
**MENOPAUSAL SYMPTOMS AMONG POST MENOPAUSAL
WOMEN AGED 40-60 YEARS RESIDING IN AN URBAN
AREA OF BELAGAVI
-A COMMUNITY BASED CROSS-SECTIONAL STUDY**

Submitted by:

REG. No. BD0115004

Dissertation

**Submitted to the
KLE University, Belagavi, Karnataka**

**In partial fulfillment
of the requirements for the degree of**

M. D. (Doctor of Medicine)

IN

COMMUNITY MEDICINE

Department of Community Medicine,

J. N. Medical College,

Belagavi – 590010, Karnataka, India.

MAY 2018

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KLE UNIVERSITY, BELAGAVI, KARNATAKA.

**ENDORSEMENT BY THE HEAD OF DEPARTMENT,
PRINCIPAL/ HEAD OF THE INSTITUTION**

This is to certify that the dissertation entitled “**MENOPAUSAL SYMPTOMS AMONG POST MENOPAUSAL WOMEN AGED 40-60 YEARS RESIDING IN AN URBAN AREA OF BELAGAVI – A COMMUNITY BASED CROSS-SECTIONAL STUDY**” is a bona fide research work done by the candidate bearing registration no. **BD0115004**.

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ABBREVIATIONS

ANM	:	Age at Natural Menopause
BMI	:	Body Mass Index
CF	:	Correction factor
CI	:	Confidence Interval
CNAA	:	Community Need Assessment Approach
DLHS	:	District Level Household Survey
E1	:	Estrone
E2	:	Estradiol
EPIC	:	European Prospective Investigation into Cancer and Nutrition
FMP	:	Final Menstrual Period
FSH	:	Follicle Stimulating Hormone
HRT	:	Hormone Replacement Therapy
HT	:	Hydroxytryptamine
IPAQ	:	International Physical Activity Questionnaire

LH	:	Luteinizing Hormone
MDSM	:	Mean Duration Since Menopause
MENQOL	:	Menopause Specific Quality of Life Questionnaire
MET	:	Metabolic Equivalent of Task
NFHS	:	National Family Health Survey
OBC	:	Other Backward Castes
OCP	:	Oral Contraceptive Pills
OR	:	Odd's Ratio
PA	:	Physical Activity
PUC	:	Pre-University College
QOL	:	Quality of Life
RCOG	:	Royal College of Obstetricians and Gynaecologists
SC	:	Schedule Castes
SES	:	Socio-Economic Status
ST	:	Schedule Tribes

SWAN	:	Study of Women's Health Across the Nation
UAE	:	United Arab Emirates
UHC	:	Urban Health Centre
UN	:	United Nations
US	:	United States
WHO	:	World Health Organization

ABSTRACT

Introduction:

According to the WHO (1981), natural menopause is defined as no menses for 12 consecutive months with no obvious intervening cause. During the menopause, women may experience vasomotor, psychosomatic, physical as well as sexual dysfunction. Studies on menopausal issues and health demand priority in Indian scenario due to the growing population of menopausal women due to increased life expectancy. As many women are choosing to avoid hormonal treatment it is increasingly important to identify other evidence-based interventions with one possible treatment option being physical activity.

Objective:

The objectives of this study were to know the prevalence of menopausal symptoms in post-menopausal women aged 40-60 years and to study the association of physical activity with menopausal symptoms.

Methodology:

A community based cross-sectional study was done between 1st January 2016 to 31st December 2016 using predesigned, pretested, structured questionnaire based on sociodemographic variables, obstetrics and gynaecology history, menopausal symptoms (Menopause specific quality of life) and physical activity (International Physical Activity Questionnaire). 345 post-menopausal women aged 40-60 years residing in the field practice area of Urban Health Centre, Ashok Nagar, Belagavi were selected by systematic random sampling technique and interviewed during house to house visit.

Outcome:

The primary outcomes of this study were menopausal symptoms in post-menopausal women and their association according to different variables (socio-demographic and obstetrics & gynaecology). Secondary outcome was association between physical activity variables with the menopausal symptoms.

Data analysis:

Data collected in the questionnaire was coded and entered in Microsoft Excel sheet. Values were expressed in the form of percentages, mean and standard deviation. Chi-square test, Analysis of Variance, Pearson's Correlation and Multiple linear regression analysis (unadjusted and adjusted) were used to determine association and relationship between different variables. Tables and Graphs were prepared. Statistical significance was set at $p \leq .05$

Results:

In this study, the mean age at menopause among study participants was 52.04 ± 5.58 years. Majority 200 (58%) were Hindus, while 266 (77.1%) were literates. 201 (58.2%) belonged to SES classes IV and III combined. As per the Asian Standards of BMI, majority 190 (55.1%) women were overweight or obese.

The mean age at menopause among 345 study participants residing in the urban area of Belagavi, Karnataka was 45.53 ± 4.34 years. More than half of the participants had duration of less than 5 years since final menstrual period with the mean duration since menopause among study participants being 6.51 ± 5.06 years.

The most common menopausal symptoms were of physical domain (75.7% - 25.5%) followed by psychosocial domain (63.9% - 49.3%) to vasomotor domain (63.5%

- 55.4%) and least common sexual domain (42.3% - 36.2%). Domain wise mean score was 3.74 ± 2.42 , 3.55 ± 1.37 , 3.19 ± 1.15 , 2.16 ± 1.37 for Vasomotor, Psychosocial, Physical and Sexual domains respectively. Overall mean MENQOL score was 3.16 ± 1.25 . All menopausal symptoms of all domains were seen most commonly in less than five years duration since menopause. Most common symptoms in less than five years of age were vasomotor, while in later years after menopause most common symptoms were psychosocial and physical.

Conclusion:

Higher mean MENQOL score was found to be significantly associated with participants of lesser age, schedule tribe, labourers, mixed diet, obese, divorced or separated, delayed menarche, age at marriage more than 30 years, higher age at first pregnancy, delayed menopause, relatives with delayed menopause, higher parity, scanty discharge and abnormal lower abdominal pain. Duration of less than 5 years since final menstrual period had highest severity in all domains and total MENQOL score.

Significant association was found between domain scores and level of physical activity. Both low and high physical activity were associated with more severe menopausal symptoms in respective domain score and overall mean score when compared to moderate physical activity level.

Keywords: Menopausal symptoms, Physical activity, Postmenopausal, MENQOL, IPAQ

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INTRODUCTION

INTRODUCTION

“Menopause is an event in life, not a disease.”

All women who live up to middle age and beyond, experience a period of transition from the reproductive to the nonreproductive stage of life, of which the most striking feature is the cessation of menstruation known as menopause.¹ It is nature's protective phenomenon against reproductive morbidity and mortality in the ageing population.

Definition

According to the World Health Organization (WHO, 1981), 'Natural Menopause' is defined as “no menses for 12 consecutive months with no obvious intervening cause, such as pregnancy, lactation, exogenous hormone use, dietary deficiencies, or surgical removal of the uterus or ovaries”. The term 'Post-menopause' is defined as dating from the menopause, although it cannot be determined until after a period of 12 months of spontaneous amenorrhea has been observed.¹

Hormonal Change

Menopause is marked by the transition from regular menstrual cycles (characteristic of the reproductive phase) to menstrual cycle irregularity to amenorrhoea. This physiological development is due to wide variation in hormonal levels. Post menopause there is a drop in the levels of oestrogen and progesterone, the two most important hormones in the female body (WHO, 1996).² This is accompanied by increased levels of follicle-stimulating hormone (FSH) and decreased levels of inhibin. This onset

not only marks the end of women's reproductive function but also introduces them to a new phase of life.

Burden

With the general increase in life expectancy worldwide, most women are likely to live for another 20-30 years after menopause and approximately, one- third of their lives in a state of oestrogen deficiency.³ The United States (US) Census report 2010 reveals that nearly 500 million women of the world will be entering the menopausal transition over the next 5 – 10 years period.⁴ According to the United Nations (UN) Population Prospects of 2015, within the next 25 years, an estimated one billion women worldwide will be older than 50 years, and therefore likely to be nearing menopause or postmenopausal.⁵ About 130 million Indian women were expected to live beyond the menopause into old age by 2015.⁶

Age at menopause

Age at menopause is determined by the number of follicles present in the ovary. The number of ovarian follicles decreases with age and few, if any, remain in the ovary after the menopause.² In addition to genetic factors, many other factors may affect the age of menopause, including obesity, parity, age at menarche, pattern of menstrual cycles, smoking, socioeconomic level, alcohol intake, educational level, diet, marital state, and use of hormonal contraceptives.³

The mean age at natural menopause (ANM) in Indian women ranges from 40.32 to 48.84 years and in developed countries from 48 to 51 years. In some of the studies in Asian countries age at menopause ranged from 47 to 50 years: Pakistan, 49 ± 3.6 years; United Arab Emirates, 47.3 ± 3.29 years and Iran, 49.6 ± 4.65 years.^{6,7}

Later age at final menstrual period (FMP) has been associated with longer survival; greater life expectancy and reduced rates of all-cause mortality.

Menopausal Symptoms

Every woman's experience of the menopause is unique; she may experience all of the symptoms or none of them. Neugarten in 1965 reported that, when women were asked what the worst thing about menopause was, the largest percentage of them said, 'Not knowing what to expect'. Thus, there is a significant element of uncertainty regarding the occurrence, duration, pattern and severity of changes in menstrual symptoms during the menopause in women.

Commonly, during the menopause, women may experience Vasomotor (hot flushes, night sweats, etc.), Psychosocial (memory, mood changes, etc.), Physical (sleep, urine incontinence, skin changes, weight gain, etc) and Sexual (vaginal dryness, decrease in sexual desire) dysfunction. Postmenopausal symptoms, persist years after the final menstrual period, having been reported more than 10-15 years after the last menses in some women.⁸ Although menopause is a universal phenomenon the prevalence of each of these symptoms varies widely not only between individuals in the different population but also between same populations.

There is great diversity in nature and frequencies of symptoms across same country or in the same culture across ethnic and socioeconomic groups or between rural and urban women.⁹ To compound the problems, the menopause symptoms are quite variable with multifactorial aetiology. Studies show that sociodemographic factors like age, education and occupation, marital status, family type, parity, menopausal status, duration in postmenopausal years, use of oral contraceptives, foetal loss and breast feeding

of the last child may have a role in the impairment of menopause-specific quality of life of middle-aged women. Additionally, experience of menopausal symptoms, culturally influenced behaviours (like diet, smoking and exercise) and attitudes towards menopause have effects on postmenopausal health.^{10,11}

Treatment for menopausal symptoms

Some of the menopausal symptoms experienced by post-menopausal women can be severe enough to affect their normal lifestyle. During the last decade, hormonal replacement therapy (HRT) has been introduced as a solution to menopausal symptoms. Hormone replacement therapy is effective in the relief of menopausal symptoms; however, its use remains controversial. So, in order to minimize serious health risks, HRT is recommended at the lowest effective dose for the shortest time period during menopausal transition only which cannot guarantee good quality of life (QOL) throughout the menopause.¹²

Since many women are choosing to avoid hormonal treatment, it is thus, increasingly important to identify other evidence-based interventions. Numerous alternative therapies currently available claim to provide a wide array of benefits to menopausal women, however, scientific support is lacking in most instances.¹²

Due to risks associated with hormone replacement therapy (HRT) and inconclusive results of alternative treatments, physical activity and exercise have been proposed as an alternative means to improve a women's quality of life during menopausal transition and beyond. Abundant evidence links habitual physical exercise (PE) to a better status on numerous health indicators and better quality of life and to the prevention and treatment of the ailments that typically occur from mid-life onwards. The Scientific

Advisory Committee of the Royal College of Obstetricians and Gynaecologists (RCOG), and their Patient Information Committee have already advised that there is evidence that the lifestyle choices like regular aerobic exercise such as running and swimming may be an effective intervention. Low-intensity exercise such as yoga may help hot flushes and general wellbeing. It is however recommended to avoid infrequent, high-impact exercise as this may make the symptoms worse.¹³ The North American Menopause Society in 2015 stated that overweight postmenopausal women having more vasomotor symptoms need to maintain a healthy weight and can undergo weight loss and mindfulness-based stress reduction to control hot flushes and night sweats. However, they did not recommend exercise, yoga, paced respiration and relaxation exercise due to lack of sufficient data.¹⁴

Indian Scenario

Menopausal issues demand health priority in India due to the growing population of menopausal women as a result of increased life expectancy. According to the 2011 census of India, there were about 96 million women aged 45 years and above and this number is expected to increase to 401 million in 2026.¹⁵ The elderly population is increasing every year and it is projected that it would increase to about 12% of the total population by the year 2025 and roughly half of this population will be women in the elderly age group.¹⁶

Menopause is generally welcomed as a favourable event in most parts of India unlike in the West. Still, there is considerable lack of awareness about menopausal symptoms, complications and treatment among Indian women. Little attention is given to serious medical concerns related to menopause like osteoporosis, heart disease, weight gain, high blood pressure and raised cholesterol levels.¹⁶

In India, there is no current health program that caters to the specific health needs of postmenopausal women. Reproductive and Child Health-II and National Health Mission only address women in the reproductive age group, ignoring those who have passed their reproductive stage. Even the health care, is largely based on the general health problems of the middle aged and elderly and not directed specifically to postmenopausal health problems.⁷

Need for the study

The information on menopausal symptoms and the way women chose to treat these symptoms are essential for designing appropriate delivery of healthcare services and to ensure easy transition.

Thorough research on menopausal symptoms can make women aware of their climacteric symptoms and other side-effects. Successful interventions can be used to treat variable presentation of menopausal symptoms, thus helping reduce the discomfort.

In India, though various studies have been done to study menopausal symptoms, majority of them are either hospital based or focus on the rural population with not much work done on urban women. The association of physical activity with menopausal symptoms is a novel concept with not much work published in India.

With this background, this study proposes to assess the prevalence of menopausal symptoms among urban women and also to study the association of physical activity on menopausal symptoms in Belagavi city of Karnataka of South India.



OBJECTIVES

OBJECTIVES

1. To know the prevalence of menopausal symptoms in postmenopausal women aged 40-60 years.
2. To study the association of physical activity with menopausal symptoms.



REVIEW OF LITERATURE

REVIEW OF LITERATURE

The word menopause literally means cessation of menstrual cycle. It is derived from Greek word ‘Meno’ meaning month and ‘pausis’ meaning pause or cessation.¹ Menopause is a normal physiological event that occurs in all women with the final menstrual period (FMP). It takes 12 months of amenorrhoea to confirm that menopause has set in, and therefore it is a retrospective diagnosis.¹⁷

Endocrinology

The process leading to the final onset of menopause is determined by the number of oogonia present in the ovaries at birth, the rate of atresia during reproductive years and the hormonal interplay regulated by the hypothalamic–pituitary–ovarian axis. Menopause is expected to set in when the follicular number falls below 1000.¹⁸⁻¹⁹

Although menopause is associated with changes in the hypothalamic and pituitary hormones that regulate the menstrual cycle, menopause is not a central event, but rather primary ovarian failure (loss of follicular activity of the ovaries). The ovarian–hypothalamic–pituitary axis remains intact during the menopausal transition.¹⁸

A fall in the level of Anti-Müllerian hormone produced by small ovarian follicles suggests low ovarian reserve and low antral follicular count. Follicle-stimulating hormone (FSH) levels rise in response to ovarian failure and the absence of negative feedback from the ovary. A fall in the level of Inhibin B (but not inhibin A) causes a rise in FSH level. The FSH appears in high concentration of more than 40 IU/l in the urine.¹⁷ Luteinizing

hormone (LH) level is more than normal. Maximum LH levels are found 2-3 years after the menopause and there is subsequently a decline in mean values with increasing age.¹

There is 50% reduction in androgen production and 66% reduction in oestrogen at menopause. The oestrogen level may remain low at 10–20 pg/mL. Some oestrogen comes from the ovary, but most of it is Estrone (E1) rather than Estradiol (E2). E1 is derived from peripheral conversion of androstenedione secreted by the ovary, and its level varies between 30 and 70 pg/mL. E2/E1 ratio maintained over 1 in the premenopausal period is reduced to less than 1 in the menopausal age, causing an oestrogen deficiency state. The ovary also secretes a small amount of testosterone which causes mild hirsutism at menopause.¹⁸

Age at menopause

The number of ovarian follicles present in the ovary, and thus the number of ovarian granulosa cells available for hormone secretion, appear to be the critical determinants of age at the menopause, steroid hormone secretion and gonadotrophin levels. Menopause normally occurs between the ages of 40 and 50 years, the average age being 47 years. Delayed menopause beyond 55 years may be related to good nutrition and better health. Menopause setting before the age of 40 is known as premature menopause.¹⁸ In developed countries, the age at menopause is approximately in early fifties, higher than developing countries where age at menopause exhibits more variability, but is most often reported to be in forties.² According to WHO, the number of women above 50 years worldwide was 467 million in 1990 and estimated to be 1200 million by 2030. Out of these, 76% will be living in the developing countries. Average age of menopause is 47.5 years in Indian women with an average life expectancy of 71 years.² The age at the final

menstrual period, holds intrinsic public health interest as it is associated with numerous health outcomes and might be a marker of aging and health.

Menopausal Symptoms

Menopausal symptoms may begin 2–3 years before menopause and may continue for 10 years or longer. The menopause is thus a phase of adjustment between the active and inactive ovarian function and occupies several years of a woman's life, and it involves vasomotor, physical, sexual and psychological adjustments.¹⁷⁻¹⁸

VASOMOTOR: The most common and the most noticeable symptoms of hot flushes and sweating are the hallmark of the climacteric symptoms. Vasomotor symptoms are a consequence of estrogen withdrawal, not simply estrogen deficiency. Hot flushes are the waves of vasodilation affecting the face and the neck and these last for 2-5 minutes each. These are followed by severe sweating. Several of these flushes occur in a day, but are more severe during the night, and can disturb sleep. The hot flushes are sometimes preceded by headache. With passage of time, the frequency and severity of flushes diminishes. Hot flushes are caused by noradrenaline, which disturbs the thermoregulatory system. Oestrogen deficiency reduces hypothalamic endorphins, which release more norepinephrine and serotonin. This leads to inappropriate heat loss mechanism.¹⁷

PSYCHOSOCIAL: Neurological symptoms like mental depression, loss of memory, irritability, poor concentration and tiredness are seen during and after menopause. It has been suggested that lack of estrogen leads to a reduction of free tryptophan and a consequent reduction of 5-hydroxytryptamine (5HT) synthesis leading to depression.¹

PHYSICAL: Some frequently mentioned symptoms are skin changes, lack of energy, weakness, backache, fluid retention, etc. In skin, the collagen content is reduced, causing skin to wrinkle. Mild virilization is seen in the form of hirsutism, probably adrenal in

origin, as also is obesity, especially the deposit of fat around the hips. Oestrogen deficiency can cause urethral caruncle, dysuria, infection, urge and stress incontinence. The stress incontinence is caused by poor vascularity and tone of the internal urinary sphincter. These urinary symptoms are clubbed together as ‘urethral syndrome’.¹⁷⁻¹⁹

SEXUAL: Sexual feeling and libido may increase in some, if they feel happy to get rid of menstruation and fear of pregnancy. Most however, notice decreased libido after menopause. Atrophic vagina reduces the vaginal secretion, and dry vagina can cause dyspareunia. Rarely, senile vaginitis can cause infection and itching.^{1-2,17-19}

RESEARCH REVIEW

Age at menopause

World

According to a United Arab Emirates (UAE) study published in *Maturitas* in 1998 on 742 women, the median age of the menopause was 48 years which is lower than the west. It was significantly related to age of the mother and older sister. Also, there was a significant positive association between the age of the menopause and each of parity and previous use of Oral Contraceptive Pills (OCP) for more than one year. If the parity was broken down into less or more than five, this association was more significant in the latter group.²⁰

A United States study, 2003 done among 444 women examined the link between bleeding patterns throughout a woman’s reproductive lifetime and her age at menopause. It was found that menstrual cycle characteristics prior to age 40 years were not, in general,

significantly related to age at menopause, although there was a marginally significant relation between high variability in cycle length at ages 35–39 years and earlier onset of menopause. Late age at menopause was associated with longer mean cycle length and short cycle lengths are associated with early onset of menopause. Also, later age at menarche and a greater number of births were associated with later age at menopause. No statistically discernible relation was found between age at menopause (ANM) and hormones use prior to age 40 years or number of months of breastfeeding²¹

In 2005, European Prospective Investigation into Cancer and Nutrition (EPIC) cohort in Heidelberg, Germany with 1009 women with natural menopause explored the influence of reproductive and dietary factors on the age at menopause. Increasing age at first full term pregnancy was associated with delayed onset of menopause, although it was not statistically significant. A longer interval between menarche and the onset of regular menses was significantly associated with later menopause. Compared to nullipara, women with 1–2 children experienced menopause at older age. Breast-feeding for 1–5 months was associated with older age at menopause. Compared to never smokers, current smokers had the risk of younger age at menopause. High intake of carbohydrate, vegetables and cereal products were inversely related to the age at natural menopause. Women with higher intake of total fat, protein and meat experienced a delayed onset of natural menopause. Education, Body Mass Index (BMI), leisure time physical activity (PA), contraceptive pills and age at menarche had no effect on ANM.²²

As per a community-based study done in the United States (1996–2007) among 3,302 participants of Study of Women's Health Across the Nation (SWAN) cohort, the median age at the FMP was 52.54 years across five ethnic populations. No significant racial/ethnic difference in age at natural menopause was found. Factors significantly

related to reaching the earlier FMP in unadjusted analyses were poverty, early maternal natural menopause; never having been married; having poorer baseline self-rated health. Women with higher educational level, prior oral contraceptive use, higher weight at baseline, being employed, having less physical activity, and having better self-rated health over follow-up were significantly associated with later age at the FMP after adjusted analysis.³ Consuming alcohol in moderation delayed menopause may be because of the estrogenic effect of alcohol at moderate level of consumption. Relation of smoking was found with earlier age at menopause. It may be because primordial oocytes are destroyed by polycyclic aromatic hydrocarbons or other smoke related components decrease oestrogen production or shift the oestrogen pathway towards 2-hydroxylation leading to less active oestrogens.^{3,22}

Age at Natural Menopause (ANM) among 33,054 Chinese women as per the Shanghai Women's Health Study, ranged from 40.6 to 50 years with an overall mean of 49.2 years. Older age at menarche was significantly associated with later menopause. Younger age at first live birth, older age at last live birth, longer duration of breastfeeding, and higher parity were significantly associated with longer reproductive years and delayed menopause. Birth control methods (oral contraceptive pill, intrauterine device, tubal ligation) were positively associated with the timing of menopause. Total dietary intake of calories, fruits, carbohydrates and protein was positively associated with later menopause. Long-term tea consumption predicted longer reproductive span ($p < 0.03$). Vegetables, fat and fibre intakes did not significantly affect reproductive span or age at menopause. Smoking was inversely associated with both early age at menopause and shorter reproductive span.²³

United Kingdom-based Breakthrough Generations Study done in 2003–2011 among 21,511 who had experienced a natural menopause, related ANM to lifestyle and anthropometric factors. Participants with high body mass index, increased alcohol consumption, non-vegetarian diet were significantly associated with older age at menopause. Smoking status was a strong determinant of early age at menopause, with menopause occurring 1–2 years earlier in current smokers than in non-smokers. Current smokers were 30% more likely to become postmenopausal at a given age than non-smokers. Overweight women were found to have a later menopause. With respect to diet, higher levels of meat consumption was linked to later menopause, suggesting a causal relation. High exercise was also associated with late menopausal age.²⁴

The Korea National Health and Nutrition Examination Survey (2010-12) among 714 women found the mean menopausal age to be 51 years. Those who did not work, had lower educational level or had lowest income had an older age at menopause. Age at menopause was not found related to smoking, exercise or living with one's spouse. Older age at last delivery was associated with younger age at menopause. Increased number of pregnancies was related to older age at menopause. Relationship between age at first delivery and age at menopause was not significant.²⁵

A systematic review of 46 studies assessing socioeconomic position and lifestyle factors with age at natural menopause and published in International Journal of Epidemiology, 2014, found the mean ANM was 48.8 years. ANM was lowest among African, Latin American, Asian and Middle Eastern countries and highest in Europe and Australia, followed by the USA. Education and occupation was associated with later ANM. Being overweight and moderate/high physical activity were modestly associated with later ANM, but findings were less conclusive.²⁶

