarthritis. Since our background study tells us that females are majorly affected by osteoarthritis after the birth of child, we can say the finding complies with our hypothesis. Number of service holders were also 7. No athlete was found having arthritis.
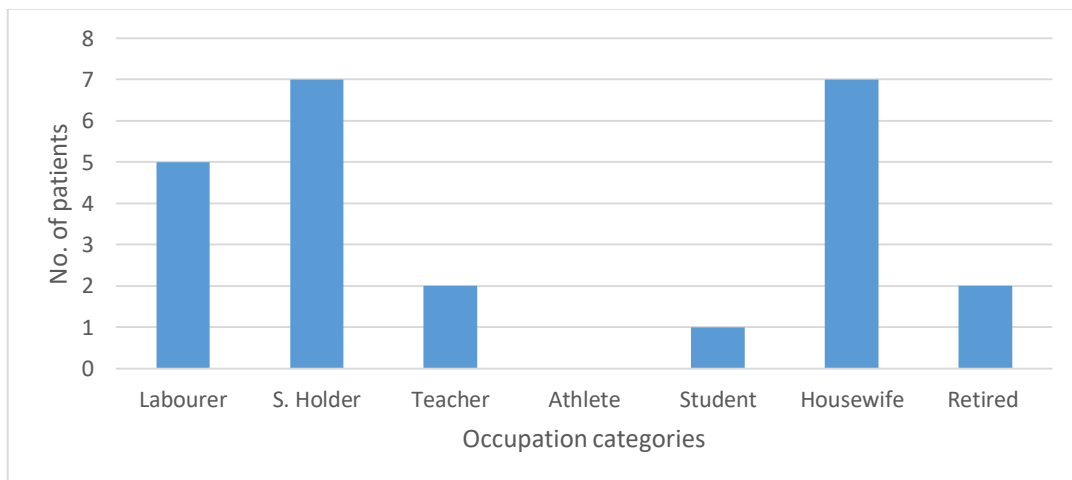

Figure 13: Occupation of arthritic patients.

Patients were asked about where they lived, weather country, suburb or city. Following is the result.
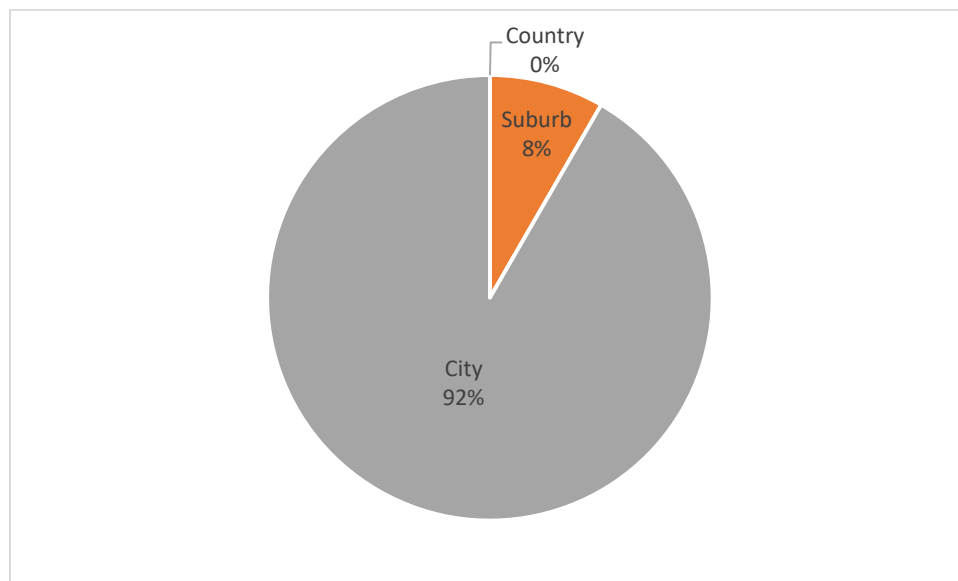

Figure 14: Patients residence.

From the above pie chart it can be seen that 92% of population having arthritic diseases participating in this study resides in the city area. No patients living in country area were approached. The rest 8% lives in area surrounding cities marked as suburb. We assumed that people living in the country area will be majorly affected by arthritic diseases. However since we limited our research in city area it was not possible to approach any patient living in countryside.

