

**MUSCULOSKELETAL COMPLAINS AMONG MENOPAUSAL
WOMEN AT MUSCULOSKELETAL DEPARTMENT OF
CENTER FOR THE REHABILITATION OF THE PARALYZED**

By

RADHIKA SHRESTHA

© 2018 RADHIKA SHRESTHA

Submitted in Partial Fulfillment of the Requirements for the Degree of

MSc in Rehabilitation Science

May 2018



Bangladesh Health Professions
Institute (BHPI)

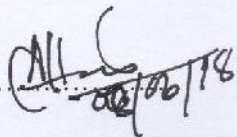
Faculty of Medicine

University of Dhaka



SUPERVISOR'S STATEMENT

As the supervisor of Ms. Radhika Shrestha's Thesis work, I certify that I consider her thesis "MUSCULOSKELETAL COMPLAINS AMONG MENOPAUSAL WOMEN AT MUSCULOSKELETAL DEPARTMENT OF CENTER FOR THE REHABILITATION OF THE PARALYZED" to be suitable for examination.

..... 

Mohammad Anwar Hossain,

Associate Professor of Bangladesh Health Professions Institute,

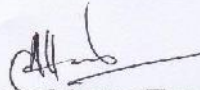
Head of Department of Physiotherapy,

CRP, Savar, Dhaka-1343

Date: 08/06/2018

(Supervisor)

We, the undersigned, certify that we have carefully read and recommended to the Faculty of Medicine, University of Dhaka, for acceptance of this thesis entitled, "MUSCULOSKELETAL COMPLAINS AMONG MENOPAUSAL WOMEN AT MUSCULOSKELETAL DEPARTMENT OF CENTER FOR THE REHABILITATION OF THE PARALYZED" submitted by **Ms. Radhika Shrestha**, for the partial fulfillment of the requirements for the degree of M. Sc. in Rehabilitation Science.

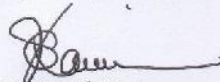


Mohammad Anwar Hossain

Associate Professor,
Head of Department of Physiotherapy,
BHPI, CRP, Savar, Dhaka.

Md. Julker Nayam

Associate Professor,
Department of Occupational therapy,
BHPI, CRP, Savar, Dhaka



Md. Fazlul Karim Patwary

Professor, Institute of IT,
Jahangirnagar University



S.J.M. Ummul Ambia

Lecturer, Rehabilitation Science,
BHPI, CRP, Savar, Dhaka

Date of approval: 06/06/2018

DECLARATION

- This work has not previously been accepted in substance for any degree and is not concurrently submitted in candidature for any degree.
- This dissertation is being submitted in partial fulfillment of the requirements for the degree of MSc in Rehabilitation Science.
- This dissertation is the result of my own independent work/investigation, except where otherwise stated. Other sources are acknowledged by giving explicit references.
- A Bibliography is appended.
- I confirm that if anything identified in my work that I have done plagiarism or any form of cheating that will directly awarded me fail and I am subject to disciplinary actions of authority.
- I confirm that the electronic copy is identical to the bound copy of the Thesis.

Signature:

Name: Radhika Shrestha

Date:, 2018

ACKNOWLEDGEMENT

First of all, I would like to pay my gratitude to Almighty Allah who gave me the passion to complete this study. I would like to thank Bangladesh Health Professions Institute and Dhaka University for providing me great opportunity to carry out this study in Bangladesh. I would also like to acknowledge my family members who has always been my inspiration and provided all necessary supports. Then, I am immensely grateful and would like acknowledge to my honorable supervisor, Mohammad Anwar Hossain, Associate Professor of Bangladesh Health Professions Institute, Head of Department of Physiotherapy, CRP, Savar, Dhaka-1343 for his supervision, guidance, cordial cooperation and feedback during study period.

I would like to thank Md Anwar Hossain, Physiotherapy department of CRP for allowing me to collect data from outdoor patient. I would also like to thank Ms. Salma Jahan, Clinical Physiotherapist; Ms. Jakia Tastuba, Clinical Physiotherapist; Ms. Mahumuda, Intern Physiotherapist; and Ms. Asma Arju, Clinical Physiotherapist of musculoskeletal department, CRP for their continuous support and co-operation throughout the data collection by informing me about the respondent who were eligible for my study.

In addition, I am thankful to all of my honorable teachers especially Nasirul Islam, Associate Professor & Principal (Acting), BHPI, CRP for valuable suggestion and course coordinator Muhammad Millat Hossain, Associate Professor, BHPI for continuous support. I would also like to express my sincere gratitude to Shamima Islam Nipa, lecturer of M.Sc. in Rehabilitation Science and Ummul Ambia, lecturer of M.Sc. in Rehabilitation Science. Accordingly, I would like to thank Mosammat Mohesana, Librarian, BHPI-CRP for providing me valuable articles that I couldn't access myself.

I would like to thank all of my friends for their direct and indirect inspiration, suggestion, tremendous support and guideline from the very beginning to throughout my study. I would also like to express my sincere thanks to all the respondent who provided valuable time and information to my study and helped me to make my study successful. Lastly, I would like to every individuals who are directly or indirectly involved with the study.

TABLE OF CONTENTS

CONTENTS	PAGE NO.
Supervisor Statement	i
Recommendation	ii
Declaration	iii
Acknowledgement	iv
Table of Contents	v-vi
List of Tables	vii
List of Figures	viii
List of Appendices	ix
List of Abbreviations	x
Abstract	xi
CHAPTER I: INRODUCTION	1-8
1.1 Introduction	1-4
1.2 Justification of the study	5
1.3 Research question	6
1.4 Operational definition	7-8
CHAPTER II: LITERATURE REVIEW	9-21
CHAPTER III: RESEARCH METHODOLOGY	22-30
3.1 Conceptual Framework	22
3.2 Study Objectives	23
3.2.1 General objective	23
3.2.2 Specific objective	23
3.3 Study design	24
3.4 Study population	24
3.5 Study site	24
3.6 Study Period	24
3.7 Sample size	24
3.8 Inclusion and Exclusion Criteria	25
3.8.1 Inclusion Criteria	25
3.8.2 Exclusion Criteria	25
3.9 Sampling techniques	25
3.10 Data collection tools/ materials	25-27
3.11 Data Collection Technique	27
3.12 Data Management and Statistical Analysis	28
3.13 Quality control and quality assurance	29
3.14 Ethical consideration	30
CHAPTER IV: RESULTS	31-64

CHAPTER V: DISCUSSION	65-68
5.1 Limitation of the Study	69
CHAPTER VI: CONCLUSION AND RECOMMENDATION	70-71
6.1 Conclusion	70
6.2 Recommendation	71
REFERENCES	72-89
APPENDIX	I-XVI

LIST OF TABLES		Page no:
Table 1	Prevalence of Musculoskeletal complains by menopausal status	42
Table 2	Distribution of common Musculoskeletal diagnosis in each site	43
Table 3	Musculoskeletal factor associated with menopausal status	45
Table 4	Musculoskeletal pain effect and menopausal status	47
Table 5	Factor associated with Musculoskeletal complains in different site of body	48
Table 6	Factors associated with neck pain in postmenopausal women	48
Table 7	Factors associated with shoulder pain in postmenopausal women	50
Table 8	Factors associated with low back pain in postmenopausal women	52
Table 9	Factors associated with knee pain in postmenopausal women	55
Table 10	Association between sociodemographic variables and severity of musculoskeletal pain	57
Table 11	Association between health-related factor and severity of musculoskeletal pain	59
Table 12	Association between menopausal status and severity of musculoskeletal pain	60
Table 13	Association between pain characteristics and severity of musculoskeletal pain	62
Table 14	Binary Logistic Regression analysis of musculoskeletal complain in different body site	64

LIST OF FIGURES

Page no:

Figure 1	Age of the respondent	31
Figure 2	Marital Status of Respondent	31
Figure 3	Educational level of respondent	32
Figure 4	Living status of the Respondent	32
Figure 5	Occupation of Respondent	33
Figure 6	Religion of the Respondent	33
Figure 7	Family Structure of the Respondent	34
Figure 8	Monthly family income of the respondent	35
Figure 9	Source of Income	35
Figure 10	Betel leaf Consumption	36
Figure 11	Sunlight exposure	36
Figure 12	Calcium supplementation	37
Figure 13	Body Mass Index	37
Figure 14	Co-morbidities of respondent	38
Figure 15	Exercise Status of Respondent	38
Figure 16	Distribution of respondent by menopausal status	39
Figure 17	Pain before menopause	40
Figure 18	Osteoporosis Risk	40
Figure 19	Distribution of Musculoskeletal complain by body part	41

LIST OF APPENDICES

Appendix I	Information Sheet (Bangla)	I
Appendix II	Information Sheet (English)	II
Appendix III	Consent Form (Bangla)	III
Appendix IV	Consent Form (English)	IV
Appendix V	Questionnaire	V-XIII
Appendix VI	Approval of thesis proposal by ethics committee of BHPI	XIV
Appendix VII	Recommendation letter to Physiotherapy department from BHPI	XV
Appendix VIII	Permission letters for data collection from Department of Physiotherapy, CRP	XVI

ABBREVIATIONS

ADL	Activities of Daily Living
BMD	Bone Mineral Density
BMI	Body Mass Index
CRP	Center for The Rehabilitation of the Paralyzed
DALY	Disability Adjusted Life Years
Df	Degree of Freedom
DHEA	Dehydroepiandrosterone
ESHRE	European Society of Human Reproduction and Embryology
GBD	Global Burden of Disease
HRT	Hormone Replacement Therapy
i.e	That is
IHME	Institute for Health Metrics and Evaluation
LBP	Low Back Pain
MSK	Musculoskeletal
NAMS	North American Menopause Society
NOF	National Osteoporosis Foundation
OSTA	Osteoporosis Self-Assessment Tool for Asian
OA	Osteoarthritis
QOL	Quality of Life
STRAW	Stages of Reproductive Aging Workshop
SPSS	Statistical Package for Social Science
VAS	Visual Analog Scale
WHO	World Health Organization
YLD	Year Lived with Disability

ABSTRACT

Introduction: The women around menopause are prone to musculoskeletal problem due to hormonal changes. The prevalence of musculoskeletal complain among menopausal women is estimated to be within 53.5% to 85%. The advancing age of postmenopausal women makes them more vulnerable toward musculoskeletal complain.

Objective: The major objective of the study was to identify common musculoskeletal complains among menopausal women. The specific objective was to identify common musculoskeletal diagnosis in menopausal women, association between musculoskeletal complain and menopausal status, factor associated with severity of musculoskeletal pain.

Methods: A cross-sectional study was carried out among 134 respondent of age range 40 to 60 years. The menopausal status was determined using STRAW. The semi-structured questionnaire adapted from Nordic Musculoskeletal questionnaire was used for collecting data.

Results: The most common complain among respondent were LBP (39%), knee pain (22%), neck pain (16%) and shoulder pain (9%). Similarly, postmenopausal women also had same pattern of pain in low back, knee, neck and shoulder with prevalence of 37.7%, 24.6%, 14.8% and 11.5% respectively. The most common diagnosis was spondylosis for low back pain and neck pain, osteoarthritis for knee pain and frozen shoulder for shoulder pain. The musculoskeletal complain at different site of body was associated with osteoporosis risk, exercise status and sunlight exposure but was not associated with menopausal status. The obese women were more likely to have shoulder pain and knee pain. The severity of musculoskeletal pain was associated with comorbid condition, menopausal status, depressed mood due to pain.

Conclusion: Although musculoskeletal complain in different part of body in menopausal women was not associated with menopausal status, the severity of pain increases with menopausal transition. The special attention should be given towards the menopausal status if the women is at this phase of midlife as menopausal status is associated with severity of pain

Keywords: Menopause, Musculoskeletal complain, Menopausal status.

1.1 Introduction

The women during their reproductive age are at low risk of musculoskeletal (MSK) disorder. However, with cessation of reproductive age and beginning of menopause marking the loss of ovarian function, women have shown high prevalence of MSK disorder which continues to increase throughout the postmenopausal period (Stevenson, 2011). Menopause is the natural biological phenomenon in the women's life marked by entering to new phase of life after the end of women's reproductive age. Menopause is the stage when menstrual cycle stops permanently for more than 12 months and level of estrogen and progesterone drops which are the most important hormones in female body (WHO, 1996).

The natural decline in estrogen during this phase ultimately hampers MSK system by increasing visceral fat mass, decreasing bone mass density, muscles strength (Maltais, Desroches, & Dionne, 2009). The rapid decrease in muscle strength and mass in women occurs at earlier age than in men at the time of menopause (Lindle et al., 1997). Menopause either natural or induced has been always associated with arthralgia, body aches and pain, diffuse MSK pain and poor sleep (Alexander et al., 2007).

MSK (MSK) system constitutes of bone, muscle, cartilage, tendons, ligaments and other connective tissues which aids normal physical functioning by providing support, stability and movement to body. MSK disorder and complains are diverse group of condition affecting these structures and are associated with pain and impaired function (Woolf, 2016). MSK disorders usually affects both gender but the study has shown higher prevalence in female than male along with chronic MSK conditions (Tosi, Boyan, & Boskey, 2005).

The women have comparatively stressful ageing process than man as they have to face several menopausal symptoms including MSK problem during the menopausal transition and are even more vulnerable to long term health problems like cardiovascular disease, osteoporosis, fractures, etc. (Morrison, Brinton, Schmidt, & Gore, 2006; Shakhatre, & Mas'ad, 2006).

MSK condition is the second most common cause of disability worldwide measured by Years Lived with Disability (YLD) and it was estimated to have increase by 45% from 1990 to 2010 (Vos et al., 2012). About 17% of disability among postmenopausal women is occurred by MSK disorder (Van et al., 2015) and around 50 to 80% of women reports menopausal symptoms such as psychological symptoms (depression, irritable, anxious, exhausted), somatic symptoms (sweating, cardiac complaints, sleeping disorders, joint and muscle complains) and urogenital symptoms (sexual problems, urinary complaints, vaginal dryness) which are principal determinants of reduced health-related Quality of Life (QOL) detected soon after onset of menopause (Jenabi et al., 2015; Kalarhoudi et al., 2011). Around 20% of the women suffer from severe menopausal symptoms, 60% suffer from mild symptoms and 20% may have no symptoms at all (Vaze & Joshi, 2010).

The middle-aged women are more prone to get MSK symptoms around their menopausal period which has a significant effect on health-related QOL (Braden et al., 2012). The chronic pain in women is more prevalent than men and increases with the increase in age (Braden et al., 2008). The prevalence rate of MSK complain among menopausal women is estimated to be within 53.5% to 85% with variation in the type of pain (Wong, 2016).

The marked decline of estrogen, progesterone, Dehydroepiandrosterone (DHEA) and other hormonal changes contributes to change in muscle mass, muscle strength and bone mineral density. The decreased estrogen receptor in type II muscle fibers and increased intramuscular fat make menopausal women prone to MSK disorder. Also, changes in muscle strength due to decreased motor units, type II muscle fibers, calcium release from sarcoplasmic reticulum and decreased ability to recruit all motor units leads to decreased isometric strength, insulin sensitivity, decreased functional performance and increased risk of fall (Maltais et al., 2009). There is also a growing evidence that along with these structures connective tissue is also affected and menopause introduces non-age-dependent variables in all loss of connective tissue, muscle bulk and power (Calleja & Brincat, 2014).

In addition, these decreased estrogen level also declines aerobic fitness, increase weight gain and incidences of coronary heart disease which is also the leading cause of death among postmenopausal women (Goodman & Kirwan, 2001). The effect of ageing just

after the onset of menopause starts appearing in physically inactive women and postmenopausal women should be prepared for it so as to become independent for functional activities to ensure a good QOL. The studies have shown that exercise training aids postmenopausal women to preserve functional capacity when approaching old age (Asikainen, Kukkonen-Harjula, & Miilunpalo, 2004). The maintenance of good muscle strength through tailored exercise prevents fragility fracture and lessens the burden of osteoporosis in postmenopausal women (Sirola & Rikkonen, 2005).

The majority of MSK pain is found in neck, lumbar region, hip and knee and most of these conditions are left over to be developed as chronic pain or recurrent MSK pain even beyond the menopausal period (Braden et al., 2012) imposing the great burden to individual, family and society as well. Though MSK disorders comprise of various conditions depending on their pathophysiology, they are linked anatomically with their common complaint of pain and impaired physical function. The women in menopausal stage are even more prone to suffer from these complaints due to decreased level of estrogen, ageing factor and lifestyle factor such as lack of physical activity, no exposure to sunlight and obesity (Woolf, 2000).

The middle aged and menopausal women experience various disorders which lead to disability and death thereby hampering QOL. MSK disorder is present at the top list of disabling diseases presented by DALY and for YLD for women at postmenopausal period and has not changed since 1990 although order of disease along with cancer, cardiovascular diseases, diabetes, chronic obstructive pulmonary diseases, depression has changed (Van et al., 2015).

The age of natural menopause occurs between 45 to 55 years for the women worldwide and it is seen that women spend significant time in postmenopausal period average life expectancy for female being 73.5 years (Dasgupta & Ray, 2009). The menopausal age of women in Bangladesh is 51.14 years like those of developing countries (Rahman et al., 2011) and life expectancy of women is 73.1 years spending their 1/3rd life in postmenopausal phase due to increased life expectancy and also QOL is being affected by old age-related problems though traditionally menopause was synonymous to end to women life (Yum & Kim, 2014).

Menopausal health is the most neglected area in developing countries and women are not at all aware about transition affecting their health. Likewise, much attention isn't

given towards it until it becomes serious matter due to ignorance in health and cultural taboo (Gyawali et al., 2016). It has been estimated that 75% of postmenopausal women in developing countries experience severe symptoms including MSK problem, which causes discomfort and life disruption (Tandon, 2010).

1.2. Justification of the study:

The special consideration towards women's health is important in all stages of life especially in developing countries like south Asian countries where it has been neglected. The differences in anatomy, physiology, hormonal system and societal responsibilities and duties in women makes them vulnerable to certain injuries like MSK disorders. The hormone levels among women generally bring out several physical infirmities which has not been the interest of research on women health (Mishra, 2011). The prevalence of MSK complains among women during midlife is higher than that of male population. It increases markedly over the duration of 1/3rd of life at postmenopausal due to increased life expectancy and advancing age (WHO, 2000).

Moreover, chronic disability caused by it tends to remain throughout the life and MSK condition is the main cause of disability among menopausal women affecting social function, mental function, activities of daily living and further deteriorating their QOL. The loss of functional muscle motor units and decreased bone mineral density make them more vulnerable to MSK disorders ranging from silent unnoticed vertebral compression fracture to life-threatening fracture at hip (Sinaki, 1998).

The numerous studies have shown association between menopausal phase and menopausal symptoms like vasomotor symptoms, depression, sleep disorder, etc. But the gap in the research regarding MSK complains (joint and muscle pain in different anatomical site like spine and peripheral joints, discomfort, aches) has been found inspite of its higher prevalence during this phase of life (Cray, Woods, & Mitchell, 2010).

Postmenopausal women have difficulty in facing the pathological health issues due to physiological changes in their body and directly affect their ageing process. These MSK problems in this phase are not life threatening but are self-limiting and leads to disability affecting their daily activities and health related QOL in some forms. This illustrates the importance of health promoting lifestyle patterns and psychological preparedness to face these changes and awareness of these changes helps them to cope with it (Noroozi et al., 2013). The main objective of rehabilitation is to prevent these sorts of MSK complain along with its management.

1.3 Research Question

What are the common musculoskeletal complains among menopausal women?

1.2 Operational definition

Menopause

Menopause is the natural physiological process which occurs when the menstruation cycle ends permanently either naturally or induced.

Age at menopause

Age at menopause is considered as the age at which permanent cessation of menstruation cycle occurs.

Premenopause

Premenopause is the phase of menopause where minor changes in length of menstrual cycle occurs before the beginning phase of the perimenopause.

Perimenopause

Perimenopause is the phase of menopause during which increased irregularity in menstruation cycle keeps occurring for the duration of 12 month before the permanent cessation of menstruation cycle.

Postmenopause

Postmenopause is the phase of menopause which is recognized by permanent cessation in menstrual bleeding for duration of past 12 months.

Musculoskeletal disorders

Musculoskeletal disorders are wide range of health problems associated with the locomotion apparatus i.e. muscles, tendons, bony skeletons, cartilages, ligaments, and nerves. They cover all type of complains from slight discomfort to irreversible and incapacitating injuries (WHO, 2004).

Musculoskeletal complains

Musculoskeletal complains is the way to express the individual's suffering of pain or other symptoms of discomfort associated to wide range of disorder associated to muscle, bones, joints, ligaments, soft tissues, etc.

Estrogen

Estrogen is the hormone produced by ovarian follicle in female which is important to regulate muscle energy metabolism, balance bone resorption and formation, maintain function of cartilage and connective tissue, maintain muscle bulk and strength.

Betel leaf Consumption

Betel leaf consumption is consumption of leaf of betel pepper and lime chewed for its psycho-stimulating effect. Approximately 200 million person chew betel regularly in South Asia.

Body Mass Index

Body Mass Index is the measure of body fat that is the ratio of the weight of body in kilograms to the square of its height in meters.

Menopause and Musculoskeletal system

The natural decline of estrogen level during menopause accelerates loss of muscle mass (sarcopenia), strength and bone mass density making them weaker by the age of 65 year on comparison to men at aged 85 year (Morley, Baumgartner, Roubenoff Mayer, & Nair, 2001). Ageing is also associated with natural decline in physiological functions including loss of bone density, muscle mass and strength. (Roubenoff & Hughes, 2000). The natural decline of estrogen occurs around age of 51 in Canada and life expectancy is higher for men (73years) compared to female (80years) spending around 30 years with decreased QOL in post-menopausal state. The women are at higher risk of health problem due to increased life expectancy. Therefore, the study has shifted to postmenopausal due to this factor and researcher are interested to know about effect of estrogen decline in women's physical health and function.

The higher incidence of MSK complain among the menopausal women may be due to gradual decline of estrogen which lead to MSK changes like loss of skeletal muscle mass and muscle weakness thereby resulting in joint and muscle pain (Lautenbach & Petri, 1999). The estrogen receptors are present in synovial tissues which plays important role in cartilage homeostasis (Cutolo et al., 1993). The deficiency of estrogen is contributing factor for loss of collagen from skin which causes skin thinning, urethra causing urinary incontinence and ligaments and soft tissues causing MSK pain (Whitehead & Godfree, 1992).

Sarcopenia occurs due to decreased rate of synthesis of myosin heavy chain protein which is major anabolic protein (Morley et al., 2001). The study by Rolland et al. (2007) found that there is decreased muscle mass of 0.6% per year occurs after menopause and lean body mass also decreases significantly in 1st 3 years of menopause due to decreased level of total body potassium ((Aloia, McGowan, Vaswani, Ross, & Cohn, 1991). The prevalence of sarcopenia was found to be 24% in healthy independent postmenopausal women and 15% in men.

Postmenopausal women are likely to have 2 times more amount of non-contractile protein such as intramuscular fat per cross-section of muscle on compared to women

who were not in postmenopausal state (Jubrias, Odderson, Esselman, & Conley, 2007). Thus, women who are not at HRT are at higher chance of storing intramuscular fat and do not have ability to oxidize it (Maltais et al., 2016). The studies have shown that physical exercise, especially focused on resistance training helps to maintain muscle mass and thereby reduce intramuscular fat (Hughes, Frontera, Roubenoff, Evans, & Singh, 2002). The women with Vitamin D deficiency has shown atrophy of type II muscle fibers thereby increasing the risk of fall (Pfeifer et al., 2000).

The loss of muscle strength comes along with the loss of muscle mass (Carville et al., 2005). The studies have shown a correlation between muscle strength and blood estrogen level though mechanism behind it is not clear (Cauley, Gutai, Kuller, LeDonne, & Powell, 1999). Wilk et al. (2008) found estrogen receptors on muscle fibers among postmenopausal women are very few in number compared to other women, men and children.

Normally, during the process of ageing, there is atrophy and denervation of type II fibers and it is re-innervated by axons of type I fiber which make aged people weaker and slower (Morley, 2001). Widrick et al. (2003) found that the cross-sectional area of type I muscle fiber larger in area than those of type II fiber in postmenopausal women independent of HRT. The decline in type II muscle fibers that are necessary to produce fast and strong contraction without fatigue makes them disabled in completing task of daily living. The decline in postural muscles fiber leads to postural instability and they require high velocity strength to protect themselves from fall which is most important predictor of fracture (Stel et al., 2004).

Delnono et al. (2005) reported that there is decline in calcium released by sarcoplasmic reticulum which affects the cross-bridge formation. So, all the motor units cannot be recruited leading to decrease in force per unit. Pollock et al (1994) had shown postmenopausal women engaged in regular resistance training showed higher level of muscle mass compared to women in sedentary or endurance training exercise.

DHEA is hormone produced by adrenal cortex and also by ovaries. With loss of ovarian follicular activity at menopause, adrenal DHEA become major precursor of extragonadal production of estrogen and androgen (Labrie, Martel, & Balsler, 2011). So, DHEA has positive skeletal effect towards BMD in postmenopausal women and it can also be converted to estrone in osteoblast (Davis, Panjari, & Stanczyk, 2011).

Age of menopause and Life Expectancy

The health of menopausal women is even more important considering the prevalence of various health issues with advancing age and life expectancy of women being 6-8 years longer than man (Wang et al., 2012). According to Global Burden of Disease (GBD) 2010, the difference between life expectancy and healthy life expectancy for female is 11.5 years (Salomon et al., 2012). So, due to increased life expectancy, studies in women's health has been shifted to postmenopausal women in 21st century (WHO, 2000). According to Institute for Health Metrics and Evaluation (IHME), Bangladesh, it was seen that over the period of 16 years from 1990, the expected life expectancy of female has been increased from 61.6 years to 70.4 years whereas observed life expectancy has been increased from 58.6 to 75.1 years which is comparatively higher than male whose expected and observed life expectancy has been 65.5 and 70.5 years respectively at the end of 2016. The age of 60 years is a realistic statistical definition for ageing in Asian and Pacific regions, particularly taking into account average retirement age, legislation, health conditions and so on. Though age of 60 defines "old age" but life expectancies are different in different places and there are many things which affect a person's ageing process (Banglapedia, 2015).

The age of menopause in south Asian countries ranges from 46-49 years (Nisar & Sohoo, 2010). However, the meta-analysis of age at menopause concluded that age of menopause ranged from 46 to 52 years. It was highest among European, Australian, followed by American and was lower among African, Latin American, Asian and middle eastern countries (Schoenaker, Jackson, Rowlands, & Mishra, 2014).

In a study done regarding menopausal symptoms assessment among middle age women in Kushtia, Bangladesh, the natural age of menopause was identified as 51.14 years (Rahman et al., 2011). The natural age of menopause in Nepal ranged from 46.8- 50 years in different studies. In cohort study of women aged 40-60, age of menopause was 48.7 years in Nepal (Paudyal & Nepal, 2014; Ghimire et al., 2015; Rajbhandarai et al., 2017). In a cross-sectional study done in Odisha, India among 100 women of age group 40-60 years, it was found that mean age of menopause was 44.82. Similarly, in other study done in India, Kashmir, mean age of menopause was 49.35 years (Tandon, Mahajan, Sharma, & Sharma, 2010). The age of menopause in Turkish study done among 321 women was 46.78 ± 4.2 (Hotun & Coskun, 2007).

Musculoskeletal complain in menopause

Also, according to IHME (2016), Low Back Pain (LBP) and neck pain has been ranked at first position since 2005 to 2016 as the cause of years lived with disability (YLDs) while other MSK complains ranks continuously at the sixth position. Around 17% of disability among women aged 50–69 year during postmenopausal period is caused by MSK disorders. The studies have found that MSK complains are commonly reported among women during midlife i.e. when menopausal transition occurs (Brown, Mishra & Dobson, 2002; Dugan et al., 2006) along with other complains like vasomotor symptoms, depression and sleep disturbance which significantly affects health related QOL (Freeman et al., 2007). In a systemic review done regarding MSK pain in women before and after menopause, all the articles included in review showed increased joint and spine pain when women were experiencing menopause or have experienced menopause (Kozinoga, Majchrzycki, & Piotrowska, 2015).