As per a cross-sectional study on 960 women done in Iran in 2016, mean and median ANM were 48.66 and 48 years, respectively. Women with BMI more than 30 kg/m² had significantly higher menopausal age. Marital status, smoking status, menarche age, age at first pregnancy and history of abortion were not significantly associated with ANM. A significant positive association was observed between age at natural menopause with pregnancy numbers and age at last pregnancy. Also, women with better socioeconomic status had significantly higher natural menopause age.²⁷

India

A cross-sectional study conducted in New Delhi in 2003, among 350 postmenopausal women of northern India found median age at menopause as 48 years and mean as 46.7 years (3 years earlier than the west). No association was found between various socio-demographic and reproductive factors and menopausal age.²⁸

According to a community based study done in Ludhiana, Punjab in 2008 among 180 participants, the mean age at menopause was 45.9 (± 3.5) years. There was positive non-significant correlation between age at natural menopause and age at menarche. The association between ANM and women's age at birth of their last child was also not significant ($p=0.430$). ANM showed a trend of later ages with taller women. Age at menarche and age at last pregnancy had no effect on the ANM. Married women reported natural menopause approximately two years earlier than widow women.²⁹

A study done in Haridwar, Uttarakhand in 2009 among 129 women deduced that middle-class women had significant late onset of menopause (45.47 years) in comparison to women of poor socioeconomic status (42.13 years). Women with active or hectic lifestyles achieved earlier menopause compared with women with a sedentary lifestyle.³⁰

According to a community based study conducted among 715 participants from six districts of West Bengal in 2010-12, mean recalled ANM was 44.87 years. Factors like age at menarche, duration of breastfeeding of the last child and age at first pregnancy discriminate the different menopausal age groups.³¹

A review article by Indian Menopausal Society in 2014 listed that current smoking, lower education, unemployment, nulliparity being separated, divorced, widowed and vegetarian diet are independently associated with accelerated menopause; while parity and prior use of oral contraceptive pills was associated with delayed ANM. Moderate-high exercise participation, and enhanced leisure time physical activity were associated with late menopause and longer reproductive span; however, severe weight loss or vigorous exercise accelerated ANM. Moderate alcohol intake and regular tea consumption was found to delay ANM. Studies on dietary factors and ANM had conflicting results; High intake of fruits and vegetables was found to delay the menopause, while earlier menopause was found with high intakes of fat, cholesterol, carbohydrates, fibre and cereal.³

According to a short report published in American Journal of Human Biology 2015, analysis of three National Family Health Surveys (NFHS) - 1992–93, 1998–99 and 2005–06 among the Indian women aged 30–49 years showed that prevalence of menopause (natural and surgical) remained similar from 1992–93 to 2005–06 among Indian women at around 18% in the last 15 years. The age of the start of menopause did not increase much from the first to third round of NFHS. The age of start of menopause among women who gave birth to a child after 25 years or above was 50.4 years compared to only 43.1 years among women who gave birth below 16 years of age. An earlier onset of menopause was associated with farming, smoking, no education, scheduled caste or

scheduled tribe and underweight. Prevalence of menopause was highest among women who never used a contraceptive or never had a child.³²

A Pan India survey done by Indian Menopause Society was published in 2016. It collected data of 2108 participants from 21 cities. Natural menopause age of Indian women was determined to be 46.2 ± 4.9 years. Region-wise determination of natural menopause age (years) was as follows: East 47.3 ± 3.9 , West 46.2 ± 4.9 , North 45.5 ± 4.9 , South 46.1 ± 5.6 , and Centre 47.8 ± 4.4 years. Multiple regression analysis showed a significant positive correlation between ANM and marital status, marriage duration, socioeconomic status, better education, and BMI. Unmarried women were found to undergo early menopause as compared to married or widowed. Women with higher BMI and of upper economic strata had a higher menopausal age. A negative correlation was observed between ANM and parity. No correlation was found for menopause age and occupation, community, food type, alcohol, smoking, abortion or contraceptive use.³³

Another study done among 100 women in Manipur in 2016, revealed a mean age of $45.5 (\pm 2.3)$ years. Women with early menarche had early onset of menopause. The study revealed a significant relationship between mean age at menopause with variables like socioeconomic status (low class had an earlier onset followed by middle class and high class), menstrual cycle (women with regular menstrual cycle had earlier age at menopause as compared to ones with irregular menstruation) and parity (women with high parity of more than two had earlier ANM as compared to those with parity of two or less). The other variable like religion, occupation, BMI, were found to be statistically insignificant.³⁴

A population based study of women below 50 years in India, published in 2016 and based on the data of 643,944 ever-married women from Indian District Level

Household Survey (DLHS) 2007-2008 found that overall, about 8.4% of women in the age group 15-49 years were in natural menopause – the highest proportion being in Karnataka (10.5%) and lowest in Kerala (5.3%). Relative to the South, women from the all parts of India (except West) had lower risk of menopause. Compared to Hindus, Muslims had higher risk of menopause; and ‘other’ religious groups had lower risk of natural menopause. Scheduled tribes had lower risk of natural menopause compared to scheduled castes. Among women with no formal education, ANM was less. Currently married women had delayed ANM as compared to divorced/widowed/ separated group. Proportion of women in natural menopause among women having more than four children was lower compared to women having no children. Among women who had been sterilized or used contraceptive pills or had reported at least one abortion, the proportion of natural menopause was lower. Proportion of women reporting natural menopause was highest among the poorest compared to the richest. Wealth index was the most important factor associated with lower risk of natural menopause.³⁵

Thus, age at natural menopause (ANM) is affected by many factors like genetic, socio-demographic, economic, reproductive, behavioural with some modifiable like lifestyle and dietary.²⁰⁻³⁵

MENQOL (Menopause Specific Quality of Life Questionnaire)

MENQOL (Menopause Specific Quality of Life Questionnaire) was developed in 1996 by John R. Hilditch, et al. It is specific tool to measure health-related quality of life in middle-aged women in the years beyond the onset of menopause. Reliability, responsiveness and validity of MENQOL were assessed and published. The face validity score was 4.7 out of a possible 5. Content validity was confirmed. Cronbach’s alpha ranged between 0.81 and 0.89 for all 4 domains, indicative of fairly high internal

consistency.³⁶⁻³⁷ Evaluation in 2012 reinforced that although MENQOL was developed almost years back, the strength of the items is still highly valuable today in the assessment of menopause related quality of life.³⁸ Review done in 2016 found an extensive and steadily increasing use of MENQOL in clinical and epidemiological research over 18 years post publication.³⁹ This standard questionnaire has been used in various studies in India to assess the menopausal symptoms.³⁶⁻³⁷

IPAQ (International Physical Activity Questionnaire)

IPAQ was developed by the International Group for Consensus of Physical Activity Measurements in 2000. These open access questionnaires are a set of well-developed instruments that can be used internationally to obtain comparable estimates of physical activity levels among adults in diverse settings. There are two versions of the questionnaire. The short version is suitable for use in national and regional surveillance systems and the long version provide more detailed information often required in research work or for evaluation purposes.⁴⁰ 14 centres from 12 countries collected reliability and/or validity data of the IPAQ instruments. Overall, the IPAQ questionnaires produced repeatable data (Spearman's rho clustered around 0.8), with comparable data from short and long forms. Criterion validity had a median rho of about 0.30, which was comparable to most other self-report validation studies.⁴¹ The internationally validated and reliable long form of this questionnaire has been used in numerous studies in India and abroad, among study participants of different age including South Indian postmenopausal women.⁴²⁻⁴⁴

Menopausal Symptoms

World

In a cross-sectional analysis of the Study of Women's Health Across the Nation (SWAN), done in United States among 3,302 multi-ethnic women, Gold and coworkers reported that Estradiol level was significantly negatively associated, while follicle-stimulating hormone was significantly positively associated, with menopausal symptoms mainly the vasomotor symptoms. Older age, lower levels of educational attainment and more difficulty in paying for basic necessities were independently associated with increased reports of vasomotor symptoms. Higher body mass index, perceived stress, and age were also significantly associated with vasomotor symptoms. No dietary nutrients were significantly associated with vasomotor symptoms but a positive association of fat intake with vasomotor symptoms in unadjusted, but not in multivariate, analyses was found. Increased body mass index was significantly positively associated with increase in hot flashes.⁴⁵

A systematic review published in 2005, in United States reported that women with vasomotor symptoms who smoke may benefit from smoking cessation and women who are heavier than ideal body weight may benefit from weight reduction.⁴⁶

Progetto Menopausa Italia Study Group conducted a study in 2005 among 66,501 women to study factors associated with climacteric symptoms in women. Women with higher age at menopause experienced more often severe hot flashes/night sweats. Moderate and severe hot flashes/night sweats, depression, difficulty to sleep, forgetfulness and irritability tended to be less frequent in more educated women and in women reporting regular physical activity. Parous women reported these symptoms more frequently.

Urinary leakage was more frequent in parous women and women with higher BMI and less frequent in women with regular physical activity.⁴⁷

In Australia 230 women of Indian descent were interviewed about their menopausal experiences using MENQOL questionnaire in 2007. Mean age of menopause for Indian women was found to be earlier than in other native groups at 48.21 years. Physical and several psychological symptoms were found to be more prevalent than the usual vasomotor symptoms. These included: 53% with a decrease in stamina, 52% feeling a lack of energy and decrease in physical strength, and 47% with lower back pain and 46% aching in muscles and joints. Indian women experienced less vasomotor symptom with 34% hot flushes and 31% night sweats compared with Caucasian women. Unemployed women were found to experience a significantly higher score for all symptoms. In contrast to other studies, this study found that a high education level was associated with increased severity of all symptoms, though the findings were not statistically significant. Study also revealed that obese women had a higher score in symptoms for all four domains (physical more than other domains) but this was not statistically significant.⁴⁸

A large US population-based study, published in *Maturitas* in 2007 used the MENQOL to assess the impact of menopausal symptoms on health-related quality of life among 2703 postmenopausal women aged 40–65 years. Scores for each domain were: vasomotor: 3.2 ± 2.2 ; psychosocial: 3.3 ± 1.8 ; physical: 3.5 ± 1.5 ; sexual: 2.9 ± 2.1 . In all four of the MENQOL domains, women aged 60–65 years old reported better quality of life scores than 40–44 years age group and 45–59 year age group, respectively ($p < 0.001$). Ethnicity/race did not significantly impact on the psychosocial, physical and sexual domains scores ($p > 0.05$). Women aged 60–65 years ($p < 0.001$), with a bachelor's degree or higher level of education ($p < 0.001$), who exercised at least 3 days a week ($p < 0.001$),

who had never smoked ($p < 0.0001$), with a body mass index $\leq 25 \text{ kg/m}^2$ ($p < 0.001$), had significantly lower scores indicating better quality of life.⁴⁹

Results from a study conducted in Pakistan, 2009 among 202 women reported that the most prevalent symptom within study subjects was body ache (81.7%). Frequencies of some classical symptoms were – (66.3%) reported "hot flushes", (68.8%) and (66.3%) reported "lack of energy" and decrease in "physical strengths" respectively. The less frequently reported symptom was increase in facial hair (9.9%). Score of physical domain was significantly more in postmenopausal group, while the score of psychological domain was significantly high closer to menopause transition.⁵⁰

An article published in *Climacteric* in 2012 assessed menopausal quality of life among 494 Turkish women aged from 35 to 65 years. Women with no education had the highest scores for vasomotor, psychosocial and physical cluster symptoms. Vasomotor and physical quality-of-life scores were significantly higher among housewives. The women whose relationships with their husband were negatively affected had higher symptoms. When analyzed according to duration at menopause, a significant difference was found in the physical score between early and late menopause (2.9 ± 1.3 , 3.2 ± 1.4). The highest scores were reported for the vasomotor cluster, with a mean score of 3.8 ± 1.9 . The second highest mean score was for the physical cluster; the mean score was 3.1 ± 1 . The third highest mean score was for the psychosocial cluster; the mean score was 2.9 ± 1 . The lowest mean score was reported for the sexuality cluster; the mean score was 2.7 ± 1.8 . The typical vasomotor symptoms of menopause seen in these women were mostly hot flushes (79.6%), night sweats (73.3%) and sweating (53.6%). The three most prevalent menopausal symptoms from the physical domain: feeling tired or worn out (74.7%), weight gain (63.2%) and aching in muscles or joints (63.2%). In the psychosocial

cluster, feeling anxious or nervous (70.9%) and being impatient with other people (56.9%) were the most prevalent symptoms. In the sexual domain, symptoms were reported as follows: vaginal dryness (45.5%), change in sexual desire (45.3%) and avoiding intimacy (38.5%).⁵¹

As per an Iranian study done among 700 women with natural menopause in 2011, the mean menopausal age was 47.6 ± 4.1 years. In physical, psychosocial and sexual domains scores, women aged 55–60 reported higher quality of life scores than lower age groups but these differences were significant only for sexual domain. Women with high school and university education had significantly lower scores, while housewives had higher impaired quality of life (QOL) than employed women in all domains. Women who had physical activity had lower QOL score in all domains and there were significant differences. In the psychosocial, physical, and sexual domains, women who had menopausal duration less than 5 years had lower scores than those who had menopausal duration of 5 or more years but there was significant difference between two groups only in physical domain. Women who had income satisfaction had significantly lower scores in comparison with other groups. Multi variance analysis showed that in vasomotor domain exercise, in physical domain education and exercise, in psychosocial domain education, exercise, income satisfaction and marriage satisfaction and in sexual domain income satisfaction were predictors for better QOL.⁵²

In the study conducted in Libya in 2012, the median ANM was 47 years. The most frequent symptoms were hot flushes and aching in muscles and joints. Increasing level of education was positively associated with more symptoms and increased tea or coffee consumption resulted in fewer symptoms. In the four domains, 87.2% reported physical

symptoms, 83.7% reported psychosocial symptoms, 76.6% reported vasomotor symptoms and 48.8% reported sexual symptoms.⁵³

A study done in Turkey in 2014 among 1030 women found significant differences between the subdomain mean scores on the MENQOL according to menopausal period duration. It was found that vasomotor and sexual symptoms were experienced more often by women who had been in the postmenopausal period of less than five years; psychosocial and physical symptoms were experienced more often by women who had been in the postmenopausal period for more than five years. Overall the most frequent menopausal symptoms were feeling tired and worn out (79.2%), aches in the muscles and joints (79.1%) and low backache (77.8%); the least experienced symptom was an increase in facial hair (28.3%). Significant differences were detected in all subdomain mean scores of the MENQOL questionnaire according to age groups, perception of income, education, parity and body mass index. Housewives who were classified as the unemployed group were seen to have significantly higher scores in the psychosocial and physical domains. The study also revealed that obese women had the highest scores in the vasomotor and physical domains whereas underweight women had the highest scores in the psychosocial and sexual domains.⁵⁴

A study done on 2507 women in United States (US) in 2015, showed association between caffeine intake and menopausal symptoms, particularly vasomotor symptoms. Menopausal symptom ratings were compared between women who used caffeine and women who did not use caffeine with smoking and menopause status included as covariates. Caffeine use was positively associated with mean vasomotor symptom.⁵⁵

A cross-sectional study was conducted on 2,201 women aged 44 to 56 years in South Korea in 2015. Postmenopausal women reported sexual symptoms as the most

bothersome domain, while poor memory was the most frequently experienced symptom women (85.8%). It revealed that age (for vasomotor and sexual symptoms) and obesity (for vasomotor and physical symptoms) were significantly associated with severity of menopause symptoms. Physically active women had fewer severe physical symptoms related to menopause than inactive women.⁵⁶

An Iranian study, 2015 done among 675 women assessed quality of life and its determinants in a population-based cross-sectional survey among postmenopausal women aged 40–60 years. It reported mean scores for each domain as: vasomotor: 2.14 ± 1.49 ; psycho-social: 1.56 ± 0.85 ; physical: 1.91 ± 0.52 and sexual: 1.37 ± 1.05 . Pain in joint and muscle had the highest score. In the vasomotor and psycho-social domains, the women who had experienced menopause five or less than five years ago had significantly higher scores from ones with longer duration. There was no significant difference in duration of menopause in the physical and sexual domains.⁵⁷

A cross-sectional study among 542 postmenopausal Saudi women in 2015 reported that 41%, 14.4%, 57% and 12.7% of women reported severe/moderate impact of vasomotor, psychosocial, physical, and sexual symptoms respectively. In addition, women who worked, were obese or lived in rented accommodations had higher odds for moderate/severe menopausal symptoms.⁵⁸

India

A study was undertaken in Punjab in 2007 among 208 women aged 35–65 years to assess variation in menopausal symptoms with age, education and working/non-working status. It found the average menopausal age to be 48.7 ± 2.3 years. A significantly higher percentage of perimenopausal women showed a severe psychological score, while

a higher percentage of postmenopausal showed severe somatic score and urogenital score. Working women seemed to suffer more from psychological symptoms, whereas non-working women showed a greater incidence of somatic and urogenital symptoms. Educated women showed a lower incidence of psychological and somatic symptoms and higher level of urogenital symptoms.⁵⁹

The Jammu study, 2007 among 117 urban women revealed mean age at menopause to be 47.35 years. Most frequent menopausal symptoms were fatigue & lack of energy (72.93%), headache (55.9%), hot flushes, cold sweats and cold hand and feet (53.86 %) and weight gain (43.13%). The study revealed, varying nature of symptoms with age and MDSM (Mean Duration since Menopause), with vasomotor symptoms being more prevalent with lesser MDSM and psychological complaints more prevalent with increasing age and MDSM.⁶⁰

According to a study done in Manipal, Karnataka in 2009 among 352 postmenopausal women using MENQOL questionnaire, the age at onset of menopause in southern Karnataka (India) was 48.7 years, which is four years more than the mean menopause age for Indian women due to better socioeconomic and health-care facility in the region. Most frequent menopausal symptoms were aching in muscles and joints, feeling tired, poor memory, lower backache, feeling bloated and difficulty in sleeping. The vasomotor and sexual domains were less frequently complained when compared to physical and psychological domains. The most common menopausal symptoms in the age group of 40–44 years with MDSM = 2.1 years were feeling tired (70%), feeling depressed (62.5%), poor memory (57.5%) and lower backache (57.5%) each, respectively. In the age group of 45–50 years with MDSM = 3.5 years, aching in muscles and joints (66.8%), feeling tired (61.4%), lower backache (60.5%) and poor memory (57.8%) were the

common complaints. In the age group > 50 years with MDSM 6.6 years, the common symptoms were aching in muscles and joints (73.0%), feeling tired (70.8%), poor memory (68.5%) and difficulty in sleeping (62.92%).⁶¹

A community based cross-sectional study was done among 100 menopausal women in Shimla, Himachal Pradesh in 2010. Mean age of menopause was 44.54 years. Main menopausal symptoms were fatigue (62%), hot flashes (56%), Cold sweats (52%), and backaches (51%).⁶²

According to a study done in Pune in 2011 on 156 urban participants, nearly 80% of the subjects reported problems associated with menopause. Mean age of natural menopause was 48.3 years. The most common vasomotor symptoms were hot flushes and night sweats. Irritability and nervousness were the chief psychological symptoms. Reporting of symptoms was influenced by income level. Women from lower income group experienced less number of symptoms as compared to those with higher family income. It was also observed that psychological symptoms were reported more among low income group, while high income group reported more of vasomotor and urogenital symptoms as compared with low-income group. Overall reporting of symptoms was observed to be lesser among the nonworking women than their working counterparts. Respondents with nuclear families had significantly more psychological symptoms as compared to other symptoms.⁶

Most frequent symptoms as per the study conducted in Ludhiana in 2013 among 180 women of 40-60 years were - Headache (94.1%), Dizzy spells (81.5%), Decreased libido (81.5%), Sleep disturbance (68.9%), Palpitations (64.4%), Hot flushes (59.3%), Lack of concentration (54.1%), Mood changes (49.6%) and Night sweats (35.6%).⁶³

According to a study done at Pondicherry in 2013 among 500 participants, the mean menopausal age was 45 years near to the mean menopausal age in the mothers and sisters (45.17 years). Vasomotor symptoms were found in 80% of the study group, psychosocial symptoms were found in 93.2%, physical symptoms were found in 99% and sexual symptoms were found in 82%. In both the groups of women (≤ 50 years and > 50 years), low back ache was the most common symptom. Vasomotor symptoms were significantly less prevalent in those with a less monthly income. Vasomotor symptoms and the sexual symptoms were more prominent in the menopause transition, while the psychosocial symptoms were more prominent among the late postmenopausal women. Rather than the ages of the study population, their duration since menopause was more associated with the prevalence of the menopausal symptoms.⁶⁴

An International Menopause Society study, 2014 among 717 women, aged 45 – 55 years, from urban centres in different regions of India found the most common symptoms attributed to the menopause to be tiredness (67.9%), aches and pains (49.9%), sleep problems (44.1%), stiff joints (43.5%), decreased sexual interest (43.4%) and hot flush/night sweat (42.7%). In analysis, (lower) educational level, (less) exercise participation, eating meat, vegetables and hot spicy foods, (lower) life satisfaction, anxiety and depression were associated with hot flush prevalence.⁶⁵

The Bengal study done in year 2014 among 250 post-menopausal women in Calcutta found that factors like early age at menarche and longer duration of breastfeeding were associated with a lower likelihood of hot flushes. Other sociodemographic and reproductive factors like the use of oral contraceptive pills, age at menarche, scanty menstrual discharge, sterilization, postmenopausal phase of life and BMI seem to be associated with night sweats. Women with a history of scanty menstrual discharge are

likely to suffer from vaginal symptoms during menopause. Both bivariate and multivariate analyses showed that menopause-specific quality of life decreases with the increase in duration of postmenopausal years. Bivariate analysis demonstrated that working women had a better menopause-specific quality of life than their non-working counterpart.⁶⁶

Another study was conducted among 1400 Bengali women in 2015. Multivariate analysis revealed socio-demographic and reproductive factors significantly associated with symptoms; vasomotor - age at menarche, menopausal and residential status, duration of breastfeeding, menstrual discharge type, use of OCP, sterilization and BMI; urinary - ages at menarche and marriage, menstrual bleeding length, use of OCP, menopausal status, monthly household expenditure and BMI and vaginal - type of menstrual discharge, menopausal status, educational level, monthly household expenditure and BMI.⁶⁷

Community based study, carried out among 214 women (40 to 60 years) in Davangere, Karnataka was published in 2016. The mean age at menopause was 44.06 ± 3.06 years. The predominant symptom of vasomotor domain was 'sweating' followed by night sweats. In psychosocial domain, accomplishing less than they used to was the predominant symptom. Decrease in the physical strength was more common symptom in physical domain and in sexual domain, change in sexual desire was more common.⁶⁸

A study conducted in Hubli in 2016, found vasomotor domain having a mean score of 2.43 ± 2.3 , psychosocial component 5.84 ± 4.9 , physical component 12.02 ± 7.4 and sexual component 1.19 ± 1.3 . Regarding menopausal symptom prevalence, 75% of women had muscle and joint pain, 60% complained of headache, 60% had low backache and 40% complained of constant weakness or lack of energy. There was no significant difference in QOL between family type, marital status and BMI.⁶⁹

Thus, sociodemographic factors like age, education and occupation, marital status, family type, parity, menopausal status, duration in postmenopausal years, use of oral contraceptives, foetal loss and breastfeeding of the last child may be responsible for the impairment of menopause specific quality of life of middle-aged women. Additionally, experience of menopausal symptoms is also influenced by lifestyle behaviours (like diet, smoking and exercise).⁴⁵⁻⁶⁹

Role of Physical Activity

A Polish study done in 2010 among 336 healthy women aged 45–55 years, found that participants with high physical activity felt better and had less severe climacteric symptoms. A low physical activity level in each IPAQ domain, (at work, during transportation, during household and gardening and during leisure time) have an influence on increased climacteric symptoms.⁷⁰

A population-based study done on 370 women aged 40–65 years in Brazil in 2011 found that all domains of climacteric symptoms were significantly affected by physical activity. The most physically active women had the lowest percentage of strong symptoms, whereas sedentary and less active women had stronger climacteric complaints. The study thus concluded that physical activity improved climacteric symptoms among middle-aged women in Brazil.⁷¹