Furthermore, the patients were also asked about the place they grew up. In the pie chart below we can see 37% of patients grew up in city, 42% grew up in country area and the rest 21% grew up in suburban area. We had assumed that people growing up in countryside will be affected greatly compared to city residents. This was based on the idea that people growing up in county area participates in more physical labor compared to people growing up in county area. The findings complies with our hypothesis since the majority of participants said they grew up in countryside (42%).
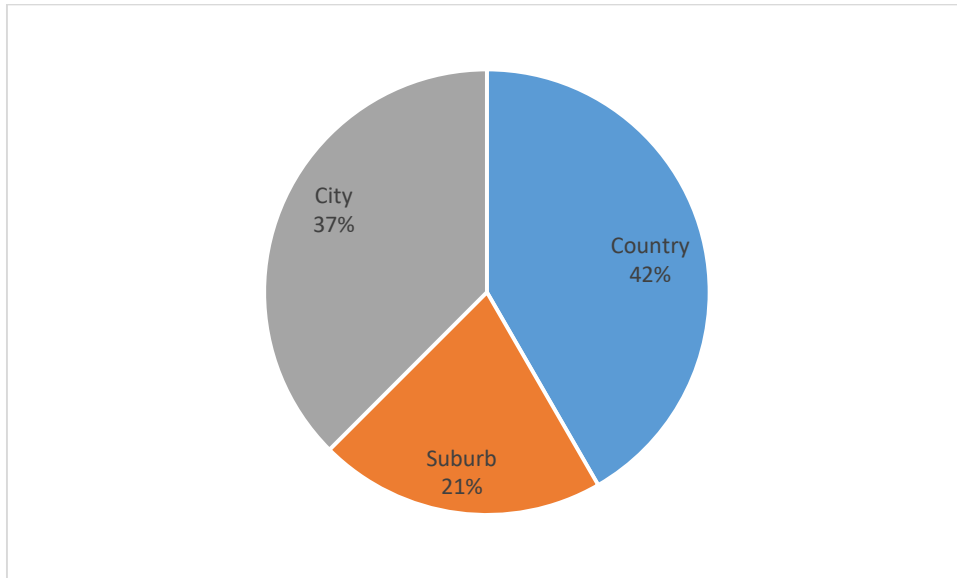
Figure 15: Area where participants grew up.

The moisture condition of the places they grew up was also asked. It was categorized in 3 categories dry, little moisture, too much moisture. Following bar diagram shows majority patients marked their area as dry, having no moisture. The percentage variation of participants responding 'dry' and 'little' was low, 50% and 42% respectively. Only 8% of them said there was too much moisture where they grew up as they had nearby rivers, canals or rainwater dripping from the rooftop etc.
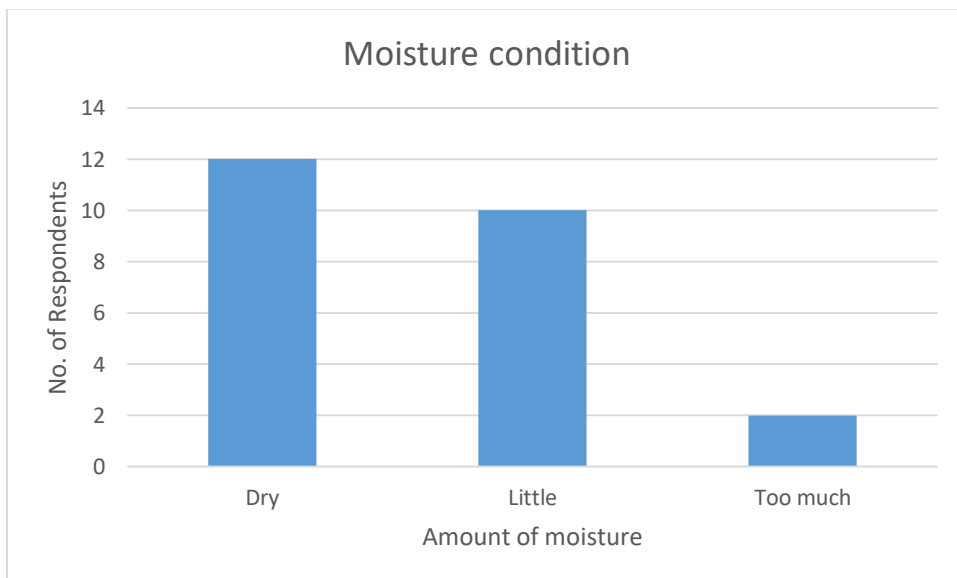

Figure 16: Moisture condition of living area.