The study done at Turkey showed that among 321 women aged 45-64years, 76% of the menopausal women had joint and muscle ache (Hotun & Coskun, 2007). In a study done in different geographical area of Nepal among menopausal women, prevalence of joint and muscle pain varied from 37% to 87% (Paudyal & Nepal, 2014; Rajbhandarai et al., 2017; Ghimire et al., 2015). Nelson et al. (2005) showed that body pain and poor general health were found comparatively higher in menopausal women in the detailed evidence-based analysis. In Bangladesh 76.20% menopausal women had joint and muscular discomfort (Rahman et al., 2011).

On the study done among midlife women at China, 21% had pain in neck, 33.4% had low back pain, 31% had knee pain, 25.6% had pain at other joint. It also showed that 23.6% had joint stiffness and 21.1% had swelling (Gao, Lin, Wei, Chen, & Wu, 2013). Perimenopausal and postmenopausal women frequently suffer from osteoporosis, sarcopenia and osteoarthritis (Van et al., 2015). The significant increase in prevalence of osteoporosis is associated with sedentary lifestyle, loss of ovarian function and changes in the estrogen during post-menopause (Stevenson, 2011).

In a descriptive cross-sectional study done among 93 climacteric women in Brazil, the prevalence of MSK pain was 93% with the greater involvement in spine (71%), followed by knees (58%) and shoulders (47%). It also showed that pain was highly prevalent in perimenopausal women with the intensity of moderate to intense

(Dedicação et al., 2017). The reason behind pain during menopausal period could be hormonal alteration i.e. hypo estrogen causing wearing of the cartilage and bone mass loss (Hunter & Sambrook, 2000).

A study done among 310 postmenopausal women in Nigeria found higher prevalence of MSK complain like pain, discomfort, ache in the lower extremity (60.97%) and back (52.9%). The study also investigated the association of obesity and overweight with the MSK pain complain which showed that the lower extremity pain was significantly associated with Body Mass Index (BMI). Obese menopausal women had twice the MSK complain on comparison with non-obese menopausal women and had 70% higher rate of back pain compared with non-obese menopausal women (Ogwumike, Adeniyi, & Orogbemi, 2016).

An observational cohort study done for the period of 3 years among 67,963 postmenopausal women who had recurrent neck pain, back pain and joint stiffness regarding the predictor of MSK pain found that BMI more than 30 and lack of physical functioning were associated with the higher intensity of pain (Braden et al., 2012). Over the period of 3 year, 40% of those women had worst pain.

In a cross-sectional study done in Odisha, India among 100 women of age group 40-60 years, 60% had joint pain, 62% had body pain, 28% had numbness of finger and 45% had tingling sensation in fingers (Satpathy, 2016). Beside this, the menopausal women with breast cancer survivor also reported 75% prevalence of joint pain, general aches, pain and 69.4% of muscle stiffness (Cao, 2013). The study shows significant association between MSK pain and menopausal status, with postmenopausal ($P < 0.0001$) women having greater MSK symptoms than those with early peri menopausal ($P = 0.002$) and late perimenopausal ($P = 0.002$) in age adjusted analysis (Dugan et al., 2006).

Freeman et al. (2007) in their longitudinal study for 9 years among the women in Penn Ovarian Aging Study demonstrated prevalence of aches, joint pain and stiffness significantly peaked during perimenopause and association of these symptoms with menopausal stage was independent of age. Among them 75% had severe pain and 40% had moderate pain. In Australian Longitudinal Study on Women's Health among age 45-50 found that approximately 50% of perimenopausal and postmenopausal women had back pain or other types of joint pain (Brown, Mishra & Dobson, 2002)

When the MSK pain was summarized on the basis of menopausal status, researchers found that neck pain, low back pain and knee pain were most common MSK complains which was more prevalent in postmenopausal followed by perimenopausal and then by premenopausal. The obese group had 1.865 times of joint stiffness on comparison to normal weight group. The study also concluded that common MSK complain was low back pain and the prevalence was not associated significantly with age. However, neck pain was associated with menopausal status and menopause increased pain risk in women in midlife (Gao et al., 2013).

Factors associated with Musculoskeletal complains in menopausal women

The factors causing MSK disorder can be classified as modifiable and non-modifiable factors. The modifiable factors like high BMI, low physical activity, inadequate calcium and vitamin D, sedentary lifestyle, osteoporosis risk is best contributor to sarcopenia and loss of strength in postmenopausal women. Similarly, non-modifiable factors like oxidative sets, inflammation, estrogen and hormone deficiency are predictors of MSK complain during postmenopause. The application of exercise and consumption of required supplements can minimize loss of muscle mass and strength (Maltais et al., 2009).

The physical exercises like brisk walking, jogging and running provide weight on the long bones of body which provides stress on bone and bone mass increases in response to weight (Tong, 2013). The study had shown that regular exercise of at least 30 mins per day for 3 times a week can significantly reduce symptoms of menopause including MSK pain by combating weight gain and bone density loss (Shakila, Sridharan, & Thiyagarajan, 2014).

The menopausal transition is associated with rapid increase in fat mass re-distribution from subcutaneous to visceral sites increasing the waist hip ratio in menopausal women (Toth, Tchernof, Sites, & Poehlman, 2000). Therefore, these group of women are at higher risk of developing cardiovascular and metabolic disease like diabetes on comparison to non-obese women (WHO, 2012). BMI is a significant predictor of MSK pain especially at neck, low back and knee though the reason is unclear, the knee joint might be more affected being a weight bearing joint (Gao et al., 2013).

Vitamin D has been identified as the contributing factor to prevent from muscle weakness and poor MSK health and the prevalence of inadequate Vitamin D is high in

post-menopausal women. And it was found that most common factor responsible for inadequate vitamin D was limited sun exposure, lack of dietary intake and wintertime (Gaugris et al., 2005). The major source of Vitamin D is dependent on sunlight exposure which is a natural way and the need for supplementation varies in every individual (Baber, Panay & Fenton, 2016).

Osteoporosis

1 in 2 women and 1 in 4 men over age 50 will have an osteoporosis-related fracture, with 20% mortality rate within 12 months of a hip fracture (bone and joint initiative). The prevalence of osteoarthritis, osteoporosis, joint laxity, ligamentous laxity, adhesive capsulitis, disc degeneration was increased in women (Tosi, Boyan, & Boskey, 2005). The most common MSK problem that affects menopausal women are osteoarthritis and osteoporosis. Both of these cause disabilities and is the major public health problem with higher incidence in women on comparison to men and have their onset around or after menopause (ESHRE, 2011). The studies have shown increased bone resorption immediately after menopause and mentioned the influence of hormonal changes, especially ovarian estrogen on bone mineral density (BMD). The depletion of BMD begins to accelerate 2-3 years before menopause and ends after 3-4 years after menopause. The 2% of bone loss occurs annually in period of few years around menopause and slows to 1-1.5% per year after that (Recker, Lappe, Davies, & Heaney, 2000).

Osteoporosis is an important clinical and public health problem due to its association with fracture causing significant morbidity, mortality, health and social care cost (O'Neill & Roy, 2005). It is characterized by low bone mineral density and micro architectural deterioration of bone which results in loss of bone strength and increased risk of fracture (Raisz, 2005) leading huge burden through the increased morbidity and mortality associated with fragility fracture. Osteoporosis is also called as silent bone diseases because it is usually asymptomatic and goes unnoticed until and unless it causes fracture with minimal trauma that normally doesn't lead to fracture (Lips & Van Schoor, 2005). In some cases, some of the fractures like collapsed vertebrae goes unnoticed leading to dowager's hump whereas sometimes it can cause severe back pain. The most common areas of the osteoporotic fractures are wrist, spine, shoulder and hip (Popescu et al., 2014). The examination of postmenopausal women should include

assessment for acute or chronic back pain with special attention to middle back for presence of vertebral fracture as they may go unnoticed (NAMS, 2006). Pelvic fracture result from low energy trauma and are major cause of mortality and morbidity (Morris, 2000).

Usually, women have smaller and thinner bones on comparison to men and they lose about 20% of bone after menopause whereas by age of 65 or 70, men and women loose bone mass at the same rate (Bradney et al., 2000). In United States around 30% postmenopausal women have osteoporosis and among them 50% suffer from fracture during life common site being vertebrae, hip, wrist and proximal femur (McClure, Adams, & Dahm, 2005). Postmenopausal women are generally disproportionately affected by osteoporosis and fracture rates among women are approximately twice as high as men. 1 in 2 women over 50 years of age suffers from osteoporosis-related fractures with 20% mortality rate within 12 months of a hip fracture (NOF, 2011). Besides, non-traumatic vertebral fracture is also of the common manifestation of osteoporosis and most of them goes unnoticed and only one-third of them come to medical attention (Cooper et al., 1992). These fracture in addition causes postural deformities like kyphosis, scoliosis, that induce chronic back pain and disability in physical activities, loss of self-esteem and depression (Silverman et al., 2005; Borgström et al., 2006).

Due to current demographic trends, the incidence of osteoporosis and osteoporotic fracture is estimated to increase drastically until and unless effective preventive measures are implemented (O'Neill & Roy, 2005). Sedentary osteoporotic menopausal women had increased intensity of pain and decreased ability to perform activities of daily living (Borchers et al., 2005). The comparative study among menopausal women with and without osteoporosis has shown that women with osteoporosis has poor MSK status which in long term resulted in limitation of daily activities, low back pain, increased risk of fall and fracture (Cunha-Henriques et al., 2011).

The BMD test is the gold standard to confirm osteoporosis and the rate of progression on bone mass loss (Fisher et al., 2013). The ordinary X-ray is least accurate for the early detection of osteoporosis as it shows the loss of bone mass only in the advanced stage and most of the damages has already been occurred. Though it is less accurate, it was used for diagnosis in past years either through less dense bone tissue or presence of

crush fractures (Peters et al., 2009). Besides, Computed Tomography scans (CT scans) and Dual Energy X-ray Absorptiometry scan are also the accurate measures of bone density. CT scans uses higher level of radiations (Saravi, 2013) and DEXA scan uses special X-ray technique and diagnosis relies on increased risk of having future fracture determine by T-score rather than disease diagnosis. T-scores should be reserved for diagnostic use in postmenopausal women and men aged 50 years or more (WHO, 2007)

Diagnostic Criteria for Osteoporosis and Osteopenia in Postmenopausal Women

Category	BMD derived from DEXA measurement
Normal	Spinal or hip BMD within 1.0 SD below the young adult female reference mean (T-score ≥ -1.0)
Low bone mass (Osteopenia)	Spinal or hip BMD between 1.0 and 2.5 SDs below the young adult female reference mean (T-score < -1.0 and > -2.5)
Osteoporosis	Spinal or hip BMD ≥ 2.5 SDs below the young adult female reference mean (T-score ≤ -2.5)
Severe/established osteoporosis	BMD ≥ 2.5 SDs below the young adult female reference mean and the presence of one or more fragility fractures (Jeremiah, Unwin, Greenawald, & Casiano, 2015)

OSTA is simple instrument for calculating risk of osteoporosis specifically developed for Asian postmenopausal population by WHO. It is validated and effective, feasible screening tool to identify patients with low BMD and risk of sustaining osteoporosis. It simply takes account of age and weight of subject. The value ≤ -1 is regarded as high risk and those with value > -1 was considered to be having low risk of osteoporosis (Koh et al., 2001, Yang et al., 2013). OSTA is simpler instrument and perform as well as or better than more complex instrument. It has even been validated for both sex and a variety of races (Nayak et al., 2015). If the women are at high risk, they are best prescribed for BMD testing.

The lifestyle factors like cessation of smoking, decreased intake of alcohol, decreased caffeine intake, multi-component exercise like strength and balance training, sunlight exposure of at least 30 min per day, 5 days per week are considered to be non-pharmacological treatment for reduction of osteoporosis related fractures (Jeremiah et al., 2015). Vitamin D supplementation helps to maintain BMD and also muscle

functions, strength, and prevent risk of fall, abnormal gait pattern and balance (Maltais et al., 2009). Vitamin D helps to utilize calcium ingested and natural sunlight for 15mins without sunscreen is the best source of it (Hasib, 2017). The regular physical exercise is most for individual to become physically fit but the care should be taken to avoid vigorous high-intensity exercise although it is necessary to stay active in order to maintain balance, coordination and reducing risk of fall (Zaki, 2014). The dietary reference intake for vitamin D is 800–1000 IU and calcium is 1000-1500mg in the postmenopausal period.

Menopausal Hormone Replacement Therapy

Hormone Replacement Therapy (HRT) helps to prevent fracture after menopause but the initiation of therapy should not be prior 10 years of onset of menopause as benefit of hormone therapy are most likely to outweigh any risk and can be considered as first line therapy. The benefit and risk calculation should be considered and lowest effective dose should be administered (Baber, Panay & Fenton, 2016). Unlike to western countries, hormone therapy is not the popular option in Asian countries instead they prefer to choose traditional therapies. Apart from cultural and economic reason, hormone therapy hasn't been choice as it is not effective for body aches and shoulder stiffness which are major concern in Asian women (Sohail, 2014). In other hand, Women Health Initiative Investigators (2002), have reported that HRT can be contributing risk factor of heart disease, breast cancer, colorectal cancer, stroke and cardiovascular diseases.

The women with osteoporosis need to be careful of doing vigorous high impact of vigorous high-impact exercise but it is important to stay active as this can help to maintain balance and coordination, so reducing the risk of fall (Zaki, 2014). The lifestyle modification to adopt healthy lifestyle with balanced diet constituting calcium and vitamin D, maintenance of healthy weight, participating in appropriate exercise, avoiding alcohol and smoking and preventive measure to prevent fall should be considered for postmenopausal women to reduce chances of getting MSK disorders. The height and weight monitoring are foremost along with assessment of chronic back pain, kyphosis and clinical risk factors (NAMS, 2010). The OSTA index should be calculated and for those with high risk BMD should be performed as OSTA only acts as screening tool. Although hormonal therapy has positive effect on fracture prevention,

considering its adverse effect, the focus should be given on other modifiable risk factors as mentioned earlier such as adequate sun exposure.

Osteoporosis and BMI

The major modifiable risk factor for osteoporosis leading to osteoporotic fracture is low BMI or underweight population whereas high BMI is thought to be protective. But, there is no risk ratio of BMI with osteoporosis. The risk ratio is smaller for BMI between 25-35 kg/m², modest for BMI over 22kg/ m² and risk is considerably high for BMI below 22 (Kanis, 2007). Asian women have lower BMI and are of smaller build. So, they are more prone to bone density loss (Sohail, 2014) with subsequent fall and risk to fracture.

Degenerative joint disease

Degenerative joint disease is characterized by progressive loss of articular cartilage associated with bone hypertrophy and subchondral bone sclerosis. During menopausal transition and postmenopausal period, osteoarthritis of synovial joint and spondylosis of intervertebral disc especially at cervical and lumbar spine are found as most common cause of joint pain worldwide. It imposes the major burden to patients, society and healthcare systems (Woolf & Pfleger, 2003).

Osteoarthritis

Osteoarthritis (OA) is characterized by progressive destruction of cartilages that lines the joint, the subchondral bones surfaces, and synovium. Pain, immobility, muscle weakness, reduction in function and inability to complete activities of daily living(ADLs) are result OA and it is highly prevalent in Knee joint, being a weight bearing joint (Newberry, FitzGerald, & SooHoo, 2017). OA is most common form of arthritis and its incidence increases after onset of menopause and severity increases to rise in postmenopausal years (Stevenson, 2011). Stiffness and pain are very common in postmenopausal women but these are no necessarily indicative of radiological osteoarthritis (Szoeki et al., 2008)

The prevalence of osteoarthritis in men and women seemed to be similar till the age of 50 years. Beyond 50 years, the disorder is more prevalent in women with increased severity which suggest that there may be relationship between onset of osteoarthritis and the menopause. This statement is further supported by finding that OA is very

common in women with hysterectomy (Wluka, Cicuttini, & Spector, 2000). MSK disorder has increased disability by 45% from 1990 to 2010 and among them OA, characterized by loss of joint cartilage is expected to make women more functionally disabled especially in hips and knees due to increased pain with the rise in socioeconomic factor like obesity, sedentary lifestyle and ageing (Vos et al., 2012). Due to increased life expectancy of women, it is expected that OA will be fourth leading cause of disability by 2020 (Woolf & Pfleger, 2003). 14.1% men and 22.8% female over 45 years old has shown OA of knee in radiographic studies of United States and European population (Valkenburg, 1980) while Hip OA has lesser incidence of 2.3% among women aged above 45 years in Swedish survey (Danielsson & Lindberg, 1997).

The postmenopausal women with OA have difficulty in performing basic activities of daily living like bathing, toileting, walking, stair climbing, etc. without assistance and it places huge burden on health care system and cost of the country as care taker should be assigned along with her (Gabriel & Michaud, 2009).

Low Back Pain

The study done by Dugan et al. (2006) among 2218 women, 61% had low back pain. Among them it was found that the highest increase in pain symptoms was observed in early perimenopausal women while pre-menopausal women were least affected by low back pain. There was positive association between increased BMI and intensity of pain may be due to mechanical overloading of the spine. The study showed that pain and aches are significantly and independently related with post-menopausal status. The study shows significant association between MSK pain and menopausal status, with post-menopausal ($P < 0.0001$) women having greater MSK symptoms than those with early peri menopausal ($P = 0.002$) and late perimenopausal ($P = 0.002$) in age adjusted analysis (Dugan et al., 2006). Mitchell & Woods (2010) did study among 540 women and found that low back pain increased in the severity as women underwent through menopausal transition as 83% of patient among late perimenopausal phase had low back pain and at early postmenopause as well. Both of these studies have reported statistically significant relationship between menopausal status and low back pain.

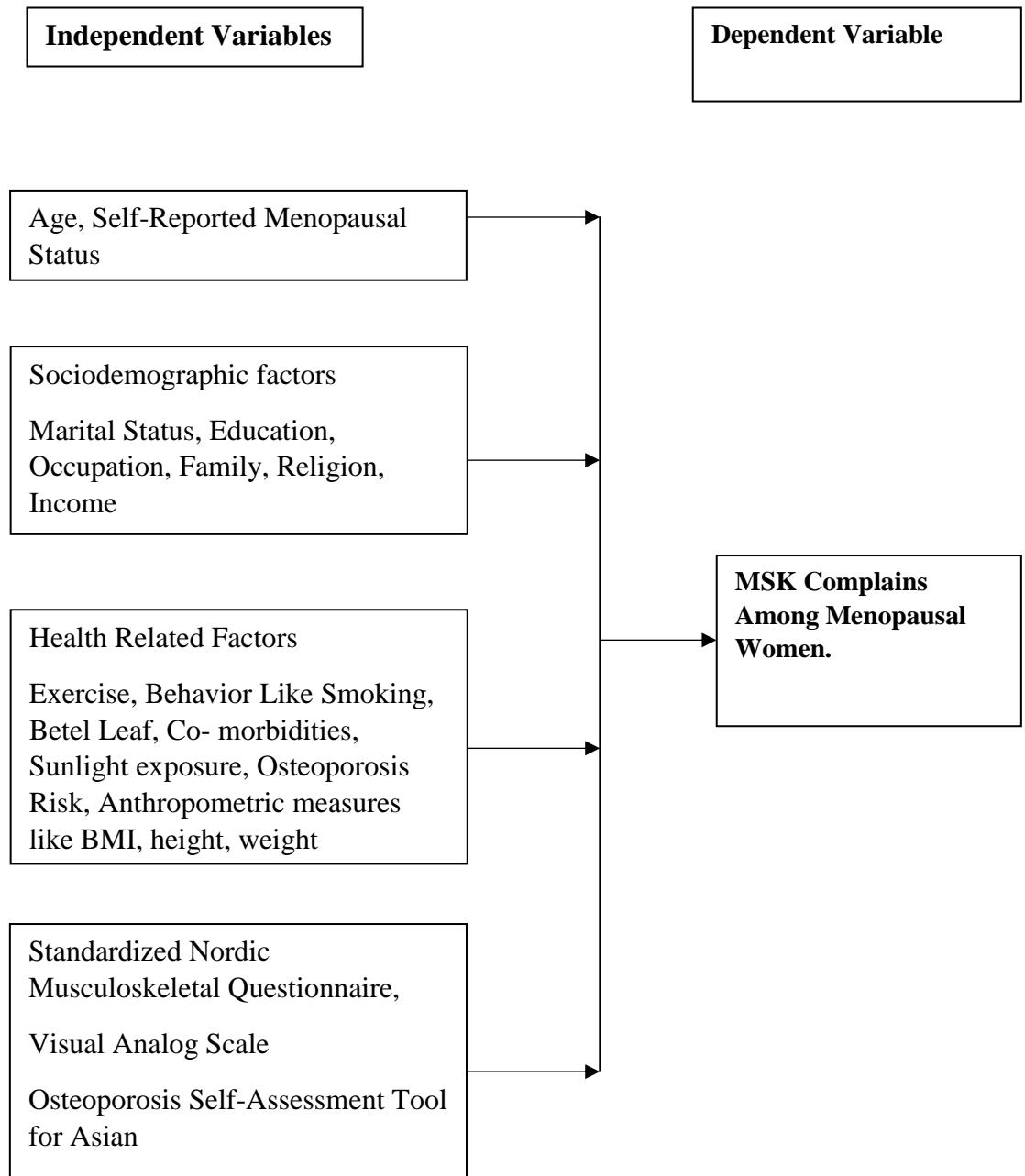
The longitudinal study was done by Szoeki et al. (2008) among Australian women of age group 45-55 years who were at premenopausal state. During the duration of 8 years of study, most of women went through perimenopausal to postmenopausal and the

prevalence of back pain ranked to 59% from the baseline 44% showing association of pain with menopausal transition ($P < 0.05$) and also increased BMI, employment status was associated with severity and frequency of MSK pain. The study done among 78 postmenopausal women hospitalized with spine pain. it showed that women who were in in postmenopausal period with low BMD had higher incidence of MSK pain there was no significant association between BMI and incidence of back pain (Park et al., 2010).

The frequently occurring MSK complain which begin at menopausal transition, regardless of severity will result in long term health issue like different disabilities including osteoporosis. The osteoporosis increases the risk of bone fracture in postmenopausal women as increased bone resorption and rapid loss of bone mass occurs due to decreased estrogen level (NAMS, 2010; Stevenson & Marsh, 2007). The lifetime osteoporotic fracture is very high (40-50%) for women than those of men (13-22%). Among them hip fracture is most severe as only 50% of them will be able to walk with walking aids at home and 20-30% die within 12 months. Spine fracture are associated with 20-30% mortality after 5 years. 50% of postmenopausal women have impaired functional mobility after distal forearm fractures (Stevenson, 2006; Johnell & Kanis, 2005; Kanis et al., 2008)

The decreased muscle fibers contributing to decreased muscle strength leads to long term effect of MSK complains among postmenopausal women. The decline in power output ultimately results in falls and prone to fracture as they require high power generation to maintain stability. They are not able to perform functional activities hampering their QOL (Maltias et al., 2009).

3.1 Conceptual Framework



3.2 Study objectives

3.2.1 General Objective

- To identify the common musculoskeletal complains among menopausal women.

3.2.2 Specific Objectives:

- To explore socio-demographic characteristics of respondent.
- To identify age of natural menopause.
- To identify association between musculoskeletal complain and menopausal status.
- To identify most common musculoskeletal diagnosis in menopausal women.
- To identify factors associated with musculoskeletal pain of postmenopausal women.
- To assess association between menopausal status and severity of pain.
- To identify factors associated with severity of pain.

3.3 Study Design

The study was done using quantitative, nonexperimental cross-sectional design to identify MSK complains among menopausal women. Researcher used this method as it is effective design to collect quantitative information about different variable that comes into the study to meet the objective of the study (Labaree, 2009). This study design best suited with the research question of this study.

3.4 Study population

The study population was women in menopausal phase who attended MSK department of CRP, Savar, Dhaka for treatment within age group 40 to 60 years.

3.5 Study Site

The study site was MSK department of CRP, Savar, Dhaka.

3.6 Study Period

The study extended from December 2017 to May 2018 for period of six months.

3.7 Sample size

The sample size was determined according to following criteria:

76.20% prevalence of muscle and joint discomfort among menopausal women in Bangladesh (Rahman et al., 2011) was used. The confidence interval was 95% and 5% error level. The formula used for sample size determination was as below:

$$\text{Sample size} = z^2 p(1-p) / d^2$$

$$z = 1.96 \text{ (statistic for a level of confidence of 95\%,)}$$

$$p = 0.762 \text{ (76.20\% prevalence)}$$

$$d = 0.05 \text{ (precision of 5\%)}$$

$$n = (1.96)^2 * 0.762(1.0.762) / (0.05)^2$$

$$n = 278$$

The estimated sample size was 278 to conduct study. However, due to time constraint the total sample size collected was 134.

3.8 Inclusion and Exclusion Criteria:

3.8.1 Inclusion Criteria

- Women with natural menopausal transition.
- Women of age group 40-60.
- Women with intact uterus and at least one intact ovary.
- Any MSK problem.

3.8.2 Exclusion Criteria

- Women not willing to participate.
- Current Pregnancy or breastfeeding women.
- Women with polycystic ovary syndrome.
- Chronic illness undergoing chemotherapy
- Surgical induced menopause like hysterectomy. (Harlow et al., 2012)
- Medically unstable patient, HIV-AIDS.
- Severe neurological disorder.
- Women with cognitive impairment and hearing impairment.

3.9. Sampling Techniques

A convenience sampling technique was used to select the sample. It is a non-probability sampling technique where a sample is taken according to convenience of researcher according to inclusion and exclusion criteria set by the researcher. It was taken as choice of sampling technique as researcher was facilitated through this technique due to time constraint and cost limitation.

3.10 Data Collection Tools/ Materials

The researcher developed semi-structured questionnaire in light of objectives in English language according to context of Bangladesh. The questionnaire was based on literature review regarding MSK complains among menopausal women. The developed questionnaire was divided into four parts based on literature. The first part of questionnaire constituted socio-demographic information of respondent, second part constituted information on health-related factors like betel leaf consumption, sunlight exposures, BMI, osteoporosis risk, co-morbidities and exercise status. The third part

constituted information on reproductive parameter such as age of menopause, parity, menopausal status on the basis of STRAW classification. The fourth part constituted of MSK complain questionnaires such as body part affected, pattern, type, severity of pain using VAS Scale. Other tools used in this study were weight measurement machine, measurement tapes, data collection sheets along with questionnaires, pen, logbook etc.

Standardized Nordic Musculoskeletal Questionnaire

The assessment of MSK symptoms was done with Standardized Nordic MSK Questionnaire. It assesses 7 day and 12-month prevalence and patterns of MSK complain, pain, discomfort in nine sites of body namely neck, shoulder, upper back, low back, wrist/hands, hips/thighs, knees, and ankles/feet. The body chart from Nordic MSK Questionnaire was used to identify the body part being affected (Kuorinka et al., 1987). It is useful for screening MSK problem in different site of body. It has excellent internal consistency with Cronbach's alpha=0.896.

Osteoporosis Self-Assessment Tool for Asian (OSTA)

The osteoporosis risk was calculated on the basis of Osteoporosis Self-Assessment Tool for Asian (OSTA) index. It is simple and effective tool for osteoporosis risk calculation established by WHO using a multinational Asian cohort taking into account of age and weight of the subject. It was developed for postmenopausal women and later translated and validated for European and North American white women. OSTA was calculated on basis of formula: $[(\text{body weight in kg} - \text{age in years}) * 0.2]$ and obtained value was rounded to close integer. The value ≤ -1 is regarded as high risk and those with value > -1 was considered to be having low risk of osteoporosis (Koh et al., 2001, Yang et al., 2013). The sensitivity of OSTA was 43% and specificity was 97%. OSTA is simpler instrument and perform as well as or better than more complex instrument. It has even been validated for both sex and a variety of races (Nayak et al., 2015).

Stages of Reproductive Aging Workshop (STRAW)

The STRAW model uses self-reported menstrual bleeding pattern instead of using age as criterion for determining menopausal stage. The respondent was identified as premenopause if they had minor changes in cycle length particularly decreased length

of cycle. Early perimenopause had increased irregularity in menstrual bleeding in last 3 months, late perimenopause had increased irregularity in menstrual bleeding in in last 12 months. Women were considered in postmenopause if they had no menstrual bleeding in past 12 months (Harlow et al., 2012). The women in early perimenopause and late perimenopause were grouped together as perimenopausal stage.