Another study done in Brazil among 370 peri-menopausal and 641 post-menopausal women published in 2012, concluded that the accumulation of 30 min/day of total physical activity seems to be associated with more favourable effects on the psychological, social and environmental domains; however, at least 60 min/day are necessary to act on the physical domain. The results revealed positive associations

between domains of quality of life and moderate intensity, vigorous intensity, moderate plus vigorous intensity and total physical activity ($p < 0.01$).⁷²

A cross-sectional study done in Israel, 2013 among 151 women aged 45–55 years, assessed the association between demographic and lifestyle parameters and perceived severity of the climacteric syndrome. It concluded that regular exercise of at least 3 times a week was the most significant lifestyle parameter to be associated with the severity of climacteric symptoms. However, though regular exercise was significantly correlated with lower psychological and physical sub-scores, yet the vasomotor and sexual sub-scores remained unchanged.⁷³

A study conducted in Iran in 2013 among 273 middle-aged women aged 40-60 years found positive significant relationship between psychological and social domain with physical activity ($p < 0.001$). In addition, a negative significant relation was found between somatic complaints like sexual problems ($p < 0.017$), vaginal dryness ($p < 0.030$), joint-muscular discomfort ($p < 0.018$) and the level of physical activity.⁷⁴

A cross-sectional study was done in Turkey, 2014 on 305 women between the ages of 45 – 60 years to study the effect of physical activity and body mass index on menopausal symptoms. Women who were physically active had lower total menopausal score than women who were less active. No differences in vasomotor symptoms were recorded related to physical activity level; significant differences were found for most menopausal symptoms, including sleep and sexual problems, joint and muscular discomfort and vaginal dryness. BMI was not associated with total menopausal symptoms however a significant increasing trend in the rate of depressive mood was observed from normal to overweight to obese participants.⁷⁵

A South Korean cross-sectional study done among 631 participants in 2014, studied the association between physical activity and menopausal symptoms using the International Physical Activity Questionnaire (IPAQ) and the Menopause-specific Quality of Life (MENQOL) questionnaire. The result concluded that total MENQOL score and the psychosocial and physical sub-scores exhibited U-shaped trends in relation to the level of physical activity. Women who performed moderate physical activity reported significantly lower psychosocial and physical symptoms than women who performed low physical activity. By contrast, a high level of physical activity did not influence the MENQOL total score and sub-scores relative to the low activity group. In addition, no associations were observed between physical activity and the vasomotor and sexual symptoms in any group.⁷⁶

As per a cross-sectional study conducted in Finland in 2015 among 2606 women found that physically active women showed higher quality of life in menopause-specific dimensions. Physically inactive women had an increased probability of anxiety/depressed mood, of somatic symptoms, of memory/concentration problems and of vasomotor symptoms as compared to physically active women. Women with the recommended level of physical activity had a higher health level and better quality of life than others of their age.⁷⁷

An Australian study done among 213 women in 2015 examined the role of different modes of physical activity (PA) and exercise behaviour on the climacteric symptoms experienced by peri and post-menopausal women. Increased levels of sport and exercise participation reduced psychological and somatic/physical symptoms as well as sexual symptoms in all women. However, active living was inversely related to somatic/physical climacteric symptoms.⁷⁸

Cross-sectional study of the Collaborative Group for Research of the Climacteric in Latin America done among 6,079 Latin American women (40-59 years) in 2016, reported that sedentary women had more severe menopausal symptoms and more depressive symptoms, anxiety and insomnia. Logistic regression analysis showed that severe menopausal symptoms including insomnia and depressive mood, were positively associated with a sedentary lifestyle.⁷⁹

An Iranian study done on 600 postmenopausal women in 2017, used IPAQ long form to assess physical activity and concluded significant relationship between the total score of physical activity and physical health, social functioning, anxiety and depression. It postulated that proper training and effective interventions for regular physical activity can be important steps to promote the general health of menopausal women.⁸⁰

Even after extensive article research, we could not come across any descriptive study conducted in India, which assesses the menopausal symptoms with respect to physical activity levels of everyday routine life.

Though many studies provide strong support for the absence of an effect of physical activity on menopausal symptoms; evidence is still inconclusive with many studies showing no effect or insignificant domain specific effect.⁸¹⁻⁸⁵

Different nations have different recommendations on the role of physical activity in menopausal symptoms. The Scientific Advisory Committee of The Royal College of Obstetricians and Gynaecologists states that women who are more active tend to suffer less from the symptoms of the menopause but infrequent vigorous exercise leads to increase in symptoms. North American Menopause Society says insufficient or

inconclusive data is present regarding exercise, yoga, paced respiration, etc. and thus not recommends it even though it advocates weight loss and stress reduction.¹³⁻¹⁴

Therefore, this study proposes to find out the prevalence of menopausal symptoms and also find out the association of physical activity with menopausal symptoms especially in context of Indian women of urban area of Belagavi city. Such regional studies will help to corroborate data so that health care providers can plan strategies for the middle-aged women suffering from these menopausal symptoms.



METHODOLOGY

METHODOLOGY

The present study was conducted in the field practice area of Urban Health Centre (UHC) Ashok Nagar, affiliated to the Department of Community Medicine, Jawaharlal Nehru Medical College, KLE University, Belagavi, Karnataka under the Arogya Bandhu Scheme. It is situated about two km from the Medical College towards South-East side.

STUDY DESIGN

Community based cross-sectional study.

STUDY POPULATION

40 to 60 years old postmenopausal women who resided in the field practice area of Urban Health Centre, Ashok Nagar, Belagavi.

Inclusion criteria:

1. Women in the age group of 40-60 years who were residents of urban field practice area of UHC Ashok Nagar, Belagavi for at least one year preceding the survey. AND
2. Women who had amenorrhea for at least 12 months preceding the survey.

Exclusion criteria:

Women who fulfilled the above criteria, but

1. Had undergone medical or surgical menopause. OR
2. Had undergone chemo/radio therapy induced ovarian failure. OR
3. Were taking hormone replacement therapy (HRT) after natural menopause.

STUDY AREA

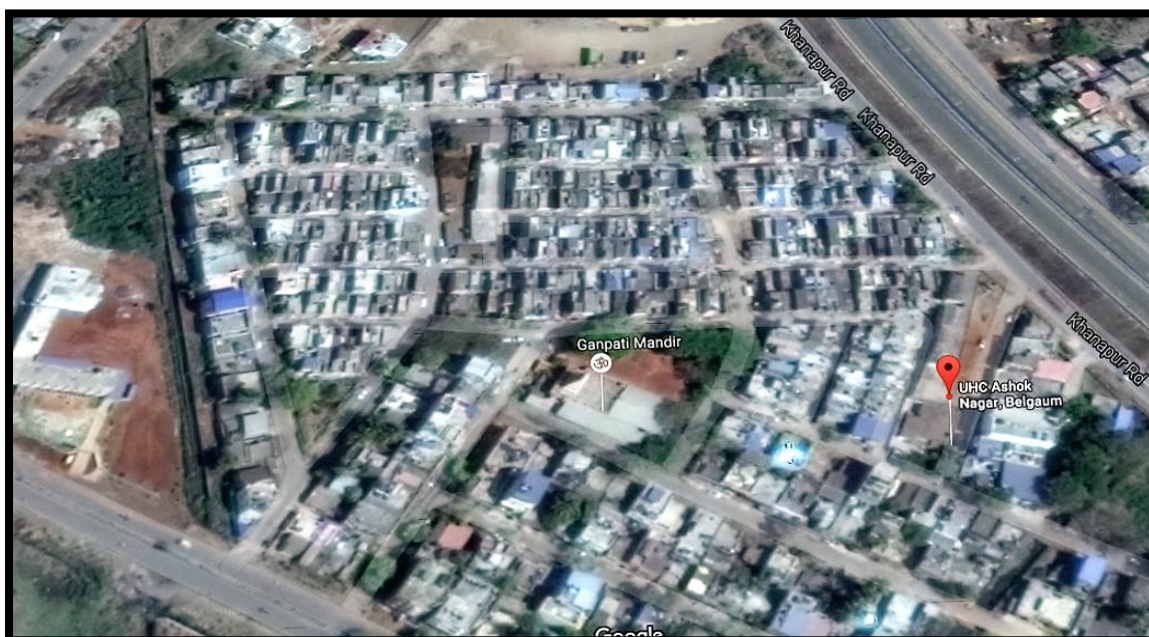


Image 1: Field practice area of Urban Health Centre Ashok Nagar, Belagavi. Satellite view, with marking at UHC.

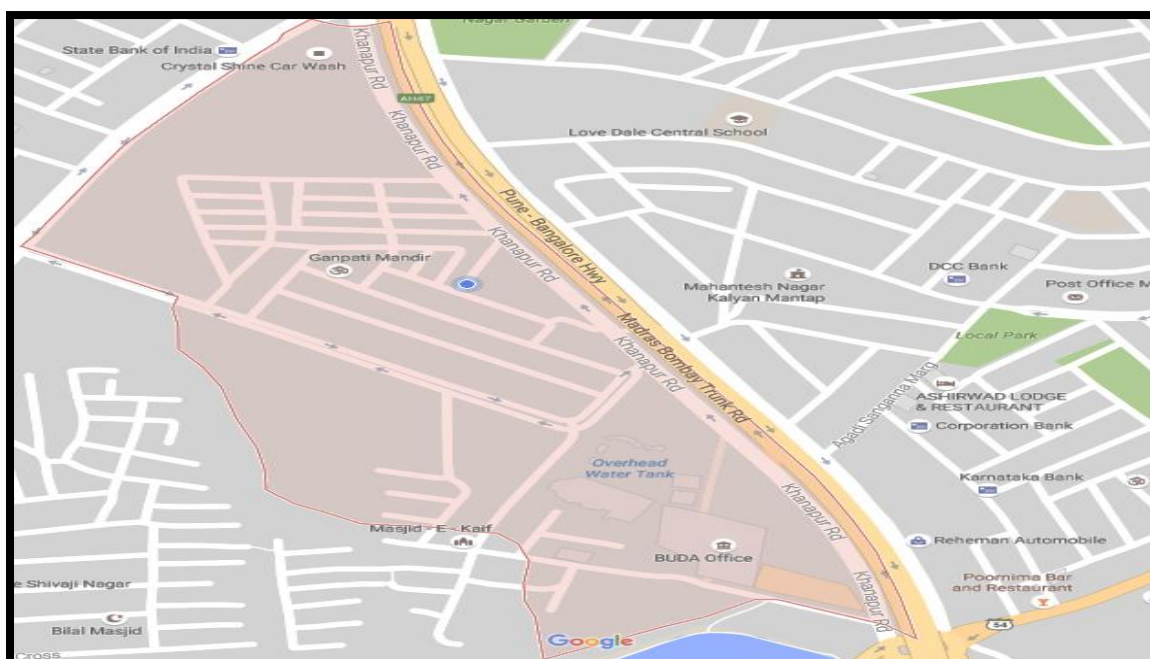


Image 2: Field practice area of Urban Health Centre Ashok Nagar, Belagavi. Area enclosed by red line.

STUDY PERIOD

The study was conducted from 1st January 2016 to 31st December 2016.

SAMPLE SIZE

Total Population residing at field area of Urban Health Centre, Ashok Nagar, Belagavi = 32,132 (Estimated from Community Need Assessment Approach [CNAA] Survey 2015-16)

Target Population Size = 3,192

$$\text{Sample Size} = \frac{Z^2 P(100-P)}{d^2}$$

Where,

Z=1.96 for 95% confidence interval

P =Estimated Prevalence, taken as 69.1% ⁸⁶

d = Absolute error in estimation of P, taken as 5%

$$\text{Thus, } n = \frac{1.96^2 \times 69.1(100-69.1)}{5^2} = 329$$

Taking 5% non-responders, corrected sample size = 329 + 16 = **345**

Thus, sample consisted of 345 postmenopausal women aged 40-60 years who fulfilled the inclusion criteria but not the exclusion criteria.

SAMPLING METHOD

Systematic Random Sampling method.

$$k = \text{total target population/sample size} = 3192/345 \approx 9$$

Any number is chosen randomly from 1 to 9 and thereafter every 9th women from the target population was interviewed till the estimated sample size was achieved.

INSTRUMENTS USED FOR DATA COLLECTION

Measuring Tape:

Height was measured in standing position using measuring tape (precision 0.5cm).

Adult weighing scale:

Weight was taken on adult weighing scale (precision 0.1kg).

Questionnaire:

A pre-designed structured questionnaire constructed after review of various articles was used to interview eligible participants. The questionnaire was pilot tested among 35 non-study participants to validate the questionnaire and check for its feasibility. Necessary changes were then made in the proforma.

The final proforma (Ref. Annexure III) had four sections:

- Socio-demographic Questionnaire
- Obstetrics and Gynaecology Questionnaire
- MENQOL Questionnaire

- IPAQ Questionnaire

ETHICAL CLEARANCE

Ethical Clearance was granted by the Institutional Ethics Committee for Human Subject's Research (MDC/DOME/378 dated 18th November 2015) of J. N. Medical College, Belagavi. (Ref: Annexure I)

INFORMED CONSENT

Written Informed Consent was obtained from all participants before start of the interview for data collection. Participants were informed in detail about the purpose of the study and their rights, possible benefits and risks. (Ref: Annexure II)

METHOD OF DATA COLLECTION

Personal interview of eligible participants was conducted by the investigator, using pre-designed and pre-tested questionnaire. House to house visit was done in the field practice area of Urban Health Centre, Ashok Nagar, Belagavi. Maximum three attempts (two follow ups after initial attempt) were made to sought interview with eligible participant before excluding that participant.

OUTCOME

Primary Outcome

- Menopausal symptoms from MENQOL questionnaire.
- Association of socio-demographic and obstetrics and gynaecology variables with menopausal symptoms.

Secondary Outcome

- Association of physical activity variables collected through IPAQ Questionnaire with the menopausal symptoms.

DATA ANALYSIS

Data collected in the questionnaire was coded and entered in Microsoft Excel sheet. Values were expressed in the form of percentages, mean and standard deviation. Chi-square test, Analysis of Variance, Pearson's Correlation and Multiple linear regression analysis (unadjusted and adjusted) were used to determine association and relationship between different variables. Tables and Graphs were prepared. Statistical significance was set at $p \leq 0.05$

PROFORMA VARIABLES

Wherever possible, standard definitions were used to determine the definitions of the terminologies in the study.

SOCIO-DEMOGRAPHIC PROFORMA

AGE: Age of the participant in years as completed on her last birthday.

RELIGION: Subject's religion was asked and grouped as Hindu, Muslim and Others (Jain, Christian, Etc.)

CATEGORY: Participant category was noted and grouped as Schedule Caste, Schedule Tribe, Other Backward Class and General Class based on the caste list as per 2011 census.

TYPE OF FAMILY⁸⁷

1. **Nuclear Family:** The family consisting of married couple along with their dependent children.
2. **Joint Family:** It consists of number of married couples and their children who live in the same household.
3. **Broken Family:** A family where the parents have separated, or where death has occurred of one or both the parents.

EDUCATION: Every study subject was asked about her educational qualification. It was classified as follows:

1. **Illiterate:** A person who cannot read and write any language.
2. **1st to 5th Standard:** A person who has studied from first to fifth standard.
3. **6th to 10th Standard:** A person who had studied sixth to tenth standard.
4. **11th -12th Standard/ P. U. C/ Diploma:** A person who has studied up to Pre-University College (PUC) or 11th – 12th or diploma course.
5. **Graduate:** A person who has completed graduation or more.

OCCUPATION: Every participant was asked about their occupation. It was classified as follows:

1. **Home Maker:** Women not engaged in any kind of economical productive work.
2. **Government Job:** Working in Central or State Government for salary.
3. **Private Job:** Works in private party/ agency/firm etc for salary.
4. **Self Employed:** Working for oneself like doctors, businessmen, etc.

5. **Farmer/Labourer:** Occupations which involve physical exertion like masonry, farming, maid, etc.

TOTAL FAMILY INCOME: Combined income of all the earning members of the family in Rupees (Rs.) per month.

FAMILY SIZE: Total number of members in the family.

SOCIO-ECONOMIC STATUS (SES) CLASS ⁸⁸⁻⁸⁹

Information regarding per capita income (in Rupees/month) was collected and socio-economic status was classified using Modified B. G. Prasad's classification for the study period (2016).

$$\text{Monthly Per Capita Income} = \frac{\text{Total monthly income of family (Rs.)}}{\text{Total members of family}}$$

Modification done with the aid of Correction factor (CF), which was obtained as below:

As our study period was from 1st January to 31st December 2016, the mean All India Consumer Price Index for the period was considered.

Average Consumer Price Index for year 2016 was 274.33.

$$\begin{aligned} \text{CF} &= \frac{\text{Value of consumer price index average (2016)} \times 4.93 \times 4.93}{100} \\ &= \frac{274.33 \times 4.93 \times 4.93}{100} \end{aligned}$$

Modified B. G. P=Per capita family monthly income of 1961 (B.G. Prasad) x CF

Socio-Economic Class	Prasad's classification 1961 (per capita income in Rupees/month)	Modified Prasad's classification 2016 (per capita income in Rupees/month)
I	100 and above	6261 and above
II	50-99	3099-6260
III	30-49	1835-3098
IV	15-29	949-1834
V	<15	948 and below

FOOD HABITS: Subjects were asked about their food habits.

1. **Vegetarian:** A person who consumes only vegetarian food.
2. **Mixed:** A person consuming both vegetarian as well as non-vegetarian food.

PERSONAL HABITS: Study subject's consumption of tea or coffee or aerated drinks.

SUBSTANCE ABUSE:

1. **Smoking:** Use of smoked form of tobacco ever (past or present).
2. **Alcohol:** Consumption of alcohol ever (past or present).
3. **Tobacco Chewer:** Oral consumption of tobacco ever (past or present).

ANTHROPOMETRY

1. **Height:** The subject was asked to stand straight without footwear with back straight. The height was measured using measuring tape (precision 0.5cm).

2. **Weight:** Body weight was measured without any foot wear and with minimal clothing using calibrated digital adult weighing scale (precision 0.1kg).

3. **Body Mass Index (BMI):** Calculation of Body Mass Index in Kg/m²:

$$= \text{Weight in kilograms} / (\text{Height in meters})^2 \times 100$$

BMI calculated was categorized as per the WHO criteria for Asian population.⁹⁰

- Underweight (BMI < 18.5)
- Normal (BMI 18.5-23)
- Overweight (BMI 23-27.5)
- Obese (BMI >27.5)

OBSTETRIC AND GYNAECOLOGY PROFORMA ¹⁷⁻¹⁹

MARITAL STATUS: Participant was asked about their marital status and grouped as married, unmarried, widow, divorced or separated.

AGE AT MENARCHE: Participant's age in years at the time of first menstrual cycle. It was classified as Early (<10 years), Normal (10-15 years) and Delayed (>15 years).

AGE AT MARRIAGE: Age of the woman in years at the time of marriage was asked and grouped as less than 15 years, 15-20 years, 20-25 years, 25-30 years and more than 30 years.

OBSTETRIC SCORE: Women was asked about her obstetric history and expressed as terms of PLADS Score (parity, live births, abortion, dead children, stillbirth).

AGE AT FIRST PREGNANCY: Age of the woman in years when she conceived for the first time was asked and grouped as less than 15 years, 15-20 years, 20-25 years, 25-30 years and more than 30 years.

AGE AT MENOPAUSE OF MOTHER: Study participant was asked about her mother's age at the time of the permanent cessation of menstruation (if known). It was further classified as Premature (< 40 years), Normal (40-55 years) and Late (>55 years).

AGE AT MENOPAUSE OF ELDER SISTER: Age of immediate elder sister at the time of their permanent cessation of menstruation. It was further classified as Premature (< 40 years), Normal (40-55 years) and Late (>55 years).

AGE AT MENOPAUSE: Age of the study subject in years at the time of the permanent cessation of menstruation. It was further classified as Premature (< 40 years), Normal (40-55 years) and Late (>55 years).

DURATION SINCE FINAL MENSTRUAL PERIOD: Duration in years since the final menstrual period (FMP) as told by the study subject. It was further grouped as less than 5 years, 5-10 years, 10-15 years and more than 15 years.

CONTRACEPTION: Contraceptive use by the participant before menopause was enquired and was grouped as none, temporary (Ex. contraceptive pills, intrauterine devices), permanent (tubectomy), both.

BREAST FEEDING: Participant was asked about the total duration for which she breast fed her last child. It was further grouped as none, less than 6 months, 6 months -1 year, 1-2 years and more than 2 years.

MENSTRUAL CYCLE: Detailed history of past menstrual cycles (during reproductive years before attaining menopause) of the study subject was enquired. Details were asked as follows:

1. **Regularity of menstrual cycle** - Regular/Irregular
2. **Length of menstrual cycle** - Short (<21 days)/ Normal (21 - 35 days)/
Prolonged (> 35 days)
3. **Duration of bleeding** - Normal (< 7 days)/ Prolonged (≥ 7 Days)
4. **Vaginal discharge** -Scanty/ Normal/Profuse
5. **Lower abdominal pain** – Normal/Abnormal

MENQOL PROFORMA³⁶⁻³⁷

Menopause Specific Quality of Life (MENQOL) Questionnaire is a validated instrument used to measure health-related quality of life in middle-aged women in the years beyond the onset of menopause, defined as one year with no menses.

It consists of 29 items grouped under four domains: Vasomotor (1-3), Psychosocial (4-10), Physical (11-26) and Sexual (27-29).

Menopause-Specific Quality of Life questionnaire (MENQOL) asks the woman to “indicate whether you have experienced the problem in the PAST MONTH.”

Scoring of the MENQOL (Menopause Specific Quality of Life) Questionnaire:

The participants are asked to rate whether or not they had experienced the symptom in the past month. If the answer to an item is yes, the subject is asked to rate the degree to which that symptom was bothersome on a 7-point Likert scale. The scale ranges from 0 (not at all bothered) to 6 (extremely bothered). For scoring each of the 29 items, this seven-point Likert scale is converted to an eight point scale, ranging from 1 to 8 with ‘1’ for ‘no’, ‘2’ for ‘yes - not bothered’ to ‘8’ for ‘yes - extremely bothered’

For frequency of a particular symptom, score of 2-8 was counted as presence, while 1 was counted as absence of a particular symptom.

For analysis, each domain was scored by averaging the converted item scores forming that domain. Hence, the average for each domain is constrained between 1 (not at all a problem; respondent selected “no” for each item in the domain) to 8 (respondent reported experiencing each symptom in the domain at the highest degree of bother). Summary score was calculated as a mean of all four domain scores.

IPAQ PROFORMA ⁴⁰

International Physical Activity Questionnaire (IPAQ) is a validated well-developed instrument used internationally to obtain comparable estimates of physical activity. Long version of IPAQ used in present study, provides more detailed information often required in research work or for evaluation purposes.

IPAQ (long form) assesses physical activity (walking, moderate-intensity, vigorous-intensity activity) undertaken across four domains, namely:

1. Job/work-related physical activity
2. Transport-related physical activity
3. Domestic and garden activity
4. Leisure time physical activity

International Physical Activity Questionnaire (IPAQ) Scoring

Continuous Score: This is suggested to be expressed as MET min per week: MET level x minutes of activity x events per week.

Categorical Score: Three levels (categories) of physical activity are proposed:

1. Category 1: Low

This is the lowest level of physical activity. Those individuals who not meet criteria for categories 2 or 3 are considered low/inactive.

2. Category 2: Moderate

Any one of the following 3 criteria:

- 3 or more days of vigorous activity of at least 20 minutes per day OR
- 5 or more days of any combination of walking, moderate intensity or walking of at least 30 minutes per day OR
- 5 or more days of any combination of walking, moderate-intensity or vigorous intensity activities achieving a minimum of at least 600 Metabolic Equivalent of Task (MET) min/week.

3. Category 3: High

Any one of the following 2 criteria:

- Vigorous intensity activity on at least 3 days and accumulating at least 1500 MET minutes/ week OR
- 7 or more days of any combination of walking, moderate intensity or vigorous intensity activities achieving a minimum of at least 3000 MET minutes/ week.