Arthritic patients participating in this study were told to mark the type of arthritis they have. From the responses we can generate the following table-

Table 5: Type of arthritic patients participating in the study.

Type of arthritis	Number of patients
Rheumatoid	5
Osteoarthritis	10
Gout	6
Lupus	0
Ankylosing Spondylitis	3
Raynaud Syndrome	0

This result highly complies with our background study. As we have already discussed, the most common types of arthritic diseases includes osteoarthritis, rheumatoid arthritis, gouty arthritis etc. and our participants responded accordingly. The most common type of arthritis is osteoarthritis as it affects 25 % of population over the age of 18 (D. Chen et al., 2017). Analyzing the data we can see that 42% of the patients participating in this study had osteoarthritis. 25% of total patients had gouty arthritis. 21% had ankylosing spondylitis.
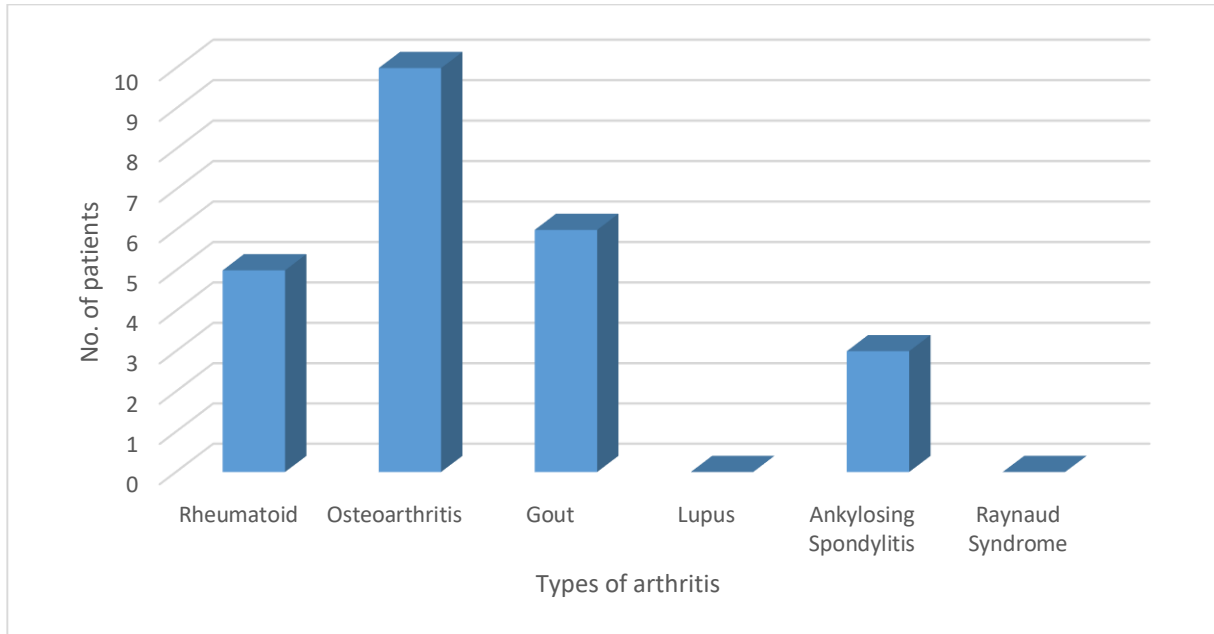
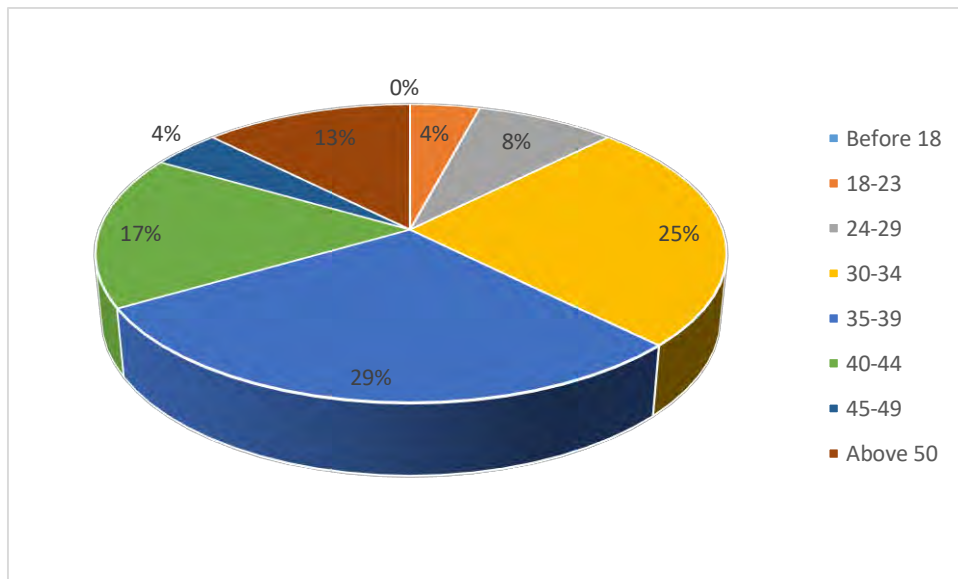*Figure 17: Types of arthritic patients participating in the study*