Visual Analog Scale (VAS)

VAS is single item unidimensional measure of pain intensity. It is continuous scale usually 10cm in length, anchored by 2 verbal description, where 0 is “no pain” and 10 is “worst imaginable pain”. the cut points on the VAS have been recommended as follows: (0-4 mm) = no pain, (5-44mm) = mild pain, (45-74mm) = moderate pain and (75-100mm) = severe pain. Test-retest reliability of VAS scale is higher among literate ($r=0.94$, $P<0.001$) than illiterate patients ($r=0.94$, $P<0.001$).

3.11 Data Collection Technique

The English version of questionnaire was translated to Bangla script language by two different people as a process of forward translation who had good English proficiency and also were medical professionals. Then, two set of translated questionnaires was cross-examined by another medical professionals with good English proficiency and translated back to English as a process of backward translation to validate that original meaning of the questionnaire was maintained in translation. The pilot study was done among 10 women under inclusion and exclusion criteria to validate the translated questionnaires. It was observed from pilot study that respondent had difficulty in answering question when it was self-administered. So, in order to minimize these difficulties, face-to-face interview was carried out rather than using self-administered. From pilot study, necessary correction was made and it was ensured that there were no any doubled meaning questions, ambiguous questions that could confuse respondent and mislead the response.

The researcher started data collection after approval of study from Institutional Review Board of Bangladesh Health Professions Institute (BHPI) and Dhaka University. The purpose of study along with information sheet was explained to eligible respondent briefly. The permission was also take from the department of physiotherapy, CRP for

data collection. The respondent was asked for verbal consent followed by signature in consent form to ensure voluntary participation. The researcher collected through face to face interview administering the developed questionnaire rather than self-administered respond. All the women were interviewed in Bengali language and the questions that were not understood were clearly explained to respondent to ensure the right answer. The respondent was assured about privacy and confidentiality.

3.12 Data Management and Statistical Analysis

The data was stored and quality control check was done for accuracy, utility and completeness after completion of data collection. The errors, incompleteness and inconsistencies in data affecting the final results were excluded. All the data was scientifically and systematically stored for future and to avoid any missing and misuse of data. The collected data was reviewed, recorded and entered in Statistical Package for Social Science (SPSS) version 16. The data analysis was done using SPSS. The large data were recoded into simplified data for easy analysis. For example, salary was recoded into range to get concrete results. The reliability test of questionnaire was done in SPSS to ensure internal validity.

The continuous data was analyzed using descriptive statistics and presented in means, standard deviation, etc. and categorical data were presented in forms of percentage of distribution and were used to generate tabulated reports, charts, distribution, descriptive statistics. The descriptive statistics was used to attain research objective. The chi-square test of independence was used to find degree of association between different variables was also determined through SPSS. A p value of <0.05 was considered as significant

Equation of chi-square test

$$X^2 = \frac{\sum (O-E)^2}{E}$$

Here, O= Observed Frequency

E=Expected Frequency

The variables thought to be significant predictor of MSK complains according to body part affected were analyzed using binary logistic regression and association was checked using odds ratio and p-value. A P-value less than 0.05 was considered statistically significant.

3.13 Quality control and Quality Assurance

The study was cross sectional study conducted at MSK department of CRP for the period of 6 months. The prepared questionnaire was adapted from Standardized Nordic MSK Questionnaire, VAS Scale, and STRAW classification. To ensure and improve quality of study, the questionnaire was translated to national Bangla language following the standard procedure of linguistic validation according to WHO guideline. The two medical persons fluent in both language was assigned for forward translation. They prepared two translated version of questionnaire and another medical professional with good English proficiency who had not seen original questionnaire was appointed for backward translation. Then, the final version of translated questionnaire in Bangla language was used.

The pilot study was conducted among 10 respondents to ensure face validity of questionnaire at MSK department of CRP and they were not included in final analysis of data. After reviewing the result of pilot study, necessary correction was made in prepared questionnaire according to requirement. The data was checked for missed responses and those were excluded. The data was reviewed, recorded and entered in SPSS in order to reduced human errors that were likely to occur while entering and analyzing the collected data. The questionnaire that has been responded were kept safely.

This was cross-sectional study conducted at MSK department of CRP. During 6-month study duration, the postmenopausal women was selected on the basis of inclusion and exclusion criteria, informed consent was taken for power of 95% and a significance level of 0.05. Then meeting and discussion regarding research methodology, sample collection, literature was done with supervisor. The progression regarding data collection and any problem encountered was informed to supervisor. The discussion regarding thesis result and discussion was done.

3.14 Ethical Consideration

The study was conducted following the standard WHO guidelines of ethical consideration and Bangladesh. The ethical approval for research was taken from Institutional Review Board of BHPI. The informed consent as well as questionnaires in both Bengali and English language were submitted along the proposal and it was followed by formal written permission from ethical committee. The permission for data collection was received from physiotherapy department of CRP, Savar. The aim of study was explained to each responded and data collection was collected only after receipt of verbal and written consent. Along with consent form, information sheet was also signed by responded which consisted of information regarding study and its objectives. The participant had their own choice of decision whether or not to participate in study. The confidentiality of data was maintained, the study was protected by the law “right to privacy” which prevents researcher from disclosing any direct information about respondent of the research. The respondent had autonomy to respond to each question and there was no physical or mental assault to respondents. The participants had liberty to leave from the study any time. The researcher was aware of doing no harm to the participants in any way.

4.1.Socio-demographic Characteristic of Respondent

Age of the Respondent

The mean age of the participant was 49.49 ± 6.02 SD. 36% (n=48) of the respondent were aged 46-50 years with modal age of 50 years and age group 51-60 years had least respondent of 16% (n=22).

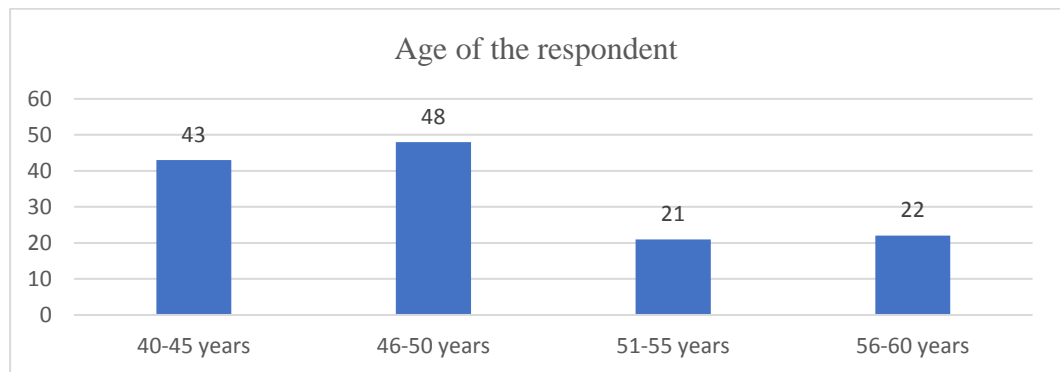


Figure 1: Age of the respondents

Marital Status of Respondent

76% (n=102) of the respondent were married, 22% (n=29) were widowed and 0.7% (n=1) of respondent were unmarried and 1% (n=2) were divorced in the study.

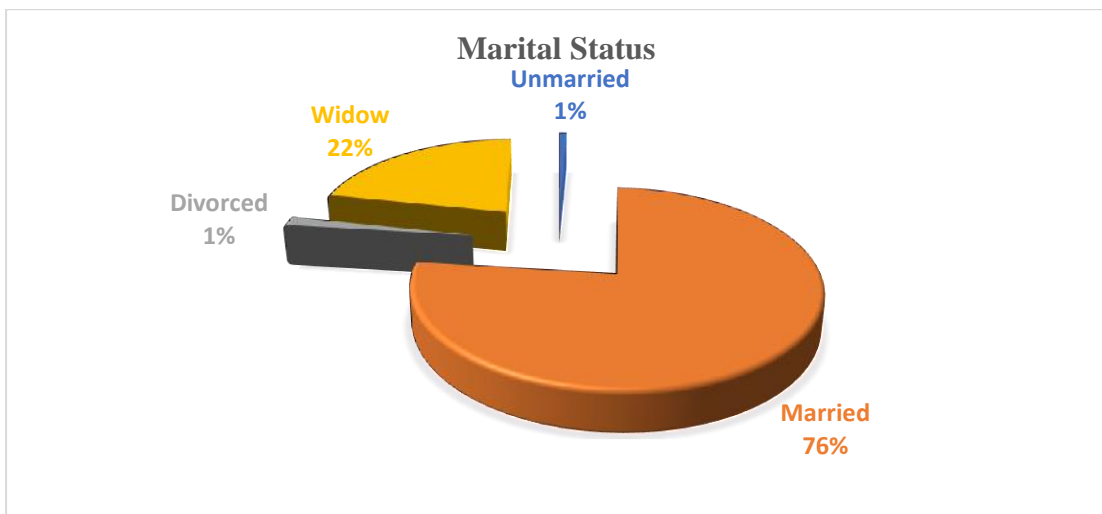


Figure 2: Marital status of the respondent

Educational Level of Respondent

The study showed that out of 134 respondents, 30% (n=40) were illiterate, 34.3% (n=46) of the respondent had acquired education till secondary level whereas only 13.4% (n=18) had studied till higher secondary level and above.

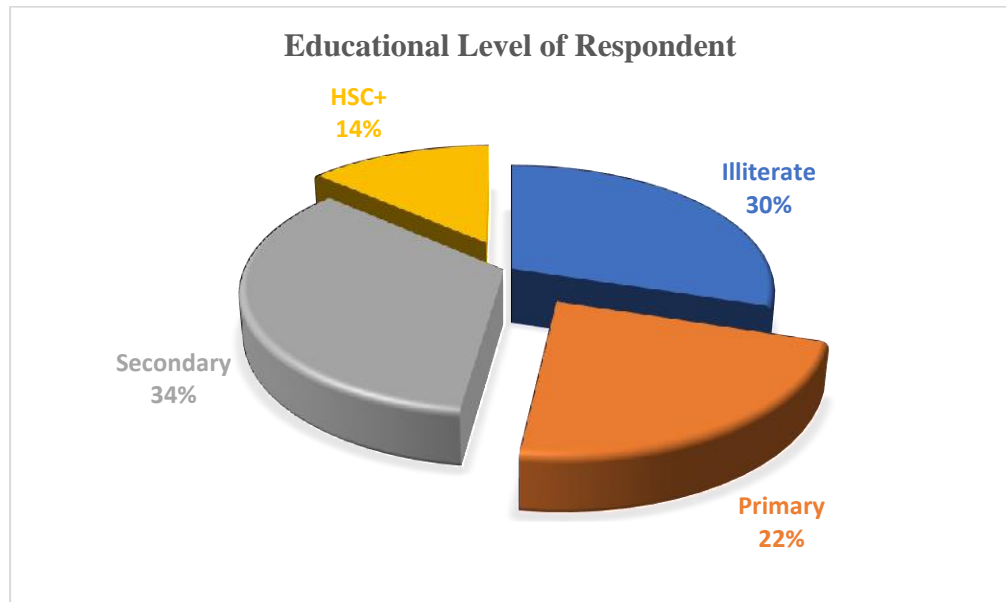


Figure 3: Educational level of respondent

Living Status of the Respondent

Out of 134 respondents, only 5% (n=7) lived alone while 95% (n=127) of them lived with the family.

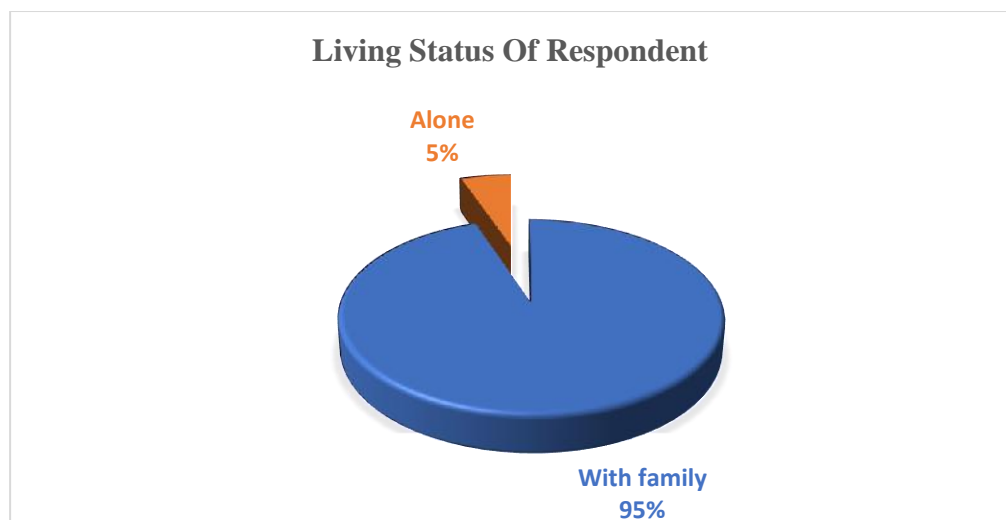


Figure 4: Living Status of Respondent

Occupation of Respondent

Most of the respondent were housewife 89% (n=119) followed by other occupations 8% (n=11). 2% (n=2) of them were farmer and 1% (n=1) were teacher and retired officers.

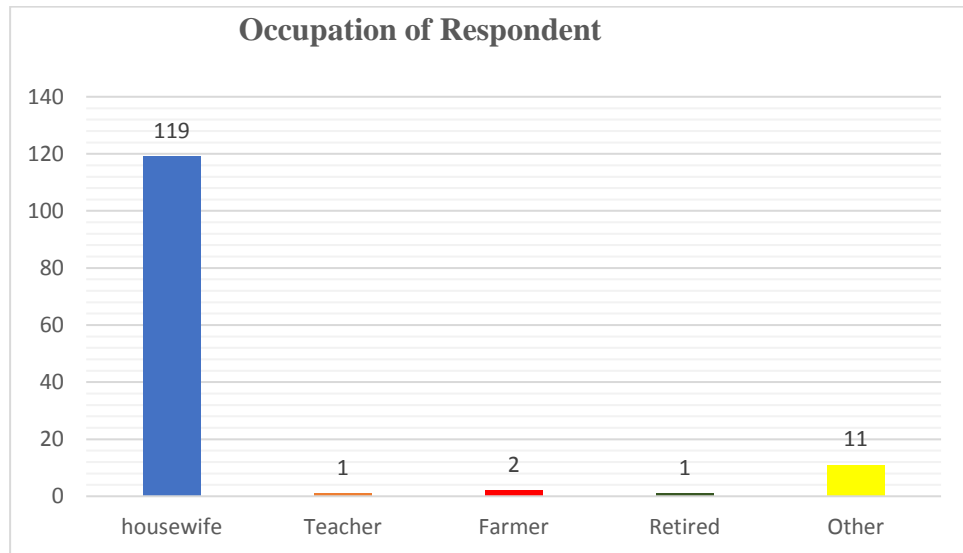


Figure 5: Occupation of Respondent

Religion of the Respondent

Most of the respondent were Muslim with 93% (n=125), followed by Christians with 4% (n=5), Hindu with 2% (n=3) and Buddhist with 1% (n=1).

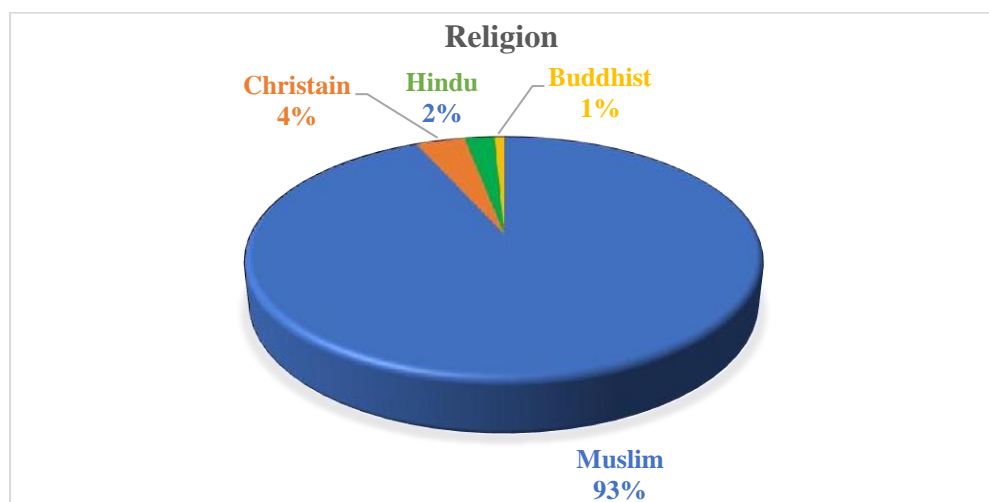


Figure 6: Religion of the Respondent

Family Structure of the Respondent

The study showed that 73.1% (n=98) of the respondent lived in a nuclear family and 26.9% (n=36) lived in a joint family.

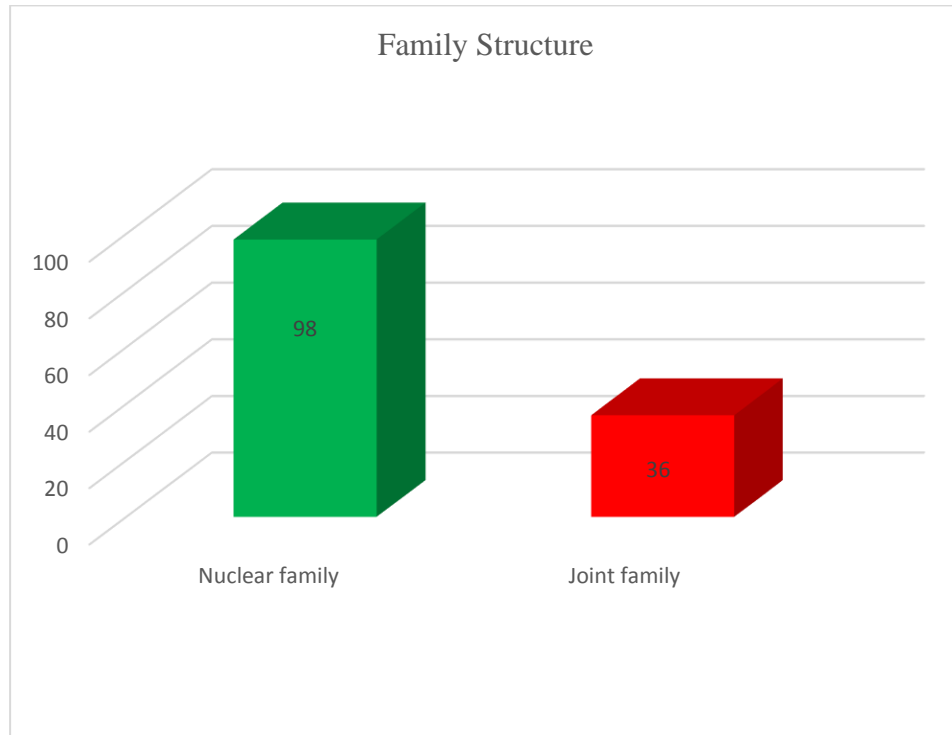


Figure 7: Family Structure of the Respondent

Monthly Family Income of the Respondent

The average monthly family income of respondent was 32686.57 ± 35511.4 SD. The maximum number (n=20, 15%) of respondent had income of 10000 and median income was 20000. 30% (n=40) had income below 11000, 24% had income between 11000-20000, 13% (n=18) had monthly income in range 21000-30000, 8% (n=10) had income 31000-40000, 11% (n=15) had income 41000-50000 and 14% (n=19) had income above 50000.

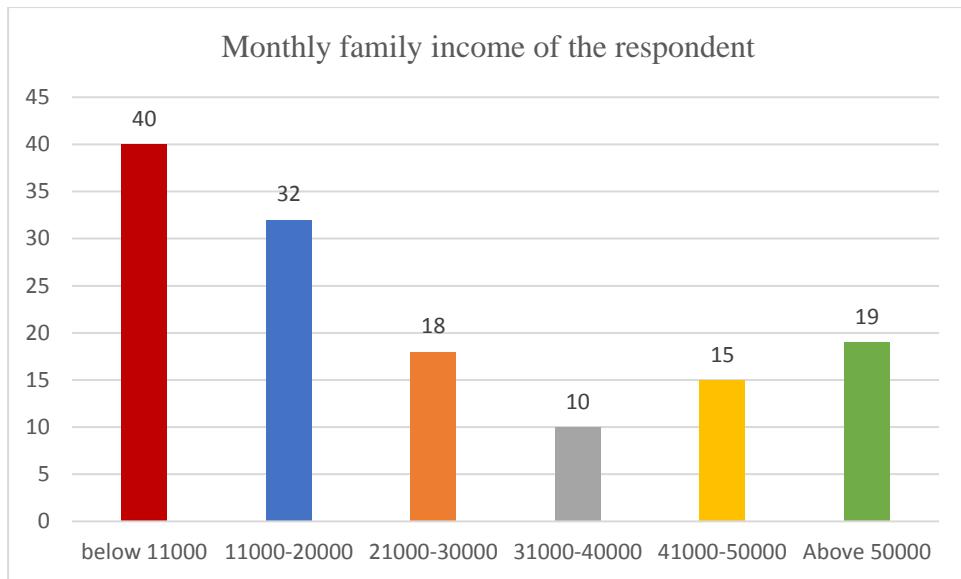


Figure 8: Monthly family income of the respondent

Source of Income

Out of 134 respondent, 43.3%(n=58) had source of income as their husband, followed by children as source of income with 39.6%(n=53), oneself with 11.2%(n=15) and other sources with 6%(n=8).

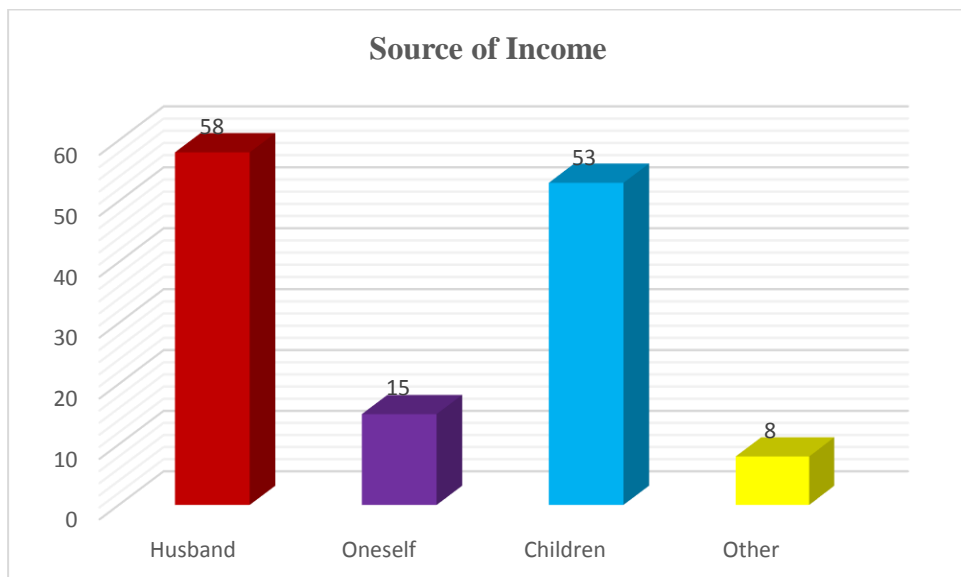


Figure 9: Source of Income

4.2. Health Related Factors

Betel leaf Consumption

Among 134 respondents, 47%(n=63) used to consume betel leaf (Paan) while 53%(n=71) didn't have such habit.

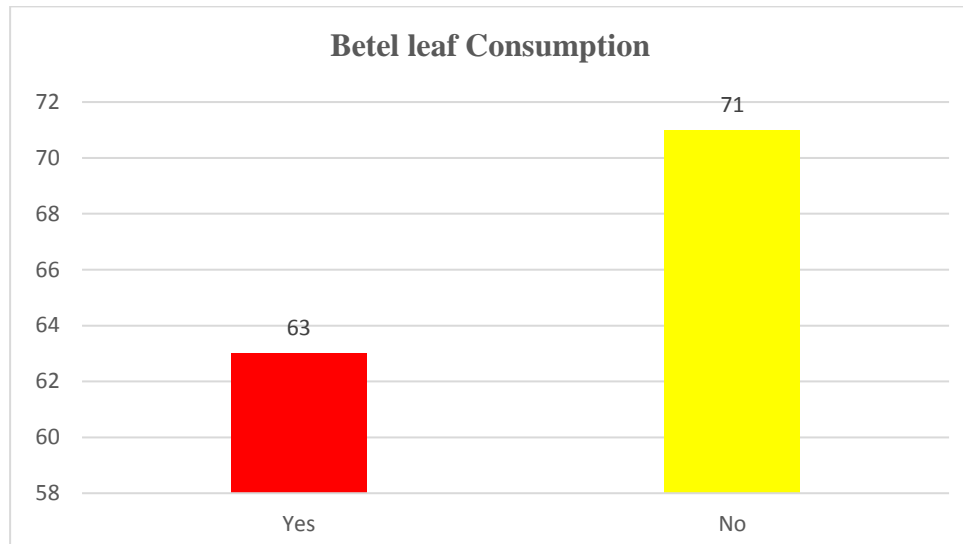


Figure 10: Betel leaf Consumption

Sunlight exposure

Among 134 respondent, only 65.7% (n=88) had daily exposure to sunlight whereas 34.3% (n=46) didn't have everyday sunlight exposure.

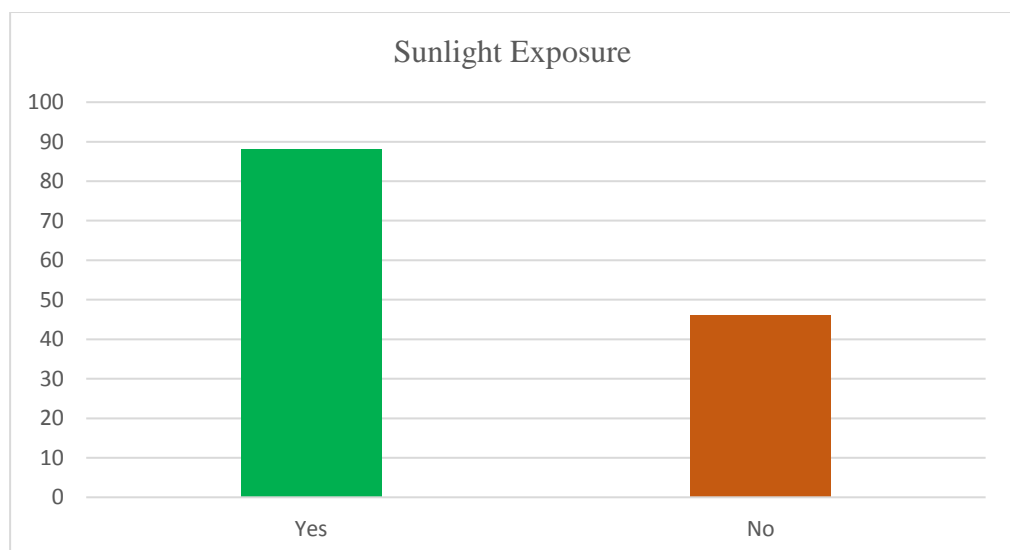


Figure 11: Sunight exposure

Calcium supplementation

Among 134 respondents 56% (n=75) used to take calcium supplementation and 44% (n=59) didn't use to take calcium supplementation.