RESULTS

RESULTS

The present study was conducted in 2016 among postmenopausal women aged 40-60 years residing in the field practice area of Urban Health Center (UHC) Ashok Nagar affiliated to the Department of Community Medicine, KLE University's Jawaharlal Nehru Medical College, Belagavi, Karnataka, India.

The data obtained was tabulated and analyzed under the following headings:

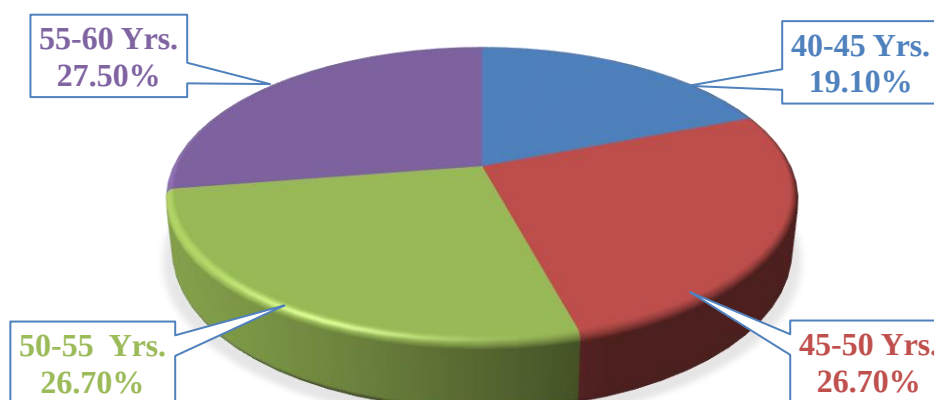
- I. SOCIO-DEMOGRAPHIC PROFILE OF THE STUDY PARTICIPANTS**
- II. OBSTETRICS AND GYNAECOLOGICAL PROFILE OF THE STUDY PARTICIPANTS**
- III. MENOPAUSAL SYMPTOMS AMONG STUDY PARTICIPANTS AS PER MENQOL QUESTIONNAIRE**
- IV. PHYSICAL ACTIVITY AMONG THE STUDY PARTICIPANTS AS PER IPAQ**
- V. DETERMINANTS OF AGE AT MENOPAUSE**
- VI. DETERMINANTS OF SEVERITY AND FREQUENCY OF MENOPAUSAL SYMPTOMS**
- VII. ASSOCIATION OF PHYSICAL ACTIVITY WITH MENOPUSAL AGE AND SYMPTOMS**

I. SOCIO-DEMOGRAPHIC PROFILE OF THE STUDY PARTICIPANTS

Table 1: Distribution of study participants according to Age

Age (years)	Total No. of Postmenopausal Women N (%)	
	No.	%
40-45	66	19.1
45-50	92	26.7
50-55	92	26.7
55-60	95	27.5
Total	345	100

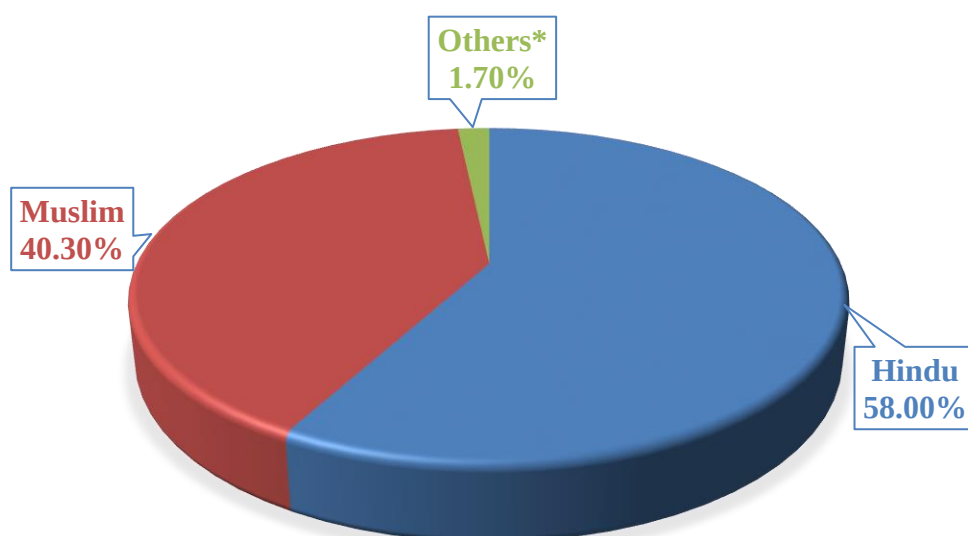
Graph 1: Distribution of study participants according to Age (%)



In the present study, highest number of participants 95 (27.5%) were in the age group of 51-55 years. 92 (26.7%) were in the age group of 46-50 years and 51-55 years each. Least number of participants 66 (19.1%) belonged to the age group of 40-45 years. Overall the mean age at menopause among study participants was 52.04 ± 5.58 years.

Table 2: Distribution of study participants according to their Religion

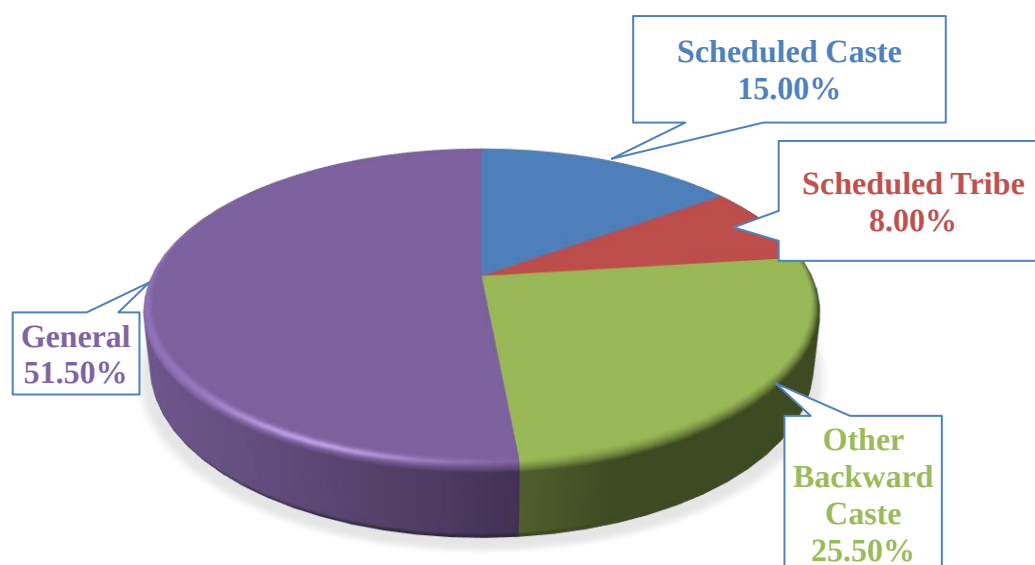
Religion	Total No. of Postmenopausal Women N (%)	
	No.	%
Hindu	200	58
Muslim	139	40.3
Others*	6	1.7
Total	345	100

Graph 2: Distribution of study participants according to their Religion (%)

In the present study, majority 200 (58%) were Hindus, while 139 (40.3%) were Muslims. Participants belonging to any other religion (* Christian, Jain, Sikh, Bodh, Etc.) were 6 (1.7%).

Table 3: Distribution of Hindu study participants according to their Category

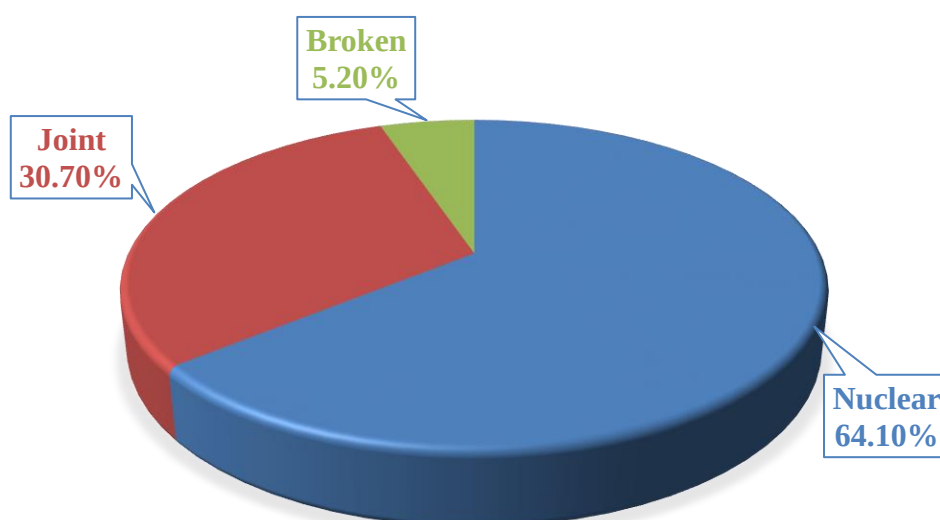
Category	Total No. of Postmenopausal Women N (%)	
	No.	%
Scheduled Caste	30	15
Scheduled Tribe	16	8
Other Backward Caste	51	25.5
General	103	51.5
Total	200	100

Graph 3: distribution of Hindu participants according to Category (%)

Among the 200 Hindu participants, 103 (51.5%) were of General Category followed by 51 (25.5%) of Other Backward Castes. Participants belonging to Scheduled Castes were 30 (15%), while 16 (8%) were in Scheduled Tribes.

Table 4: Distribution of study participants according to Type of Family

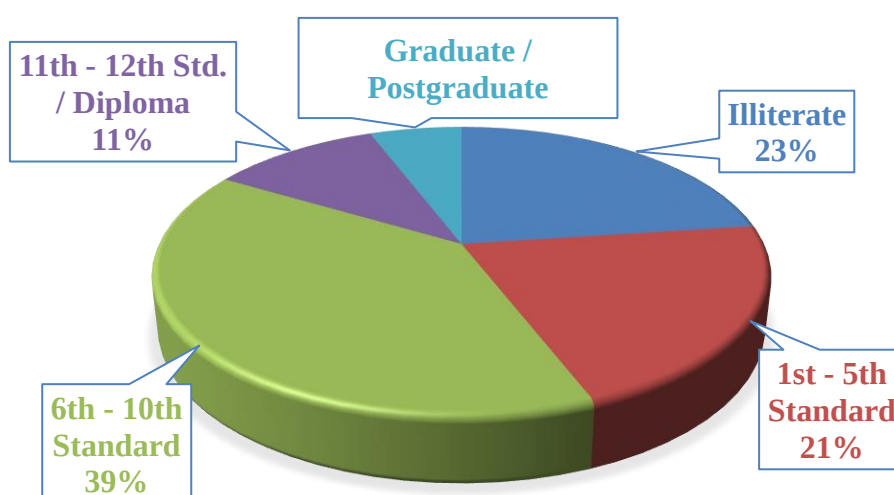
Family Type	Total No. of Postmenopausal Women N (%)	
	No.	%
Nuclear	221	64.1
Joint	106	30.7
Broken	18	5.2
Total	345	100

Graph 4: Distribution of study participants according to Type of Family (%)

In the present study, 221 (64.1%) of the participants had nuclear families, while 106 (30.7%) belonged to joint families. Participants from broken families were 18 (5.2%).

Table 5: Distribution of study participants according to their Educational Status

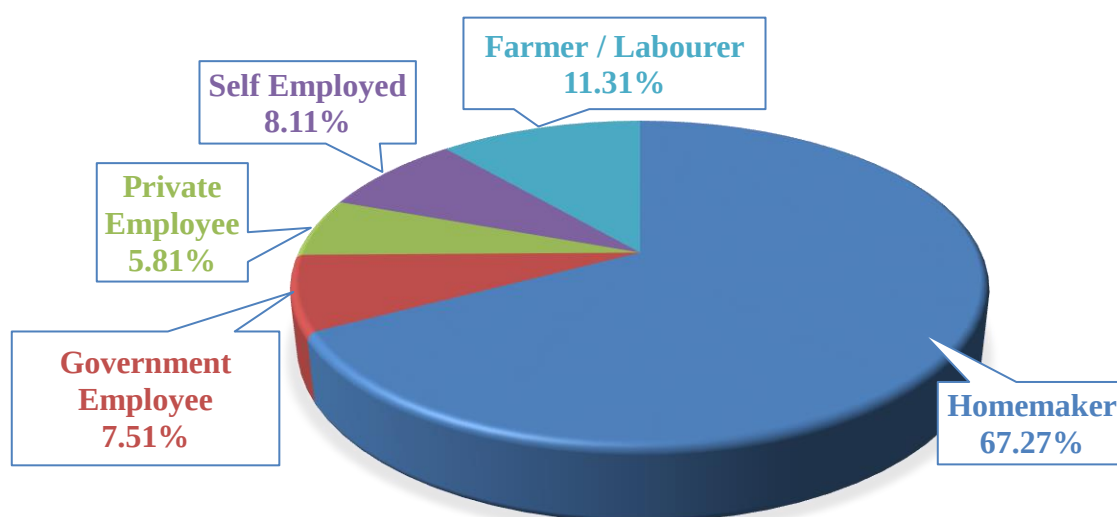
Education Level	Total No. of Postmenopausal Women N (%)	
	No.	%
Illiterate	79	22.9
1 st - 5 th Standard	73	21.2
6 th - 10 th Standard	136	39.4
11 th - 12 th Std. / Diploma	37	10.7
Graduate / Postgraduate	20	5.8
Total	345	100

Graph 5: Distribution of study participants according to their Educational Status (%)

In the present study, out of 345 study participants, 266 (77.1%) were literates. Among them, most of the participants 136 (39.4%) had studied up to 6th - 10th standard, followed by 73 (21.2%) up to 1st - 5th standard. About 37 (10.7%) participants studied up to 11th - 12th Std./Diploma and 20 (5.8%) were Graduate/ Post-Graduates. Remaining 79 (22.9%) participants were illiterate.

Table 6: Distribution of study participants according to Occupation

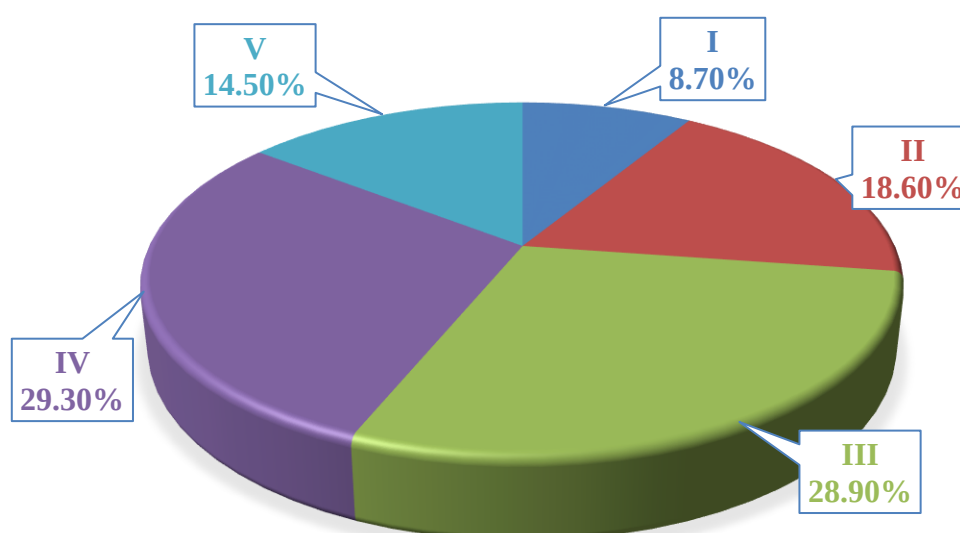
Occupation	Total No. of Postmenopausal Women N (%)	
	No.	%
Homemaker	232	67.2
Government Employee	26	7.5
Private Employee	20	5.8
Self Employed	28	8.1
Farmer / Labourer	39	11.3
Total	345	100

Graph 6: Distribution of study participants according to Occupation (%)

In the present study, majority of the participants 232 (67.2%) were homemakers. 39 (11.3%) women worked as farmer/labourer followed by 28 (8.1%) who were self-employed. Government Employed and Private Employed were 26 (7.5%) and 20 (5.8%) respectively.

Table 7: Distribution of study participants according to Socio Economic Status

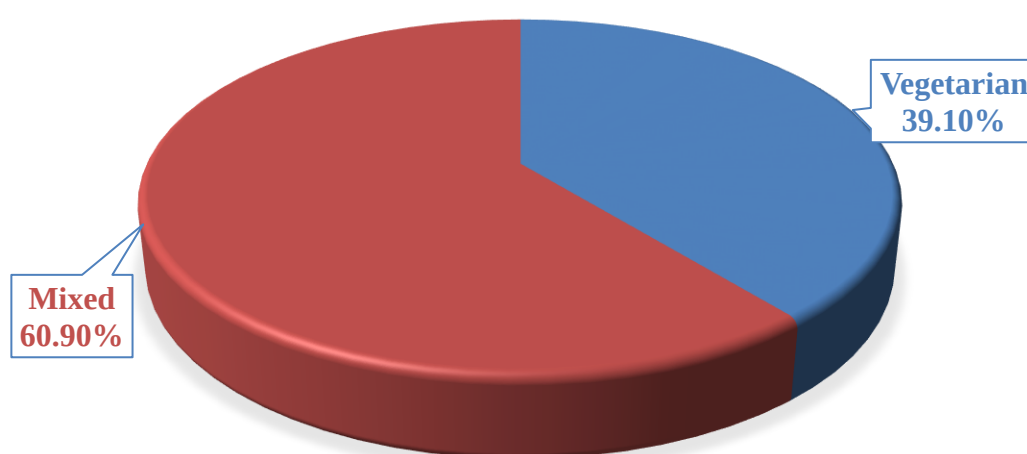
Socio-economic Class (Modified B.G. Prasad's Classification)	Total No. of Postmenopausal Women N (%)	
	No.	%
I	30	8.7
II	64	18.6
III	100	28.9
IV	101	29.3
V	50	14.5
Total	345	100

Graph 7: Distribution of study participants according to SES (%)

Out of 345 study participants, 101 (29.3%) belonged to SES class IV, 100 (28.9%) belonged to SES class III, 50 (14.5%) belonged to SES class V and 30 (8.7%) belonged to SES class I socio-economic status as per the Modified B. G. Prasad's Classification.

Table 8: Distribution of study participants according to their Food Habits

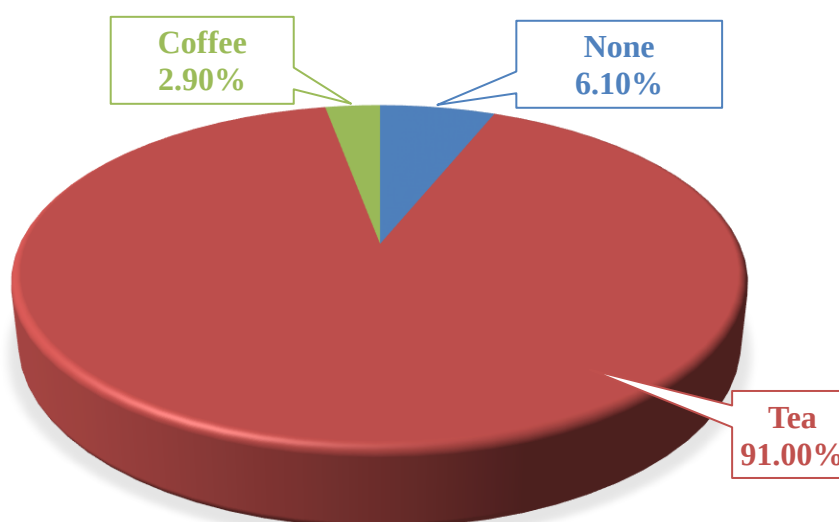
Food Habits	Total No. of Postmenopausal Women N (%)	
	No.	%
Vegetarian	135	39.1
Mixed	210	60.9
Total	345	100

Graph 8: Distribution of study participants according to their Food Habits (%)

Majority of the study participants 210 (60.9%) had mixed food habits, while 135 (39.1%) consumed vegetarian food only.

Table 9: Distribution of study participants according to their Personal Habits

Personal Habits	Total No. of Postmenopausal Women N (%)	
	No.	%
None	21	6.1
Tea	314	91
Coffee	10	2.9
Aerated Drinks	0	0
Total	345	100

Graph 9: Distribution of study participants according to their Personal Habits (%)

Most of the participants 314 (91%) consumed tea 1-8 times a day. Coffee drinkers 10 (2.9%) consumed 2-3 cups per day. None of the participants consumed aerated drinks. 21 (6.1%) did not have any of these habits.

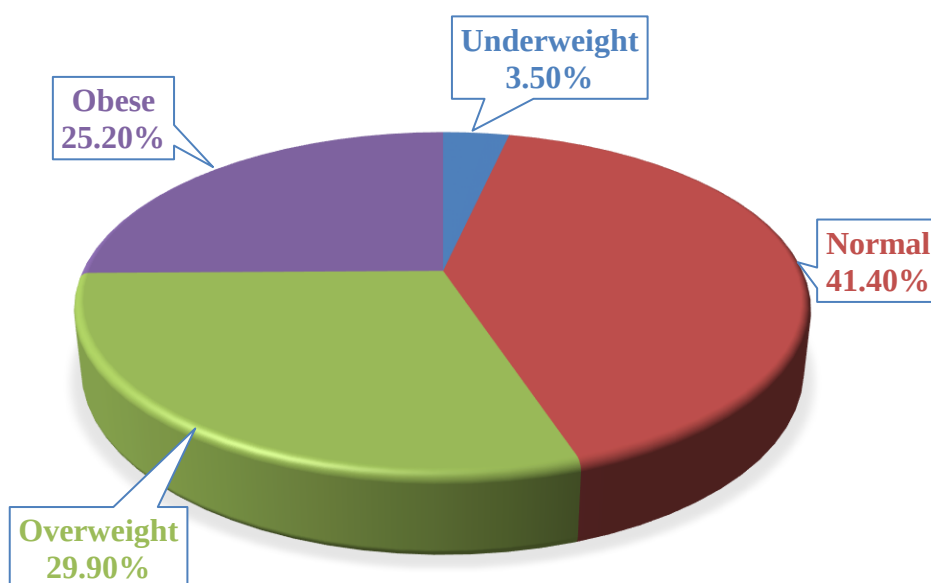
Table 10: Distribution of study participants according to Substance Abuse

Substance Abuse	Total No. of Postmenopausal Women N (%)	
	No.	%
None	280	81.2
Smoking	0	0
Alcohol	0	0
Tobacco Chewer	65	18.8
Total	345	100

Most of the participants 280 (81.2%) had no history of substance abuse in past or present. Only 65 (18.8%) women were tobacco chewers ever who consumed it 1-5 times a day. None of the participants was habituated to smoking or alcohol.

Table 11: Distribution of study participants according to Body Mass Index

Body Mass Index	Total No. of Postmenopausal Women N (%)	
	No.	%
Underweight	12	3.5
Normal	143	41.4
Overweight	103	29.9
Obese	87	25.2
Total	345	100

Graph 10: Distribution of study participants according to BMI (%)

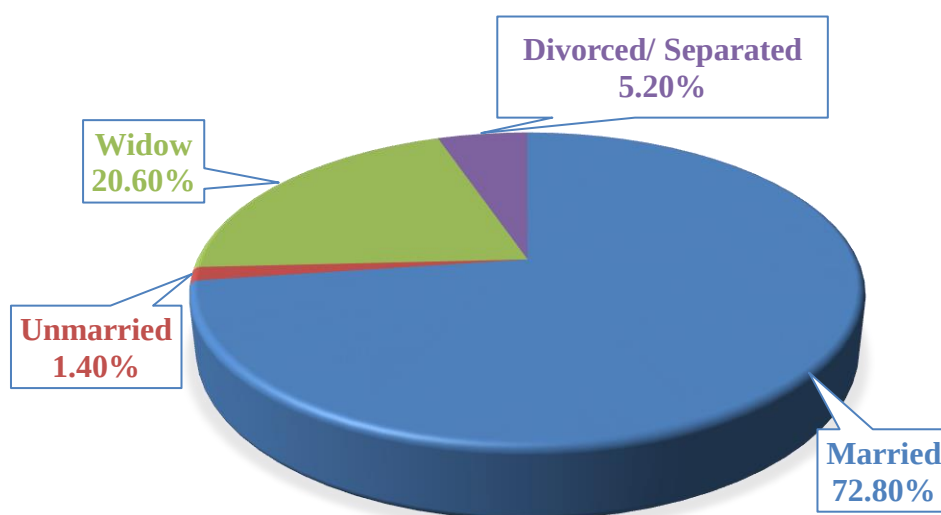
Among the 345 study participants classified as per Asian Standards of BMI, 143 (41.4%) had normal BMI. 103 (29.9%) women were overweight followed by 87 (25.2%) obese. Only 12 (3.5%) were underweight.