Figure 18: Disease diagnosed age.

Patients were asked their age at which they were diagnosed with arthritis. We generated the following table from the responses.

Table 6: Age when disease diagnosed.

Disease diagnosed age	Number of patients
Before 18	0
18-23	1
24-29	2
30-34	6
35-39	7
40-44	4
45-49	1
Above 50	3

From this table we can find out the percentages of different ages. The below pie diagram shows that 29% of total patients were diagnosed having arthritis at the age range 35 to 39. The second major group was 30-34 having the percentage of 25%. No patients diagnosed having arthritis before the age of 18. It can be understood from this result that most of our participants were diagnosed the disease at age 30-34.

When patients were asked about their satisfaction with their treatment, 58% of them agreed that they are satisfied with the treatment they are having.
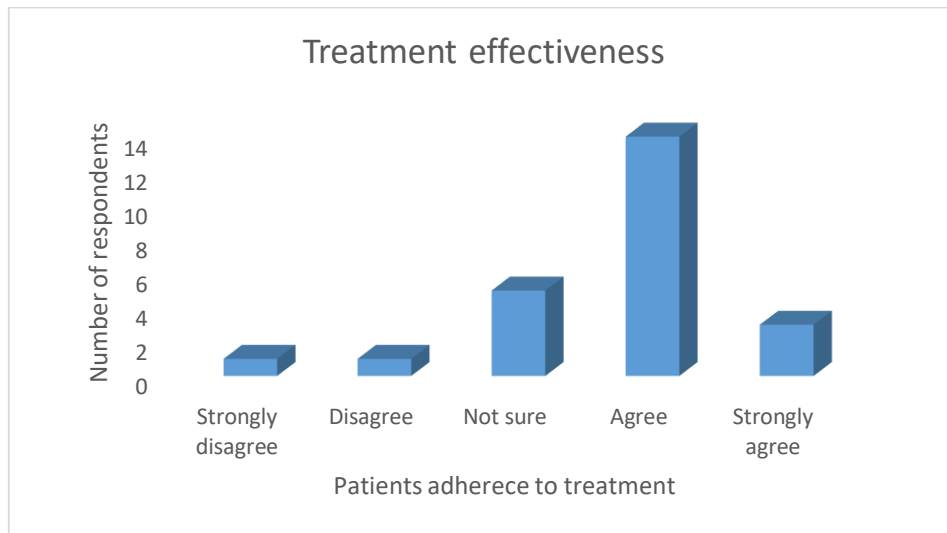
Figure 19: Treatment effectiveness

21% of them could not be sure if they are getting relief by their treatment policy. 13% patients said they were not satisfied with the treatment at all. Patients agreed that the treatment is helping them to cope up with the disease. As arthritis treatment mainly focuses on pain relief and patient's adherence with the treatment methods for their disease management, we can say that current treatment policies are successful.