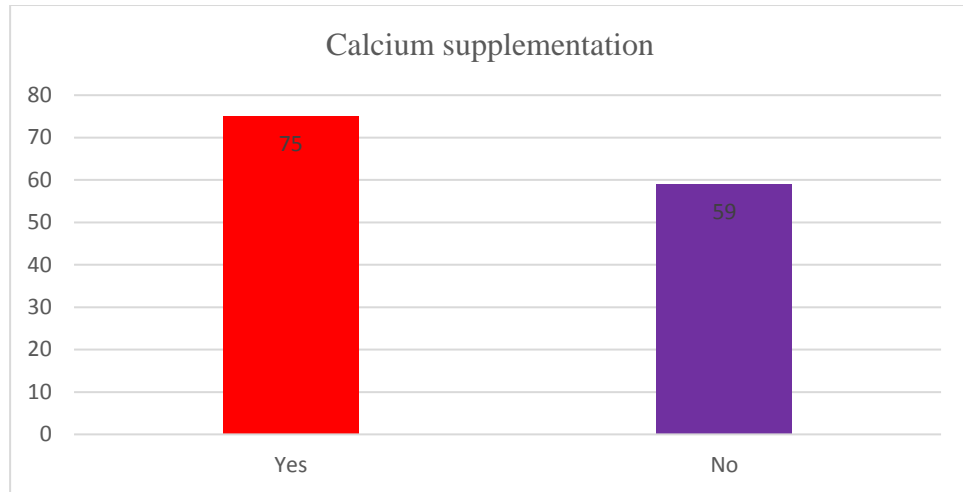


Figure12: Calcium supplementation

Body Mass Index

The average BMI of the respondent was 25.69 ± 4.5 SD. Out of 134 respondents, 52.2% (n=70) women were obese, followed by 24.6% (n=33) were normal weight, 20.9% (n=28) were overweight and 2.2% (n=3) were underweight.

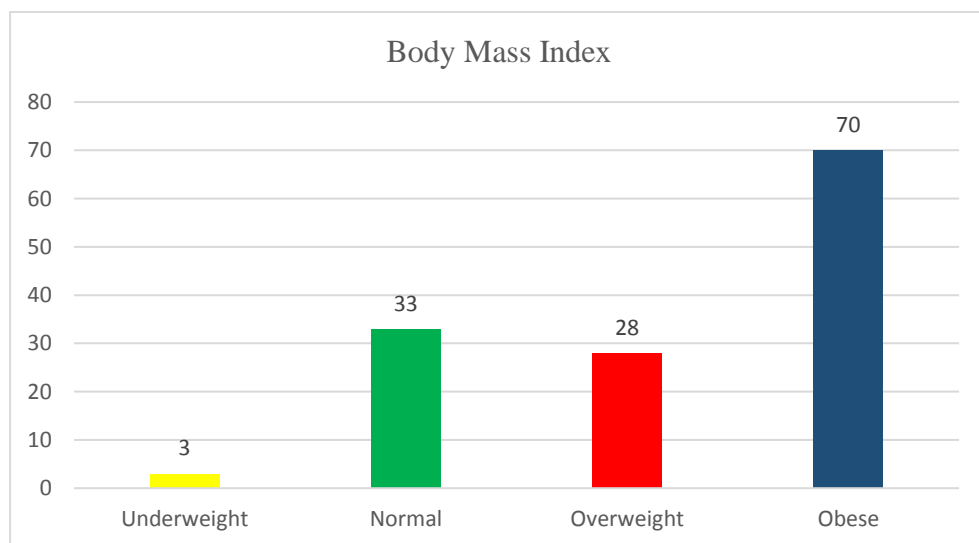


Figure 13: Body Mass Index of Respondent

Co-morbidities of respondent

Out of 134 respondent, 65.7% (n=88) had some types of co-morbidities while 34.3% (n=46) didn't have any type of co-morbid conditions. Among them, 54% (n=47) had hypertension, 35.6% (n=31) had diabetes, 16.1% (n=14) had respiratory disease, 9.2% (n=8) had heart disease and 21.8% (n=19) had other co-morbidities.

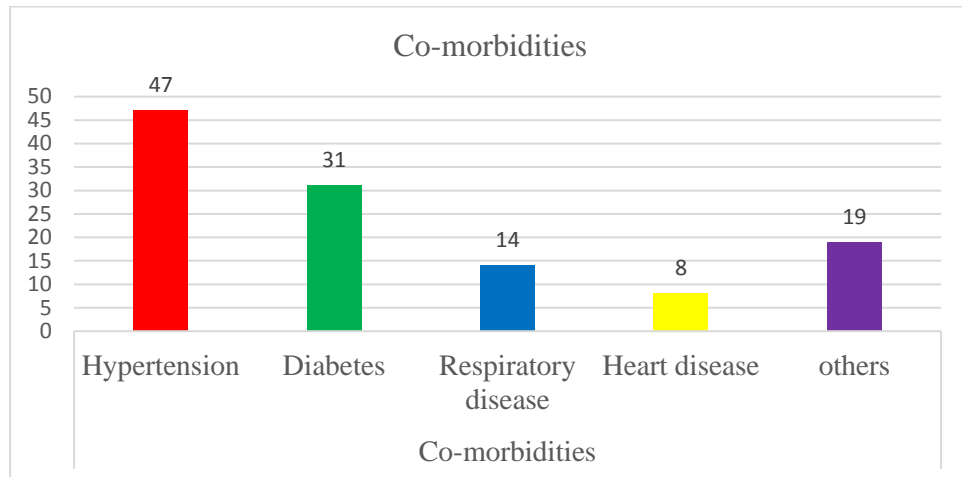


Figure 14: Co-morbidities of respondent

Exercise Status of Respondent

The study showed that only 10% (n=13) of women used to do physical exercise whereas 90% (n=121) of women didn't do any type of physical exercise.

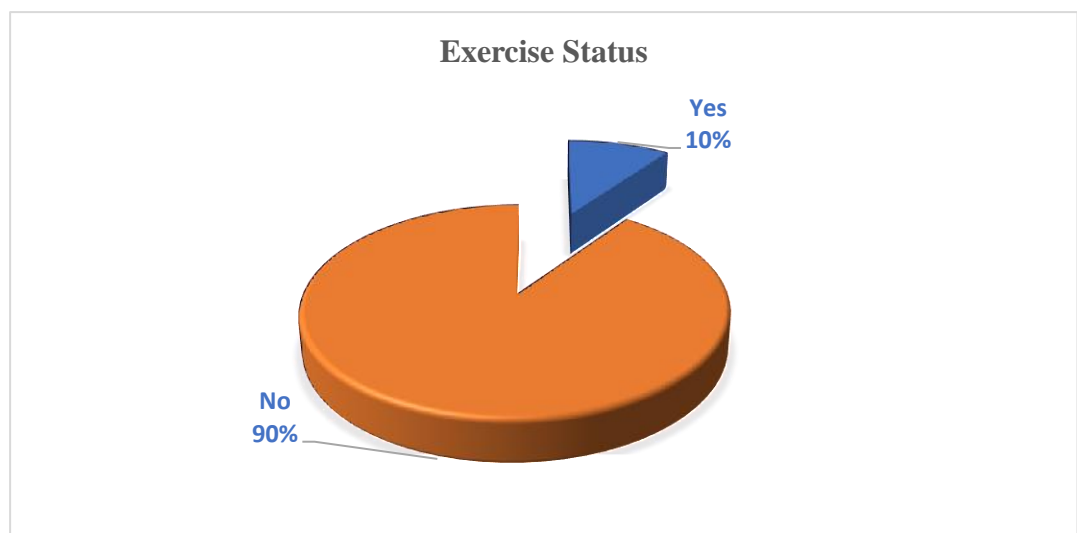


Figure 15: Exercise Status of Respondent

4.3.Reproductive parameter of Respondent

Age of menopause

The average age of menopause among 77 menopausal in study population was 45.44 ± 4.2 SD with age range (35-55). 7% of them had premature menopause i.e. menopause before 40 years.

Parity

The average number of children respondent had was 3.3 ± 1.4 where minimum number of children was 0 and maximum number of children was 7.

Distribution of respondent by menopausal status

Out of 134 respondent, 21.6% (n=29) were in premenopausal status, 20.9% (n=28) were in perimenopausal status and 57.5% (n=77) were in postmenopausal status being highest number of respondent.

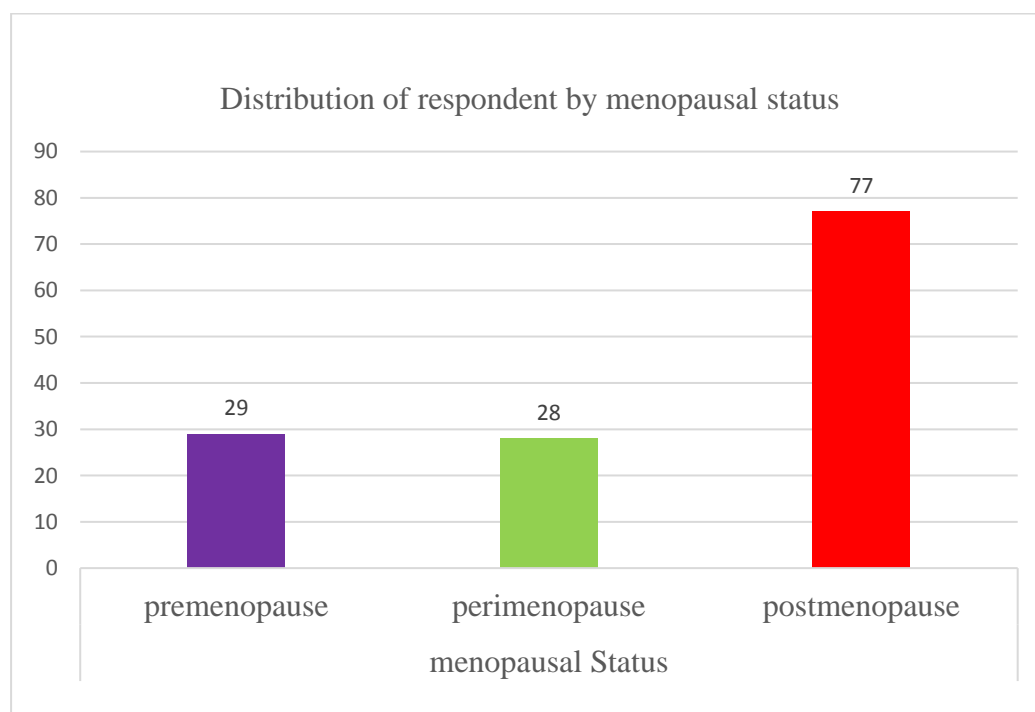


Figure 16: Distribution of respondent by menopausal status

Pain before menopause

Out of 77 menopausal women, only 15.6% (n=12), had MSK complain before menopause whereas 84.4% (n=65) women didn't have any kind of MSK complain before menopause in life time. Among them, 83.3% (n=10) had low back pain (LBP) and 2.6% (n=2) had knee pain.

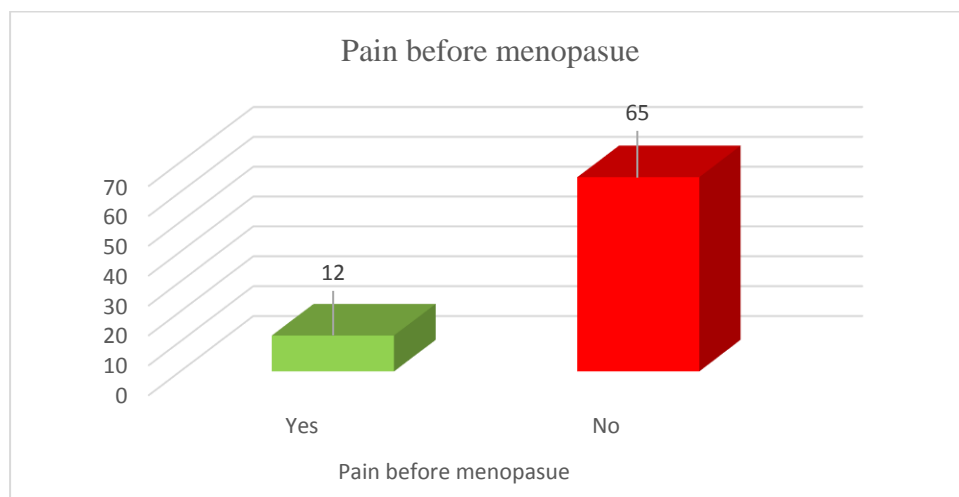


Figure 17: Pain before menopause

Risk for Osteoporosis

The average OSTA score was 2.2 ± 2.5 . Among them 9% (n=12) were at high risk of osteoporosis and 91% (n=122) were at low risk of osteoporosis. None of the respondent had done confirmatory BMD testing. The mean score of OSTA was 2.2 ± 2.5 .

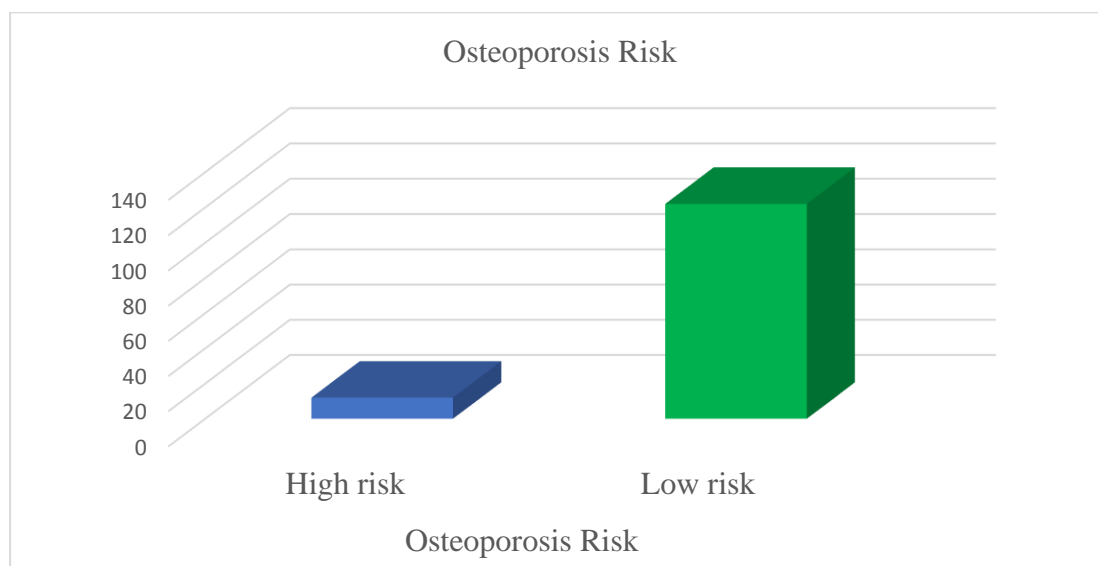


Figure 18: Osteoporosis Risk

4.4. Distribution of Musculoskeletal complain by Body Part

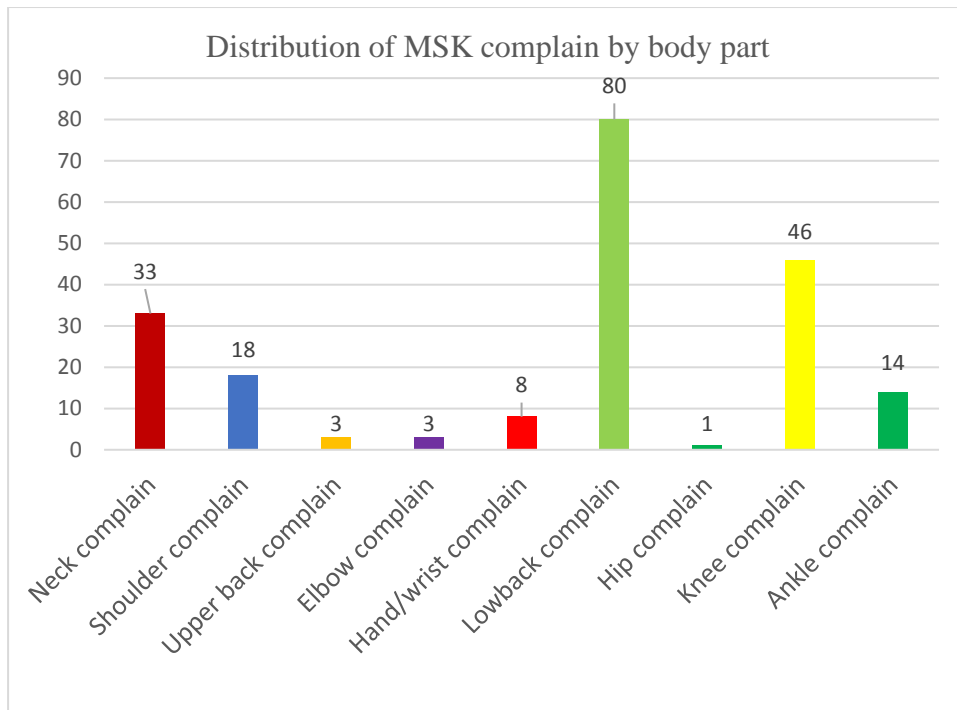


Figure 19: Distribution of musculoskeletal complain by body part

According to body part being affected, the most prevalent MSK complain was low back pain with 38.8% (n=80), followed by knee pain with 22.3% (n=46), neck pain with 16.0% (n=33), shoulder pain 8.7% (n=18), ankle pain with 6.8% (n=14). The complain of upper back pain and elbow pain was 1.5% (n=3) and hip was least affected with 0.5% (n=1).

4.5. Musculoskeletal Complains and Menopausal status

Table 1: Prevalence of Musculoskeletal complains by menopausal status

Body Complain	Premenopause N=29		Perimenopaus e N=28		Post- menopause N=77		Total N=134	χ^2	df	P- val ue
	N (%)	%	N (%)	%	N (%)	%				
Neck	9(27.3)	22	6(18.2)	14	18(54.5)	14.8	33(16.0)			
Shoulder	1(5.6)	2.4	3(16.7)	7	14(77.8)	11.5	18(8.7)			
Upper back	2(66.6)	4.9	0(0)	0	1(33.3)	0.8	3(1.5)			
Elbow	2(6.9)	4.9	0(0)	0	1(33.3)	0.8	3(1.5)	25	18	0.1 2
Hand/wris t	1(66.6)	2.4	4(50.0)	9.3	3(37.5)	2.5	8(3.9)	21		
Low back	18(22.5)	43.9	16(20)	37.2	46(57.5)	37.7	80(38.8)			
Hip	0(0)	0	1(100)	2.3	0(0)	0	1(0.5)			
Knee	7(15.2)	17.1	9(19.6)	20.9	30(65.2)	24.6	46(22.3)			
Ankle	1(7.1)	2.4	4(28.6)	9.3	9(64.3)	7.4	14(6.8)			

The table 1 shows the prevalence of MSK complains in 9 different parts of the body in every menopausal status. The general trend observed was that among all respondent, highest prevalence was 38.8%(n=80), 22.3% (n=46), 16% (n=33) and 8.7%(n=18) found at low back, knee, neck and shoulder respectively.

The most common MSK complains in postmenopausal women were complains in low back, knee, neck and shoulder with prevalence of 37.7%, 24.6%, 14.8% and 11.5% respectively. The prevalence of low back, knee pain, neck pain decreased at perimenopausal state on comparison to premenopausal state whereas increased at postmenopausal state. But, the prevalence of shoulder pain increased continuously from premenopause to perimenopause and perimenopause to post menopause. Out of 80 women with LBP, 57.5%(n=46) were postmenopausal women followed by premenopausal 22.5%(n=18) and perimenopausal women with 20%(n=16). Out of 46 respondents with knee pain, maximum of them were postmenopausal women i.e. 65.2%(n=30), followed by perimenopausal with 19.6%(n= 9) and premenopausal with 15.2%(n=7). Out of 33 women with neck pain, highest prevalence was in menopausal women with 54.5%(n=18), followed by premenopausal women with 27.3%(n=9) and perimenopausal women with 18.2%(n=6).

Association between Musculoskeletal complains and menopausal status

The table 1 shows the association between complain at each body part with menopausal status. The standard chi-square value for 18 df at 5% level of significance is 28.87 and the χ^2 observed value in above table was 25.21 which is less than standard value at same df. According to test P-value in each association was greater than 0.05 which stated that this difference was not statistically significant which stated that there is no association between MSK complains at each body part and menopausal status, χ^2 (18, N=134) = 25.21, p=0.12).

4.6. Common musculoskeletal diagnosis among menopausal women

Table 2: Distribution of common Musculoskeletal diagnosis in each site

Variables	Category	All respondent N=134 N (%)	Postmenopause N=77 N (%)
neck pain(n=33)	Cervical Spondylosis	24(72.7%)	16(88.9%)
	PCID	3(9.1%)	0(0%)
	Postural neck pain	5(15.2%)	2(11.1%)
	others	1(3%)	0(0%)
shoulder pain(n=19)	Frozen Shoulder	14(73.7%)	11(73.3%)
	Rotator cuff disorder	4(21.1)	3(20.0%)
Upper Back pain (n=3)	Others	1(5.3%)	1(6.7%)
	Myofascial Pain	2(66.7%)	1(100%)
Elbow Pain (n=3)	Postural pain	1(33.3%)	
	Lateral epicondylitis	1(33.3%)	1(100%)
Hand/wrist(n=8)	Fracture/Dislocation	1(33.3%)	0(0%)
	Others	1(33.3%)	0(0%)
	CTS	2(25%)	0(0%)
LBP (n=80)	Dequervains tenosynovitis	3(37.5%)	2(66.7%)
	others	3(37.5%)	1(33.3%)
	PLID	16(20%)	10(21.7%)
Hip pain (n=1)	Spondylolisthesis	10(12.5%)	5(10.9%)
	Lumbar Spondylosis	40(50%)	26(56.5%)
	others	14(17.5%)	5(10.9%)
	Osteoarthritis	1	0(0%)
Knee pain (n=46)	Osteoarthritis	39(84.8%)	29(96.7%)
	Ligament injury	2(4.3%)	0(0%)
	PFPS	2(4.3%)	0(0%)
	Others	3(6.5%)	1(3.3%)
Ankle pain (n=14)	Plantar fasciitis	1(7.1%)	0(0%)
	Ankle Sprain	2(14.3%)	2(22.2%)
	Fracture	1(7.1%)	0(0%)
	Others	10(71.4%)	7(77.8%)

The table 2 shows the major MSK diagnosis among 134 respondent and the diagnosis among postmenopausal women. The major diagnosis of neck pain was cervical spondylosis (88.9%, n=16) for postmenopausal women and for other (72.7%, n=24) respondents as well. The most prevalent shoulder MSK diagnosis was frozen shoulder for both postmenopausal women with 73.3%(n=11) and all respondent with 74% (n=14). The major diagnosis of upper back pain was myofascial pain for both postmenopausal women and all respondent. Lateral epicondylitis was diagnosed in postmenopausal women at elbow. Dequeirvans tenosynovitis was most prevalent in both the groups in table. Low back pain had highest prevalence in all the menopausal status and mostly common diagnosed condition was lumbar spondylosis with 57% (n=26) in postmenopausal women and was 50% (n=40) in study population. The knee osteoarthritis was most commonly made diagnosis in postmenopausal women with 97% (n=29) and in all respondent having knee pain with 85% (n=39). Ankle sprain was most prevalent diagnosis made in ankle in both menopausal women and overall respondent.

Musculoskeletal factor associated with menopausal status

Menopausal Status and pattern of pain

Most of the menopausal women had asymmetrical pattern of pain with 46.8% (n=36), followed by symmetrical pain 36.4% (n=28), and only 16.9% (n=13) of them had central pain. The menopausal and perimenopausal women had similar pattern of pain. The table 3 also showed association between pattern of pain and menopausal status. The observed chi-square value for 4 df at 5% level of significance was less than standard value for same df which means that the association isn't statistically significant, $\chi^2(4, N=134) = 7.88, p=0.09$.

Menopausal Status and Maximum time of pain

The time of maximum pain for menopausal women was during night with prevalence of 55.8% (n=43), followed by morning pain with 24.7% (n=19). During day, 11.7% (n=9) had pain and 7.8% (n=6) had pain in the evening. The perimenopausal women had similar type of pain characteristic regarding the time of maximum pain while it is slightly different for premenopausal women. The observed χ^2 value at showed that the association is not statistically significant, $\chi^2(6, N=134) = 4.71, p=0.58$.

Menopausal Status and Type of pain

Among 77 menopausal women, 57.1% (n=44) had continuous type of pain, 37.7% (n=29) had intermittent pain, and only 5.2% (n=4) had occasional pain. The premenopausal women also had similar type of pain with higher prevalence of continuous pain followed by intermittent and occasional pain whereas for perimenopausal women, most of them (57.1%) had intermittent pain, followed by continuous and occasional pain. The association between these variables was not statistically significant at 5% level of significance, $\chi^2(4, N=134) = 6.18, p=0.18$.

Table 3: Musculoskeletal factor associated with menopausal status

Categories	Premeno pause N=29	Perimenopau se N=28	Post- menopaus e N=77	χ^2	d f	p- value
Pattern of pain						
Symmetrical	6(20.7%)	7(25%)	28(36.4%)	7.88	4	0.09
Asymmetrical	11(37.9%)	14(50%)	36(46.8%)			
Central	12(41.4%)	7(25%)	13(16.9%)			
Maximum time of pain						
Morning	6(20.7%)	8(28.6%)	19(24.7%)			
Day	8(27.6%)	5(17.9%)	9(11.7%)	4.71	6	0.58
Evening	2(6.9%)	1(3.6%)	6(7.8%)			
Night	13(44.8%)	14(50%)	43(55.8%)			
Type of pain						
Continuous	14(48.3%)	11(39.3%)	44(57.1%)			
Intermittent	11(37.9%)	16(57.1%)	29(37.7%)	6.18	4	0.18
Occasional	4(13.8%)	1(3.6%)	4(5.2%)			
Duration of pain						
1-3 months	10(34.5%)	7(25%)	21(27.3%)			
4-6 months	2(6.9%)	6(21.4%)	8(10.4%)	7.13	8	0.52
7-9months	1(3.4%)	2(7.1%)	2(2.6%)			
10-12months	0(0%)	0(0%)	3(3.9%)			
More than a year	16(55.2%)	13(46.4%)	43(55.8%)			
Severity of pain						
Mild	6(20.7%)	0(0%)	5(6.5%)			
Moderate	12(41.4%)	14(50%)	30(39%)	9.84	4	0.04*
Severe	11(37.9%)	14(50%)	42(54.5%)			
Osteoporosis Risk						
Low risk	28(96.6%)	28(100%)	66(85.7%)	6.52	2	0.038*
High risk	1(3.4%)	0(0%)	11(14.3%)			

Menopausal Status and Duration of pain

The maximum respondent in all menopausal status had been suffering from MSK pain for a period of more than a year, followed by duration of 1-3 months. The association between these variables was not statistically significant at 5% level of significance, χ^2 (8, N=134) = 7.13, p=0.52.

Menopausal Status and VAS Scale

54.5% (n=42) menopausal respondent had severe pain, 39% (n=30) had moderate pain and 6.5 % (n=5) had mild pain on VAS Scale. The observed χ^2 value for association for 4 df was 9.84 which is greater than standard value for same df at 5% level of significance. According to χ^2 test of independence, this difference was statistically significant, χ^2 (4, N=134) = 9.84, p=0.043

Menopausal status and pain interfering work

Among the menopausal status, the table 4 shows that MSK pain had affected mostly in menopausal category. 32.5% (n= 25) were moderately affected, followed by quite a bit with 29.9% (n=23), extremely with 22.1% (n=17). 9.1% (n=7) had a little bit effect on work and 6.5% (n=5) didn't have any effect on work due to MSK pain. The χ^2 value for 8 df at 5% level of significance was observed greater than standard value at same df which showed that there was significant association between these variables, χ^2 (8, N=134) = 21.08, p=0.007.

Menopausal status and level of assistance

The table 4 shows among menopausal women, 32.5% (n=25) of them required moderate assistance, followed by minimal assistance being 24.7% (n=19), maximal assistance being 18.2% (n=14), complete dependence being 22.1% (n=17) and total dependence being 2.6% (n=2). The highest prevalence of level of assistance in premenopause was minimal assistance with 44.8% (n=13), followed by complete independence with 41.4% (n=12). The highest prevalence of level of assistance in perimenopause was constant for moderate assistance, minimal assistance and complete independence being 32.1% (n=9). None of the respondent in perimenopause and post menopause were totally dependent on others for ADL. The chi-square test showed statistically significant association between these variables, χ^2 (8, N=134) = 17.15, p=0.029.