II. OBSTETRICS AND GYNAECOLOGY PROFILE OF THE STUDY PARTICIPANTS

Table 12: Distribution of study participants according to Marital Status

Marital Status	Total No. of Postmenopausal Women N (%)	
	No.	%
Married	251	72.8
Unmarried	5	1.4
Widow	71	20.6
Divorced/ Separated	18	5.2
Total	345	100

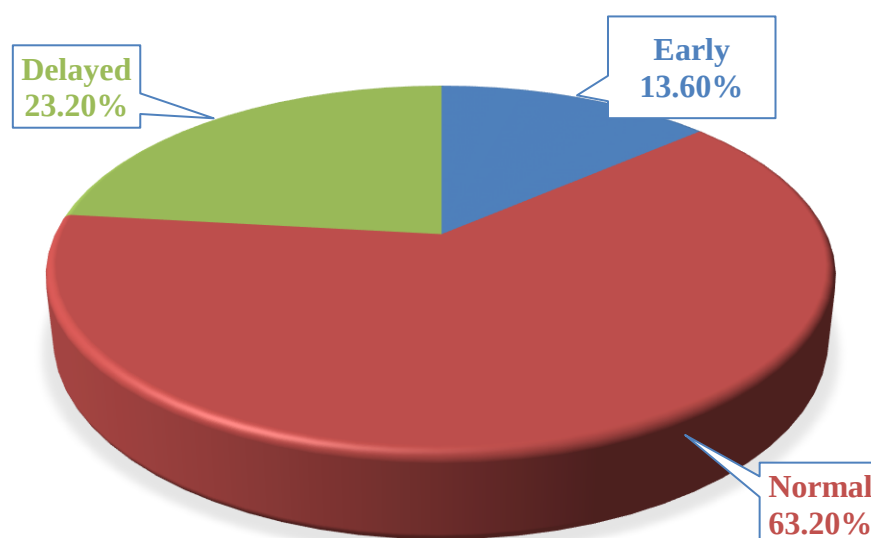
Graph 11: Distribution of study participants according to Marital Status (%)



Majority of the participants 251(72.8%) were married, while 71 (20.6%) were widows. 12 (3.5%) women were divorced/separated from their partners. Only 5 (1.4%) participants were unmarried.

Table 13: Distribution of study participants according to Age at Menarche

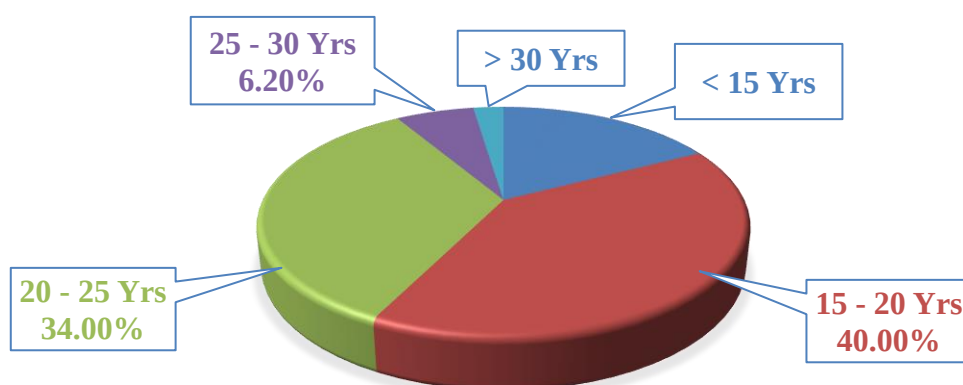
Age at Menarche	Total No. of Postmenopausal Women N (%)	
	No.	%
Early	47	13.6
Normal	218	63.2
Delayed	80	23.2
Total	345	100

Graph 12: Distribution of study participants according to Age of Menarche (%)

Among 345 participants, 218 (63.2%) reported normal age at menarche. 80 (23.2%) had history of delayed menarche, while 47 (13.6%) had early menarche.

Table 14: Distribution of study participants according to Age at Marriage

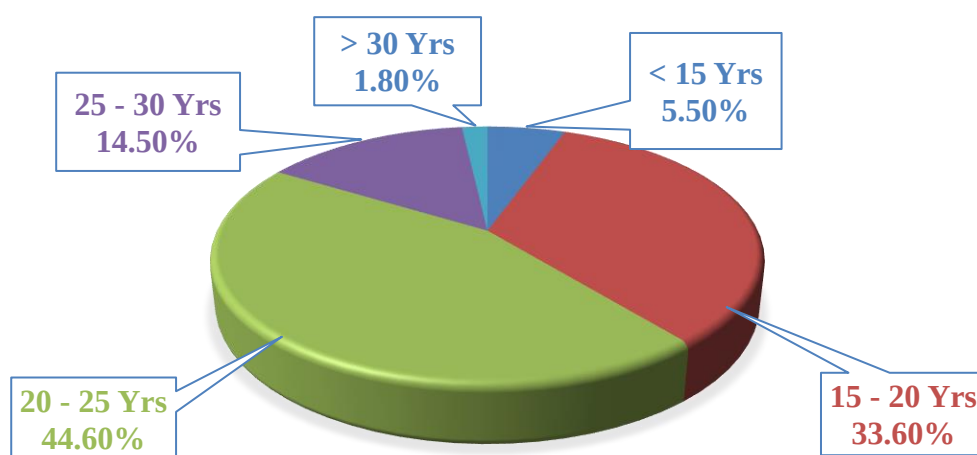
Age at Marriage (years)	Total No. of Postmenopausal Women N (%)	
	No.	%
< 15	59	17.4
15 – 20	136	40
20 - 25	116	34
25 – 30	21	6.2
> 30	8	2.4
Total	340	100

Graph 13: Distribution of study participants according to Age of Marriage (%)

In the present study, majority 340 (98.5%) were ever married. Out of 340 such participants, 136 (40%) were married in age group of 15-20 years followed by 116 (34%) who married in age group of 20-25 years. 59 (17.4%) were married in < 15 years of age, while 21 (6.2%) married in age group of 25-30 years. 8 (2.4%) women got married above the age of 30 years.

Table 15: Distribution of study participants according to Age at First Pregnancy

Age at First Pregnancy (years)	Total No. of Postmenopausal Women N (%)	
	No.	%
< 15	18	5.5
15 - 20	111	33.6
20 – 25	147	44.6
25 - 30	48	14.5
> 30	6	1.8
Total	330	100

Graph 14: Distribution of Study participants according to Age at First Pregnancy (%)

Among 330 study participants who ever got pregnant, 147 (44.6%) had first pregnancy in the age group of 20-24 years, followed by 111 (33.6%) in the age group of 15-19 years and 48 (14.5%) in age group 25 – 29 years. 18 (5.5%) had first pregnancy in < 15 years of age, while 6 (1.8%) had in > 30 years.

Table 16: Distribution of study participants according to Parity

Parity	Total No. of Postmenopausal Women N (%)	
	No.	%
None	15	4.3
1	18	5.2
2	85	24.6
3	80	23.2
4	72	20.9
5	37	10.7
6	24	7.0
7	10	2.9
8	4	1.2
Total	345	100

Among 345 participants, majority 237 (68.7%) had a parity of 2-4. About 15 (4.3%) of the participants did not have children. Overall median parity was 3 i.e. 3 children per woman.

Table 17: Distribution of study participants according to Living Children

Living children	Total No. of Postmenopausal Women N (%)	
	No.	%
None	8	2.4
1	30	9.2
2	105	31.8
3	73	22.1
4	72	21.8
5	27	8.2
6	11	3.3
8	4	1.2
Total	330	100

Out of 330 participants who were ever pregnant, majority 250 (72.5%) had 2-4 living children. About 8 (4.3%) of the participants had no child alive. Overall median was 3 living children per woman.

Table 18: Distribution of study participants according to History of Abortions

Abortions	Total No. of Postmenopausal Women N (%)	
	No.	%
None	264	76.5
1	59	17.1
≥ 2	22	6.4
Total	345	100

In the current study, majority 264 (76.5%) of the women did not have history of previous abortions. 59 (17.1%) women had single abortion, while 22 (6.4%) women had two or more abortions.

Table 19: Distribution of study participants according to History of Child Deaths

Child Deaths	Total No. of Postmenopausal Women N (%)	
	No.	%
None	312	90.4
1	27	7.8
≥ 2	6	1.8
Total	345	100

As per the present study, majority 312 (90.4%) of the women did not have history of death of their children. 27 (7.8%) and 6 (1.8%) women reported one dead child and 6 (1.8%) had two or more child deaths.

Table 20: Distribution of study participants according to History of Stillbirth

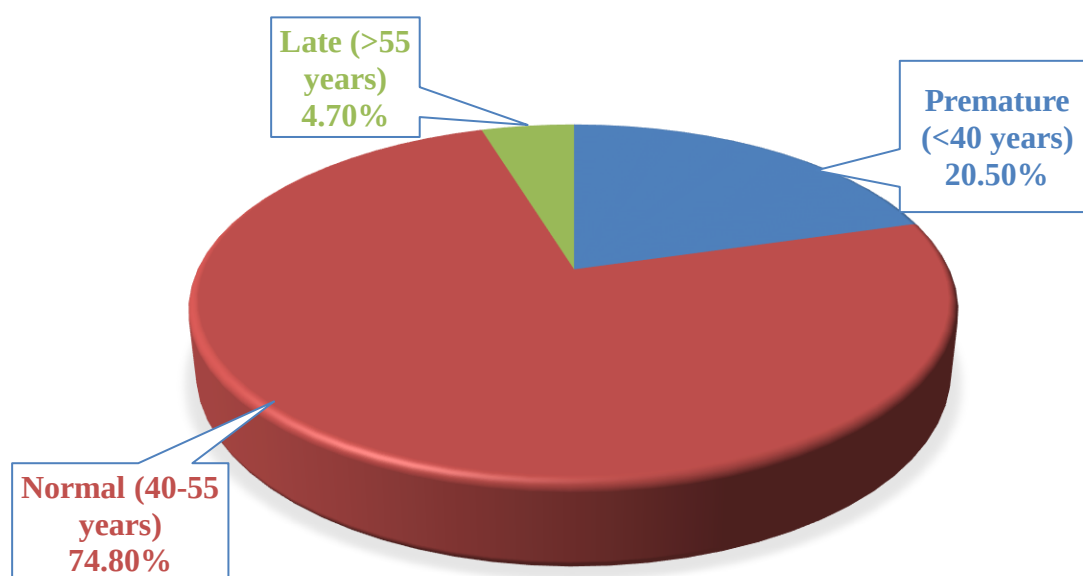
Stillbirth	Total No. of Postmenopausal Women. N (%)	
	No.	%
None	341	98.8
≥1	4	1.2
Total	345	100

In the present study, majority 341 (98.8%) of the women did not have history of stillbirth. Only 4 (1.2%) reported of previous stillbirth.

**Table 21: Distribution of study participants according to their
Mother's Age at Menopause**

Mother's Age at Menopause (as reported by the study subject)	Total No. of Postmenopausal Women N (%)	
	No.	%
Premature (<40 years)	26	20.5
Normal (40-55 years)	95	74.8
Late (>55 years)	6	4.7
Total	127	100

**Graph 15: Distribution of study participants according to their
Mother's Age at Menopause (%)**

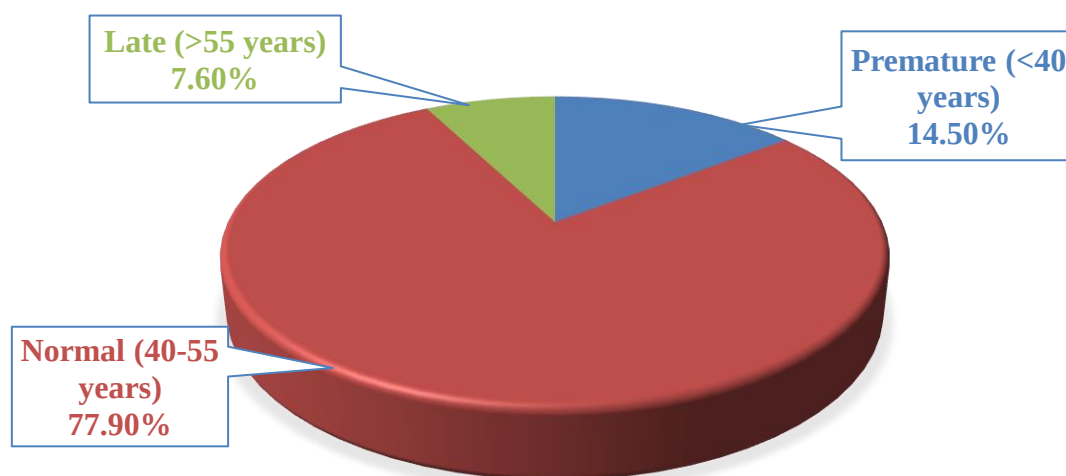


Only 127 (36.8%) participants out of 345 knew about the age at menopause of their mother. Mothers of 95 (74.8%) had normal menopause, 26 (20.5%) had premature menopause, while 6 (4.7%) had delayed menopause. The mean of age at menopause of mother (as reported by the study subjects) was 45.01 ± 4.26 years.

Table 22: Distribution of study participants according to Age at Menopause of Elder Sister

Age at Menopause of Elder Sister	Total No. of Postmenopausal Women N (%)	
	No.	%
Premature (<40 years)	19	14.5
Normal (40-55 years)	102	77.9
Late (>55 years)	10	7.6
Total	131	100.0

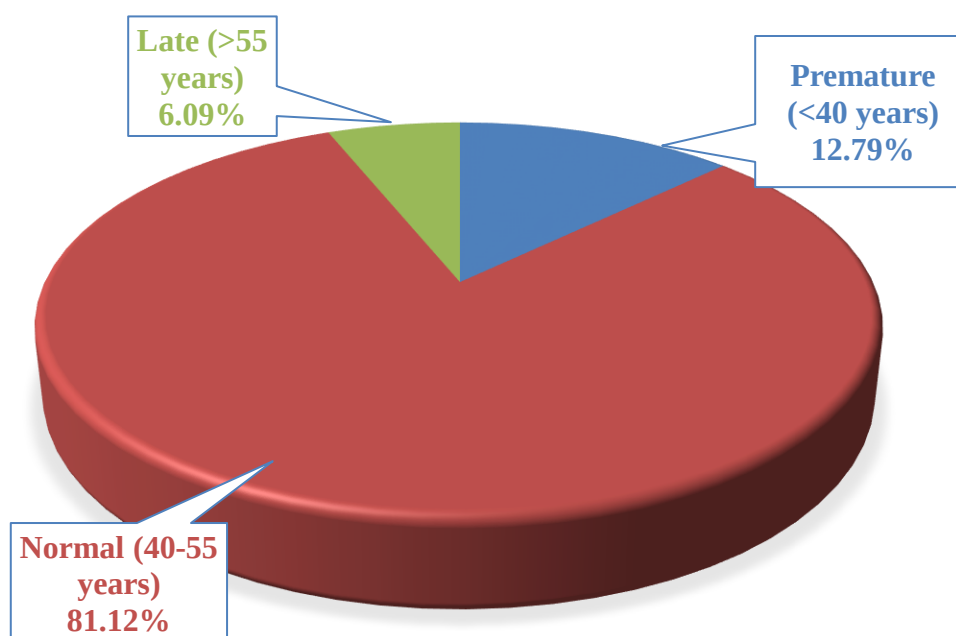
Graph 16: Distribution of study participants according to Age at Menopause of Elder Sister (%)



Only 131 (36.8%) out of 345 participants, knew about the age at menopause of their elder sisters. Classifying as per mean menopausal age of elder sisters 102 (77.9%) of them had normal menopause, 19 (14.5%) had premature menopause, while 10 (7.6%) had delayed menopause. The mean of mean age at menopause of women's elder sisters was 45.36 ± 4.26 years.

Table 23: Distribution of study participants according to their Age at Menopause

Age at Menopause	Total No. of Postmenopausal Women N (%)	
	No.	%
Premature (<40 years)	44	12.8
Normal (40-55 years)	280	81.2
Late (>55 years)	21	6.1
Total	345	100

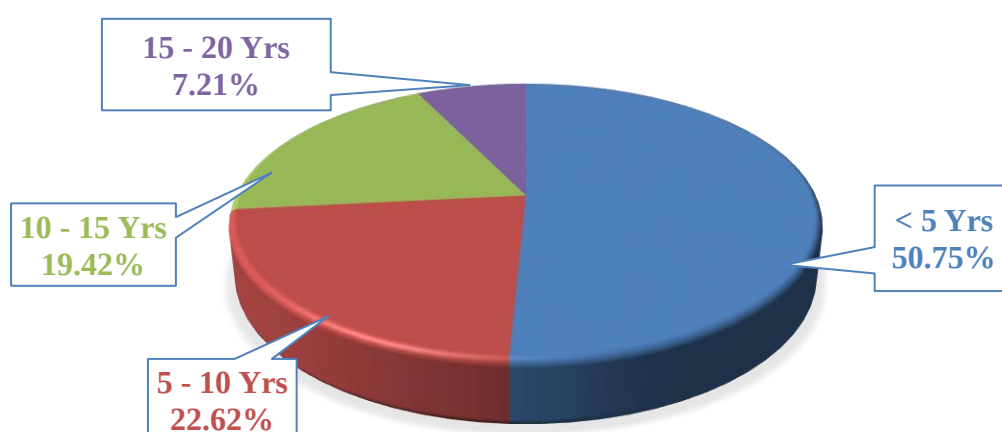
Graph 17: Distribution of study participants according to their Age at Menopause (%)

Among 345 study participants, 280 (81.2%) had normal menopause, 44 (12.8%) had premature menopause, while 21 (6.1%) had delayed menopause. The mean age at menopause among study participants was 45.53 ± 4.34 years.

Table 24: Distribution of study participants according to the Duration since Menopause

Duration since Menopause (Years)	Total No. of Postmenopausal Women N (%)	
	No.	%
< 5	175	50.7
5 – 10	78	22.6
10 – 15	67	19.4
15 - 20	25	7.2
Total	345	100

Graph 18: Distribution of study participants according to the Duration since Menopause (%)

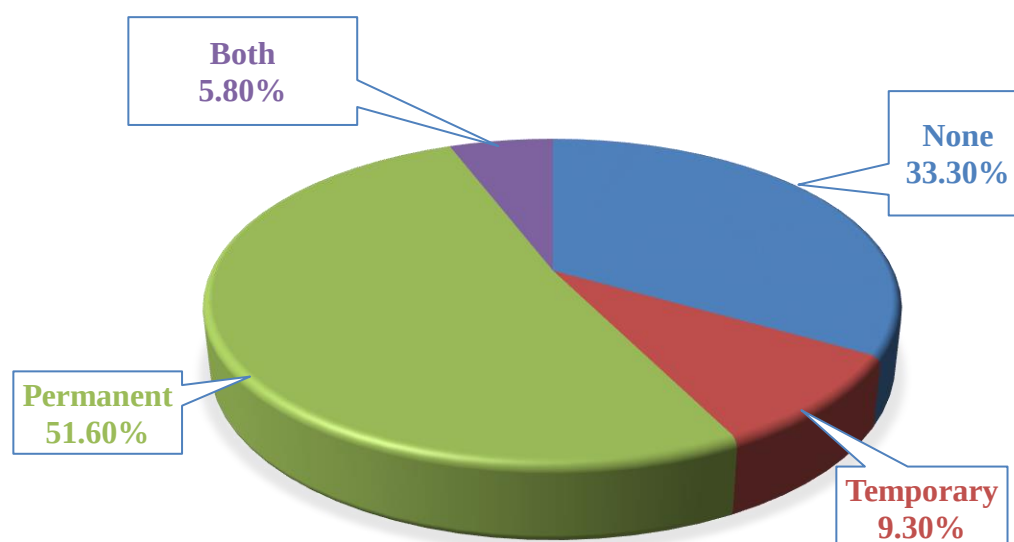


In the present study, majority 175 (50.7%) of the participants had duration of <5 years since final menstrual period, followed by 78 (22.6%) with a duration of 5-10 years. 67 (19.4%) women had 10-15 years duration since FMP, while only 25 (7.2) had of 15-20 years. Mean duration since menopause among study participants was 6.51 ± 5.06 years.

Table 25: Distribution of study participants according to History of Method of Contraception

Contraception Use (past)	Total No. of Postmenopausal Women N (%)	
	No.	%
None	115	33.3
Temporary	32	9.3
Permanent	178	51.6
Both	20	5.8
Total	345	100

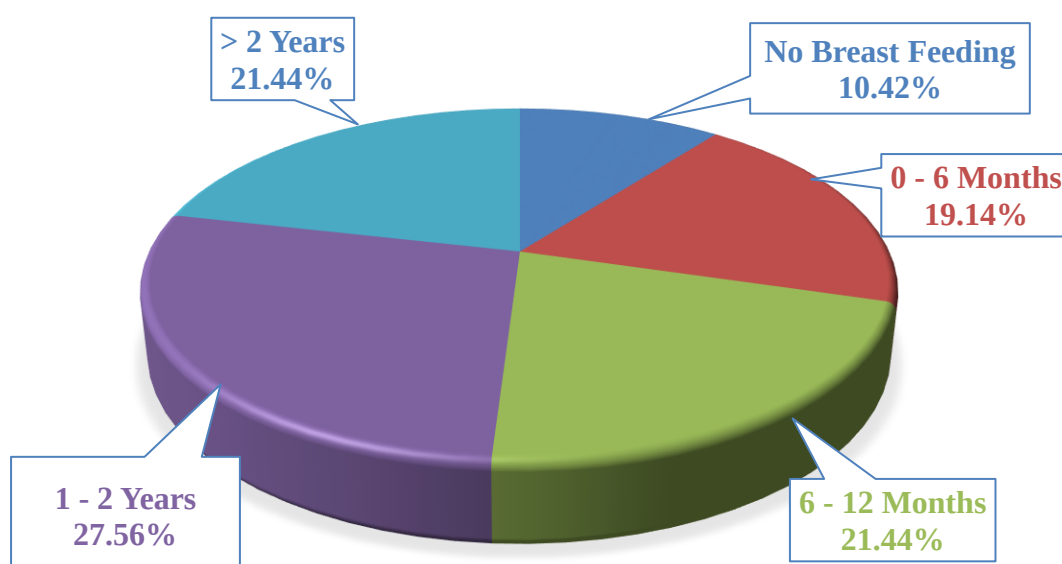
Graph 19: Distribution of study participants according to History of Method of Contraception (%)



Among 345 study participants 115 (33.3%) women never used any contraception. 178 (51.6%) had used permanent method only, while 32 (9.3%) used temporary method only. Few participants 20 (5.8%) had used both methods.