It has been found that physiotherapy is commonly being suggested by the doctors for patients' wellbeing. However, from the data that we have found that 33% of the patients go to physiotherapy clinics on a weekly basis. 37% patients have never went to physiotherapy centers for pain relief.
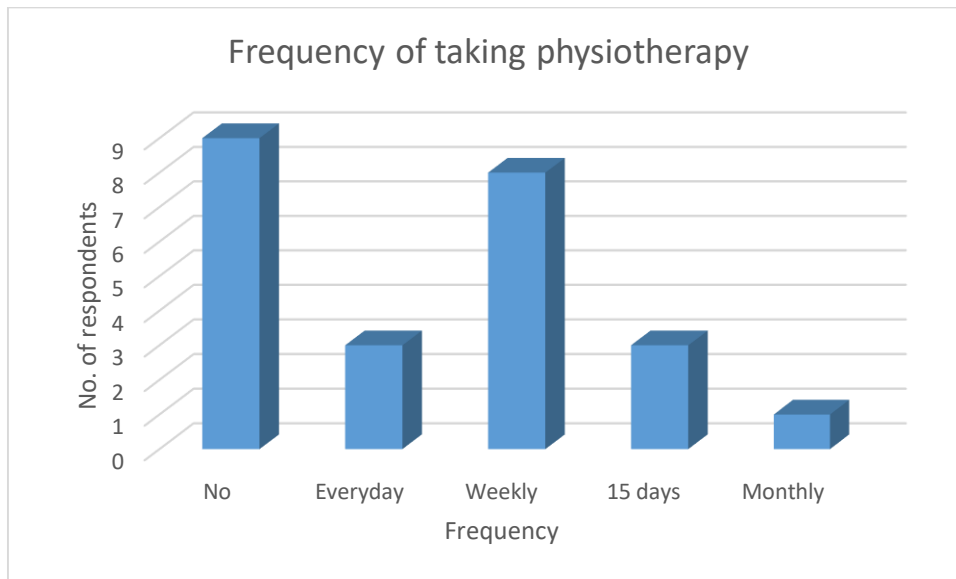
Figure 20: Treatment effectiveness

When asked about affectivity of physiotherapy on their wellbeing most of the patients agreed that physiotherapy is effective in their wellbeing. Since a big number of people do not go to physiotherapy clinics they are not sure about the affectivity of the treatment. We can come to the conclusion that patients are not taking physiotherapy positively as a management policy.
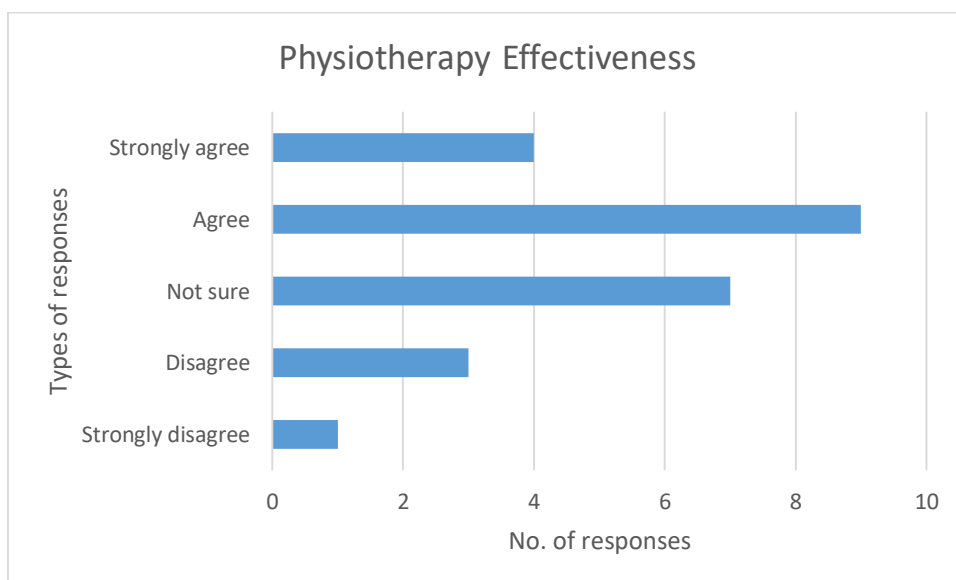