Table 4: Musculoskeletal pain effect and menopausal status

Variables	Premenopause N=29	Perimenopause N=28	Post- menopause N=77	χ^2 value	df	p- value
Pain interfering work						
Not at all	8(27.6%)	4(14.3%)	5(6.5%)	21.08	8	0.007**
A little bit	6(20.7%)	4(14.3%)	7(9.1%)			
Moderately	11(37.9%)	13(46.4%)	25(32.5%)			
Quite a bit	3(10.3%)	3(10.7%)	23(29.9%)			
Extremely	1(3.4%)	4(14.3%)	17(22.1%)			
Level of assistance for ADL						
Complete independence	12(41.4%)	9(32.1%)	17(22.1%)	17.15	8	0.029**
Minimal Assistance	13(44.8%)	9(32.1%)	19(24.7%)			
Moderate assistance	3(10.3%)	9(32.1%)	25(32.5%)			
Maximal assistance	1(3.4%)	1(3.6%)	14(18.2%)			
Total dependence	0(0%)	0(0%)	2(2.6%)			
Depressed Mood						
Not at all	15(51.7%)	2(7.1%)	7(9.1%)	42.82	8	0.00**
Mild	9(31.0%)	7(25.0%)	20(26.0%)			
Moderate	2(6.9%)	12(42.9%)	20(26.0%)			
Severe	2(6.9%)	7(25.0%)	15(19.5%)			
Very severe	1(3.4%)	0(0%)	15(19.5%)			

Menopause status and Depressed mood

Among 77 menopausal women, 26% (n=20) responded to both mild and moderate depressed mood, 19.5% (n=15) responded to both severe and very severe depressed mood and 9.1% (n=7) never had any type of depressed mood because of MSK complains. Most of the respondent i.e. 51.7% (n=15) in premenopausal didn't experience any depressed mood while 31% (n=9) had mild depressed mood. The highest percentage i.e. 42.9% (n=12) in perimenopausal state responded to moderate depressed behavior and none of them responded to very severe depressed behavior. The observed chi-square value for association for 8 df was 15.51 which is greater than standard value for same df at 5% level of significance. According to χ^2 test of independence, this difference was statistically highly significant, $\chi^2(8, N=134) = 42.82$, $p=0.000$.

Table 5: Factor associated with Musculoskeletal complains in different site of body

Variables	Category	χ^2 value	df	p-value
Educational status	Illiterate	14.93(16.92)	9	0.09
	literate			
Sunlight exposure	Yes	17.09(16.92)	9	0.04**
	No			
OSTA	Low risk	24.50	9	0.004*
	High risk			
Exercise status	Yes	19.22	9	0.023**
	No			

The table 5 shows the association of MSK complains in 9 different sites of body with educational status, sunlight exposure, osteoporosis risk and exercise status. The χ^2 association of sunlight exposure, osteoporosis risk and exercise status were found significant with MSK complains in 9 different sites of body.

4.7. Factors associated with Musculoskeletal complain in postmenopausal women

4.7.1. Factors associated with Neck pain in postmenopausal women

Table 6: Factors associated with neck pain in postmenopausal women

Variables	Neck pain No(n=59)	Neck pain Yes(n=18)	X² value (N=77)	df	p-value
Age					
40-45	7(11.9%)	1(5.6%)			
45-50	21(35.6%)	6(33.3%)	2.39	3	0.45
51-55	13(22.0%)	7(38.9%)			
56-60	18(30.5%)	4(22.2%)			
BMI					
Normal	16(27.1%)	7(38.9%)			
Overweight	14(23.7%)	3(16.7%)	1.01	2	0.60
Obese	29(49.2%)	8(44.4%)			
Paresthesia					
Yes	12(20.3%)	8(44.4%)	4.17	1	0.045*
No	47(79.7%)	10(55.6%)			
Pain interfering work					
Not at all	1(1.7%)	4(22.2%)			
A little bit	5(8.5%)	2(11.1%)			
Moderately	22(37.3%)	3(16.7%)	11.27	4	0.024*
Quite a bit	17(28.8%)	6(33.3%)			
Extremely	14(23.7%)	3(16.7%)			

Association between neck pain and age

The table 6 shows association between age group and neck pain in menopausal women. The trend observed was that age group 51-55 with 38.9% (n=7) had highest prevalence of neck pain, followed by age group 45-50 with 33.3% (n=6), 56-60 age group with 22.2% (n=4) prevalence. The youngest age group 40-45 had least prevalence of neck pain i.e. 5.6% (n=1). It was seen that chi-square test didn't show statistically significant association between age-group and neck pain with P-value 0.45 at 5% level of significance, χ^2 (3, N=77) =2.39, p=0.045.

Association between neck pain and BMI

Most of the menopausal women who had neck pain were obese with 44% (n= 8) prevalence followed by normal weight 39% (n=7) and overweight respondent 17% (n=3). The chi-square test didn't show statistically significant association between neck pain and BMI, χ^2 (2, N=77) =4.17, p=0.60.

Association between neck pain and paresthesia

The table 6 shows the association between neck pain and paresthesia in menopausal women. Among 18 menopausal women who had neck pain, 44.4% had paresthesia while 55.6% didn't have paresthesia. The χ^2 test showed significant association between neck pain and paresthesia at 5% level of significance, χ^2 (1, N=77) =4.17, p=0.045.

Association between neck pain and its interfere on daily work

The table 6 shows the association between neck pain and degree how much pain interfere with work inside and outside house. Among 18 menopausal neck pain women, 33.3%(n=6) responded as quite a bit, 16.7% (n= 3) responded as moderately and extremely, 22.2% (n=3) responded as not at all and 11.1% (n=1) responded as a little bit. The χ^2 test showed that there was significant association between neck pain and its level of interfere in work inside and outside house at 5% level of significance, χ^2 (4, N=77) =11.27, p=0.024.

4.7.2. Factors associated with shoulder pain in postmenopausal women

Table 7: Factors associated with shoulder pain in postmenopausal women

Variables	Shoulder pain No(n=63)	Shoulder pain Yes(n=14)	χ^2 value	df	p- value
Age group					
40-45	7(11.1%)	1(7.1%)			
45-50	23(36.5%)	4(28.6%)	1.74	3	0.63
51-55	17(27.0%)	3(21.4%)			
56-60	16(25.4%)	6(42.9%)			
Sunlight exposure					
No	30(47.6%)	2(14.3%)			
Yes	33(52.4%)	12(85.7%)	5.24	1	0.022*
BMI					
Normal	14(22.2%)	9(64.3%)			
Overweight	15(23.8%)	2(14.3%)	9.78	2	0.008
Obese	34(54.0%)	3(21.4%)			
OSTA					
Low risk	58(92.1%)	8(57.1%)	11.40	1	0.003*
High risk	5(7.9%)	6(42.9%)			
Stiffness					
No	55(87.3%)	6(42.9%)	13.75	1	0.001*
Yes	8(12.7%)	8(57.1%)			

Association between shoulder pain and age group

The table 7 shows association between age group and shoulder pain. The highest prevalence of shoulder pain was found in oldest age group i.e. 56-60 years with prevalence of 42.9% (n=6), followed by age group 45-50 years with prevalence of 28.6% (n=4), age group 51-55 years with 21.6% (n=3) and least prevalence of 7.1% (n=1) in young age group 40-45 years. The association between shoulder pain and age group was statistically non-significant with P-value 0.62 at 5% level of significance, χ^2 (3, N=77) =1.74, p=0.63.

Association between shoulder pain and sunlight exposure.

The table 7 shows the association between shoulder pain and sunlight exposure status. Among 14 menopausal women, who had shoulder pain, only 85.7% had daily exposure to sunlight whereas 14.3% didn't have daily exposure to sunlight. The chi-square test showed there was statistically significant association between daily sunlight exposure

and prevalence of shoulder pain in menopausal women at 5% level of significance, χ^2 (1, N=77) =5.24, p=0.022.

Association between BMI and shoulder pain

The table 7 shows the association between BMI and shoulder pain. among 14 menopausal women with shoulder pain, maximum of them (64.3%, n=9) had normal BMI, 21.4% (n=3) were obese and 21.4% (n=2) were overweight. The association between BMI and shoulder pain was statistically significant at 5% level of significance, χ^2 (2, N=77) =9.78, p=0.008.

Association between OSTA and shoulder pain

The table 7 shows the association between risk of osteoporosis and shoulder pain. among 14 menopausal women who had shoulder pain, 57.1%(n=8) were at low risk of osteoporosis and 42.9%(n=6) were at high risk of osteoporosis. The χ^2 test between two variables revealed statistically significant association with P-value of 0.003 at 5% level of significance, χ^2 (1, N=77) =11.40, p=0.003.

Association between shoulder pain and stiffness

The table 7 shows the association between shoulder pain and stiffness. Out of 14 menopausal women with shoulder pain, 57.1%(n=8) had stiffness while 42.9%(n=6) didn't have any kind of stiffness. The chi- square test showed statistically highly significant association between these variables at 5% level of significance χ^2 (1, N=77) =13.75, p=0.001.

4.7.3. Factors associated with low back pain in postmenopausal women

Association between low back pain and age group

The association between LBP and age group shows that among 46 menopausal women with LBP, age group 46-50 years had highest prevalence of 39.1% (n=18), followed by 56-60 years age group with 26.1% (n=12) prevalence. The prevalence of 23.9% (n=11) was present in age group 51-55 and age group 40-45 had least percentage of LBP i.e. 10.9% (n=5). The chi-square test didn't show statistically significant association between LBP and age group with P-value of 0.80 at 5% level of significance, χ^2 (3, N=77) =0.99, p=0.80.

Table 8: Factors associated with low back pain in postmenopausal women

Variables	Low back pain No(n=31)	Low back pain Yes (n=46)	χ^2 value	df	p-value
Age Group					
40-45	3(9.7%)	5(10.9%)			
46-50	9(29.0%)	18(39.1%)	0.99	3	0.80
51-55	9(29.0%)	11(23.9%)			
56-60	10(32.3%)	12(26.1%)			
Sunlight exposure					
No	8(25.8%)	24(52.2%)	5.30	1	0.021
Yes	23(74.2%)	22(47.8%)			
BMI					
Normal	10(32.3%)	13(28.3%)			
Overweight	7(22.6%)	10(21.7%)	0.19	2	0.91
Obese	14(37.8%)	23(50%)			
OSTA					
Low risk	24(77.4%)	42(91.3%)	2.92	1	0.08
High risk	7(22.6%)	4(8.7%)			
Exercise Status					
No	29(93.5%)	39(84.8%)	1.38	1	0.21
Yes	2(6.5%)	7(15.2%)			
Pattern of Pain					
Symmetrical	10(32.3%)	18(39.1%)	13.89	2	0.001*
Asymmetrical	21(67.7%)	15(32.6%)			
Central	0(%)	13(28.3%)			
Maximum time of pain					
Morning	6(19.4%)	13(28.3%)			
Day	1(3.2%)	8(17.4%)	8.29	3	0.040*
Evening	1(3.2%)	5(10.9%)			
Night	23(74.2%)	20(43.5%)			
Paresthesia					
No	27(87.1%)	30(65.2%)	4.61	1	0.032*
Yes	4(12.9%)	16(34.8%)			
Tingling Sensation					
No	17(54.8%)	11(23.9%)	7.65	1	0.006*
Yes	14(45.2%)	35(76.1%)			

Association between sunlight exposure and low back pain

The table 8 shows the association between sunlight exposure and low back pain. Out of 46 menopausal women with LBP, 52.2% (n=24) didn't have daily sunlight exposure whereas 47.8% (n=22) had exposure to sunlight daily. The χ^2 test showed that these two

variables had statistically significant association as observed value for 1 df at 5% level of significance was greater than standard value, $\chi^2 (1, N=77) = 5.30, p=0.021$.

Association between BMI and low back pain

The χ^2 test showed that there is no statistically significant association between BMI and low back pain, $\chi^2 (2, N=77) = 0.19, p=0.91$. But, the table 8 showed that the prevalence of low back pain was highest in obese menopausal women with 50%, followed by 28.3% in normal BMI and 21.7% in overweight menopausal women.

Association between Osteoporosis risk and low back pain

The table 8 shows the association between osteoporosis risk and low back pain. Among 46 menopausal women with back pain, 91.3. % (n=42) were at low risk of osteoporosis and 8.7% (n=4) were at high risk of osteoporosis. But the chi-square test showed non-significant association between these two variables, $\chi^2 (1, N=77) = 2.92, p=0.08$.

Association between physical exercise status and low back pain

The table 8 shows the association between exercise status and low back pain. Among 46 menopausal women with low back pain, 84.8% (n=39) didn't do any type of physical exercise while 15.2% (n=7) used to do physical exercise at least 1 day in a week. But, the chi-square test showed statistically non-significant association between low back pain and physical exercise status as observed χ^2 value for 1df at 5% level of significance was less than standard value, $\chi^2 (1, N=77) = 1.38, p=0.21$.

Association between pattern of pain and low back pain

The table 8 shows the association between pattern of pain and low back pain in menopausal women. Out of 46 menopausal women with low back pain, most of them had symmetrical pattern of pain i.e. 39.1% (n=18), followed by asymmetrical pattern by 32.6% (n=15) and central pain by 28.3% (n=13). The chi-square test showed highly significant association between pattern of pain and low back pain with P-value 0.001 at 5% level of significance, $\chi^2 (2, N=77) = 13.89, p=0.001$.

Association between maximum time of pain and low back pain

The table 8 shows the association between maximum time of pain and low back pain. out of 46 menopausal women, 43.5% (n=20) had maximum pain during night, 28.3% (n=13) had pain at morning, 17.4% (n=8) had maximum pain during day and only 10.9% (n=5) had maximum pain at evening. The χ^2 test showed statistically significant

association between time at maximum pain and low back pain, $\chi^2 (3, N=77) = 8.29$, $p=0.040$.

Association between paresthesia and low back pain

The table 8 shows association between low back pain and paresthesia. Among 46 menopausal women with LBP, 34.8% (n=16) had paresthesia and 65.2% (n=30) didn't have sensation of paresthesia. The paresthesia was associated with LBA significantly with P-value 0.032 at 5% level of significance, $\chi^2 (1, N=77) = 4.61$, $p=0.032$.

Association between low back pain and tingling sensation

The association between low back pain and tingling sensation showed that 76.1% (n=35) of menopausal women with LBP has tingling sensation and 23.9% (n=11) didn't have tingling sensation. The χ^2 test showed statistically significant association between LBP and tingling sensation at 5% level of significance, $\chi^2 (1, N=77) = 7.65$, $p=0.006$.

4.7.4. Factors associated with knee pain in postmenopausal women

Association between knee pain and age group

Out of 77 menopausal women, 30 respondent had knee pain. 33.3% (n=10) of women who had knee pain belonged to age category 51-55 and 56-60. 26.7% (n=8) belonged to age category 46-50 and 6.7% (n=2) belonged to age category 40-45. The general trend of observation was that knee pain increased its prevalence with advancing age. But, the association was not statistically significant at 5% level of significance as observed chi-square value at 3df was less than standard value, $\chi^2 (3, N=77) = 3.06$, $p=0.38$.

Association between knee pain and Osteoporosis risk

Out of 30 menopausal women with knee pain, 96.7%(n=29) were at low risk of developing osteoporosis and 3.3%(n=1) was at high risk of developing osteoporosis. The χ^2 test showed statistically significant association between osteoporosis risk and knee pain with P-value 0.02 at 5% level of significance, $\chi^2 (1, N=77) = 4.81$, $p=0.026$.

Association between knee pain and Swelling

There was highly statistically significant association between knee pain and swelling with P-value 0.000 at 5% level of significance, $\chi^2 (1, N=77) = 13.19$, $p=0.000$. Out of

30 menopausal women with knee pain, 40% (n=12) had swelling and 60% (n=18) didn't have swelling.

Table 9: Factors associated with knee pain in postmenopausal women

Variables	Knee pain No (n=47)	Knee pain Yes (n=30)	χ^2 value	Df	p-value
Age					
40-45	6(12.8%)	2(6.7%)	3.06	3	0.38
46-50	19(40.4%)	8(26.7%)			
51-55	10(21.3%)	10(33.3%)			
56-60	12(25.5%)	10(33.3%)			
Religion					
Muslim	45(95.7%)	28(93.3%)			
Christian	2(4.3%)	0(0%)	4.42	2	0.11
Hindu	0(0%)	2(4.3%)			
Sunlight Exposure					
No	20(42.6%)	12(40.0%)	0.05	1	0.83
Yes	27(57.4%)	18(60.0%)			
BMI					
Normal	18(38.3%)	5(16.7%)			
Overweight	11(23.4%)	6(20.0%)	5.35	2	0.06
Obese	18(38.3%)	19(63.3%)			
OSTA					
Low risk	37(78.7%)	29(96.7%)	4.81	1	0.026*
High Risk	10(21.3%)	1(3.3%)			
Swelling					
No	44(93.6%)	18(60%)	13.19	1	0.000*
Yes	3(6.4%)	12(40%)			
Stiffness					
No	40(85.1%)	21(70%)	2.54	1	0.11
Yes	7(14.9%)	9(30%)			
Sleep Disturbance					
Not at all	15(31.9%)	18(60.0%)			
1 times per week	3(6.4%)	0(0%)			
2-3 times per week	13(27.7%)	3(10%)	11.87	4	0.018*
4-5 times per week	0(0%)	2(6.7%)			
More than 5 times per week	16(34.0%)	7(23.3%)			

Association between knee pain and stiffness.

The table 9 shows the association between knee pain and stiffness where 70% (n=21) menopausal women with knee pain didn't have stiffness whereas stiffness. There was no significant association between knee pain and stiffness, $\chi^2 (1, N=77) = 2.54, p=0.11$.

Association between knee pain and sleep disturbance due to pain

The table 9 shows association between knee pain and frequency of sleep disturbance in menopausal women with knee pain. The study showed that 60% (n=28) of women didn't have any disturbance in sleep, whereas 23.3% (n=7) had disturbed sleep for more than 5 times per week, 10% (n=3) had disturbed sleep for 2-3 times per week, 6.7% (n=2) had disturbed sleep 4-5 times per week and none of the menopausal respondent with knee pain had disturbed sleep once a week. The chi-square test showed statistically significant association between these variables with P-value 0.018 at 5% level of significance, $\chi^2 (4, N=77) = 11.87, p=0.018$.

Osteoporotic fracture and postmenopausal women

Among 77 postmenopausal women, only 7% (n=5) had osteoporotic fracture while 93% (n=72) didn't have any osteoporotic fracture.

4.8. Factors associated with severity of musculoskeletal complain in menopausal women

4.8.1. Association between sociodemographic variables and severity of musculoskeletal pain

The table 10 shows the association between sociodemographic variables and severity of pain in all respondent and in menopausal women also. The value obtained from VAS scale was coded into categorical variable for chi-square analysis. The average value of VAS in each category is also presented in a table.

Association between age and severity of pain

The average VAS score in menopausal women was high in elderly age category i.e. in 50-60 years. The observed χ^2 value at 6 df was 9.36 for menopausal women at 5% level of significance and standard table value for same is 12.59 which is greater than observed chi-square value. This showed that there is no statistically significant association between age group in severity of pain, $\chi^2 (6, N=77) = 9.36, p=0.16$.

Table 10: Association between sociodemographic variables and severity of musculoskeletal pain

All respondent (N=134)					Postmenopausal women (N=77)			
Variables	VAS	χ^2 value (n=134)	df	P-value	VAS	χ^2 value (n=77)	df	p-value
Age								
40-45	5.8±1.9				5.6±2.3			
46-50	6.5±1.8	10.09	6	0.12	6.4±1.8	9.36	6	0.16
51-50	5.9±1.7				5.9±1.7	(12.59)		
56-60	7.0±1.4				7.0±1.4			
Marital Status								
Unmarried	4.0±0							
Married	6.3±1.9	5.56	6	0.47	6.2±1.9	4.09	4	0.39
Divorced	5.0±0				5.0±0.0			
Widow	6.5±1.6				6.8±1.4			
Educational Level								
Illiterate	6.2±1.9				6.6±2.0			
Primary	6.4±1.7	15.87	6	0.01*	6.4±1.4	6.51	6	0.37
Secondary	6.3±1.6				6.3±1.5			
HSC and higher	6.3±2.3				6.0±2.6			
Living Status								
With family	6.3±1.8	5.9	2	0.05	6.4±1.8	5.42	2	0.6
Alone	5.6±0.9				5.6±1.0			
Occupation								
Housewife	6.3±1.8				6.5±1.7			
Teacher	7.0±0.0	4.11	8	0.84	0.0±0.0	3.72	6	0.72
Farmer	6.0±2.8				6.0±2.8			
Retired	5.0±0.0				5.0±0.0			
Others	5.6±2.2				5.6±2.5			
Religion								
Muslim	6.2±1.8	5.01	6	0.54	6.3±1.8	1.91	4	0.75
Christian	6.6±0.9				6.5±0.7			
Hindu	7.7±0.6				7.5±0.7			
Buddhist	7.0±0				0.0±0.0			
Family Structure								
Nuclear	6.23±1.8				6.1±2.2			
Joint family	6.23±1.8	0.50	2	0.78	6.5±1.6	0.47	2	0.79

Marital status and severity of pain

The average VAS score in menopausal women was highest in widowed women compared to other marital status (M=6.8, SD=1.4). The observed χ^2 value for menopausal women at 4 df was 4.09 which is less than standard value at same df (9.49) at 5% level of significance. According to χ^2 test of independence this difference was statistically non-significant, $\chi^2(4, N=77) = 4.09, p=0.39$.

Educational level and severity of pain

The average VAS score for menopausal women was highest in illiterate women compared to other educational level (M=6.6, SD=2.0). The 5% level of significance at 6 df in standard value is 12.59 and table showed observed value is less which states that there was no significant association between educational level and severity of pain, $\chi^2(6, N=77) = 6.51, p=0.37$.

Living status and severity of pain.

The average VAS score for menopausal women was highest in women who lived with family (M=6.4, SD=1.8). compared to who lived alone. The observed value at 2 df was 5.42 which is less than standard value at same df at 5% level of significance which means that there was no significant association between living status and severity of pain, $\chi^2(2, N=77) = 5.42, p=0.60$.

Occupation and severity of pain

The average VAS score for menopausal women was highest for house wife (M=6.5, SD=1.7) compared to menopausal women with other occupation. The observed value at 6 df was 3.72 which is less than standard value at same df at 5% level of significance which means that there was no significant association between occupation and severity of pain, $\chi^2(6, N=77) = 3.72, p=0.72$.

Religion and severity of pain

The average VAS score for menopausal women was highest for hindu religion (M=7.5, SD=0.7) compared to other religion. The standard value at 4 df at 5% level of significance is 9.49 which is greater than observed value in the above table. According to χ^2 test of independence, this difference was not statistically significant, $\chi^2(4, N=77) = 1.91, p=0.75$.

Family structure and severity of pain

The average VAS score for menopausal women was higher for women in joint family (M=6.5, SD=1.6) compared to nuclear family. The chi-squared test showed non-significant association between family structure and severity of pain as observed value at 2 df is less than standard value in same df at 5 % level of significance, χ^2 (2, N=77) = 0.47, p=0.79.

4.8.2. Association between health-related factor and severity of MSK pain

Table 11: Association between health-related factor and severity of musculoskeletal pain

Variables	All respondent (N=134)				Postmenopausal women (N=77)			
	VAS	χ^2 value (n=134)	df	P-value	VAS	χ^2 value (n=77)	df	p-value
Sunlight exposure								
Yes	6.3±1.8	1.97	2	0.37	6.5±1.7	1.45	2	0.49
No	6.2±1.9				6.2±1.9			
BMI								
Underweight	6.0±2.6				9.0±0.0			
Normal	6.0±1.7	6.16	6	0.41	6.3±1.6	7.76	6	0.26
Overweight	6.2±1.8				6.0±1.8			
Obese	6.4±1.8				6.5±1.8			
Co-morbidity								
Yes		6.90	2	0.032*	6.6±1.7	6.44	2	0.040*
No					5.8±1.7			
Exercise Status								
Yes	6.5±1.9	4.37	2	0.11	6.0±2.1	4.62	2	0.09
No	6.2±1.8				6.4±1.7			

Association between health-related factor and severity of musculoskeletal pain

The table 11 shows the association between health-related factor and severity of pain in all respondent and in menopausal women also.

Sunlight exposure and severity of pain

The average VAS score for menopausal women who stays in sunlight daily is (M=6.5, SD=1.7) less than those who don't stay in sunlight daily. The standard χ^2 value at 2 df is 5.99 which is greater than observed value in above table at 5% level of significance.

The χ^2 test of independence shows no significant association between sunlight exposure and severity of pain, $\chi^2(2, N=77) = 1.45, p=0.49$.

BMI and severity of pain

The average VAS score for menopausal women is highest for underweight women (M=9.0, SD=0.0) than those of normal, overweight and obese women. The observed χ^2 value at 6 df is 7.76 and standard value is 12.59 for same df at 5% level of significance which showed observed value is less than standard value. Thus, χ^2 test of independence showed non-significant association between BMI and severity of pain, $\chi^2(6, N=77) = 7.76, p=0.26$.

Co-morbidities and severity of pain

The average VAS score for menopausal women with co-morbidity is (M=6.6, SD=1.7) higher than those of women without co-morbidity. The standard χ^2 value for 2 df is 5.99 at 5% level of significance and observed value in table is 6.44 at same df which is greater than standard value. Thus, χ^2 test of independence shows statistically significant difference between co-morbidities and severity of pain, $\chi^2(2, N=77) = 6.44, p=0.040$.

Exercise status and severity of pain

The average VAS score for menopausal women who do not do physical exercise is (M=6.4, SD=1.7) greater than those who does it. The observed chi-square value at 2 df is 4.62 which was slightly less than standard value 5.99 for same df at 5% level of significance. Thus, there is nearly significant association between exercise status and severity of pain, $\chi^2(2, N=77) = 4.62, p=0.09$.

4.8.3. Association between menopausal status and severity of MSK pain

Table 12: Association between menopausal status and severity of musculoskeletal pain

Variables	Percentage	VAS	χ^2 Value	df	P-value
Premenopause	29(21.6%)	5.6±2.1	9.84	4	0.043**
Perimenopause	28(20.9%)	6.6±1.4			
Postmenopause	77(57.5%)	6.4±1.8			

The average VAS Score for perimenopausal women (M=6.6, SD=1.4) is greater than those for postmenopausal women (M=6.4, SD=1.8) and followed by premenopausal women (M=5.6, SD=2.1). The observed chi-square value for association for 4 df was 9.84 which is greater than standard value for same df at 5% level of significance. According to χ^2 test of independence, this difference was statistically significant, $\chi^2(4, N=134) = 9.84, p=0.043$.

4.8.4. Association between pain characteristics and severity of musculoskeletal pain

The table 13 shows the association between pain characteristic and severity of MSK pain in all respondent and in menopausal women also.

Maximum time of pain and severity of pain

The average VAS score for menopausal women having maximum pain at night was (M=6.7, SD=1.4) highest followed by pain during morning, evening and day. The observed χ^2 at 6 df at 5 % level of significance was 11.26 which is less than standard value at same df. According to χ^2 test, it showed that severity of pain didn't differ statistically by maximum time of pain, $\chi^2(6, N=77) = 11.26 p=0.08$.

Type of pain and severity of pain

The average VAS score for menopausal women having continuous type of pain was (M=6.9, SD=1.4) highest among other type of pain. The observed χ^2 value at 4 df was 23.16 at 5% level of significance which is greater than standard value at same level of significance. According to χ^2 test of independence, this difference was highly statistically significant, $\chi^2(4, N=77) = 23.16, p=0.000$.

Duration of pain and severity of pain

The average VAS score for menopausal women was (M=7.1, SD=1.3) highest for women who had pain for 1-3 month among other women who had pain since more than 3 months. The observed chi-square value at 8 df for 5% level of significance was 9.47 which was less than standard value at same df which means there was no statistically significant association between duration of pain and severity of pain, $\chi^2(8, N=77) = 9.47, p=0.30$.