Table 26: Distribution of study participants according to History of Breast Feeding

Breast Feeding	Total No. of Postmenopausal Women N (%)	
	No.	%
No Breast Feeding	36	10.4
0 - 6 Months	66	19.1
6 - 12 Months	74	21.4
1 - 2 Years	95	27.5
> 2 Years	74	21.4
Total	345	100

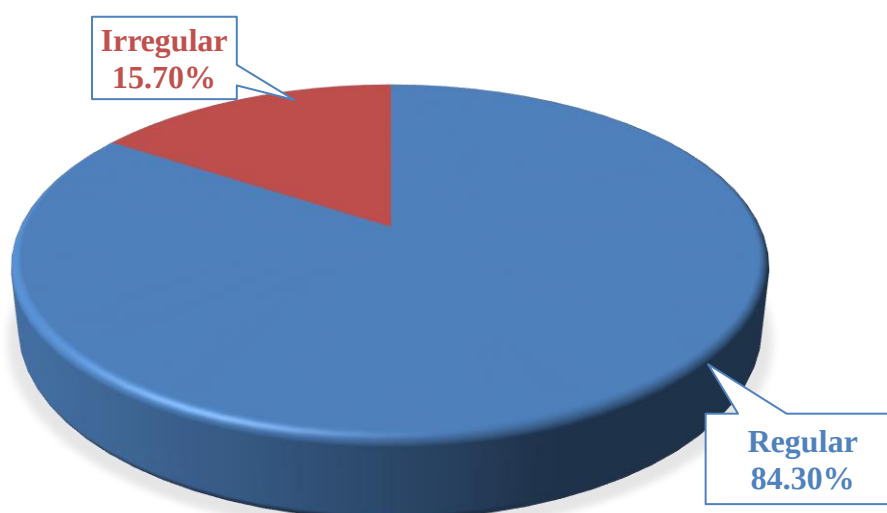
Graph 20: Distribution of study participants according to History of Breast Feeding (%)

Out of 345 study participants, only 309 (89.6%) had ever breast fed. 95 (27.5%) did breastfeeding for 1-2 years, followed by 74 (21.4%) each for 6-12 months and >2 years. Only 66 (19.1%) participants breastfed for less than less than 6 months.

Table 27: Distribution of study participants according to History of Regularity of Past Menstrual Cycles

Regularity (past menstrual cycles)	Total No. of Postmenopausal Women N (%)	
	No.	%
Regular	291	84.3
Irregular	54	15.7
Total	345	100

Graph 21: Distribution of study participants according to History of Regularity of Past Menstrual Cycles (%)

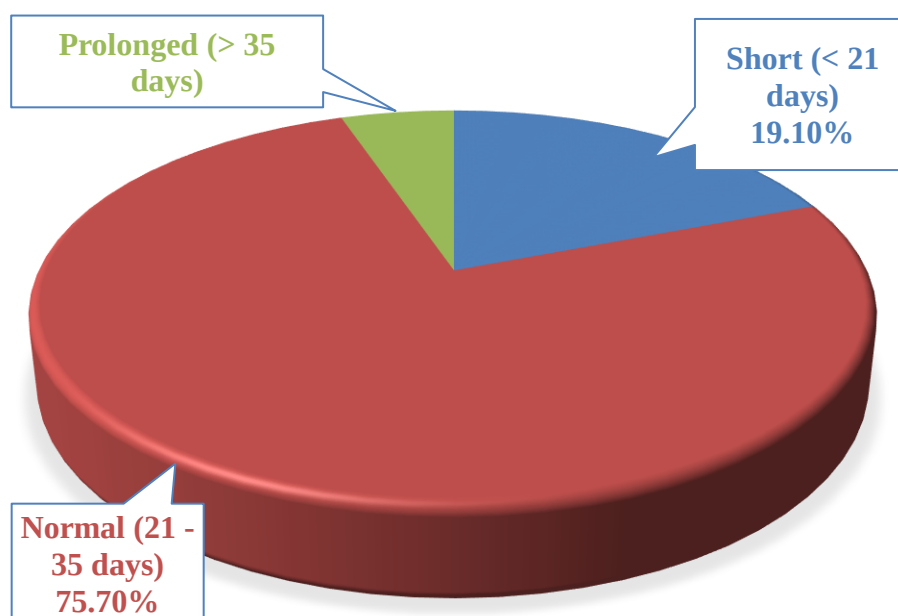


Among 345 study participants, 291 (84.3%) women had regular menstrual cycles, while 54 (15.7%) had irregular menstrual cycle in their past

Table 28: Distribution of study participants according to History of Length of Past Menstrual Cycles

Length of Menstrual Cycles (past menstrual cycles)	Total No. of Postmenopausal Women N (%)	
	No.	%
Short (< 21 days)	66	19.1
Normal (21 - 35 days)	261	75.7
Prolonged (> 35 days)	18	5.2
Total	345	100

Graph 22: Distribution of study participants according to History of Length of Past Menstrual Cycles (%)



Out of 345 study participants, majority 261 (75.7%) women had normal menstrual cycle of 21 - 35 days. 66 (19.1%) had shorter menstrual cycles, while 18 (5.2%) had prolonged cycles during past menstrual cycles.

Table 29: Distribution of study participants according to History of Duration of Bleeding During Past Menstrual Cycles

Duration of Bleeding (past menstrual cycles)	Total No. of Postmenopausal Women N (%)	
	No.	%
Normal (< 7 days)	308	89.3
Prolonged (≥ 7 Days)	37	10.7
Total	345	100

In the present study, majority 308 (89.3%) had normal bleeding duration of < 7 days, while 37 (10.7%) had prolonged bleeding duration of ≥ 7 days in their past menstrual cycles.

Table 30: Distribution of study participants according to History of Vaginal Discharge During Past Menstrual Cycles

Vaginal Discharge (past menstrual cycles)	Total No. of Postmenopausal Women N (%)	
	No.	%
Scanty	71	20.6
Normal	222	64.3
Profuse	52	15.1
Total	345	100

Among 345 study participants, 222 (64.3%) had normal menstrual discharge. 71 (20.6%) had profuse bleeding, while 52 (15.1%) had scanty bleeding in their past menstrual cycles.

Table 31: Distribution of study participants according to History of Lower Abdominal Pain During Past Menstrual Cycles

Lower Abdominal Pain (past menstrual cycles)	Total No. of Postmenopausal Women N (%)	
	No.	%
Normal	274	79.4
Abnormal	71	20.6
Total	345	100

In the present study, majority 274 (79.4%) reported normal lower abdominal pain, while 71 (20.6%) women had abnormal lower abdominal pain in their past menstrual cycles.

III. MENOPAUSAL SYMPTOMS AMONG STUDY PARTICIPANTS AS PER MENQOL QUESTIONNAIRE

**Table 32: Frequency of Self-Reported Menopausal Symptoms
among Study Participants (N=345)**

Menopausal Symptoms (Self-Reported)	No.	%
Vasomotor		
• Hot Flushes	191	55.4
• Night Sweats	199	57.2
• Sweating	219	63.5
Psychosocial		
• Dissatisfaction with Personal Life	209	60.6
• Feeling Anxious or Nervous	170	49.3
• Poor Memory	189	54.8
• Accomplishing Less Than Used To	193	55.9
• Feeling Depressed, Down or Blue	217	63.9
• Being Impatient with Other People	213	61.7
• Feelings of Wanting to Be Alone	205	59.4

Menopausal Symptoms	No.	%
Physical		
• Flatulence (Wind) Or Gas Pains	171	49.6
• Aching in Muscles and Joints	251	72.8
• Feeling Tired or Worn Out	261	75.7
• Difficulty Sleeping	188	54.5
• Aches in Back of Neck or Head	164	47.5
• Decrease in Physical Strength	206	39.7
• Decrease in Stamina	228	65.8
• Lack of Energy	197	57.1
• Dry Skin	118	34.2
• Weight Gain	136	39.4
• Increased Facial Hair	88	25.5
• Changes in Appearance, Texture or Tone of Skin	133	38.6
• Feeling Bloating	184	53.3
• Low Backache	221	64.1
• Frequent Urination	133	38.6
• Involuntary Urination when Laughing or Coughing	137	39.7
Sexual		
• Decrease in Sexual Desire	125	36.2
• Vaginal Dryness	146	42.3
• Avoiding Intimacy	143	41.4

In the present study, among 345 participants, the most common symptoms were of physical domain - 'Feeling Tired or Worn Out' 261 (75.7%) followed by 'Aching in Muscles and Joints' 251 (72.8%), 'Decrease in Stamina' 228 (65.8%), 'Low Backache' 221 (64.1%) followed by Psychosocial domain – 'Feeling Depressed, Down or Blue' 217 (63.9%) to Vasomotor Domain - 'Sweating' 219 (63.5%). Least common symptoms were 'Increased Facial Hair' 88 (25.5%) to 'Dry skin' 118 (34.2%), 'Decrease in Sexual Desire' 126 (36.2%) to 'Changes in Appearance, Texture or Tone of Skin' 133 (38.6%).

Domain wise frequency of vasomotor symptoms varied from 219 (63.5%) for 'Sweating' to 191 (55.4%) for 'Hot flushes'. Among psychosocial symptoms most commonly seen were 217 (63.9%) for 'Feeling Depressed, Down or Blue' to 170 (49.3%) for 'Feeling Anxious or Nervous'. In the physical symptoms, maximum frequency is for 'Feeling tired or worn out' 261 (75.7%) and the least frequent symptom was 'Increased facial hairs' 88 (25.5%). Overall Sexual domain had lesser frequency of symptoms ranging from 146 (42.3%) for 'Dryness of vagina' to 125 (36.2%) for 'Decreased sexual desire'.

Table 33: Severity of Menopausal Symptoms among Study Participants

Menopausal Symptoms	No.	Mean± SD
Vasomotor		
• Hot Flushes	191	3.76 ± 2.72
• Night Sweats	199	3.5 ± 2.37
• Sweating	219	3.96 ± 2.58
Psychosocial		
• Dissatisfaction with Personal Life	209	3.57 ± 2.19
• Feeling Anxious or Nervous	170	3.14 ± 2.29
• Poor Memory	189	3.22 ± 2.15
• Accomplishing Less Than Used To	193	3.39 ± 2.26
• Feeling Depressed, Down or Blue	217	3.94 ± 2.37
• Being Impatient with Other People	213	3.85 ± 2.36
• Feelings of Wanting to Be Alone	205	3.74 ± 2.39

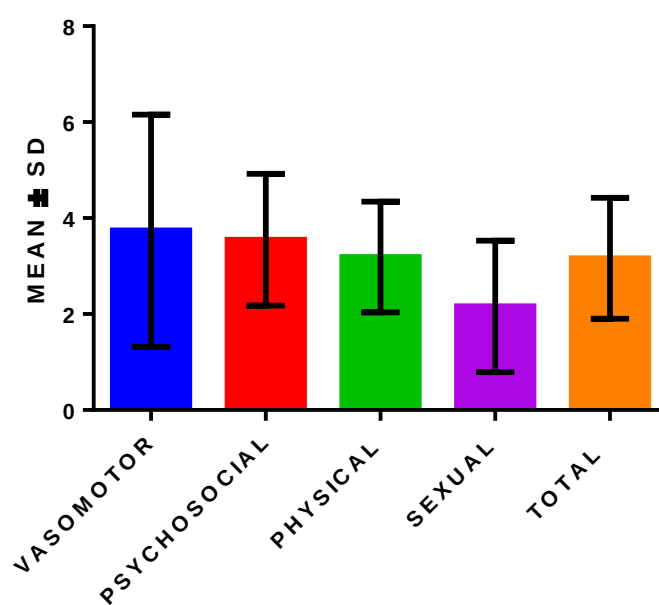
Menopausal Symptoms	No.	Mean $\pm$ SD
Physical		
• Flatulence (Wind) Or Gas Pains	171	2.91 $\pm$ 2.07
• Aching in Muscles and Joints	251	4.23 $\pm$ 2.14
• Feeling Tired or Worn Out	261	4.37 $\pm$ 2.14
• Difficulty Sleeping	188	3.38 $\pm$ 2.4
• Aches in Back of Neck or Head	164	3.15 $\pm$ 2.38
• Decrease in Physical Strength	206	3.76 $\pm$ 2.38
• Decrease in Stamina	228	3.97 $\pm$ 2.32
• Lack of Energy	197	3.62 $\pm$ 2.42
• Dry Skin	118	2.47 $\pm$ 2.17
• Weight Gain	136	2.41 $\pm$ 1.88
• Increased Facial Hair	88	1.89 $\pm$ 1.65
• Changes in Appearance, Texture or Tone of Skin	133	2.48 $\pm$ 1.98
• Feeling Bloating	184	3.04 $\pm$ 2.11
• Low Backache	221	4.02 $\pm$ 2.41
• Frequent Urination	133	2.66 $\pm$ 2.18
• Involuntary Urination When Laughing or Coughing	137	2.69 $\pm$ 2.23
Sexual		
• Decrease in Sexual Desire	125	2.12 $\pm$ 1.57
• Vaginal Dryness	146	2.24 $\pm$ 1.65
• Avoiding Intimacy	143	2.13 $\pm$ 1.52

In the present study, overall the severity of symptoms ranged highest for 'Feeling Tired or Worn Out' (4.37 ± 2.14) followed by 'Aching in Muscles and Joints' (4.23 ± 2.14) and 'Low Backache' (4.02 ± 2.41). Least severe symptoms were 'Increased Facial Hair' (1.89 ± 1.65), 'Decrease in Sexual Desire' (2.12 ± 1.57) and 'Avoiding Intimacy' (2.13 ± 1.52).

Domain wise the severity of vasomotor symptoms varied from 3.96 ± 2.58 for 'Sweating' to 3.50 ± 2.37 for 'Night sweats'. Among psychosocial symptoms the severity ranged from 3.94 ± 2.37 for 'Feeling Depressed' to 3.14 ± 2.28 for 'Feeling Anxious or Nervous'. In the physical symptoms, maximum severity 4.36 ± 2.14 was for 'Feeling Tired or Worn Out', while the minimum was for 1.89 ± 1.65 for 'Increased Facial Hair'. Severity of sexual symptoms ranged from 2.24 ± 1.65 for 'Vaginal Dryness' to 2.12 ± 1.57 for 'Decrease in Sexual Desire'.

Table 34: Domain Specific and Total Mean MENQOL Score

Domain	Mean Score $\pm$ SD
Vasomotor	3.74 ± 2.42
Psychosocial	3.55 ± 1.37
Physical	3.19 ± 1.15
Sexual	2.16 ± 1.37
Total	3.16 ± 1.25

Graph 23: Domain Specific and Total MENQOL Scores

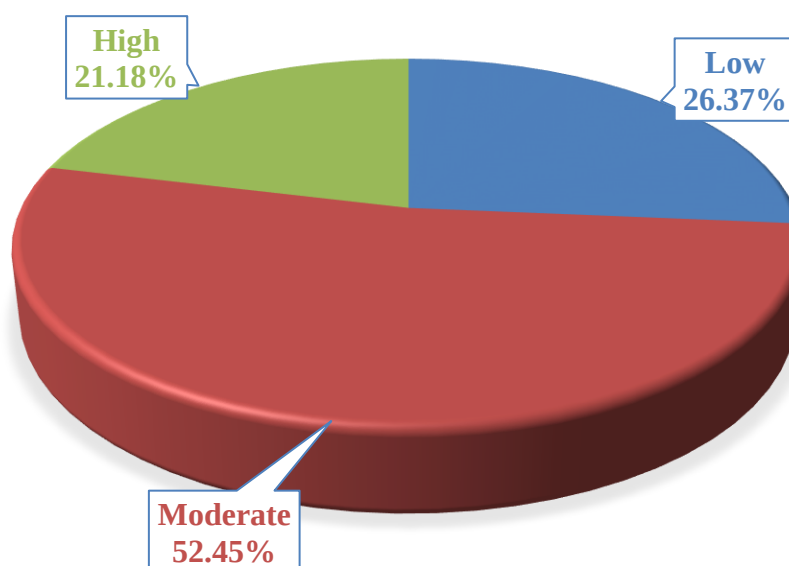
In the present study, domain wise mean score was 3.74 ± 2.42 , 3.55 ± 1.37 , 3.19 ± 1.15 , 2.16 ± 1.37 for Vasomotor, Psychosocial, Physical and Sexual domain. Overall mean MENQOL score was 3.16 ± 1.25 .

IV. PHYSICAL ACTIVITY AMONG STUDY PARTICIPANTS AS PER IPAQ

Table 35: Distribution of study participants as per IPAQ Physical Activity Levels

Physical Activity	Total No. of Postmenopausal Women N (%)	
	No.	%
Low	91	26.4
Moderate	181	52.5
High	73	21.2
Total	345	100

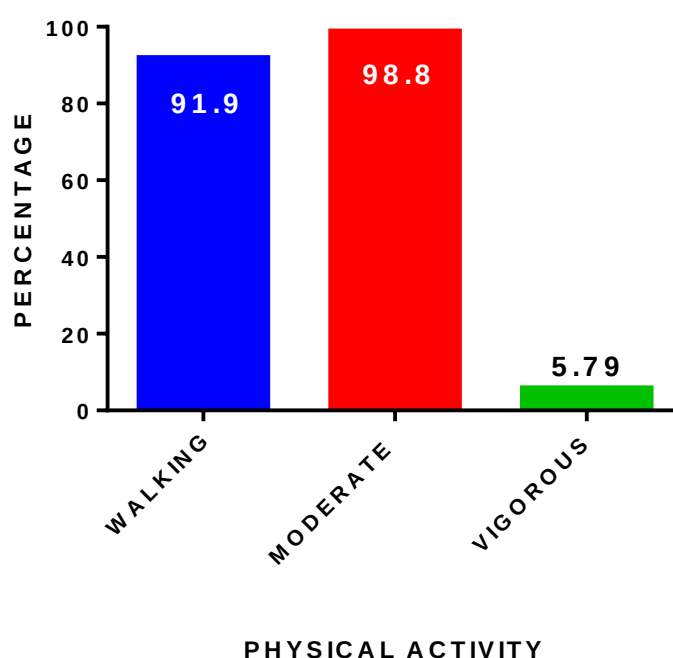
Graph 24: Distribution of study participants as per IPAQ Physical Activity Levels (%)



In the present study among 345 participants, majority 181 (52.5%) had moderate activity level followed by 91 (26.4%) for low activity level and 73 (21.2%) for high activity level.

Table 36: Distribution of Study Participants as per Types of Physical Activity

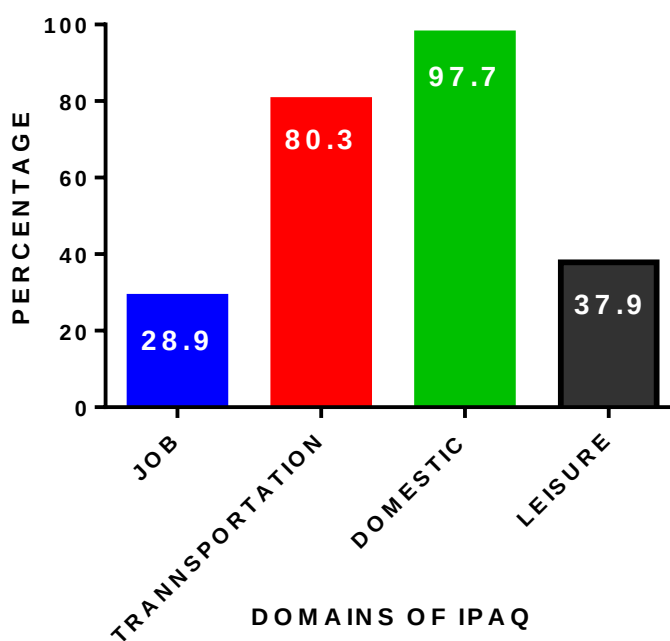
Types of Physical Activity	Total No. of Postmenopausal Women N (%)	
	* Not Mutually Exclusive	
	No.	%
Walking*	317	91.9
Moderate*	341	98.8
Vigorous*	20	5.79

Graph 25: Distribution of Study Participants as per Type of Physical Activity (%)

Among 345 participants, 341 (98.8%) did moderate type of activity and 317 (91.9%) did walking. Only 20 (5.79%) participated in vigorous type of activity. Type of activities are not mutually exclusive and participant can have more than one activity.

Table 37: Distribution of study participants as per Domains of IPAQ

IPAQ Domains	Total No. of Postmenopausal Women N (%)	
	No.	%
Job Related	100	28.9
Transportation	277	80.3
Domestic	337	97.7
Leisure	131	37.9

Graph 26: Distribution of Study Participants as per Domains of IPAQ (%)

Out of 345 participants, 337 (97.7%) did activity in domestic domain and 277 (80.3%) in Transportation domain. 131 (5.79%) participated in leisure domain, while only 100 (28.9%) had activity in job related domain. Participants generally have activities in more than one type of domain.

V. DETERMINANTS OF AGE AT MENOPAUSE

Table 38: Association of Sociodemographic Variables (Religion, Category, Family Type) with Menopausal Age of Study Participants

Sociodemographic Variables		Mean $\pm$ SD Age at Menopause	p value
Religion	Hindu	46.19 $\pm$ 4.43	0.002
	Muslim	44.54 $\pm$ 4.10	
	Others	46.5 $\pm$ 2.74	
Category	SC	48.5 $\pm$ 5.85	0.002
	ST	44.12 $\pm$ 1.2	
	OBC	45.19 $\pm$ 3.62	
	General	46.33 $\pm$ 4.36	
Family Type	Nuclear	45.42 $\pm$ 3.73	<0 .001
	Joint	46.29 $\pm$ 5.03	
	Broken	42.33 $\pm$ 5.44	

Age at menopause was highest for participants of other religion at 46.50 $\pm$ 2.74 years followed by Hindus 46.19 $\pm$ 4.43 years and least for Muslims 44.540 $\pm$ 4.10 years (p=0.002).

Among the 200 Hindu study participants, age at menopause ranged from 48.50 $\pm$ 5.85 years for Schedule Castes followed by 46.33 $\pm$ 4.37 years for general category and 45.19 $\pm$ 3.62 years for OBCs and least 44.13 $\pm$ 1.20 for Schedule Tribes. (p =0.002)

In the present study, women belonging to joint family had higher ANM 46.29 ± 5.04 years followed by 45.43 ± 3.74 years for nuclear family members and least 42.33 ± 5.45 years for ones with broken families. ($p < 0.001$)

Table 39: Association of Sociodemographic Variables (Education, Occupation, Socio-economic Status) with Menopausal Age of Study Participants

Sociodemographic Variables		Age at Menopause Mean $\pm$ SD	p value
Education	Illiterate	47.34 ± 5.19	<0 .001
	1 st - 5 th Standard	44.51 ± 4.04	
	6 th – 10 th Standard	44.97 ± 4.01	
	11 th – 12 th Standard / Diploma	45.16 ± 3.91	
	Graduate / Postgraduate	46.60 ± 2.06	
Occupation	Homemaker	45.7 ± 4.49	0.757
	Govt. Employed	45.69 ± 3.23	
	Private Employed	45.4 ± 5.37	
	Self Employed	45 ± 4.55	
	Farmer / Labourer	44.82 ± 3.32	
SES	Class I	47.7 ± 4.32	0.031
	Class II	45.45 ± 3.79	
	Class III	45.43 ± 4.16	
	Class IV	44.86 ± 4.23	
	Class V	44.80 ± 5.21	

Among 345 study participants, age of menopause was significantly associated ($p < 0.001$) with higher age at higher education level among literates. Age at Menopause was 44.51 ± 4.03 years for 1st - 5th Standard and 46.60 ± 2.062 years for Graduates / Postgraduates. Illiterates, however had highest ANM at 47.34 ± 5.19 years.

No significant variation in mean age at menopause was found among women belonging to different occupational categories. As per this study, association of socio-economic status with menopausal age was significantly observed with highest ANM 47.7 ± 4.32 years for Class I to 44.80 ± 5.21 years for Class V. ($p=0.031$).

Table 40: Association of Sociodemographic Variables (Food Habits, Personal Habits, Substance Abuse) with Menopausal Age of Study Participants

Sociodemographic Variables		Age at Menopause Mean $\pm$ SD	p value
Food Habits	Vegetarian	47.04 $\pm$ 4.58	<0 .001
	Mixed	44.56 $\pm$ 3.89	
Personal Habits	None	46.86 $\pm$ 3.57	<0 .001
	Tea	45.22 $\pm$ 4.22	
	Coffee	52.40 $\pm$ 3.81	
Substance Abuse	None	45.70 $\pm$ 4.59	0.141
	Tobacco Chewer	44.82 $\pm$ 2.98	
BMI (Asian Standards)	Underweight	43.66 $\pm$ 3.39	0.097
	Normal	44.65 $\pm$ 4.13	
	Overweight	44.98 $\pm$ 3.45	
	Obese	46.24 $\pm$ 5.5	

Vegetarian participants had higher ANM at 47.04 $\pm$ 4.58 years, while participants consuming mixed food had menopausal age of 44.56 $\pm$ 3.89 years ($p < 0.001$).