Figure 21: Effectiveness of physiotherapy.

Arthritic patients participating in the study were asked about whether they have children or not. From the response we get the following bar diagram-
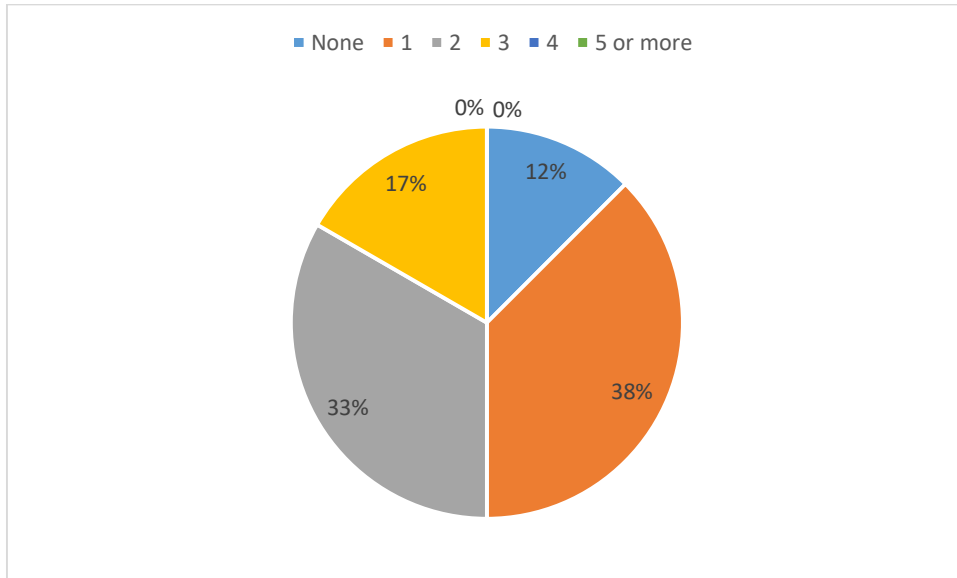
Figure 22: No. of children female participants have.

Finally, the patients were asked if they had any accidents in the past that affected their joints or bones. 58% of them had accidents in the past affecting their bones and rest 42% did not have any such accidents.

Figure 23: Accidents history of patients.

Figure 24: Family history of arthritic patients.

58% of arthritic patients had at least one person in their family who had arthritis. Among them 33% of the patients parent had arthritis.