Table 13: Association between pain characteristics and severity of musculoskeletal pain

All respondent (N=134)				Postmenopausal women (N=77)				
Variables	VAS mean±SD n=134	X ² value	Df	p- value	VAS mean±SD n=77	X ² value	Df	p- value
Maximum time of pain								
Morning	6.4±1.8	8.24	6	0.22	6.4±2.1	11.26	6	0.08
Day	5.8±2.3				4.9±2.1			
Evening	5.8±1.9				6.2±1.6			
Night	6.4±1.6				6.7±1.4			
Type of Pain								
Continuous	6.8±1.3	26.24	4	0.000*	6.9±1.4	23.16	4	0.000*
Intermittent	5.8±1.9				5.7±1.9			
occasional	4.9±2.4				5.0±2.4			
Duration of Pain								
1-3 months	6.8±1.4	11.67	8	0.17	7.1±1.3	9.47	8	.30
4-6 months	6.1±2.1				6.6±1.9			
7-9months	7.0±1.2				6.0±1.4			
10- 12months	4.7±0.6				4.7±0.6			
More than a year	6.0±1.9				6.1±1.9			
Pain interfering work								
Not at all	5.2±1.6	12.14	8	0.15	5.2±0.8	14.46	8	0.07
A little bit	5.9±2.1				6.6±2.3			
Moderately	6.6±1.6				6.9±1.3			
Quite a bit	6.2±1.9				6.0±2.1			
Extremely	6.6±1.7				6.4±1.7			
Not at all	4.7±1.9	20.55	8	0.008*	3.4±1.7	21.30	8	0.006*
Depressed Mood								
Mild	6.3±1.9				6.5±1.6			
Moderate	6.7±1.6				6.9±1.6			
Severe	6.9±1.3				6.9±1.4			
Very severe	6.6±1.3				6.5±1.3			

Severity of pain and pain interfering work

The average VAS score for menopausal women was (M=6.9, SD=1.3) highest for women who had moderate interfere in daily work outside and inside home, followed by a little bit, extremely, quite a bit and not at all. The standard value for 8 df at 5 % level of significance is 15.51 and observed chi-square value was 14.46 which is less than

standard value. Thus, there was no statistically significant association between these variables, $\chi^2(8, N=77) = 14.46, p=0.07$.

Severity of pain and depressed mood

The average VAS score for menopausal women was (M=6.9, SD=1.6) highest for women who were moderately depressed because of MSK pain, followed by severely depressed, very severely depressed, mild depressed and not at all depressed. The standard χ^2 value for 8 df at 5% level of significance is 15.51 and observed value was 21.30 which is much greater than standard value. According to χ^2 test of independence, this difference was statistically significant, $\chi^2(8, N=77) = 21.30, p=0.006$.

4.9. Binary logistic regression

The logistic regression was done between the variables thought to be predictor of MSK complains in neck, shoulder, low back and knee and shown in table 14. The predictor variables were taken as age, menopausal status, BMI, sunlight exposure, exercise status and osteoporosis risk. The table 13 showed that age was statistically significant predictor of shoulder pain. The women with age category 56-60 years had 7.6 times more risk of shoulder pain with p-value 0.019. The BMI was significant predictor of pain at shoulder and knee. The obese women were more likely to have shoulder pain with OR 0.28 on comparison to normal weight women. Also, overweight women had 3.24 times risk and obese women had 3.54 times risk of having knee pain on comparison to normal weight.

Table 14: Binary Logistic Regression analysis of musculoskeletal complain in different body site

Variables	Neck pain OR (95% CI) p-value	Shoulder pain OR (95% CI) P value	Low back pain OR (95%) CI) P-value	Knee pain OR (95% CI) P-value
Age				
40-45	1	1	1	1
46-50	0.68(0.26-1.78) 0.43	3.50(0.69-17.86) 0.13	0.99(0.42-2.31) 0.97	0.86(0.35-2.13) 0.74
51-55	1.29(0.42-3.98) 0.66	3.41(0.52-22.24) 0.19	0.65(0.23-1.86) 0.42	2.09(0.72-6.15) 0.17
56-60	0.57(0.16-2.05) 0.39	7.6(1.4-42.14) 0.019*	0.71(0.25-2.02) 0.52	1.9(0.67-5.56) 0.22
Menopausal status				
Premenopause	1	1	1	1
Perimenopause	3.36(0.33-34.42) 0.30	0.60(0.18-2.0) 0.41	0.82(0.28-2.35) 0.71	1.49(0.47-4.76) 0.50
Postmenopause	6.62(0.78-49.66) 0.08	0.68(0.26-1.74) 0.42	0.91(0.38-2.18) 0.83	2.01(.76-5.27) 0.16
BMI				
Normal	1	1	1	1
Overweight	0.49(0.15-1.64) 0.24	0.36(0.87-1.48) 0.15	1.29(0.46-3.55) 0.63	3.24 (1.02-10.31) 0.04*
Obese	7.29(.29-1.78) 0.49	0.28(0.91-0.86) 0.027*	1.01 (0.45-2.28) 0.98	3.54(1.3-9.59) 0.01*
Sunlight				
No	1	1	1	1
Yes	0.79(0.33-1.83) 0.57	0.21(0.005-0.93) 0.04*	0.92(0.28-2.97) 0.88	1.19 (0.35-4.12) 0.78
Exercise status				
No	1	1	1	1
Yes	0.33(0.10-1.08) 0.06	1.96(0.24-16.07) 0.53	0.92(1.28-2.97) 0.88	1.19(0.35-4.11) 0.78
OST				
Low risk	1	1	1	1
High risk	1.6(0.45-5.71) 0.47	9.17 (2.55-32.93) 0.001*	0.45 (0.14-1.49) 0.19	.16(.02-1.245) 0.08

In this study regarding common MSK complains among menopausal women, the mean age of participant was 49.49 ± 6.02 . The mean age of menopause was 45.44 ± 4.2 SD with age range (35-55) years. The mean age of menopause in a study done at Bangladesh on khustia was 51.14 (Rahman et al., 2011) which was greater than present study whereas age of menopause in studies done in Nepal ranged from 46-50 years. Likewise, the age of menopause was 44.82 and 49.32 in different studies done in India. The mean age of menopause in study almost matched with the range of age at menopause of south Asian countries i.e. 46-49 years whereas the meta-analysis on age at menopause concluded the range of 46-52 years highest being Europe, Australia, USA and lower in Africa, Asian and middle east countries. Thus, mean age of menopause of respondent is comparatively less than previous studies done in Bangladesh and other countries.

Among 134 respondent, 21.6% were premenopausal status, 20.9% perimenopausal and 57.5% were postmenopausal status being highest number of respondent with ratio of almost 1:1:2 ratio. In Brazilian study, 42% were menopausal women and study done about MSK pain and menopausal status across women's health across the nation in 7 sites of nation women in premenopausal, perimenopausal and postmenopause were 14%, 74% and 12% respectively among 2218 respondent. In study done in China, 40% were premenopausal, 22% were perimenopausal and 43% were postmenopausal. On summary, in this study, number of postmenopausal women were higher than other menopausal state.

Among postmenopausal women, 12% had experienced MSK pain before menopause and 83% of them had LBP, followed by knee pain. In contrast, Kozinoga et al. (2015) in their systematic review showed that all the studies included in review showed high incidence of MSK pain after the menopause rather than before transition. The study also showed high incidence of spine pain as in this study. The women had comparatively very high prevalence of MSK pain after onset of menopause. When MSK complains on different site of body was summarized according to menopausal status of women, this study found that most common complaints were LBP, knee pain, neck pain, shoulder pain which was more prevalent in women at postmenopause,

followed by perimenopause and premenopause which supported the finding of Chinese study (Gao et al., 2013).

The most prevalent complain among respondent were LBP (39%), knee pain (22%), neck pain (16%) and shoulder pain (9%). Similarly, postmenopausal women also had same pattern of pain in low back, knee, neck and shoulder with prevalence of 37.7%, 24.6%, 14.8% and 11.5% respectively. The study done in china (Gao et al., 2013) also had similar finding on site being affected i.e. highest in low back (33%), followed by knee (31%), neck (21%) and other joints (25.6%). The Brazilian study also showed most common MSK pain as pain in spine (71%), knees (58%), shoulders (47%) (Dedicação et al., 2017). In Nigerian study done only among postmenopausal women, the higher prevalence of MSK pain was on lower extremity (61%) and back (53%) (Ogwumike et al., 2016). The different studies supported finding of this study that pain at low back, knee, neck, shoulder was most common MSK complains faced by menopausal women.

The association between MSK complain in different part of body and menopausal status wasn't statistically significant but earlier studies has shown significant association between these. It may due to small sample size. Park et al. (2010) found postmenopausal women with low BMD had higher incidence of MSK pain. In this study, researcher tried to see this association but none respondent had done BMD may be because of economic status. However, OSTA was used for calculation of women at risk of osteoporosis and it was found that osteoporosis risk was significantly associated with MSK complain. The result was also supported by study done by Brochers et al. (2005) where osteoporotic menopausal women had decreased ability to perform activities of daily life.

The severity of pain and osteoporosis risk was statistically significant with menopausal status with p value < 0.05 at 5% level of significance. The study showed that association of MSK interfering pain, level of assistance in ADL and depressed mood was statistically significant. The MSK complain among menopausal women was also significantly associated with sunlight exposure, osteoporosis risk and exercise status. Among 77 postmenopausal women, only 7% (n=5) had osteoporotic fracture while 93% (n=72) didn't have any osteoporotic fracture whereas in study done in US 50% of postmenopausal women suffer from fracture (McClure et al., 2005)

Out of 33 women with neck pain, highest prevalence was in menopausal women with 54.5%(n=18), followed by premenopausal women with 27.3%(n=9) and perimenopausal women with 18.2%(n=6). The neck pain among postmenopausal was significantly associated with paresthesia and pain interfering work in postmenopausal women. Neck pain was not associated in this study and also in study done in China. The major cases of neck pain (89%) was diagnosed in this study which was also confirmed by Wood & Pflieger (2003).

The shoulder pain in postmenopausal women was significantly associated with sunlight exposure, BMI, stiffness and osteoporosis risk. The association with stiffness might be because most of the diagnosis of shoulder pain was frozen shoulder.

Out of 80 women with LBP, 57.5%(n=46) were postmenopausal women followed by premenopausal 22.5%(n=18) and perimenopausal women with 20%(n=16). 57% of postmenopausal women were diagnosed with lumbar spondylosis in this study which was thought to be most common cause of back pain (Woolf & Pflieger, 2003). LBP among postmenopausal women was associated significantly with pattern of pain, maximum time of pain, paresthesia and tingling sensation. LBP was not associated significantly with age which was also supported by other study (Geo et al., 2013). Dugan et al. (2006) showed perimenopausal was affected more than premenopausal women. Mitchell & Wood (2010) has shown statistically significant relationship between menopausal status and LBP which was found non-significant in this study. The women in late perimenopause and postmenopause had higher incidence of LBP.

Another study by Szoeki et al. (2008) in 8-year longitudinal study found that prevalence of backpain was increased to 59% from 44% baseline and all the women at postmenopausal from perimenopausal state which showed association of back pain and menopausal transition.

Out of 46 respondents with knee pain, maximum of them were postmenopausal women i.e. 65.2%(n=30), followed by perimenopausal with 19.6%(n= 9) and premenopausal with 15.2%(n=7). This is supported finding that common MSK problem affecting postmenopausal women is osteoarthritis (ESHRE, 2011; Stevenson, 2011), as 97% of them were diagnosed with it. The knee pain among postmenopausal women was significantly associated with osteoporosis risk, swelling and sleep disturbance.

The severity of pain was associated with presence of co-morbid condition, menopausal status, type of pain, depressed mood because of pain. The mean score for severity of pain is greater in perimenopausal women, followed by postmenopause and premenopause and the association was significantly associated. This finding was supported by Brazilian study (Dedicação et al., 2017) and Philadelphia County, Pennsylvania (Freeman et al., 2007) with high severity of pain in perimenopause. Dugan et al. (2006) reported that postmenopausal women have greater pain than perimenopausal women with P-value <0.0001 and <0.002 . Though χ^2 test was significantly associated in this study, binary logistic regression didn't show significant association. The association between severity of pain and decreased ability to perform ADL was found in study done by Brochers et al. (2005) but it was not significant in this study.

The study had shown that lack of physical function was associated with severity of pain (Braden et al., 2012) which was not supported by this study. But it was seen in this study that physical exercise was significantly associated with the MSK in different site of body.

The binary logistic regression showed BMI was associated with knee pain and shoulder pain was associated with age, BMI, sunlight exposure and osteoporosis risk. This study showed that obesity and overweight was associated with knee pain which was supported by Brazilian study stating association of BMI with lower extremity pain (Ogwumike et al., 2016). Overweight women had 3.24 times risk and obese women had 3.54 times risk of having knee pain on comparison to normal weight which was supported by study done in Brazil that obese menopausal women were 2 times at risk of getting lower extremity pain on comparison to non-obese menopausal women. Interestingly, this study also showed that BMI was associated with shoulder pain and the reason behind it is unknown. The literature had shown association of BMI with low back pain (Dugan et al., 2006; Park et al., 2010). This study didn't show any such significance though LBP had highest prevalence and study done by Park et al. (2010) also didn't show significant association between BMI and LBP in menopausal women and postmenopausal women.

5.1 Limitation of the Study

- The prevalence of osteoporosis was anticipated to be found in this study. But, because of lack of BMD test by respondent, the osteoporotic finding couldn't be explored in this study.
- The sample size of the study was small than estimated sample size. Out of estimated sample of 280, the total sample could not be collected due to short study duration. Thus, only 134 sample was collected.
- The respondent was hesitated to talk about menopause.
- The study couldn't show the prevalence of MSK complain as it was done in physiotherapy department setting and all of them had some MSK complain. The study done at community level would show better prevalence of MSK complain among menopausal women.
- Researcher was not known to Bangla language. So, researcher had to face some difficulties in data collection.
- There was no standard questionnaire for the study. So, researcher had to make own questionnaire.
- As it is cross-sectional study, researcher has only found the association between MSK complain and menopausal status rather than direction of cause between them.
- The hormonal changes were not assessed in the study due to lack of resources though hormonal changes is thought to be main reason behind the MSK complain rather than normal ageing.

6.1. Conclusion

Menopause is the natural biological phenomenon. The decreased level of estrogen has numerous adverse effect on musculoskeletal system making menopausal women prone to musculoskeletal disorder. This study found common musculoskeletal condition among menopausal women as low back pain, knee pain, neck pain and shoulder pain with most common diagnosis as lumbar spondylosis, knee osteoarthritis, cervical spondylosis and frozen shoulder respectively. The study concludes that along with various musculoskeletal problem arising after onset of menopause, severity of these pain was significantly associated with menopausal status and increased in severity since menopausal transition. Exercise status, co-morbidities and depressed mental status were also found to be associated with severity of pain. BMI had increased risk of knee pain in overweight and obese menopausal women. In summary, menopausal health is a neglected aspect of health care system in Bangladesh. Most of the menopausal women are suffering from musculoskeletal disorder despite they are going through psychological, somatic and social changes. The health promoting strategies to enhance quality of life of menopausal women should be initiated by concerned authorities. The menopausal group of patients comes in close contact with physiotherapist during treatment of their musculoskeletal disorder and physiotherapist should consider these common musculoskeletal conditions along with other risk factor causing them pain. Also, education regarding menopausal health should be given to them with focus of getting them engaged to regular physical exercise to promote healthy lifestyle.

6.2. Recommendation

- The study with large sample size in a community setting is recommended in the further study to see the prevalence of MSK complain among menopausal women.
- The hormonal changes and its effect in MSK complain s recommended in further study to know about direction of cause of MSK complain.
- Randomized controlled trials to see the effect of strength training in reduction of intramuscular fat and optimal intervention for treating MSK complain along with psychological and physical challenge they face should be done.
- The study to understand the process of ageing among women in relation to menopausal transition should be conducted.
- The osteoporosis study along with level of bone mineral density is recommended to see effect of menopause of bone mass loss.
- The longitudinal study to see the causes for developing chronic and recurrent MSK complain in menopausal women and appropriate management to modify the causes should be conducted.
- The medical professionals who manages the MSK complains among women in midlife should consider the physiological, psychological, somatic, social changes taking place in their transition. In addition, the tailored pre, peri, postmenopausal educational intervention can be provided according to menopausal status, MSK complain and severity of pain.
- Since menopausal health is neglected topic in Bangladesh, the awareness program should be conducted among general population especially targeting women. The program should consist of education about bodily changes, common MSK complains and reason behind MSK complain and pain that happens after menopause. They also should be aware about necessary intervention to prevent and treat those complains.
- The appropriate health care strategies to facilitate easier menopausal transition and ensure healthy postmenopausal life for women by limiting chronic disabilities.

REFERENCES

- Alexander, J. L., Dennerstein, L., Woods, N. F., Halbreich, U., Kotz, K., Richardson, G., ... Sherman, J. J. (2007). Arthralgias, bodily aches and pains and somatic complaints in midlife women: etiology, pathophysiology and differential diagnosis. *Expert Review of Neurotherapeutics*, 7(sup1), S15-S26. doi:10.1586/14737175.7.11s.s15
- Aloia, J. F., McGowan, D. M., Vaswani, A. N., Ross, P., & Cohn, S. H. (1991). Relationship of menopause to skeletal and muscle mass. *The American Journal of Clinical Nutrition*, 53(6), 1378-1383. doi:10.1093/ajcn/53.6.1378
- Arnold CM, Beatty B, Harrison EL, Olszynski W. The reliability of five clinical postural alignment measures for women with osteoporosis. *Physiotherapy Canada* 2000;52(5):286-294.
- Asikainen, T. M., Kukkonen-Harjula, K., & Miilunpalo, S. (2004). Exercise for health for early postmenopausal women. *Sports medicine*, 34(11), 753-778.
- Banglapedia. (2015). Ageing - Banglapedia. Retrieved from <http://en.banglapedia.org/index.php?title=Ageing> on 2nd february 2018
- Borchers, M., Cieza, A., Sigl, T., Kollerits, B., Kostanjsek, N., & Stucki, G. (2005). Content comparison of osteoporosis-targeted health status measures in relation to the International Classification of Functioning, Disability and Health (ICF). *Clinical rheumatology*, 24(2), 139-144.

- Braden, J. B., Young, A., Sullivan, M. D., Walitt, B., LaCroix, A. Z., & Martin, L. (2012). Predictors of Change in Pain and Physical Functioning Among Post-Menopausal Women With Recurrent Pain Conditions in the Women's Health Initiative Observational Cohort. *The Journal of Pain, 13*(1), 64-72. doi:10.1016/j.jpain.2011.10.007
- Bradney, M., Karlsson, M. K., Duan, Y., Stuckey, S., Bass, S., & Seeman, E. (2000). Heterogeneity in the Growth of the Axial and Appendicular Skeleton in Boys: Implications for the Pathogenesis of Bone Fragility in Men. *Journal of Bone and Mineral Research, 15*(10), 1871-1878. doi:10.1359/jbmr.2000.15.10.1871
- Brown, W. J., Mishra, G. D., & Dobson, A. (2002). Changes in physical symptoms during the menopause transition. *International Journal of Behavioral Medicine, 9*(1), 53-67. doi:10.1207/s15327558ijbm0901_04
- Calleja-Agius, J., & Brincat, M. (2014). Menopause-Related Changes in the MSK System, Cartilages and Joints. In *Frontiers in Gynecological Endocrinology* (pp. 201-205). Springer, Cham.
- Cao, M. (2013). Symptoms Experienced By Post-Menopausal Breast Cancer Survivors On Aromatase Inhibitors: A Secondary Analysis Of Baseline Data.
- Carville, S. F., Rutherford, O. M., & Newham, D. J. (2005). Power output, isometric strength and steadiness in the leg muscles of pre- and postmenopausal women; the effects of hormone replacement therapy. *European Journal of Applied Physiology, 96*(3), 292-298. doi:10.1007/s00421-005-0078-4
- Cauley, J., Gutai, J., Kuller, L., D, L., & Powell, J. (1999). The epidemiology of serum sex hormones in postmenopausal women. *Maturitas, 11*(4), 341. doi:10.1016/0378-5122(89)90030-3

- Chen, Y., Lin, S. Q., Wei, Y., Gao, H. L., Wang, S. H., & Wu, Z. L. (2008). Impact of menopause on quality of life in community-based women in China. *Menopause*, *15*(1), 144-149.
- Cooper, C., Atkinson, E. J., MichaelO'Fallon, W., & Melton, J. L. (1992). Incidence of clinically diagnosed vertebral fractures: a population-based study in Rochester, Minnesota, 1985-1989. *Journal of bone and mineral research*, *7*(2), 221-227.
- Cray, L., Woods, N. F., & Mitchell, E. S. (2010). Symptom clusters during the late menopausal transition stage. *Menopause*, *17*(5), 972-977. doi:10.1097/gme.0b013e3181dd1f95
- Cunha-Henriques, S., Costa-Paiva, L., Pinto-Neto, A. M., Fonseca-Carvesan, G., Nanni, L., & Morais, S. S. (2011). Postmenopausal women with osteoporosis and musculoskeletal status: a comparative cross-sectional study. *Journal of clinical medicine research*, *3*(4), 168.
- Cutolo, M., Accardo, S., Villaggio, B., Clerico, P., Bagnasco, M., Coviello, D. A., ... Castagnetta, L. (1993). Presence of estrogen-binding sites on macrophage-like synoviocytes and cd8+, cd29+, cd45ro+ t lymphocytes in normal and rheumatoid synovium. *Arthritis & Rheumatism*, *36*(8), 1087-1097. doi:10.1002/art.1780360809
- Danielsson, L., & Lindberg, H. (1997). Prevalence of Coxarthrosis in an Urban Population During Four Decades. *Clinical Orthopaedics and Related Research*, *342*, 106-110. doi:10.1097/00003086-199709000-00017
- Dasgupta, D., & Ray, S. (2009). Menopausal problems among rural and urban women from Eastern India. *Journal of social, behavioral, and health sciences*, *3*(1), 2.

- Davis, S. R., Panjari, M., & Stanczyk, F. Z. (2011). Clinical review: DHEA replacement for postmenopausal women. *The Journal of clinical endocrinology and metabolism*, 96(6), 1642-1653.
- Dedicação, A. C., Sato, T. D. O., Avila, M. A., Moccellini, A. S., Saldanha, M. E. S., & Driusso, P. (2017). Prevalence of musculoskeletal pain in climacteric women of a Basic Health Unit in São Paulo/SP. *Revista Dor*, 18(3), 212-216.
- Delbono, O., O'Rourke, K., & Ettinger, W. (2005). Excitation-calcium release uncoupling in aged single human skeletal muscle fibers. *The Journal of Membrane Biology*, 148(3). doi:10.1007/bf00235039
- Dugan, S. A., Powell, L. H., Kravitz, H. M., Everson Rose, S. A., Karavolos, K., & Luborsky, J. (2006). Musculoskeletal Pain and Menopausal Status. *The Clinical Journal of Pain*, 22(4), 325-331. doi:10.1097/01.ajp.0000208249.07949.d5
- ESHRE Capri Workshop Group. (2011). Perimenopausal risk factors and future health. *Human reproduction update*, 17(5), 706-717. doi:10.1093/humupd/dmr020
- Fisher, A., Srikusalanukul, W., Davis, M., & Smith, P. (2013). Cardiovascular diseases in older patients with osteoporotic hip fracture: prevalence, disturbances in mineral and bone metabolism, and bidirectional links. *Clinical interventions in aging*, 8, 239.
- Freeman, E. W., Sammel, M. D., Lin, H., Gracia, C. R., Pien, G. W., Nelson, D. B., & Sheng, L. (2007). Symptoms associated with menopausal transition and reproductive hormones in midlife women. *Obstetrics & Gynecology*, 110(2), 230-240.
- Gabriel, S. E., & Michaud, K. (2009). Epidemiological studies in incidence, prevalence, mortality, and comorbidity of the rheumatic diseases. *Arthritis Research & Therapy*, 11(3), 229. doi:10.1186/ar2669

- Gao, H., Lin, S., Wei, Y., Chen, Y., & Wu, Z. (2013). The effect of age and menopausal status on musculoskeletal symptoms in Chinese women aged 35–64 years. *Climacteric*, *16*(6), 639-645. doi:10.3109/13697137.2013.769095
- Gaugris, S., Heaney, R., Boonen, S., Kurth, H., Bentkover, J., & Sen, S. (2005). Vitamin D inadequacy among post-menopausal women: a systematic review. *QJM: An International Journal of Medicine*, *98*(9), 667-676. doi:10.1093/qjmed/hci096
- Ghimire, N., Dhakal, P., Norrish, D., Dangal, G., Sharma, D., Dhimal, M., ... & Karki, K. B. (2015). Menopausal health status of women of Kapilvastu district of Nepal. *J Nepal Health Res Counc*, *13*(31), 182-7
- Goodman, J., & Kirwan, L. (2001). Exercise-induced myocardial ischaemia in women. *Sports Medicine*, *31*(4), 235-247.
- Habib, M., & Rahman, S. U. (2015). Musculoskeletal symptoms (MSS) and their associations with ergonomic physical risk factors of the women engaging in regular rural household activities: A picture from a rural village in Bangladesh. *Work*, *50*(3), 347-356.
- Harlow, S. D., Gass, M., Hall, J. E., Lobo, R., Maki, P., Rebar, R. W., ... & STRAW+ 10 Collaborative Group. (2012). Executive summary of the Stages of Reproductive Aging Workshop+ 10: addressing the unfinished agenda of staging reproductive aging. *The Journal of Clinical Endocrinology & Metabolism*, *97*(4), 1159-1168.
- Hasib, M. H. (2017). *A Survey on Knowledge, Attitude and Practice of Osteoporosis among working women in Bangladesh* (Doctoral dissertation, East West University).
- Hotun Sahin, N., & Coskun, A. (2007). The menopausal age, related factors and climacteric complaints in Turkish women. *Referência-Revista de Enfermagem*, *2*(4).

- Hughes, V. A., Frontera, W. R., Roubenoff, R., Evans, W. J., & Singh, M. A. (2002). Longitudinal changes in body composition in older men and women: role of body weight change and physical activity. *The American Journal of Clinical Nutrition*, 76(2), 473-481. doi:10.1093/ajcn/76.2.473
- Hunter, D. J., & Sambrook, P. N. (2000). Bone loss: epidemiology of bone loss. *Arthritis Research & Therapy*, 2(6), 441.
- Institute for Health Metrics and Evaluation. (2016.). Global Burden of Disease Study 2016. Bangladesh. Retrieved from <http://www.healthdata.org/bangladesh> . Accessed on 30/03/2018
- Jeremiah, M. P., Unwin, B. K., Greenawald, M. H., & Casiano, V. E. (2015). Diagnosis and management of osteoporosis. *Am Fam Physician*, 92(4), 261-268.
- Johnell, O., & Kanis, J. (2005). Epidemiology of osteoporotic fractures. *Osteoporosis International*, 16(S02), S3-S7. doi:10.1007/s00198-004-1702-6
- Jubrias, S. A., Odderson, I. R., Esselman, P. C., & Conley, K. E. (2007). Decline in isokinetic force with age: muscle cross-sectional area and specific force. *Pflugers Arch European Journal of Physiology*, 434(3), 246-253. doi:10.1007/s004240050392
- Kanis, J. A. (2007). Assessment of osteoporosis at the primary health care level. WHO Collaborating Centre for Metabolic Bone Diseases. *WHO Collaborating Centre for Metabolic Bone Diseases*.
- Kanis, J. A., Burlet, N., Cooper, C., Delmas, P. D., Reginster, J., & Rizzoli, R. (2008). European guidance for the diagnosis and management of osteoporosis in postmenopausal women. *Osteoporosis International*, 19(4), 399-428. doi:10.1007/s00198-008-0560-z

- Koh, L. K., Ben Sedrine, W., Torralba, T. P., Kung, A., Fujiwara, S., Chan, S. P., ... Reginster, J. Y. (2001). A Simple Tool to Identify Asian Women at Increased Risk of Osteoporosis. *Osteoporosis International*, 12(8), 699-705. doi:10.1007/s001980170070
- Kozinoga, M., Majchrzycki, M., & Piotrowska, S. (2015). Low back pain in women before and after menopause. *Menopausal Review*, 3, 203-207. doi:10.5114/pm.2015.54347
- Kuorinka, I., Jonsson, B., Kilbom, A., Vinterberg, H., Biering-Sørensen, F., Andersson, G., & Jørgensen, K. (1987). Standardised Nordic questionnaires for the analysis of MSK symptoms. *Applied ergonomics*, 18(3), 233-237.
- Labaree, R. V. (2009). *Research Guides: Organizing Your Social Sciences Research Paper: Types of Research Designs*.
- Labrie, F., Martel, C., & Balser, J. (2011). Wide distribution of the serum dehydroepiandrosterone and sex steroid levels in postmenopausal women. *Menopause*, 18(1), 30-43. doi:10.1097/gme.0b013e3181e195a6
- Lautenbach, G. L., & Petri, M. (1999). WOMEN'S HEALTH. *Rheumatic Disease Clinics of North America*, 25(3), 539-565. doi:10.1016/s0889-857x(05)70086-7
- Lima, R., Wofford, M. & Reckelhoff, J.F. *Curr Hypertens Rep* (2012) 14: 254. <https://doi.org/10.1007/s11906-012-0260-0>
- Lindle, R. S., Metter, E. J., Lynch, N. A., Fleg, J. L., Fozard, J. L., Tobin, J., ... & Hurley, B. F. (1997). Age and gender comparisons of muscle strength in 654 women and men aged 20–93 yr. *Journal of applied physiology*, 83(5), 1581-1587.