Participants habitual to taking tea had lesser ANM at 45.22 $\pm$ 4.22 years, while those taking coffee had higher menopausal age at 52.40 $\pm$ 3.81 years as compared to participants taking none of these with ANM of 46.86 $\pm$ 3.57 years ($p < 0.001$).

Tobacco Chewers had lesser age at menopause 44.82 ± 2.98 years as compared to non-tobacco chewers at 45.67 ± 4.59 years ($p=0.141$). Non-significant trend with increase in ANM with rise in BMI was observed with ANM being for underweight 43.67 ± 3.39 years and highest 46.24 ± 5.50 years for obese participants

Table 41: Association of Obstetrics and Gynecology Variables with Menopausal Age of Study Participants

Obstetrics and Gynecology Variables		Mean $\pm$ SD Age at Menopause	p value
Marital Status	Married	45.75 $\pm$ 4.54	<0 .001
	Unmarried	41.0 $\pm$ 2.74	
	Widow	45.9 $\pm$ 2.66	
	Divorcee/Separated	42.33 $\pm$ 5.44	
Age at Menarche	Early	40.53 $\pm$ 2.64	<0 .001
	Normal	45.84 $\pm$ 3.8	
	Delayed	47.63 $\pm$ 4.34	
Age at Marriage	< 15 Years	46.58 $\pm$ 3.29	<0.001
	15 - 20 Years	44.29 $\pm$ 3.92	
	20 - 25 Years	46.68 $\pm$ 4.69	
	25 - 30 Years	46.29 $\pm$ 5.68	
	> 30 Years	43.0 $\pm$ 1.24	
Age at First Pregnancy	< 15 Years	45.22 $\pm$ 2.46	0.018
	15 - 20 Years	45.03 $\pm$ 4.0	
	20 - 25 Years	46.08 $\pm$ 4.73	
	25 - 30 Years	45.6 5 $\pm$ 4.27	
	> 30 Years	50.67 $\pm$ 1.03	
Duration since Menopause	< 5 Years	46.37 $\pm$ 4.86	<0.001
	5 - 10 Years	45.39 $\pm$ 3.57	
	10 - 15 Years	44.97 $\pm$ 3.4	
	15 - 20 Years	41.6 $\pm$ 2.12	

Marital status had significant association with ANM ($p < 0.001$). Married women (45.75 ± 4.54 years) and widows (45.90 ± 2.66 years) had higher menopausal age, while unmarried and divorced/separated women had lower ANM.

As per this study, age at menarche had a significant association with menopausal age with ANM being 40.53 ± 2.64 years for women with early menarche to 47.63 ± 4.34 years for women with late menarche. ($p < 0.001$)

Study participants with age at marriage < 15 years had ANM of 46.57 ± 3.29 years, while it was 43.00 ± 1.24 among those who married at > 30 Years ($p < 0.001$)

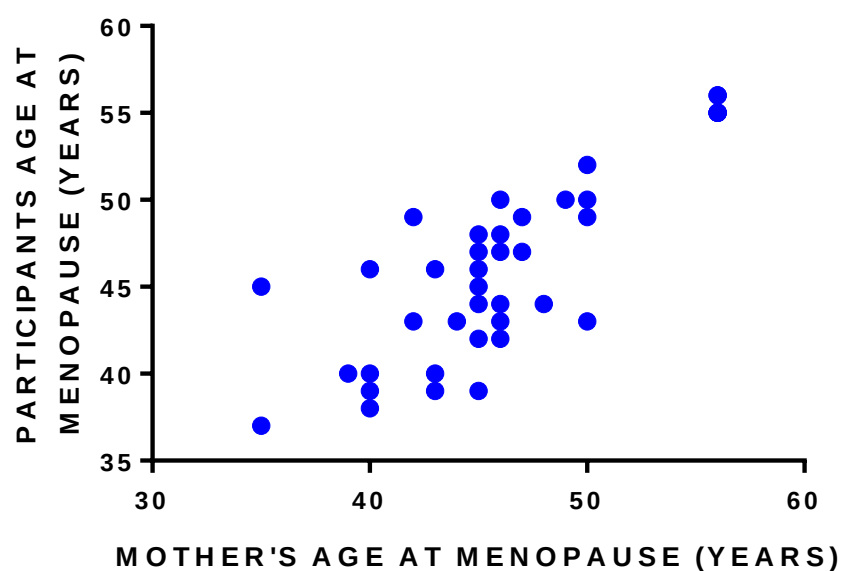
In the current study, study participants with age at first pregnancy < 15 years had lower ANM as compared to those who got pregnant at > 30 Years ($p = 0.018$)

The present study showed a significant association of menopausal age among different groups classified as per duration since menopause. There was a trend of increase in ANM with it being maximum 46.37 ± 4.86 years for < 5 years duration to least 41.6 ± 2.12 years for group with a duration of 15-20 years ($p < 0.001$).

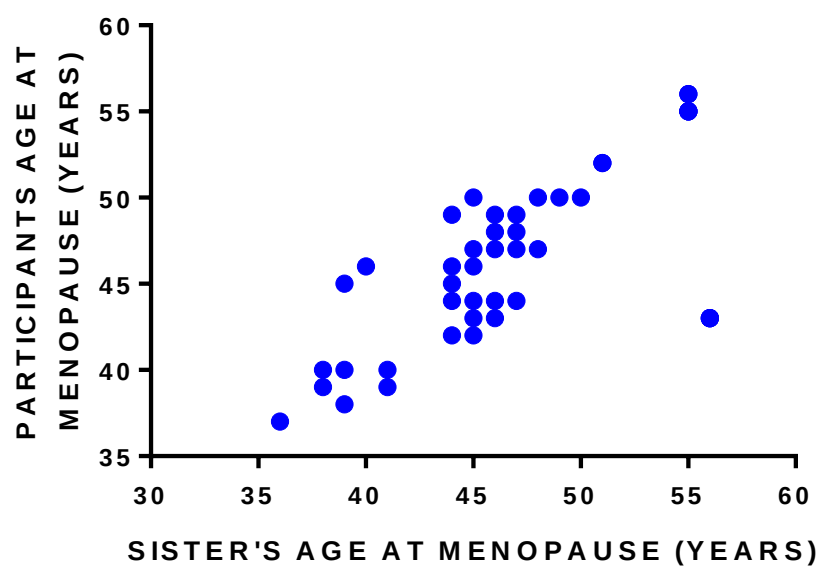
Table 42: Correlation of Mother's & Sister's Age at Menopause with Age at menopause of Study Participant

	Participants age at menopause (Mean $\pm$ SD)	Age at Menopause of Mother/Sister (Mean $\pm$ SD)	p value
Mother's age at Menopause (N=127)	45.01 $\pm$ 4.264	44.91 $\pm$ 4.38	<0.001
Pearson's correlation coefficient (r) 0.751			
Sister's age at Menopause (N=131)	45.36 $\pm$ 4.259	45.02 $\pm$ 4.24	<0.001
Pearson's correlation coefficient (r) 0.750			

Graph 27: Correlation of Participants and Participants Mother's Age at Menopause



Graph 28: Correlation of Participants and Participants Sister's Age at Menopause



Mother's and mean of elder sister's age at menopause significantly correlated with age of menopause of the participant in this study. ($p < 0.001$)

Table 43: Association of Contraception and Breast Feeding with Menopausal Age of Study Participants

Obstetrics and Gynecology Variables		Mean $\pm$ SD Age at Menopause	p value
Contraception	None	45.18 $\pm$ 4.16	<0.001
	Temporary	49.22 $\pm$ 5.03	
	Permanent	45.23 $\pm$ 4.19	
	Both	45.30 $\pm$ 2.597	
Breast Feeding	No Breast Feeding	43.58 $\pm$ 3.18	<0.001
	0 - 6 Months	44.11 $\pm$ 3.89	
	6 - 12 Months	44.72 $\pm$ 3.39	
	1 - 2 Years	47.54 $\pm$ 4.11	
	> 2 Years	45.99 $\pm$ 5.24	

Breast feeding was found to be significantly associated with ANM. Participants who had not breast fed, had lesser ANM of 43.58 $\pm$ 3.18 years, in contrast to highest ANM of 47.54 $\pm$ 4.11 years for women who breast fed 1-2 years. ($p < 0.001$). For women who continued breast feeding >2 years, the ANM was 45.99 $\pm$ 5.24 years.

Contraception was significantly associated with ANM. Participants who had used temporary contraceptive methods had menopausal age of 49.22 $\pm$ 5.03 years, as compared to those using none 45.18 $\pm$ 4.16 years. Women who used permanent methods had ANM of 45.23 $\pm$ 4.19. ($p < 0.001$)

Table 44: Association of Obstetric Score with Menopausal**Age of Study Participants**

Obstetric Score		Mean $\pm$ SD Age at Menopause	p value
Parity	Less than 3	43.98 $\pm$ 4.0	<0.001
	3 or more	46.34 $\pm$ 4.31	
Living Children	Less than 3	43.86 $\pm$ 3.70	<0.001
	3 or more	46.94 $\pm$ 4.35	
Abortion	None	45.38 $\pm$ 4.25	0.254
	Present	46.01 $\pm$ 4.61	
Child deaths	None	45.5 $\pm$ 4.39	0.690
	Present	45.82 $\pm$ 3.82	
Stillbirths	None	45.62 $\pm$ 4.27	<0.001
	Present	37.5 $\pm$ 2.88	

In this study, parity of less than 3 was significantly associated with lower ANM 43.98 $\pm$ 4 years, as compared to women with 3 or more pregnancies 46.34 $\pm$ 4.31 years. (p<0.001)

Study participants with less than 3 living children had significantly lower ANM 43.86 $\pm$ 3.70 years, as compared to women with 3 or more living children 46.94 $\pm$ 4.35 years. (p<0.001)

No significant association was found with abortion or child death, but women with stillbirth had much lesser mean menopausal age of 37.5 $\pm$ 2.88 years. (p<0.001)

Table 45: Association of Menstrual Cycle Variables with Menopausal**Age of Study Participants**

Menstrual Cycle Variables		Mean $\pm$ SD Age at Menopause	p value
Regularity	Regular	45.47 $\pm$ 4.46	0.555
	Irregular	45.85 $\pm$ 3.67	
Length of Menstrual Cycle	< 21 Days	43.52 $\pm$ 4.05	<0.001
	21 - 35 Days	45.82 $\pm$ 4.32	
	> 35 Days	48.78 $\pm$ 2.31	
Duration of Bleeding	< 7 Days	45.51 $\pm$ 4.51	0.799
	> 7 Days	45.7 $\pm$ 2.66	
Vaginal Discharge	Scanty	45.87 $\pm$ 5.44	0.292
	Normal	45.62 $\pm$ 3.78	
	Profuse	44.69 $\pm$ 4.87	
Lower Abdominal Pain	Normal	45.58 $\pm$ 4.44	0.654
	Abnormal	45.32 $\pm$ 3.98	

In the present study, length of menstrual cycle was also significantly associated with age at menopause. Women with < 21 days cycles had lower ANM at 43.52 $\pm$ 4.05 years, as compared to women with normal cycle. ANM was highest for women with > 35 days cycle with menopausal age of 48.78 $\pm$ 2.31 years.

Other variables of menstrual cycles (regularity, duration of bleeding, vaginal discharge, lower abdominal pain) had no significant association with menopausal age.

VI. DETERMINANTS OF FREQUENCY AND SEVERITY OF MENOPAUSAL SYMPTOMS

Table 46: Association of Menopausal Symptoms with Duration Since Menopause

Menopausal Symptoms	No. of study participants with duration since menopause (%)				
	<5 Years	5-10 Years	10-15 Years	15-20 Years	χ^2 , p value
Vasomotor					
Hot Flushes	175 (91.6%)	10 (12.8%)	6 (9.0%)	0 (0%)	287.6, 0.001
Night Sweats	167 (83.9%)	8 (4%)	20 (10.1%)	4 (2.0%)	213, 0.001
Sweating	169 (77.2%)	21 (9.6%)	25 (11.4%)	4 (1.8%)	171, 0.001
Psychosocial					
Dissatisfaction with Personal Life	130 (62.2%)	27 (12.9%)	33 (15.8%)	19 (9.1%)	41.87, 0.001
Feeling Anxious or Nervous	115 (67.6%)	18 (10.6%)	35 (20.6%)	2 (1.2%)	57.62, 0.001
Poor Memory	63 (33.3%)	57 (30.2%)	48 (25.4%)	21 (11.1%)	51.76, 0.001

Menopausal Symptoms	No. of study participants with duration since menopause (%)				
	< 5 Years	5-10 Years	10-15 Years	15-20 Years	χ^2 , p value
Accomplishing Less Than Used To	95 (49.2%)	45 (23.3%)	32 (16.6%)	21 (10.9%)	10.09, 0.018
Feeling Depressed, Down or Blue	139 (64.1%)	33 (15.2%)	26 (12%)	19 (8.8%)	53.17, 0.001
Being Impatient with Other People	129 (60.6%)	78 (15.5%)	67 (18.3%)	25 (5.6%)	24.44, 0.001
Feelings of Wanting to Be Alone	134 (65.4%)	33 (16.1%)	30 (14.6%)	8 (3.9%)	44.57, 0.001
Physical					
Flatulence (Wind) Or Gas Pains	100 (58.5%)	31 (18.1%)	38 (22.2%)	2 (1.2%)	25.7, 0.001
Aching in Muscles and Joints	135 (53.8%)	51 (20.3%)	51 (20.3%)	14 (5.6%)	7.7, 0.05
Feeling Tired or Worn Out	134 (51.3%)	51 (19.5%)	55 (21.1%)	21 (8%)	6.99, 0.072
Difficulty Sleeping	101 (53.7%)	34 (18.1%)	39 (20.7%)	14 (7.4%)	4.86, 0.182
Aches in Back of Neck or Head	100 (61%)	18 (11%)	38 (23.2%)	8 (4.9%)	29.87, 0.001

Menopausal Symptoms	No. of study participants with duration since menopause (%)				
	< 5 Years	5-10 Years	10-15 Years	15-20 Years	χ^2 , p value
Decrease in Physical Strength	123 (59.7%)	27 (13.1%)	39 (18.9%)	17 (18.3%)	29.331, 0.001
Decrease in Stamina	136 (59.9%)	33 (14.5%)	44 (19.4%)	14 (6.2%)	31.23, 0.001
Lack of Energy	114 (57.9%)	25 (12.7%)	44 (22.3%)	14 (7.1%)	26.62, 0.001
Dry Skin	49 (41.5%)	24 (20.3%)	28 (23.7%)	17 (14.4%)	17.80, 0.001
Weight Gain	76 (55.9%)	21 (15.4%)	31 (22.8%)	8 (5.9%)	8.171, 0.043
Increased Facial Hair	65 (73.9%)	4 (4.5%)	19 (21.6)	0 (0%)	38.36, 0.001
Changes in Appearance, Texture or Tone of Skin	78 (58.6%)	14 (10.5%)	27 (20.3%)	14 (10.5%)	19.95, 0.001
Feeling Bloating	114 (62.0%)	34 (18.5%)	24 (13.0%)	12 (6.5%)	21.323, 0.001
Low Backache	127 (57.5%)	35 (15.8%)	44 (19.9%)	15 (6.8%)	18.23, 0.001

Menopausal Symptoms	No. of study participants with duration since menopause				
	<5 Years	5-10 Years	10-15 Years	15-20 Years	χ^2 , p value
Frequent Urination	71 (53.4%)	18 (13.5%)	28 (21.1%)	16 (12.0%)	15.32, 0.002
Involuntary Urination When Laughing or Coughing	77 (56.2%)	22 (16.1%)	22 (16.1%)	16 (11.7%)	13.14, 0.004
Sexual					
Decrease in Sexual Desire	102 (81.6%)	6 (4.8%)	17 (13.6%)	0 (0%)	81.96, 0.001
Vaginal Dryness	117 (80.1%)	7 (4.8%)	21 (14.4%)	1 (4%)	97.04, 0.001
Avoid Intimacy	120 (83.9%)	10 (7%)	13 (9.1%)	0 (0%)	110.5, 0.001

Significant association was seen between menopausal symptoms and duration since menopause except for two physical symptoms.

All the menopausal symptoms of all the domains were seen most commonly in less than 5 years duration since menopause.

Most common symptoms in less than 5 years were vasomotor - hot flushes (n=175) sweating (n=169) and night sweat (n=167), while least common were dry skin (n=49) and poor memory (n= 63) and increased facial hair (n=65).

In 5-10 years since menopause, most common symptoms were psychosocial and physical - being impatient with other people (n=78) and poor memory (n=57), aches in muscles and joints (n=51) and feeling tired or worn out (n=51), while least common symptoms were increased facial hair (n=4), decrease in sexual desire (n=6) and vaginal dryness (n=7).

In 10-15 years since menopause, psychosocial and physical symptoms were more common - being impatient with other people (n=67) and feeling tired or worn out (n=55) and aches in muscles and joints (n=51); least common symptoms were hot flushes (n=6) and avoiding intimacy (n=13) and decrease in sexual desire (n=17).

In 15 - 20 years since final menstrual period, the most common symptoms were psychosocial and physical - being impatient with other people (n=25), accomplishing less than used to (n=21) and dissatisfaction with personal life (n=21); least seen symptoms were hot flushes, decrease in sexual desire and increased facial hair (n=0 for all).

Table 47: Association of Sociodemographic Variables (Religion, Category, Family Type) with MENQOL Scores of Study Participants

Sociodemographic Variables		Vasomotor Score	Psychosocial Score	Physical Score	Sexual Score	Total Score
Religion	Hindu	3.72±2.37	3.64±1.37	3.08±1.09	2.07±1.34	3.13±1.24
	Muslim	3.78±2.53	3.46±1.4	3.32±1.24	2.34±1.43	3.22±1.29
	Others	3.22±1.56	2.74±0.37	3.9±0.72	1.33±0.56	2.8±0.64
p value		0.851	0.171	0.059	0.063	0.605
Category	SC	4.22±2.51	3.71±0.78	3.72±1.07	2.51±1.34	3.54±1.16
	ST	4.67±2.2	4.53±0.92	3.19±0.93	3.44±1.07	3.95±0.96
	OBC	3.18±2.14	3.44±1.52	3.19±1.13	2.18±1.58	3±1.28
	General	3.7±2.41	3.58±1.44	2.83±1.02	1.66±1.04	2.94±1.22
p value		0.087	0.043	0.001	<0.001	0.004
Family Type	Nuclear	4.02±2.43	3.53±1.3	3.08±1.05	2.23±1.47	3.21±1.27
	Joint	2.95±2.2	3.5±1.53	3.47±1.38	2.1±1.24	3±1.25
	Broken	5±2.42	4.11±1.23	2.9±0.53	1.7±0.69	3.43±0.95
p value		<0.001	0.202	0.009	0.257	0.237

Muslims had higher vasomotor (3.78 ± 2.53) and sexual score (2.34 ± 1.43) as compared to other religion, while Hindus had more severe symptoms in psychosocial domain (3.64 ± 1.37). Other religion participants had higher physical score (3.9 ± 0.72). None of the associations were found statistically significant.

Study participants of SC and ST category among 200 Hindu participants, had significant higher vasomotor and MENQOL total score as compared to OBCs and General category women.

Participants of nuclear family had more vasomotor symptoms, while physical symptoms were more in women from joint family. Other domains had non-significant association with family types. Women from broken and nuclear family reported higher psychosocial symptoms but the association was not significant ($p=0.202$).

**Table 48: Association of Sociodemographic Variables (Age, Education) with
MENQOL Scores of Study Participants**

Sociodemographic Variables		Vasomotor Score	Psychosocial Score	Physical Score	Sexual Score	Total Score
Age	40-45 Years	5.73±1.69	3.48±1.45	3.11±1.16	2.97±1.67	3.82±1.24
	45 – 50 Years	4.77±2.39	3.58±1.34	3.06±1.18	2.38±1.38	3.45±1.39
	50 – 55 Years	3.42±2.25	3.47±1.24	3.2±0.97	2.04±1.11	3.03±1.13
	55 – 60 Years	1.66±0.82	3.65±1.49	3.36±1.29	1.51±1.00	2.54±0.86
p value		<0.001	0.807	0.332	<0.001	<0.001
Education	Illiterate	2.94±2.05	3.58±1.39	3.17±1.2	1.72±1.08	2.85±1.13
	1 st - 5 th Standard	2.26±1.90	3.39±1.60	2.97±1.21	1.58±0.88	2.55±0.91
	6 th - 10 th Standard	4.79±2.40	3.64±1.21	3.34±1.12	2.44±1.36	3.55±1.25
	PUC	4.42±2.26	3.67±1.04	3.19±0.92	3.17±1.79	3.61±1.22
	Graduate	3.87±2.14	3.21±1.96	3.08±1.38	2.3±1.6	3.11±1.66
p value		<0.001	0.562	0.295	<0.001	<0.001

Vasomotor symptoms were more severe (5.73 ± 1.69) in less than 45 years of age and decreased significantly with increase in age to (1.66 ± 0.82) for 56-60 years age. Psychosocial and physical domain had more symptoms with increase in age, but results were not significant. Sexual symptoms were also significantly associated with age - more severity 2.97 ± 1.67 at < 45 years and least 1.51 ± 1.00 in women >55 years. Total score showed a significant decrease from 3.82 ± 1.24 to 2.54 ± 0.86 with increase in age. ($p < 0.001$)

According to this study, vasomotor, sexual and total score were significantly more in participants who studied from 6th standard to PUC/Diploma. No significant variation was seen for other domains.

Table 49: Association of Sociodemographic Variables (Occupation, Socioeconomic Scale) with MENQOL Scores of Study Participants

Demographic Variable		Vasomotor Score	Psychosocial Score	Physical Score	Sexual Score	Total Mean Score
Occupation	Homemaker	3.5±2.48	3.47±1.45	3.15±1.12	5.62±3.28	3±1.19
	Govt. Employed	4.41±2.34	3.77±1.3	3.31±1.11	9.27±5.52	3.65±1.42
	Private Employed	3.43±2.42	3.27±1.24	3.03±1.22	6.65±4.18	2.99±1.44
	Self Employed	3.81±1.83	3.35±1.51	2.93±1.32	6.29±4.59	3.05±1.29
	Farmer / Labourer	4.79±2.2	4.14±0.6	3.63±1.16	9.87±4.81	3.96±1.02
p value		0.17	0.39	0.92	<0.001	<0.001
SES	Class I	3.62±2.12	3.89±1.78	3.35±1.22	2.13±1.34	3.25±1.21
	Class II	3.71±2.45	3.16±1.24	3.03±0.99	2.17±1.58	3.02±1.23
	Class III	3.93±2.48	3.62±1.31	3.05±1.07	1.85±1.08	3.11±1.22
	Class IV	3.67±2.49	3.44±1.44	3.29±1.31	2.15±1.44	3.13±1.35
	Class V	3.59±2.36	3.95±1.11	3.4±1.1	2.83±1.31	3.44±1.15
p value		0.913	0.015	0.222	0.002	0.445

Farmers and labourers reported more scores than other occupational categories, but findings were significant only for sexual domain score and overall score. ($p < 0.001$)

According to present study, Class 5 had significantly higher psychosocial and sexual scores as compared to other socio-economic class. Results were not significant for other domains with respect to socio-economic class.

Table 50: Association of Sociodemographic Variables (Food Habits, Personal Habits, Substance Abuse) with MENQOL Scores of Study Participants

Sociodemographic Variables		Vasomotor Score	Psychosocial Score	Physical Score	Sexual Score	Total Score
Food Habits	Vegetarian	3.21±2.16	3.52±1.42	3.16±1.06	2.02±1.19	2.98±1.15
	Mixed	4.08±2.52	3.57±1.35	3.21±1.22	2.26±1.48	3.28±1.3
p value		0.001	0.715	0.719	0.120	0.028
Personal Habits	None	3.37±2.28	4.22±1.61	3.79±1.43	2.63±1.38	3.5±1.37
	Tea Consumption	3.75±2.43	3.5±1.36	3.16±1.14	2.13±1.39	3.13±1.24
	Coffee Consumption	4.2±2.35	3.8±1.13	2.91±0.75	2.07±0.78	3.24±1.15
p value		0.649	0.053	0.039	0.266	0.416
Substance Abuse	None	3.87±2.39	3.51±1.42	3.17±1.14	2.13±1.34	3.17±1.25
	Tobacco Chewer	3.19±2.47	3.74±1.18	3.26±1.21	2.3±1.52	3.12±1.24
p value		0.042	0.216	0.570	0.365	0.795

As per the present study, regarding food habits, participants with mixed food diet had significantly more score than vegetarians in vasomotor domain and overall mean score. Other domains had similar but non-significant findings.