Chapter 4

Conclusion

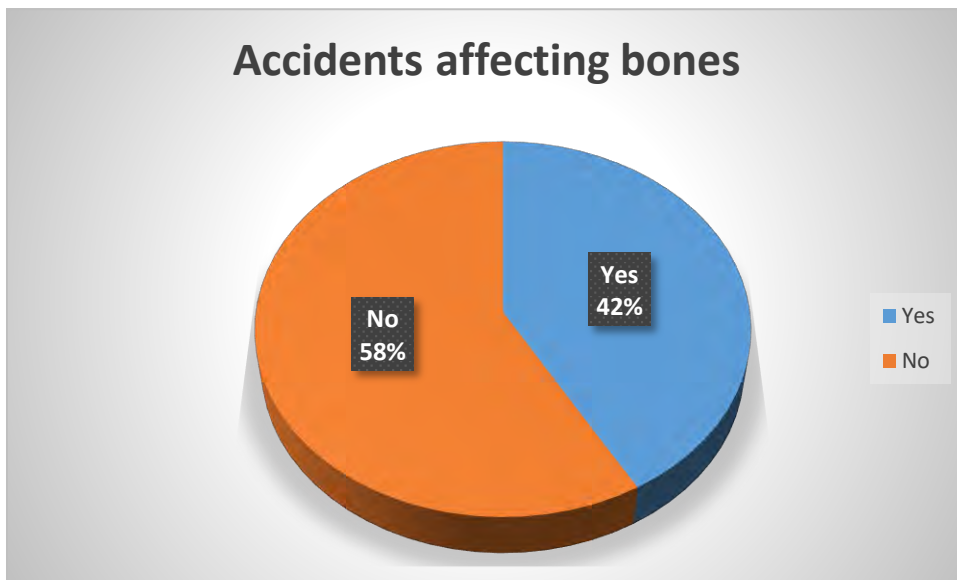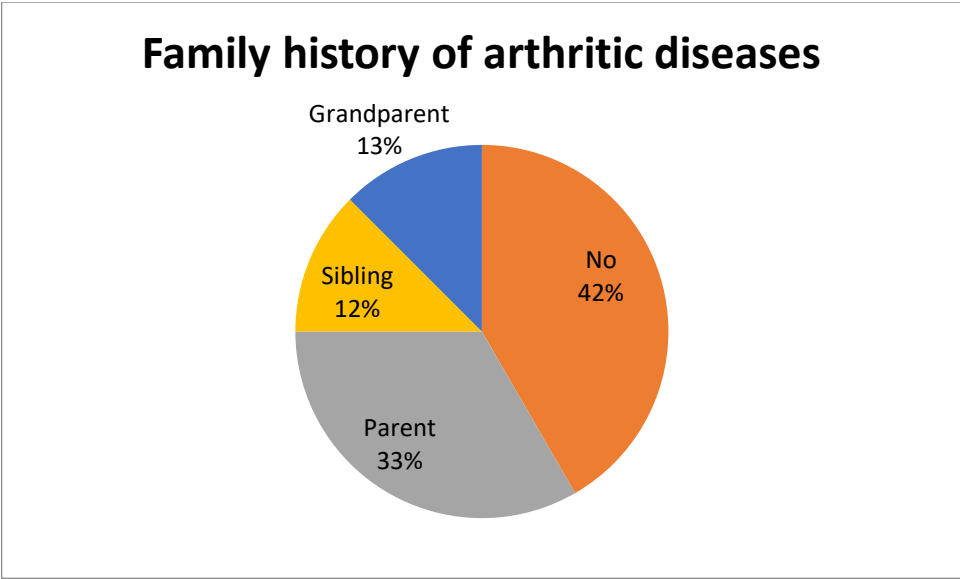We have analyzed the data of 24 arthritic patients and found male-female percentage of 54% and 46%. Among different types of arthritic diseases we have seen that 42% of the patients approached had osteoarthritis, 25% had gouty arthritis, 21% was of rheumatoid arthritis, and 12% was of ankylosing spondylitis. The most affected age group was 41-50 years (37%). 92% of our participants were city residents. 42% of the total patients grew up in country area. 54% patients were diagnosed with their disease at the age between 30-39 years. Doctors and physicians recommend X-ray, blood tests and physical examinations for the diagnosis of disease, generally depending on medicines and physiotherapy for the recovery and management of the disease. Considering our country's perspective people generally develop the disease in later years of their life. Most women affected were housewife and was suffering from osteoarthritis. Doctors suggest maintaining their weight, avoiding oily food and preferably avoiding lifting heavy weight. It has been seen that patients do not usually go to physiotherapy centers regularly for management of the disease rather they choose to exercise at home and apply pain medication and hot water treatment for pain relief. Through this research we hope scientists and fellow students will be benefited by the data and findings.

Chapter 5

Future Plans

However, from our study we understood that mass population of our country is generally not aware of the arthritic diseases. It can be hoped that in the near future people will be more aware of the arthritic diseases and will take necessary care to prevent being affected by the disease. To ensure public awareness, government and non-government organizations should spread out information about arthritic diseases to the general mass. Also, government should offer free treatment to the poor patients in every corner of the country. Being diagnosed at early stages and having proper treatment, arthritic patients can hope to lead a healthy and decent life.

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