- Lips, P., & Van Schoor, N. M. (2005). Quality of life in patients with osteoporosis. *Osteoporosis International*, *16*(5), 447-455. doi:10.1007/s00198-004-1762-7
- Maltais, M. L., Desroches, J., & Dionne, I. J. (2009). Changes in muscle mass and strength after menopause. *J Musculoskelet Neuronal Interact*, *9*(4), 186-97.
- Marahatta, R. K. (2012). Study of menopausal symptoms among peri and postmenopausal women attending NMCTH. *Nepal Med Coll J*, *14*(3), 251-255.
- McClure, S. K., Adams, J. E., & Dahm, D. L. (2005, June). Common musculoskeletal disorders in women. In *Mayo Clinic Proceedings* (Vol. 80, No. 6, pp. 796-802). Elsevier.
- Merigliola, M. C., Nanni, M., Bachiocco, V., Vodo, S., & Aloisi, A. M. (2012). Menopause affects pain depending on pain type and characteristics. *Menopause*, *19*(5), 517-523.
- Mitchell, E. S., & Woods, N. F. (2010). Pain symptoms during the menopausal transition and early postmenopause. *Climacteric*, *13*(5), 467-478. doi:10.3109/13697137.2010.483025
- Morley, J. E., Baumgartner, R. N., Roubenoff, R., Mayer, J., & Nair, K. (2001). Sarcopenia. *Journal of Laboratory and Clinical Medicine*, *137*(4), 231-243. doi:10.1067/mlc.2001.113504
- Morris, R. O. (2000). Closed pelvic fractures: characteristics and outcomes in older patients admitted to medical and geriatric wards. *Postgraduate Medical Journal*, *76*(900), 646-650. doi:10.1136/pmj.76.900.646
- Morrison, J. H., Brinton, R. D., Schmidt, P. J., & Gore, A. C. (2006). Estrogen, Menopause, and the Aging Brain: How Basic Neuroscience Can Inform Hormone Therapy in

Women. *Journal of Neuroscience*, 26(41), 10332-10348. doi:10.1523/jneurosci.3369-06.2006

National Osteoporosis Foundation (NOF, 2011). Available at: <http://nof.org/news/185>. Accessed February 6, 2018.

Nayak, S., Edwards, D. L., Saleh, A. A., & Greenspan, S. L. (2015). Systematic review and meta-analysis of the performance of clinical risk assessment instruments for screening for osteoporosis or low bone density. *Osteoporosis International*, 26(5), 1543-1554.

Nelson, H. D., Haney, E., Humphrey, L., Miller, J., Nedrow, A., Nicolaidis, C., ... & Nygren, P. (2005). Management of Menopause-Related Symptoms: Summary.

Newberry, S. J., FitzGerald, J., & SooHoo, N. F. (2017). Treatment of Osteoarthritis of the Knee: An Update Review. doi:10.23970/ahrqepccer190

Nisar, N., & Sohoo, N. A. (2010). Severity of Menopausal symptoms and the quality of life at different status of Menopause: a community based survey from rural Sindh, Pakistan. *International Journal of Collaborative Research on Internal Medicine & Public Health*, 2(5).

North American Menopause Society. (2006). Management of osteoporosis in postmenopausal women: 2006 position statement of The North American Menopause Society. *Menopause (New York, NY)*, 13(3), 340.

North American Menopause Society. (2010). NAMS Continuing medical education activity; Management of osteoporosis in postmenopausal women: 2010 position statement. *Menopause*, 17(1), 23-56.

- Ogwumike, O. O., Adeniyi, A. F., & Orogbemi, O. O. (2016). Musculoskeletal pain among postmenopausal women in Nigeria: Association with overall and central obesity. *Hong Kong Physiotherapy Journal*, 34, 41-46. doi:10.1016/j.hkpj.2015.06.001
- O'Neill, T. W., & Roy, D. K. (2005). How many people develop fractures with what outcome?. *Best Practice & Research Clinical Rheumatology*, 19(6), 879-895.
- Park, J. J., Shin, J., Youn, Y., Champagne, C., Jin, E., Hong, S., ... Yeom, S. (2010). Bone mineral density, body mass index, postmenopausal period and outcomes of low back pain treatment in Korean postmenopausal women. *European Spine Journal*, 19(11), 1942-1947. doi:10.1007/s00586-010-1559-7
- Paudyal, P. N., & Nepal, M. (2014). Knowledge on Perimenopausal Symptoms among Women Attending Lumbini Medical College Teaching Hospital. *Journal of Lumbini Medical College*, 2(2), 41. doi:10.22502/jlmc.v2i2.56
- Peters, M. J., Symmons, D. P. M., McCarey, D., Dijkmans, B. A. C., Nicola, P., Kvien, T. K., ... & Semb, A. (2010). EULAR evidence-based recommendations for cardiovascular risk management in patients with rheumatoid arthritis and other forms of inflammatory arthritis. *Annals of the rheumatic diseases*, 69(2), 325-331.
- Pfeifer, M., Begerow, B., Minne, H. W., Abrams, C., Nachtigall, D., & Hansen, C. (2000). Effects of a Short-Term Vitamin D and Calcium Supplementation on Body Sway and Secondary Hyperparathyroidism in Elderly Women. *Journal of Bone and Mineral Research*, 15(6), 1113-1118. doi:10.1359/jbmr.2000.15.6.1113
- Pollock, M. L., Graves, J. E., Swart, D. L., & Lowenthal, D. T. (1994). Exercise training and prescription for the elderly. *Southern medical journal*, 87(5), S88-95.

- Popescu, C., Bojincă, V., Opreș, D., & Ionescu, R. (2014). Whole Body Bone Tissue and Cardiovascular Risk in Rheumatoid Arthritis. *Journal of Osteoporosis*, 2014, 1-8. doi:10.1155/2014/465987
- Puri, S., Bhatia, V., & Mangat, C. (2008). Perceptions of menopause and postmenopausal bleeding in women of Chandigarh, India. *Internet Journal of Family Practice*, 6(2), 1-6.
- Rahman, S., Salehin, F., & Iqbal, A. (2011). Menopausal symptoms assessment among middle age women in Kushtia, Bangladesh. *BMC research notes*, 4(1), 188.
- Raisz, L. G. (2005). Pathogenesis of osteoporosis: concepts, conflicts, and prospects. *The Journal of clinical investigation*, 115(12), 3318-3325.
- Rajbhandari S. Menopause and cultural belief in Nepal. 1998. Available from http://210.101.116.28/W_files/kiss9/45700215_pv.pdf.
- Rajbhandari, S., Subedi, R. K., Dangal, G., Phuyal, A., Vaidya, A., Karki, A., ... & Shrestha, S. (2017). Menopausal Health Status of Nepalese Women. Higher Education. *Journal of Nepal Medical Association*. 246, 12-3.
- Recker, R., Lappe, J., Davies, K., & Heaney, R. (2000). Characterization of perimenopausal bone loss: a prospective study. *Journal of Bone and Mineral Research*, 15(10), 1965-1973.
- Rees, M. (2009). Alternative treatments for the menopause. *Best Practice & Research Clinical Obstetrics & Gynaecology*, 23(1), 151-161. doi:10.1016/j.bpobgyn.2008.10.006
- Rolland, Y. M., Perry, H. M., Patrick, P., Banks, W. A., & Morley, J. E. (2007). Loss of Appendicular Muscle Mass and Loss of Muscle Strength in Young Postmenopausal

Women. *The Journals of Gerontology Series A: Biological Sciences and Medical Sciences*, 62(3), 330-335.

Rossouw, J. E. (2002). Risks and benefits of estrogen plus progestin in healthy postmenopausal women. principal results from the women's health initiative randomized controlled trial. *ACC Current Journal Review*, 11(6), 38-39. doi:10.1016/s1062-1458(02)00919-4

Roubenoff, R., & Hughes, V. A. (2000). Sarcopenia: Current Concepts. *The Journals of Gerontology Series A: Biological Sciences and Medical Sciences*, 55(12), M716-M724. doi:10.1093/gerona/55.12.m716

Salomon, J. A., Wang, H., Freeman, M. K., Vos, T., Flaxman, A. D., Lopez, A. D., & Murray, C. J. (2012). Healthy life expectancy for 187 countries, 1990–2010: a systematic analysis for the Global Burden Disease Study 2010. *The Lancet*, 380(9859), 2144-2162.

Saraví, F. D. (2013). Osteoporosis Self-Assessment Tool Performance in a Large Sample of Postmenopausal Women of Mendoza, Argentina. *Journal of Osteoporosis*, 2013, 1-6. doi:10.1155/2013/150154

Satpathy, M. (2016). A Study on Age at Menopause, Menopausal Symptoms and Problems among Urban Women from Western Odisha, India. *International Journal of Scientific and Research Publications*, 6(3), 422-427.

Schoenaker, D. A., Jackson, C. A., Rowlands, J. V., & Mishra, G. D. (2014). Socioeconomic position, lifestyle factors and age at natural menopause: a systematic review and meta-analyses of studies across six continents. *International Journal of Epidemiology*, 43(5), 1542-1562. doi:10.1093/ije/dyu094

- Shakhatreh, F. M., & Mas'ad, D. (2006). Menopausal symptoms and health problems of women aged 50–65 years in Southern Jordan. *Climacteric*, 9(4), 305-311. doi:10.1080/13697130600861542
- Shakila, P., Sridharan, P., & Thiyagarajan, S. (2014). An Assessment of Women's Awareness and Symptoms in Menopause (A Study with Reference to Academic Women's at Sri Lanka). *Journal of Business & Economic Policy*, 1(2), 115-124. ISSN 2375-0766
- Sharma, S., & Mahajan, N. (2015). Menopausal symptoms and its effect on quality of life in urban versus rural women: A cross-sectional study. *Journal of mid-life health*, 6(1), 16.
- Shuster, L. T. (2012). The burden of pain with menopause. *Menopause*, 19(5), 494-495.
- Sinaki, M. (1998). Musculoskeletal challenges of osteoporosis. *Aging Clinical and Experimental Research*, 10(3), 249-262.
- Sirola, J., & Rikkonen, T. (2005). Muscle performance after the menopause. *British Menopause Society Journal*, 11(2), 45-50. doi:10.1258/136218005775544561
- Sohail, S. (2014). Menopause and the Asian woman. *Journal of SAFOMS*, 2(1), 23.
- Soules, M. R., Sherman, S., Parrott, E., Rebar, R., Santoro, N., Utian, W., & Woods, N. (2001). Executive summary: stages of reproductive aging workshop (STRAW). *Climacteric*, 4(4), 267-272.
- Stel, V., Pluijm, S., Deeg, D., Smit, J., Bouter, L., & Lips, P. (2004). Functional limitations and poor physical performance as independent risk factors for self-reported fractures in older persons. *Osteoporosis International*, 15(9). doi:10.1007/s00198-004-1604-7
- Stevenson, J. C. (2006). HRT, osteoporosis and regulatory authorities Quis custodiet ipsos custodes? *Human Reproduction*, 21(7), 1668-1671. doi:10.1093/humrep/del043

- Stevenson, J. C. (2011). A woman's journey through the reproductive, transitional and postmenopausal periods of life: Impact on cardiovascular and musculo-skeletal risk and the role of estrogen replacement. *Maturitas*, *70*(2), 197-205. doi:10.1016/j.maturitas.2011.05.017
- Stevenson, J., & Marsh, M. (2007). *An Atlas of Osteoporosis, Third Edition*. doi:10.3109/9780203090848
- Szoeke, C. E., Cicuttini, F. M., Guthrie, J. R., & Dennerstein, L. (2008). The relationship of reports of aches and joint pains to the menopausal transition: a longitudinal study. *Climacteric*, *11*(1), 55-62. doi:10.1080/13697130701746006
- Tandon, V., Mahajan, A., Sharma, S., & Sharma, A. (2010). Prevalence of cardiovascular risk factors in postmenopausal women: A rural study. *Journal of Mid-life Health*, *1*(1), 26. doi:10.4103/0976-7800.66993
- The North American Menopause Society. (2010). Management of osteoporosis in postmenopausal women: 2010 position statement of The North American Menopause Society. *Menopause*, *17*(1), 25-54. doi:10.1097/gme.0b013e3181c617e6
- Tong, I. L. (2013). Nonpharmacological treatment of postmenopausal symptoms. *The Obstetrician & Gynaecologist*, *15*(1), 19-25. doi:10.1111/j.1744-4667.2012.00143.x
- Tosi, L. L., Boyan, B. D., & Boskey, A. L. (2005). DOES SEX MATTER IN MUSCULOSKELETAL HEALTH? *The Journal of Bone and Joint Surgery-American Volume*, *87*(7), 1631-1647. doi:10.2106/00004623-200507000-00030
- Toth, M., Tchernof, A., Sites, C., & Poehlman, E. (2000). Effect of menopausal status on body composition and abdominal fat distribution. *International Journal of Obesity*, *24*(2), 226-231. doi: 10.1038/sj.ijo.0801118

- Valkenburg, H. A. (1980). Clinical versus radiological osteoarthritis in the general population. *Epidemiologie de l'arthrose*.
- Van Dijk, G. M., Kavousi, M., Troup, J., & Franco, O. H. (2015). Health issues for menopausal women: the top 11 conditions have common solutions. *Maturitas*, *80*(1), 24-30.
- Vos, T., Flaxman, A. D., Naghavi, M., Lozano, R., Michaud, C., Ezzati, M., ... & Abraham, J. (2012). Years lived with disability (YLDs) for 1160 sequelae of 289 diseases and injuries 1990–2010: a systematic analysis for the Global Burden of Disease Study 2010. *The lancet*, *380*(9859), 2163-2196.
- Wang, H., Dwyer-Lindgren, L., Lofgren, K. T., Rajaratnam, J. K., Marcus, J. R., Levin-Rector, A., ... & Murray, C. J. (2012). Age-specific and sex-specific mortality in 187 countries, 1970–2010: a systematic analysis for the Global Burden of Disease Study 2010. *The Lancet*, *380*(9859), 2071-2094.
- Whelan, T. J., Goss, P. E., Ingle, J. N., Pater, J. L., Tu, D., Pritchard, K., ... Muss, H. B. (2005). Assessment of Quality of Life in MA.17: A Randomized, Placebo-Controlled Trial of Letrozole After 5 Years of Tamoxifen in Postmenopausal Women. *Journal of Clinical Oncology*, *23*(28), 6931-6940. doi:10.1200/jco.2005.11.181
- Whitehead, M. I., & Godfree, V. (1992). *Hormone replacement therapy: Your questions answered*. Churchill Livingstone.
- Widrick, J. J., Maddalozzo, G. F., Lewis, D., Valentine, B. A., Garner, D. P., Stelzer, J. E., ... Snow, C. M. (2003). Morphological and Functional Characteristics of Skeletal Muscle Fibers From Hormone-replaced and Nonreplaced Postmenopausal Women. *The Journals of Gerontology Series A: Biological Sciences and Medical Sciences*, *58*(1), B3-B10. doi:10.1093/gerona/58.1.b3

- Wiik, A., Ekman, M., Johansson, O., Jansson, E., & Esbjörnsson, M. (2008). Expression of both oestrogen receptor alpha and beta in human skeletal muscle tissue. *Histochemistry and Cell Biology*, *131*(2), 181-189. doi:10.1007/s00418-008-0512-x
- Wluka, A. E., Cicuttini, F. M., & Spector, T. D. (2000). Menopause, oestrogens and arthritis. *Maturitas*, *35*(3), 183-199. doi:10.1016/s0378-5122(00)00118-3
- Women in Your Life: Menopause. (2012). Retrieved from: <http://bhisaj.wordpress.com/2012/k02/09/women-in-your-life-menopause>.
- Wong, L. P., & Ah, N. L. (2007). A Survey of Knowledge and Perceptions of Menopause among Young to middle-Aged Women in Federal Territory, Kuala Lumpur, Malaysia. *Journal of the University of Malaya Medical Centre (JUMMEC)*, *10*(2), 22-30.
- Wong, A. Y. (2016). Musculoskeletal pain in postmenopausal women—Implications for future research. *Hong Kong Physiotherapy Journal*, *34*, A1-A2. doi:10.1016/j.hkpj.2016.03.001
- Woolf, A. D., & Pfleger, B. (2003). Burden of major musculoskeletal conditions. *Bulletin of the World Health Organization*, *81*(9), 646-656.
- Woolf, A. D. (2000). The Bone and Joint Decade 2000-2010. *Annals of the Rheumatic Diseases*, *59*(2), 81-82. doi:10.1136/ard.59.2.81
- Woolf, A.D. (2016). *Musculoskeletal pain: incidence, prevalence, and impact on healthy ageing*. Retrieved from https://www.sip-platform.eu/files/structure_until_2016/Symposia/SIP%202012%20Programme/Workshop%202/Presentations/SIP%202012_WS2_TWoolf_Musculoskeletalpresentation.pdf on 08/02/2018

World Health Organization (2000) Women aging and health. Fact sheet No. 252. Geneva: WHO

World Health Organization(WHO). (2004). Prevención de Trastornos Musculoesqueléticos en el Lugar de Trabajo. Retrieved from http://www.who.int/occupational_health/publications/en/pwh5sp.pdf on 5th february 2018

World Health Organization. (1996). Research on the menopause in the 1990s: report of a WHO scientific group.

World Health Organization. (2007). WHO scientific group on the assessment of osteoporosis at the primary health care level: summary meeting report. Brussels, Belgium; May 5-7, 2004. Geneva, Switzerland: World Health Organization; 2007. Retrieved from <http://www.who.int/chp/topics/Osteoporosis.pdf>

World Health Organization. (2012). Obesity and overweight. Fact sheet No 311.. [<http://www.who.int/mediacentre/factsheets/fs311/en/>]

Writing Group for the Women's Health Initiative Investigators (2002). Risks and Benefits of Estrogen Plus Progestin in Healthy Postmenopausal Women Principal Results from the Women's Health Initiative Randomized Controlled Trial. *JAMA*. 2002;288(3):321–333. doi:10.1001/jama.288.3.321

Yang, Y., Wang, B., Fei, Q., Meng, Q., Li, D., Tang, H., ... & Su, N. (2013). Validation of an osteoporosis self-assessment tool to identify primary osteoporosis and new osteoporotic vertebral fractures in postmenopausal Chinese women in Beijing. *BMC musculoskeletal disorders*, 14(1), 271.

Zaki, M. E. (2014). Effects of whole body vibration and resistance training on bone mineral density and anthropometry in obese postmenopausal women. *Journal of osteoporosis*, 2014.

APPENDIX

Appendix I: Information Sheet (Bangla)

তথ্যপত্র

আসসালামু আলাইকুম/নমস্কার,

আমি রাধিকা শ্রেষ্ঠা, রিহ্যাবিলিটেশন সায়েন্স, বাংলাদেশ হেলথ প্রফেশন্স ইন্সটিটিউট (বিএইচপিআই), ঢাকা বিশ্ববিদ্যালয়ের একজন ছাত্রি । স্নাতকোত্তর ডিগ্রী প্রাপ্তির জন্য আমার একটি গবেষণামূলক প্রকল্প পরিচালনা করা প্রয়োজন এবং আমার গবেষণা প্রকল্পটি হচ্ছে “**Musculoskeletal complains among Menopausal women at Musculoskeletal Department of CRP**” এর জন্য আমি একটি জরিপ সঞ্চালন সি আর পি তে মাস্কুলোস্কেলেটাল সমস্যা সহ ঋতুবাড়া মহিলাদের উপর। এই গবেষণায় অংশগ্রহণের জন্য আপনাকে কিছু প্রশ্ন করা হবে এবং আপনাকে এইগুলোর সঠিক উত্তর দিতে হবে। হয়ত আপনি এতে সরাসরি উপকৃত হবেন না তবে এই গবেষণার ফলাফলে অন্য অনেকে উপকৃত হতে পারে। তথ্য পাওয়ার জন্য আমার আপনাকে কিছু প্রশ্ন জিজ্ঞাসা করতে হবে। আপনার সরবরাহকৃত যাবতীয় তথ্য গোপন রাখা হবে এমনকি প্রতিবেদন এবং প্রকাশনের সময়েও। আপনার সাহায্য যথাযথ ভাবে সমাদৃত হবে; আমি আপনাকে সত্য তথ্য দিতে অনুরোধ করবো। এই অধ্যয়নে আপনার অংশগ্রহণ স্বেচ্ছাকৃত এবং যে কোন নেতিবাচক প্রভাবে আপনি এই অধ্যয়ন থেকে নিজেকে প্রত্যাহার করে নিতে পারবেন। সাক্ষাতকার নিতে হয়ত ৩০ মিনিটের মত সময় লাগবে এবং কম সাহায্যের প্রয়োজন হবে। আপনার যদি কোন অনুসন্ধান থাকে তাহলে কোন সংকোচ ছাড়াই জিজ্ঞাসা করতে পারেন।

রাধিকা শ্রেষ্ঠা

মাস্টার্স ইন রিহেবিলিটেশন সায়েন্স(বি এইচ পি আই)

অংশগ্রহনকারীর স্বাক্ষর:

তারিখ:

তদন্তকারীর স্বাক্ষর:

তারিখ:

Appendix II: Information Sheet (English)

Information sheet

Namaste,

I am Radhika Shrestha, student of the Bangladesh Health Professions Institute (BHPI) which is the academic institute of the Centre for the Rehabilitation of the Paralyzed (CRP), Savar, and Dhaka. I am studying M.Sc. in Rehabilitation. In regards to the fulfillment of M.Sc. Degree, it is mandatory to conduct a research in final year of study. I request you to participate in the research study **Musculoskeletal complains among Menopausal women at Musculoskeletal Department of CRP**. It will be very helpful if you accept my invitation and take part in my study.

You will be asked few questions about the musculoskeletal symptoms of menopausal women if you participate in the study. The research will be directly beneficial for women approaching menopause, women in menopausal phase and the caregiver of severely affected women due to musculoskeletal symptoms. This research will help to develop appropriate interventions like educational strategy, awareness program and health promotional activities which will be helpful to you and women experiencing menopausal symptoms. Please try to give truthful answer as much as possible and you can also refuse to give answer if you are not comfortable at sharing the information. If you have any questions regarding the questionnaire, you can ask it anytime.

The confidentiality of all records will be highly maintained and all details will be kept on a confidential database that is only accessible to me and my supervisor. The identity of you will not be disclosed in any presentation or publication without your agreement. If you have any queries now regarding this study please feel free to ask. I am accountable to answer all questions regarding this study.

Radhika Shrestha

M. Sc. in Rehabilitation Science

BHPI

Participant's signature:

Date:

Investigator's signature:

Date:

Appendix III: Consent Form (Bangla)

সম্মতিপত্র

দয়া করে নিম্নোক্ত বিবৃতিগুলো পড়ুন এবং টিকে চিহ্ন (✓) দিন হ্যাঁ অথবা না এর উপরে এটা বলার জন্য যে আপনি তথ্যপত্রের বিষয়গুলো বুঝতে পেরেছেন, আপনার সম্পৃক্ততা এবং আপনি **Musculoskeletal complains among Menopausal women at Musculoskeletal Department of CRP** নামের গবেষণাতে যুক্ত হতে রাজি।

1. আমি নিশ্চিত করছি যে, গবেষণার সাথে সংযুক্ত তথ্যপত্র বুঝতে পেরেছি অথবা আমার কাছে ব্যাখ্যা করা হয়েছে এবং আমার সুযোগ ছিল প্রশ্ন করার।
-----হ্যাঁ/না
2. গবেষণা সম্পর্কিত আমার প্রশ্ন গুলোর সন্তোষজনক উত্তর আমি পেয়েছি।
-----Yes / No
3. আমি বুঝতে পেরেছি যে এই গবেষণায় আমার অংশগ্রহন সম্পূর্ণ স্বৈচ্ছাকৃত এবং যেকোন সময় কোন কারণ দেখানো ছাড়াই আমার সংযুক্ততা উঠিয়ে নিতে পারি অথবা যে উপাত্ত গ্রহন করা হয়েছে আমার থেকে সেগুলো নষ্ট করে দিতে অনুরোধ করতে পারি।
----- হ্যাঁ/না
4. সাক্ষাতকারের এবং প্রশ্নপত্রের তথ্য যেগুলো তদন্তকারী গ্রহন করেছে সেগুলো হয়ত বা কর্মকর্তা যাচাই করতে পারেন। তবে যা ই হোক পুরো তথ্য সর্বোচ্চ গোপনীয় রাখা হবে। সংগ্রহকৃত তথ্যে প্রবেশ করতে আমি তদন্তকারী ও কর্মকর্তাকে অনুমতি দিচ্ছি।
----- হ্যাঁ/না
5. আমার পর্যাপ্ত সময় রয়েছে আমার সিদ্ধান্ত ও অংশগ্রহন নিতে।
----- হ্যাঁ/না
6. উপরোক্ত গবেষণায় আমার সাক্ষাতকার থেকে নেয়ে বিষয়গুলো ব্যবহার করতে দিতে আমি রাজি।
----- হ্যাঁ/না
7. উল্লেখিত গবেষণায় আমি অংশগ্রহনে রাজি
----- হ্যাঁ/না

অংশগ্রহনকারীর স্বাক্ষর _____ তারিখ _____

তদন্তকারী

আমি উপরোক্ত অংশগ্রহন কারীকে গবেষণা সম্পর্কে ভালভাবে বুঝিয়েছি এবং উনি স্বৈচ্ছায় এতে অংশগ্রহনের ইচ্ছা পোষণ করেছেন।

তদন্তকারীর স্বাক্ষর _____ তারিখ _____

Appendix IV: Consent Form (English)

Consent Form

Please read the following statements and put tick (√) on yes or no to say that you understand the content of the information sheet, your involvement, and that you agree to take part in the study name **Musculoskeletal complains among Menopausal women at Musculoskeletal Department of CRP**

I confirm that I have read and understood the information sheet for the study or that it has been explained to me and I have had the opportunity to ask questions.

-----Yes / No

1. I have satisfactory answers to my questions regarding with this study.

-----Yes / No

2. I understand that participation in the study is voluntary and that I am free to end my involvement at any time, or request that the data collected in the study be destroyed without giving a reason.

-----Yes / No

3. Information from interview and questionnaire, those will be collected by the investigator might be examined by research supervisor. However, all personal details will be treated as highly confidential. I have permitted the investigator and supervisor to access my recorded information

-----Yes / No

4. I have sufficient time to come to my decision about participation.

-----Yes / No

5. I agree for quotations from my interviews to be used in the above study.

-----Yes / No

6. I agree to take part in the above study.

-----Yes / No

Participant's signature _____

Date _____

Investigator

I have explained the study to the above participant precisely and he/she has indicated a willingness to take part.

Investigator's signature _____

Date _____

Appendix V: Questionnaire

Questionnaire (প্রশ্নাবলী) Code no (কোড নাম্বার): _____

Title(শিরোনাম): **Musculoskeletal Complains Among Menopausal Women at Musculoskeletal Department of CRP**

(সি আর পি এর মাস্কুলোস্কেলেটাল বিভাগে ঋতুচক্র বন্ধ হয়ে যাওয়া মহিলাদের মাস্কুলোস্কেলেটাল অভিযোগ).

Part 1(অংশ ১): Socio-demographic Information (সামাজিক-জনতাত্ত্বিকতথ্য)

1. Age of Participant (অংশগ্রহনকারীর বয়স)	_____ Years (বছর)
2. Marital Status (বৈবাহিক অবস্থা):	1. Unmarried(অবিবাহিত) 2. Married (বিবাহিত) 3. Divorced (তলাকপ্রাপ্ত) 4. Widowed (বিধবা)
3. Educational level (শিক্ষাগত যোগ্যতা):	1. Illiterate (অশিক্ষিত) 2. Primary (প্রাথমিক) 3. Secondary (মাধ্যমিক) 4. Higher Secondary (উচ্চমাধ্যমিক) 5. Graduation (স্নাতক) 6. Post-graduation and above (স্নাতকোত্তর এবং এর উপরে)
4. Living Situation (থাকার অবস্থা):	1. With family (পরিবার সাথে) 2. Alone (একা)
5. Occupation (পেশা):	1. Housewife (গৃহিনী) 2. Teacher (শিক্ষক) 3. Farmer (কৃষক) 4. Retired (অবসরপ্রাপ্ত) 5. Other(Specify) (অন্যান্য (উল্লেখ করুন))
6. Religion (ধর্ম):	1. Muslim (মুসলিম) 2. Buddhist (বৌদ্ধ) 3. Christian (খ্রিস্টান) 4. Hindu(হিন্দু)
7. Family structure (পরিবারের আকার):	1. Joint family (যৌথ পরিবার) 2. Nuclear family (একক পরিবার)
8. Monthly Income (মাসিক আয়):	_____ Taka (টাকা)

9. Source of Income (আয়ের উৎস):	1. Only Husband (শুধুমাত্র স্বামী) 2. Oneself (শুধু আপনি) 3. Children (সন্তান) 4. Other(Specify) (অন্যান্য (উল্লেখ করুন))
----------------------------------	--

Part 2(অংশ ২): Health Related factors (স্বাস্থ্য সম্পর্কিত বিষয়)

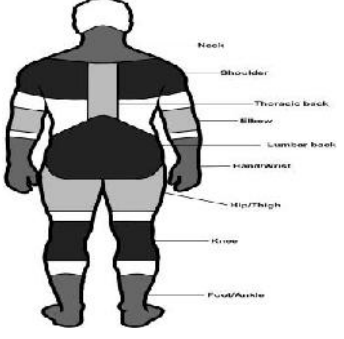
10. Do you smoke or take betel leaf? (আপনি কি ধূমপান করেন অথবা পান খান?)	1. Yes (হ্যাঁ) 2. No (না)
11. Do you stay in sunlight every day? (আপনি কি প্রতিদিন সূর্যালোকে থাকেন?)	1. Yes (হ্যাঁ) 2. No (না)
12. How many hours do you stay in sunlight in a week? (সপ্তাহে কত ঘন্টা আপনি সূর্যালোক থাকবেন?)	_____ Hours (ঘন্টা)
13. Are you taking any hormone replacement therapy? (আপনি কি কোন ধরনের হরমোন প্রতিস্থাপনের চিকিৎসা নিয়েছেন?)	1. Yes (হ্যাঁ) 2. No (না)
14. Do you take calcium supplementation? (আপনি কি ক্যালসিয়াম সম্পূরক নেন?)	1. Yes (হ্যাঁ) 2. No (না)
15. Height (উচ্চতা):	_____ cm (সেন্টিমিটার)
16. Weight (ওজন):	_____ kg (কেজি)
17. What other disease are you suffering from except musculoskeletal problem (কি অন্যান্য রোগ আপনি থেকে ভুগছেন মাস্কুলোস্কেলেটাল সমস্যা ছাড়া?)	1. Hypertension (উচ্চরক্তচাপ) 2. Diabetes (ডায়াবেটিস) 3. Respiratory disease (বক্ষব্যাধি) 4. Heart disease (হৃদরোগ) 5. Other(Specify) (অন্যান্য (উল্লেখ করুন)) 6. Not at all (মোটো না)
18. How often do you exercise in a week? (আপনি সপ্তাহে কতবার ব্যায়াম করেন?)	1. Not at all (মোটো না) 2. 1-2 times per week (প্রতি সপ্তাহে ১-২ বার) 3. 3-4 times per week (প্রতি সপ্তাহে ৩-৪ বার)

	4. More than 4 times per week (প্রতি সপ্তাহে ৪ বারের বেশী)
--	--

Part 3(অংশ ৩): Information about Reproductive Parameter (প্রজননের স্থিতিমাপক সম্পর্কিত তথ্য)

19. At which age you had first period? (আপনার প্রথম ঋতুচক্র হয়েছিল কত বছর বয়সে?)	_____ years (বছরে)
20. At which age you had last period? (আপনার সর্বশেষ ঋতুচক্র হয়েছিল কত বছর বয়সে?)	_____ years (বছরে)
21. How many children did you give birth to? (আপনি কতজন বাচ্চার জন্ম দিয়েছেন?)	_____ children (সন্তান)
22. Did you have regular menstruation cycle in past 3 months? (গত ৩মাসে আপনার কি নিয়মিত ঋতুচক্র হয়েছে?)	1. Yes (হ্যাঁ) 2. No (না)
23. If no, which of the following are you experiencing? (যদি না হয়ে থাকে আপনি নিচের কোনটির সম্মুখীন হচ্ছেন?)	1. Irregular menstruation cycle in past 3 months (early perimenopause) (গত ৩মাসে অনিয়মিত ঋতুচক্র (ঋতুঝড়ার পূর্বে)) 2. Irregular menstruation cycle in past 12 months (late perimenopause) (গত ১২মাসে অনিয়মিত ঋতুচক্র) (দেরীতে ঋতুঝড়া)) 3. No menstrual bleeding in last 12 months (post-menopause) (গত ১২মাসে ঋতুচক্রে রক্তপাত হয়নি (ঋতুঝড়ার পরে))
24. Did you have any abortion? (আপনার কি কখনো গর্ভপাত হয়েছিল?)	1. Yes (হ্যাঁ) 2. No (না)

Part 4 (অংশ ৪) : Musculoskeletal complaint Questionnaire (মাঙ্কুলোস্কেলেটাল অভিযোগের প্রশ্নাবলী)

<p>25. Did you experience any musculoskeletal pain before menopause? (ঋতুঝড়ার পূর্বে কি আপনি কোন ধরনের মাঙ্কুলোস্কেলেটাল জাতীয় ব্যাথা ভোগ করেছেন?)</p>	<p>1. Yes (হ্যাঁ) 2. No (না)</p>
<p>26. If yes, what musculoskeletal condition did you have? (যদি হ্যাঁ হয়, কোন ধরনের মাঙ্কুলোস্কেলেটাল সমস্যা আপনার ছিল?)</p>	<p>_____</p>
<p>27. Do you have any kind of trouble such as ache, pain, discomfort, numbness in your body during last 12 months? (গত ১২ মাসে কি আপনার শরীরে কোন সমস্যা হয়েছিল যেমন ব্যাথা, অস্বস্থি, অবশতা?)</p>	<p>1. Yes (হ্যাঁ) 2. No (না)</p>
<p>28. If yes, which part of your body is affected? (যদি হ্যাঁ হয়, আপনার শরীরের কোন অংশ আক্রান্ত হয়েছে?)</p> 	<p>1. Neck (ঘাড়) 2. Shoulder (কাধ) 3. Upper Back (পিঠ) 4. Elbow (কনুই) 5. Wrist/Hand (কাজি/হাত) 6. Low back (কোমড়) 7. Hip/Thigh (নিতম্ব/উরু) 8. Knee (হাটু) 9. Ankle/Feet (গোরালি/পায়ের পাতা)</p>
<p>29. If you have neck pain, what is your diagnosed musculoskeletal neck condition? (যদি আপনার ঘাড়ে ব্যাথা থাকে, আপনার ঘাড়ের অবস্থার মাঙ্কুলোস্কেলেটাল রোগ নির্ণয় কি?)</p>	<p>1. Cervical Spondylosis (সারভাইকাল স্পোন্ডাইলোসিস) 2. Postural Neck Pain (অবস্থানগত ঘাড়ে ব্যাথা) 3. Fibromyalgia (ফাইব্রোমাইয়েলজিয়া) 4. Other(Specify) (অন্যান্য (উল্লেখ করুন))</p>
<p>30. If you have shoulder pain, what is your diagnosed musculoskeletal Shoulder condition? (যদি আপনার কাধে ব্যাথা থাকে, আপনার কাধের অবস্থার মাঙ্কুলোস্কেলেটাল রোগ নির্ণয় কি?)</p>	<p>1. Frozen Shoulder (ফ্রোজেন শোল্ডার) 2. Rotator Cuff Disorder (রোটোটর কাফ ব্যাধি) 3. Fracture/ Dislocation (হাড় ভাঙ্গা/সরে যাওয়া) 4. Other(Specify) (অন্যান্য (উল্লেখ করুন))</p>
<p>31. If you have upper back pain, what is your diagnosed musculoskeletal upper back</p>	<p>1. Fibromyalgia (ফাইব্রোমাইয়েলজিয়া)</p>

condition? (যদি আপনার পিঠে ব্যাথা থাকে, আপনার পিঠের অবস্থার মাস্কুলোস্কেলেটাল রোগ নির্ণয় কি?)	<ol style="list-style-type: none"> 2. Myofascial Pain (মাইয়োফাইসিইয়াল ব্যাথা) 3. Muscle Strain (মাংসপেশী ছেড়া) 4. Postural Pain (অবস্থানগত ব্যাথা) 5. Other(Specify) (অন্যান্য (উল্লেখ করুন))
32. If you have elbow pain, what is your diagnosed musculoskeletal elbow condition? (যদি আপনার পিঠে ব্যাথা থাকে, আপনার পিঠের অবস্থার মাস্কুলোস্কেলেটাল রোগ নির্ণয় কি?)	<ol style="list-style-type: none"> 1. Lateral epicondylitis (লেটারাল এপিকন্ডাইলাইটিস) 2. Medial Epicondylitis (মিডিয়াল এপিকন্ডাইলাইটিস) 3. Fracture/Dislocation (হাড় ভাংগা/সরে যাওয়া) 4. Other(Specify) (অন্যান্য (উল্লেখ করুন))
33. If you have pain in hand/wrist, what is your diagnosed musculoskeletal Hand/Wrist condition? (যদি আপনার হাত/কব্জি তে ব্যাথা থাকে, আপনার হাত/কব্জির অবস্থার মাস্কুলোস্কেলেটাল রোগ নির্ণয় কি?)	<ol style="list-style-type: none"> 1. Carpal Tunnel Syndrome (কারপাল টানেল সিনড্রম) 2. De-quervain tenosynovitis (ডি কোয়ারভেন টেনোসাইনোভাইটিস) 3. Trigger Finger (ট্রিগার ফিংগার) 4. Other(Specify) (অন্যান্য (উল্লেখ করুন))
34. If you have pain in low back, what is your diagnosed musculoskeletal Low Back condition? (যদি আপনার কোমড়ে ব্যাথা থাকে, আপনার কোমড়ের অবস্থার মাস্কুলোস্কেলেটাল রোগ নির্ণয় কি?)	<ol style="list-style-type: none"> 1. PLID (পি এল আইডি) 2. Spondylolisthesis (স্প্যানডাইলোসিসথেসিস) 3. Lumbar spondylosis (লাম্বার স্পানডাইলোসিস) 4. Piriformis Syndrome (পিরিফরমিস সিনড্রম) 5. Sacroiliac joint dysfunction (সেক্রোইলিয়াক জয়েন্ট ডিসফাংশন) 6. Other(Specify) (অন্যান্য (উল্লেখ করুন))
35. If you have Hip pain, what is your diagnosed musculoskeletal Hip condition? (যদি আপনার নিতম্বে ব্যাথা থাকে, আপনার নিতম্বের অবস্থার মাস্কুলোস্কেলেটাল রোগ নির্ণয় কি?)	<ol style="list-style-type: none"> 1. Osteoarthritis (অস্টিও আর্থ্রাইটিস) 2. Fracture/Dislocation (হাড় ভাংগা/সরে যাওয়া) 3. Iliotibial Band Injury (ইলিওটিবিয়াল বেন্ড ইনজুরি) 4. Other(Specify) (অন্যান্য (উল্লেখ করুন))
36. If you have knee pain, what is your diagnosed musculoskeletal Knee condition? (যদি আপনার হাঁটুতে ব্যাথা থাকে, আপনার হাঁটুর অবস্থার মাস্কুলোস্কেলেটাল রোগ নির্ণয় কি?)	<ol style="list-style-type: none"> 1. Osteoarthritis (অস্টিও আর্থ্রাইটিস) 2. Ligament Injury (লিগামেন্ট আঘাত) 3. Patellofemoral Pain Syndrome (প্যাটেলো-ফিমোরাল পেইন সিনড্রম) 4. Other(Specify) (অন্যান্য (উল্লেখ করুন))

<p>37. If you have ankle/foot pain, what is your diagnosed musculoskeletal Ankle/Foot condition? (যদি আপনার গোড়ালি/পায়ের পাতায় ব্যাথা থাকে, আপনার গোড়ালি/পায়ের পাতার অবস্থার মাস্কুলোস্কেলেটাল রোগ নির্ণয় কি?)</p>	<ol style="list-style-type: none"> 1. Plantar fasciitis (প্লানটার ফাসাইটিস) 2. Ankle Sprain (এংকেল স্প্রইন) 3. Fracture (হাড় ভাংগা) 4. Other(Specify) (অন্যান্য (উল্লেখ করুন))
--	---

<p>38. What others condition are you suffering from? (আপনি অন্যান্য আর কি ধরনের সমস্যা ভোগ করছেন?)</p>	<ol style="list-style-type: none"> 1. Urinary Incontinence (প্রসাবের অসংযমতা) 2. Pelvic organ Prolapse ((শ্রোণীদেশীয় অংগের স্থানচ্যুতি) 3. Fecal Incontinence (পায়খানার অসংযমতা) 4. None (না)
<p>39. What is the pattern of pain? (ব্যথার ধরণ কি রকম?)</p>	<ol style="list-style-type: none"> 1. Symmetrical (উভয়পাশে) 2. Asymmetrical (একপাশে)
<p>40. At what time do you have maximum pain? (কোন সময়ে আপনি সর্বোচ্চ ব্যাথা অনুভব করেন?)</p>	<ol style="list-style-type: none"> 1. Morning (সকালে) 2. Day (দিনে) 3. Evening (সন্ধ্যায়) 4. Night (রাতে)
<p>41. What type of pain do you have? (আপনার কোন ধরনের ব্যাথা রয়েছে?)</p>	<ol style="list-style-type: none"> 1. Continuous(চলমান) 2. Intermittent(বিরতিসহ) 3. Occasional (মাঝে মাঝে)
<p>42. In what words would you best describe your symptoms? (কোন শব্দগুলো আপনার লক্ষণ গুলোকে ভালোভাবে বর্ণনা করতে পারে?)</p>	<ol style="list-style-type: none"> 1. Swelling (ফুলে যাওয়া) 2. Stiffness(সিটফনেস) 3. Paresthesia(পেরেসথেসিয়া) 4. Tingling (চিনচিনে ভাব) 5. Numbness (অবশ ভাব) 6. Cramping(ক্রামপিং) 7. Contracture(কনট্রাকচার)
<p>43. How long have you been suffering from the current problem? (আপনি কতদিন ধরে বর্তমানের সমস্যাগুলোতে ভুগছেন?)</p>	<ol style="list-style-type: none"> 1. 1-3 months (১-৩মাস) 2. 4-6 months (৪-৬মাস) 3. 7-9 months (৭-৯মাস) 4. 10-12 months (১০-১২মাস) 5. More than a year (১বছরের বেশী)

<p>44. How much would you rate your pain that you have had during past week? (আপনার গত সপ্তাহের ব্যাথা যেটা ছিল সেটা আপনি কতটুকু নির্ধারণ করবেন?)</p>	
<p style="text-align: center;"> </p>	
pain	
<p>45. Have you undergone X-ray for this pain? (ব্যথার জন্য আপনি কি এক্স রে করিয়েছেন?)</p>	<p>1. Yes (হ্যাঁ) 2. No (না)</p>
<p>46. If yes, what is finding regarding bone density in X-ray? (যদি হ্যাঁ হয়, হাড়ের ঘনত্বের উপর ভিত্তি করে এক্স রে তে কি পাওয়া গিয়েছিল?)</p>	<p>1. Osteoporosis(অস্ট্রিওপরোসিস) 2. Osteopenia(অস্ট্রিওপেনিয়া) 3. Normal(স্বাভাবিক)</p>
<p>47. Have you done Bone Mineral Density test? (আপনি কি হাড় খনিজের ঘনত্বের পরীক্ষা করিয়েছেন?)</p>	<p>1. Yes (হ্যাঁ) 2. No (না)</p>
<p>48. If yes, what is the finding? (যদি হ্যাঁ হয়ে থাকে,কি পাওয়া গিয়েছিল?)</p>	<p>1. Osteoporosis (অস্ট্রিওপরোসিস) 2. Osteopenia (অস্ট্রিওপেনিয়া) 3. Normal (স্বাভাবিক)</p>
<p>49. Have you got any osteoporotic fracture? (আপনার কি হাড় ক্ষয়ের জন্য হাড় ভেঙেছিল?)</p>	<p>1. Yes (হ্যাঁ) 2. No (না)</p>
<p>50. What treatment are you taking for your musculoskeletal problem? (আপনার মাস্কুলোস্কেলেটাল সমস্যার জন্য আপনি কোন ধরনের চিকিৎসা নিচ্ছেন?)</p>	<p>1. Medication (ঔষধ) 2. Physiotherapy (ফিজিওথেরাপি) 3. Other(Specify) (অন্যান্য (উল্লেখ করুন))</p>
<p>51. How does your pain get relieved? (ব্যাথা থেকে কিভাবে আপনি মুক্তি পেয়ে থাকেন?)</p>	<p>1. Rest(বিশ্রাম) 2. Physiotherapy(ফিজিওথেরাপি) 3. Medication(ঔষধ) 4. Other(Specify) (অন্যান্য (উল্লেখ করুন))</p>
<p>52. Do you experience any sorts of barrier for receiving treatment? (চিকিৎসা নেবার ক্ষেত্রে আপনি কোন বাধার সম্মুখীন হয়েছেন?)</p>	<p>1. Yes (হ্যাঁ) 2. No (না)</p>
<p>53. If yes, what sorts of barriers do you experience for receiving treatment? (যদি হ্যাঁ হয়, তবে চিকিৎসা নেবার ক্ষেত্রে কি ধরনের বাধার সম্মুখীন হয়েছেন?)</p>	<p>1. Distance from health facilities (স্বাস্থ্য সুবিধা থেকে দূরত্ব) 2. Transportation problem (পরিবহন সমস্যা)</p>

	<ol style="list-style-type: none"> 3. Lack of money (অর্থের অভাব) 4. Communication problem (যোগাযোগের সমস্যা) 5. Unsatisfactory service (অসন্তোষজনক সেবা) 6. Refusal of decision maker of family (পরিবারের সিদ্ধান্ত গ্রহনকারীর অস্বীকার) 7. Other(Specify) (অন্যান্য (উল্লেখ করুন))
<p>54. How much did the pain interfere with your normal work including work inside and outside house in past 12 months? (বিগত ১২মাসে ঘরে অথবা বাইরে ব্যাথাটা আপনার স্বাভাবিক কাজে কতবার হস্তক্ষেপ করেছে?)</p>	<ol style="list-style-type: none"> 1. Not at all (মোটেনো না) 2. A little bit (অল্প) 3. Moderately (পরিমিতরূপে) 4. Quite a bit (বেশী মাত্রায়) 5. Extremely (অনেক বেশী মাত্রায়)
<p>55. What level of assistance do you require to perform functional activities of daily living due to musculoskeletal pain? (মাঙ্কুলোস্কেলেটাল ব্যাথার ফলে প্রতিদিনের কাজ করার জন্য আপনার কত মাত্রার সাহায্যের প্রয়োজন হয়?)</p>	<ol style="list-style-type: none"> 1. Total Assistance (পুরোপুরি সহায়তা) 2. Maximal Assistance (সর্বোচ্চ সহায়তা) 3. Moderate Assistance (মধ্যবর্তী সহায়তা) 4. Minimal Assistance (অল্প সহায়তা) 5. Supervision(রক্ষণাবেক্ষণ) 6. Modified Independence (পরিবর্তিত স্বাধীন) 7. Complete Independence (পুরোপুরিভাবে স্বাধীন)
<p>56. How often have you had trouble in sleeping because of pain? (ব্যাথার কারণে আপনার ঘুমের কতবার সমস্যা হয়েছে?)</p>	<ol style="list-style-type: none"> 1. Not at all (মোটেনো না) 2. 1 times per week (সপ্তাহে একবার) 3. 2-3 times per week (সপ্তাহে ২-৩বার) 4. 4-5 times per week (সপ্তাহে ৪-৫ বার) 5. More than 5 times per week (সপ্তাহে ৫ বারের বেশী)
<p>57. Have you experienced depressive mood like feeling down, sad, lack of thrive, mood swings due to the musculoskeletal problem that you are facing? (আপনি কি মাঙ্কুলোস্কেলেটাল সমস্যা যেটার সম্মুখীন আপনি হয়েছেন এরজন্য কি নিজেকে হতাশজনক মনে হয়েছে, যেমন ছোট মনে হওয়া, দুঃখী, উন্নতীলাভের অভাব, মেজাজ উঠানামা করা?)</p>	<ol style="list-style-type: none"> 1. Not at all (মোটেনো না) 2. Mild (অল্প) 3. Moderate (পরিমিতরূপে) 4. Severe (বেশী) 5. Very Severe (অনেক বেশী)

58. Do you have any comments to say about your pain (ব্যথা সম্পর্কে বলার মত আপনার কোন মন্তব্য রয়েছে?)	<hr/> <hr/>
--	-------------

Thank you for your assistance (আপনার সহায়তা করার জন্য আপনাকে ধন্যবাদ).....

Annex VI: Approval of thesis proposal by ethics committee of BHPI



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

Ref: CRP-BHPI/TRB/01/18/188

Date: 07/01/2018

To,
Radhika Shrestha
Part-II, M.Sc. in Rehabilitation Science (MRS)
Session: 2016-2017, Student ID:181160067
BHPI, CRP-Savar, Dhaka-1343, Bangladesh

Subject: Application for review and ethical approval- "Musculoskeletal Complains among Menopausal Women at Musculoskeletal Department of CRP" by ethics committee

Dear Radhika Shrestha,

Congratulations,

The Institutional Review Board (IRB) of BHPI has reviewed and discussed your application on April 29, 2017 to conduct the above-mentioned thesis, with yourself, as the Principal Investigator. The Following documents have been reviewed and approved:

S.N.	Name of Documents
1.	Thesis Proposal
2.	Questionnaire (English and Bangla version)
3.	Information sheet & Consent form.

The purpose of the study is to identify common musculoskeletal complains among menopausal women. This research will help to develop appropriate interventions like educational strategy, awareness program and health promotional activities which will be helpful to you and women experiencing musculoskeletal problem. The questionnaire will be used to achieve related information from the participant which will take about 10 to 15 min and the study have no likelihood of any harm to the participant. Data collector will receive informed consents from all participants. Any data collected will be kept confidential. The members of the Ethics committee have approved the study to be conducted in the presented form at the meeting held at 9.00 AM on 08-05-2017.

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

Best regards,

Muhammad Millat Hossain
Assistant Professor, MRS
Member Secretary,
Institutional Review Board (IRB)
BHPI, CRP, Savar, Dhaka-1343, Bangladesh

সিআরপি-চাপাইন, সাভার, ঢাকা-১৩৪৩, বাংলাদেশ, ফোন : ৯৯৪৫৪৬৪-৫, ৯৯৪১৪০৪ ফ্যাক্স : ৯৯৪৫০৬৯

CRP-Chapain, Savar, Dhaka-1343, Tel : 7745464-5, 7741404, Fax : 7745069, E-mail : contact@crp-bangladesh.org, www.crp-bangladesh.org

Annex VII: Recommendation letter to Physiotherapy department from BHPI



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

Ref.

CRP-BHPI/MRS/01/18/0082

Date: 07/01/2018

To Whom It May Concern

This is to certify that Ms. Radhika Shrestha, a student of M.Sc. in Rehabilitation science at Bangladesh Health Professions Institute (BHPI) under the faculty of Medicine of University of Dhaka(DU). This is 2 year full time course under the project of "Regional Inter-professional Master's program in Rehabilitation Science" funded by SAARC Development Fund (SDF). She will have to conduct a thesis entitled, "**Musculoskeletal Complains among Menopausal Women at Musculoskeletal Department of CRP**" under the thesis supervisor, Mohammad Anwar Hossain, Associate Professor, BHPI, CRP. The purpose of the study is to identify common musculoskeletal complains among menopausal women which will be directly beneficial for women approaching menopause, women in menopausal phase and the caregiver of severely affected women due to musculoskeletal symptoms. The questionnaire will be used to achieve related information from the participant which will take about 10 to 15 min and the study have no likelihood of any harm to the participant. Data collector will receive informed consents from all participants. Any data collected will be kept confidential. The research proposal has been approved by Institutional Review Board (IRB) of this institute. To accomplish research objectives, she will collect data from musculoskeletal unit under physiotherapy department at CRP.

We request you to provide her necessary support from the physiotherapy department. I wish her every success in order to accomplish her research.

Best regards,

Muhammad Millat Hossain
Assistant Professor, BHPI
Project and Course Coordinator, M.Sc. in Rehabilitation Science
BHPI, CRP, Savar, Dhaka-1343. Bangladesh

সিআরপি-চাপাইন, সাভার, ঢাকা-১৩৪৩, বাংলাদেশ, ফোন : ৭৭৪৫৪৬৪-৫, ৭৭৪১৪০৪ ফ্যাক্স : ৭৭৪৫০৬৯

CRP-Chapain, Savar, Dhaka-1343, Tel : 7745464-5, 7741404, Fax : 7745069, E-mail : contact@crp-bangladesh.org, www.crp-bangladesh.org

Annex VIII: Permission letters for data collection from Department of Physiotherapy, CRP

Date: 07/01/2018

To,
The Head of Physiotherapy Department,
CRP, Chapain, Savar, Dhaka- 1343

Subject: Application for permission of data collection for master's thesis

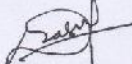
Dear Sir,

With due respect, I would like to draw your kind attention that I am a student of Masters in Rehabilitation Science program at Bangladesh Health Professions Institute(BHPI)- an academic institute of Center of Rehabilitation Science(CRP) under Faculty of Medicine of University of Dhaka(DU). This is 2 year full time course under the project of "Regional Inter-professional Master's program in Rehabilitation Science" funded by SAARC Development Fund (SDF). I have to conduct a thesis entitled, "**Musculoskeletal Complains among Menopausal Women at Musculoskeletal Department of CRP.**" under honorable supervisor, Mohammad Anwar Hossain, Associate Professor, BHPI, CRP. The purpose of the study is to identify common musculoskeletal complains among menopausal women which will be directly beneficial for women approaching menopause, women in menopausal phase and the caregiver of severely affected women due to musculoskeletal symptoms. This research will help to develop appropriate interventions like educational strategy, awareness program and health promotional activities which will be helpful to you and women experiencing musculoskeletal problem.

The questionnaire will be used for data collection and related information will be collected from patients file and it will take about 10 to 15 min and the study have no likelihood of any harm to the participant . Data collector will receive informed consents from all participants. Any data collected will be kept confidential. Ethical approval is received from the Institutional Review Board of Bangladesh Health Professions Institute (BHPI).

Therefore, I look forward to having your permission for starting data collection at musculoskeletal unit of Physiotherapy department. I also assure you that I will maintain all the requirements for study.

Sincerely Yours,


Radhika Shrestha
Part-II, M.Sc. in Rehabilitation Science (MRS)
Session: 2016-2017, Student ID:181160067
BHPI, CRP-Savar, Dhaka-1343, Bangladesh

Approved
Callis
13/01/18
Please contact with Jaleel Tustefa
clinical PT. m.s-2 as a
coordinator of data collection
process
Callis
13/01/18
Mohammad Anwar Hossain
Associate Professor & Head
Physiotherapy Dept. CRP
CRP, Chapain, Savar, Dhaka