Participants not consuming any tea or coffee had significantly higher physical 3.79 ± 1.43 and psychosocial score 4.22 ± 1.61 . They also reported non-significant but higher vasomotor score.

Tobacco chewers had significantly lesser vasomotor score 3.19 ± 2.47 than others 3.87 ± 2.39 . ($p=0.042$)

**Table 51: Association of Sociodemographic Variables (BMI) with
MENQOL Scores of Study Participants**

Demographic Variable		Vasomotor Score	Psychosocial Score	Physical Score	Sexual Score	Total Score
BMI (Asian Standards)	Underweight	3.14±2.53	4.21±1.3	2.75±0.83	2.25±1.32	3.09±1.14
	Normal	3.02±2.16	3.05±1.36	2.96±1.21	2.01±1.3	2.76±1.2
	Overweight	3.73±2.51	3.8±1.53	3.35±1.26	2.1±1.36	3.25±1.33
	Obese	5.01±2.21	3.98±0.88	3.44±0.86	2.47±1.48	3.73±1.01
p value		<0.001	<0.001	0.003	0.095	<0.001

In the present study, obese participants had more severity of symptoms across vasomotor, physical and sexual domains and overall - 5.01 ± 2.21 , 3.98 ± 0.88 , 3.44 ± 0.86 , 2.47 ± 1.48 , 3.73 ± 1.01 respectively ($p < 0.001$). Underweight participants had more psychosocial symptoms 4.21 ± 1.3 ($p < 0.001$).

**Table 52: Association of Obstetrics and Gynaecology Variables with
MENQOL Scores of Study Participants**

Obstetrics and Gynaecology Variables		Vasomotor Score	Psychosocial Score	Physical Score	Sexual Score	Total Score
Marital Status	Married	4.26±2.37	3.64±1.27	3.27±1.11	2.48±1.45	3.41±1.25
	Un-married	1.13±0.3	1.29±0.39	1.91±0.6	1.0±0.3	1.33±0.22
	Widow	1.75±1.12	3.26±1.61	3.08±1.36	1.24±0.58	2.33±0.83
	Divorced/Separated	5±2.42	4.11±1.23	2.9±0.53	1.7±0.69	3.43±0.95
p value		<0.001	<0.001	0.030	<0.001	<0.001
Age at Menarche	Early	3.78±2.68	3.64±1.42	2.94±0.97	2.28±1.7	3.16±1.33
	Normal	3.57±2.33	3.45±1.37	3.16±1.13	2.05±1.35	3.06±1.22
	Delayed	4.17±2.49	3.78±1.35	3.42±1.28	2.4±1.19	3.44±1.25
p value		0.164	0.169	0.059	0.130	0.062
Age at Marriage	< 15 Years	3.27±2.31	3.24±1.37	2.94±1.07	1.68±0.95	2.78±1.24
	15 - 20 Years	3.82±2.41	3.84±1.33	3.19±1.04	2.1±1.34	3.24±1.19
	20 - 25 Years	4.18±2.49	3.46±1.38	3.25±1.33	2.28±1.45	3.3±1.32
	25 - 30 Years	3.13±2.35	3.1±1.04	3.27±0.49	2.87±1.67	3.09±1.04
	> 30 Years	2.58±0.39	4.79±0.13	4.81±0.63	3.83±0.89	4±0.13
p value		0.050	0.001	0.001	<0.001	0.025

Obstetrics and Gynaecology Variables		Vasomotor Score	Psychosocial Score	Physical Score	Sexual Score	Total Score
Age at First Pregnancy	< 15 Years	4.53±2.47	3.57±1.07	3.32±1.06	1.89±0.82	3.43±1.31
	15 - 20 Years	3.5±2.4	3.63±1.47	3.15±1.1	1.92±1.18	3.05±1.24
	20 - 25 Years	3.67±2.38	3.66±1.31	3.13±1.16	2.22±1.49	3.17±1.24
	25 - 30 Years	4.47±2.61	2.83±1.09	3.18±1.18	2.47±1.51	3.24±1.28
	> 30 Years	4.67±1.55	5.05±0.81	4.1±0.96	2.61±0.8	4.11±0.99
p value		0.035	<0.001	0.327	0.116	0.259

Divorced or Separated women had higher symptoms in vasomotor and psychosocial domains, while married women had more severe physical and sexual symptoms. Unmarried had least severity across all the domains ($p < 0.001$).

As per the present study, women with late marriage above 30 years (4 ± 0.13) had more total score, while those married at < 15 years (2.78 ± 1.24) had least MENQOL score ($p = 0.025$).

Participants with first child birth after 30 had significant higher vasomotor 4.67 ± 1.55 , psychosocial 5.05 ± 0.81 than others. Other associations were not significant.

**Table 53: Association of Obstetrics and Gynecology Variables with
MENQOL Scores of Study Participants**

Obstetrics and Gynecology Variables		Vasomotor Score	Psychosocial Score	Physical Score	Sexual Score	Total Score
Age of Menopause	Premature	3.89±2.63	3.25±1.65	2.72±1.16	2.06±1.45	2.98±1.44
	Normal	3.55±2.4	3.56±1.37	3.2±1.15	2.09±1.37	3.1±1.22
	Delayed	5.94±0.13	4.07±0.4	3.99±0.52	3.32±0.44	4.33±0.2
p value		<0.001	0.075	<0.001	<0.001	<0.001
Duration since Menopause	< 5 years	5.92±1.17	3.91±1.17	3.49±1	2.89±1.37	4.05±0.93
	5 – 10 years	1.43±0.67	2.83±1.29	2.38±0.87	1.2±0.54	1.96±0.49
	10 – 15 years	1.68±0.79	3.36±1.67	3.38±1.38	1.83±1.21	2.56±1
	15 – 20 years	1.19±0.4	3.79±1.18	3.09±1.11	1.03±0.13	2.27±0.5
p value		<0.001	<0.001	<0.001	<0.001	<0.001
Mother's Age at Menopause	Premature	3.51±2.46	3.35±1.61	2.2±0.76	1.6±0.74	2.67±1.21
	Normal	4.31±2.53	3.43±1.26	3.22±1.24	2.35±1.59	3.33±1.4
	Delayed	6±0	4.57±0	3.25±0.1	2.67±0	4.12±0.02
p value		0.071	0.108	<0.001	0.046	0.023
Elder Sister's Age at Menopause	Premature	3.88±2.67	3.41±1.63	2.37±0.74	1.82±0.75	2.87±1.35
	Normal	4.12±2.54	3.4±1.27	3.14±1.26	2.25±1.58	3.23±1.41
	Delayed	6.13±0.17	4.06±0.88	3.16±0.15	3.73±1.38	4.27±0.23
p value		0.042	0.314	0.030	0.004	0.029

As per the present study, participants with late menopause had significant higher symptoms across all domains. ($p<0.001$)

Duration of < 5 years since final menstrual period had highest severity in all domains and total MENQOL score ($p<0.001$). Women with 15-20 years after menopause had least vasomotor, sexual and total scores ($p<0.001$).

Table 54: Association of Obstetric Score with MENQOL**Scores of Study Participants**

Obstetric Scores		Vasomotor Score	Psychosocial Score	Physical Score	Sexual Score	Total Score
Parity	< 3	4.36±2.4	3.75±1.38	3.23±1.08	2.43±1.41	3.44±1.22
	≥ 3	3.42±2.37	3.45±1.37	3.17±1.2	2.02±1.34	3.01±1.24
p value		0.001	0.052	0.610	0.009	0.002
Living Children	< 3	4.06±2.48	3.6±1.41	3.08±1.1	2.37±1.55	3.28±1.28
	≥ 3	3.47±2.34	3.51±1.35	3.28±1.19	1.99±1.19	3.06±1.22
P – Value		0.24	0.558	0.101	0.009	0.112
Abortion	None	3.84±2.44	3.53±1.43	3.22±1.12	2.18±1.3	3.19±1.26
	Present	3.42±2.34	3.62±1.19	3.09±1.26	2.12±1.59	3.06±1.21
p value		0.176	0.608	0.360	0.720	0.410
Child Death	None	3.88±2.43	3.55±1.33	3.15±1.15	2.24±1.41	3.21±1.27
	Present	2.36±1.78	3.6±1.76	3.55±1.18	1.43±0.64	2.74±0.92
p value		0.001	0.836	0.059	0.001	0.040
Stillbirth	None	3.76±2.42	3.57±1.37	3.2±1.15	2.18±1.38	3.18±1.25
	Present	1.83±0.19	1.64±0.74	1.97±0.25	1.08±0.17	1.63±0.23
p value		0.113	0.065	0.033	0.114	0.014

Women with parity less than 3 had significantly higher overall score (3.44 ± 1.22) as compared to women with higher parity (3.01 ± 1.24).

No significant association was seen with living child except higher score of 3.28 ± 1.28 in sexual domain among women of less living children ($p=0.009$).

Among women with history of death of a child, higher non-significant score was found in psychosocial and physical domains.

**Table 55: Association of Contraception and Breast Feeding with
MENQOL Scores of Study Participants**

Obstetrics and Gynecology Variables		Vasomotor Score	Psychosocial Score	Physical Score	Sexual Score	Total Score
Breast Feeding	No Breast Feeding	4.25±2.36	4.18±1.39	3.61±1.15	3.19±1.37	3.81±1.26
	0 - 6 Months	4.11±2.25	3.29±1.47	2.62±0.83	2.11±1.56	3.03±1.33
	6 - 12 Months	3.72±2.7	3.09±1.24	3.26±1.17	2.5±1.5	3.14±1.35
	1 - 2 Years	3.56±2.12	3.85±1.4	3.46±1.11	1.82±1.06	3.18±1.01
	> 2 Years	3.4±2.64	3.54±1.19	3.08±1.26	1.82±1.1	2.96±1.28
p value		<0.001	<0.001	<0.001	<0.001	0.015
Contraception	None	3.59±2.5	3.25±1.38	3.27±1.18	2.2±1.3	3.15±1.27
	Temporary	4.13±2.05	3.4±1.4	3.35±1.1	2.43±1.54	3.38±1.34
	Permanent	3.68±2.37	3.05±1.37	3.58±1.15	2.11±1.41	3.11±1.23
	Both	4.5±2.85	3.53±1.42	3.34±0.93	2±1.21	3.34±1.2
p value		0.344	0.921	0.072	0.615	0.623

As per the current study, women who never breastfed had significantly higher MENQOL score as compared to others. Significant association of decrease in severity of symptoms with increase in duration of breast feeding was seen in vasomotor and sexual domains. (p <0.001)

No significant association was found between menopausal symptoms and contraceptive usage though temporary contraceptive usage had highest score in all domains except psychosocial domain. Vasomotor and sexual symptoms were seen more with use of temporary contraceptives, while physical symptoms were more seen with sterilization.

**Table 56: Association of Menstrual Cycle Variables with
MENQOL Scores of Study Participants**

Menstrual Cycle Variables		Vasomotor Score	Psychosocial Score	Physical Score	Sexual Score	Total Score
Regularity	Regular	3.69±2.47	3.57±1.38	3.28±1.16	2.11±1.38	3.16±1.25
	Irregular	3.98±2.11	3.46±1.36	2.73±1.01	2.45±1.33	3.15±1.27
p value		0.422	0.601	0.001	0.094	0.970
Length of Menstrual Cycle	< 21 Days	4.03±2.28	3.58±1.62	2.68±1.12	2.12±1.31	3.1±1.22
	21-35 Days	3.7±2.48	3.61±1.31	3.34±1.13	2.2±1.42	3.21±1.26
	> 35 Days	3.3±2.05	2.62±1.02	2.97±1.1	1.83±0.73	2.68±1.1
p value		0.449	0.012	<0.001	0.536	0.201
Duration of Bleeding	< 7 Days	3.52±2.43	3.5±1.37	2.24±1.19	2.14±1.35	3.1±1.27
	≥ 7 Days	5.57±1.26	3.97±1.34	2.77±0.64	2.36±1.55	3.67±0.91
p value		<0.001	0.048	0.019	0.357	0.009
Vaginal Discharge	Scanty	5.46±2.22	3.97±1.09	3.5±1.08	2.8±1.18	3.93±1.18
	Normal	2.96±2.09	3.48±1.44	3.16±1.19	1.82±1.15	2.85±1.11
	Profuse	4.69±2.48	3.27±1.34	2.9±1.04	2.77±1.9	3.41±1.4
p value		<0.001	0.009	0.014	<0.001	<0.001
Pain	Normal	3.45±2.34	3.53±1.41	3.14±1.19	1.98±1.17	3.03±1.19
	Abnormal	4.83±2.42	3.62±1.26	3.39±1	2.87±1.83	3.68±1.34
p value		<0.001	0.614	0.106	<0.001	<0.001

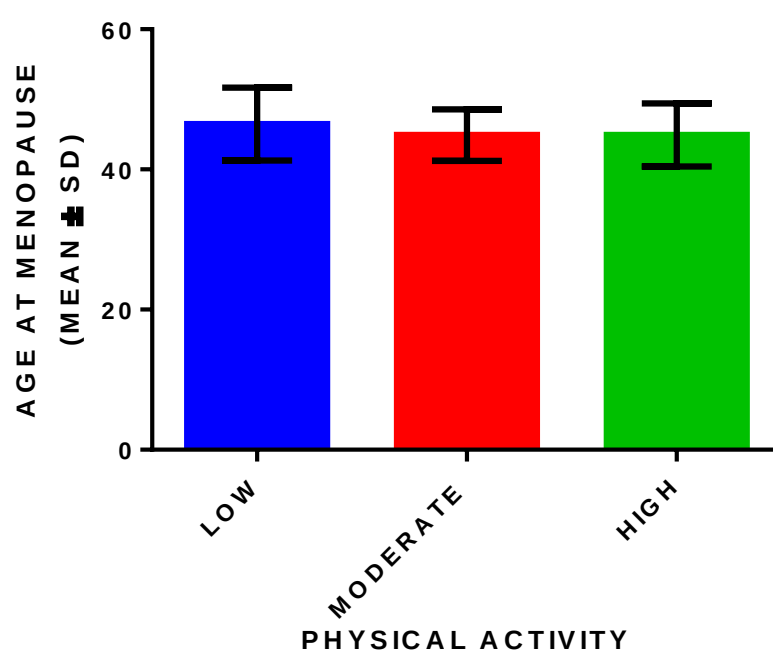
In the present study, women with regular cycles had more physical domain score ($p < 0.001$). Participants with more duration of bleeding of ≥ 7 Days, having scanty discharge and abnormal pain had higher MENQOL score across all four domains.

VII. ASSOCIATION OF PHYSICAL ACTIVITY WITH MENOPUSAL AGE AND SYMPTOMS

Table 57: Association of IPAQ Physical Activity Levels with Menopausal Age of Study Participants

Physical Activity Variables		Age at Menopause Mean $\pm$ SD	p value
IPAQ Physical Activity Levels	Low	46.47 $\pm$ 5.22	0.013
	Moderate	44.9 $\pm$ 3.66	
	High	44.92 $\pm$ 4.5	

Graph 29: Association of IPAQ Physical Activity Levels with Menopausal Age of Participants



In the present study, participants with low activity (46.47 ± 5.22 years) had higher menopausal age than women with high activity level (44.92 ± 4.50 years) moderate activity (44.90 ± 3.66 years). ($p = 0.013$)

In this current study, women doing walking or moderate activity had higher menopausal age ($p=0.036$), while those doing vigorous activity had lesser age at menopause ($p=0.057$).

In this current study, women doing domestic work were significantly associated with higher menopausal age. None of the other IPAQ domains had any significant association with age at menopause.

**Table 58: Association of IPAQ Physical Activity Levels with
MENQOL Score of Study Participants**

Physical Activity Variables		Vasomotor Score	Psychosocial Score	Physical Score	Sexual Score	Total Mean Score
IPAQ Physical Activity Levels	Low	5.07±2.2	4.6±0.86	3.77±0.93	2.99±1.23	4.11±0.73
	Moderate	2.18±1.58	2.76±1.27	2.49±0.89	1.21±0.59	2.16±0.63
	High	5.93±1.58	4.21±0.83	4.21±0.77	3.5±1.13	4.46±0.65
	Total	3.74±2.42	3.55±1.38	3.19±1.15	2.16±1.37	3.16±1.25
p value		<0.001	<0.001	<0.001	<0.001	<0.001

In the current study, significant association was found between domain scores and level of physical activity ($p<0.001$). Low and high physical activity was associated with more severe menopausal symptoms in respective domain score when compared to moderate physical activity level.

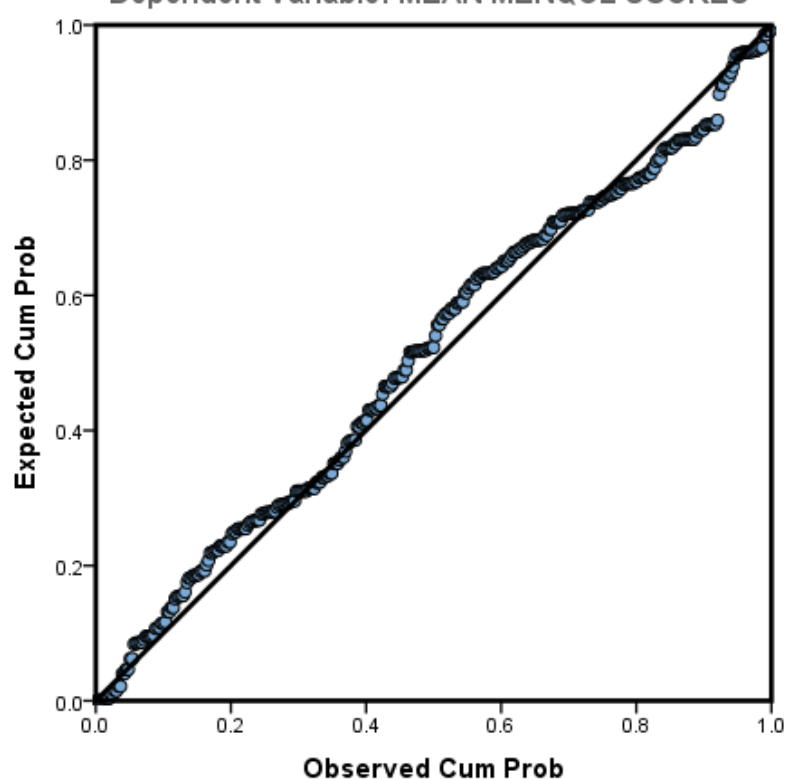
Table 59: Multiple linear regression analysis (unadjusted) of the relationship MENQOL Scores (Total and Domain scores) and IPAQ physical activity levels.

IPAQ Physical Activity Levels	Total		
	β	SE	p value
Low	Reference		
Moderate	-1.950	0.085	<0.001
High	0.354	0.104	<0.001

IPAQ Physical Activity Levels	Vasomotor			Psychosocial		
	β	SE	p value	β	SE	p value
Low	Reference			Reference		
Moderate	-2.885	0.227	<0.001	-1.847	0.140	<0.001
High	0.862	0.277	0.002	-0.393	0.171	0.022

IPAQ Physical Activity Levels	Physical			Sexual		
	β	SE	p value	β	SE	p value
Low	Reference			Reference		
Moderate	-1.280	0.113	<0.001	-1.786	0.118	<0.001
High	0.440	0.138	0.002	0.510	0.145	<0.001

Graph 30: Normal P-P Plot of Regression Standardized Residual (Not-Adjusted)
Dependent Variable: MEAN MENQOL SCORES



Among the 345 participants included in this analysis, compared to the low activity group, women with a moderate level of physical activity had significantly lower MENQOL Total Scores ($\beta = -1.950$, $p < 0.001$) in contrast to women with high activity who reported more MENQOL Total Score ($\beta = 0.354$, $p < 0.001$).

These women with moderate activity also reported significantly lower scores in all four MENQOL domains - Vasomotor ($\beta = -2.885$, $p < 0.001$), Psychosocial ($\beta = -2.885$, $p < 0.001$), Physical symptoms ($\beta = -1.280$, $p < 0.001$) and Sexual ($\beta = -1.786$, $p < 0.001$) than the low physical activity group. Women with high level of activity reported more symptoms than the reference group in total scores and all domain scores except psychosocial domain.

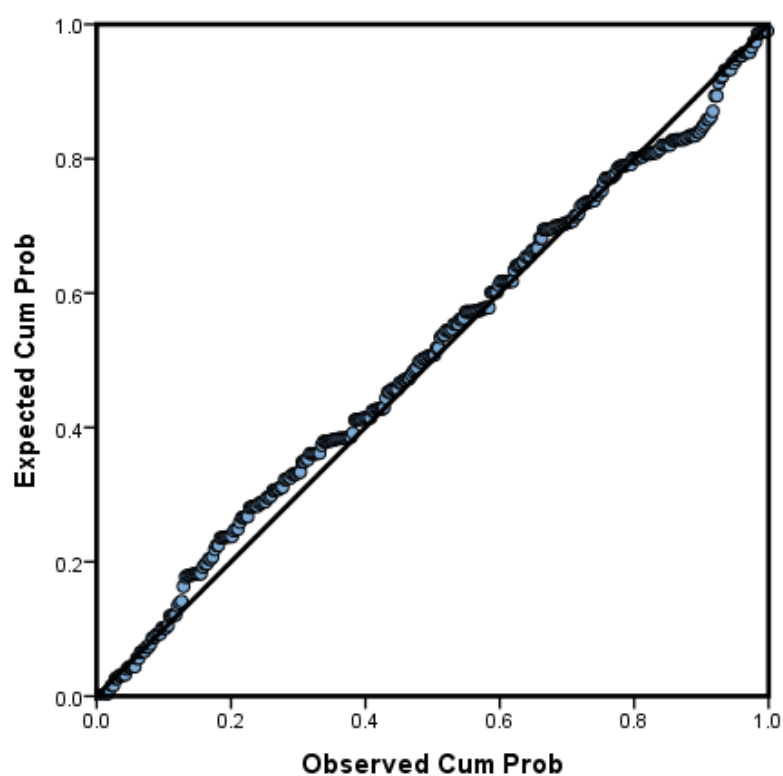
**Table 60: Multiple linear regression analysis (Adjusted) of the relationship
MENQOL Scores (Total and Domain scores) and IPAQ physical activity levels.**

IPAQ Physical Activity Levels	Total		
	β	SE	p value
Low	Reference		
Moderate	-1.866	0.088	<0.001
High	0.280	0.101	0.006

IPAQ Physical Activity Levels	Vasomotor			Psychosocial		
	β	SE	p value	β	SE	p value
Low	Reference			Reference		
Moderate	-2.885	0.227	<0.001	-1.847	0.140	<0.001
High	0.862	0.277	0.002	-0.393	0.171	0.022

IPAQ Physical Activity Levels	Physical			Sexual		
	β	SE	p value	β	SE	p value
Low	Reference			Reference		
Moderate	-1.491	0.115	<0.001	-1.802	0.118	<0.001
High	0.436	0.131	0.001	0.275	0.145	0.042

Graph 31: Normal P-P Plot of Regression Standardized Residual (Adjusted)
Dependent Variable: MEAN MENQOL SCORES



After adjustment for age, BMI, marital status, family income, education and parity, participants with moderate activity had significantly lower scores in total ($\beta = -1.866$, $p < 0.001$) and all four MENQOL domains - Vasomotor ($\beta = -2.230$, $p < 0.001$), Psychosocial ($\beta = -1.940$, $p < 0.001$), Physical symptoms ($\beta = -1.491$, $p < 0.001$) and Sexual ($\beta = -1.802$, $p < 0.001$) than the low physical activity group. By contrast, a high level of physical activity had higher but non-significant MENQOL total score and sub scores relative to the low activity group in all domain scores except psychosocial domain.



DISCUSSION

DISCUSSION

This community based cross-sectional study was conducted from 1st January 2016 to 31st December 2016 among 345 post-menopausal women age 40-60 years residing in the field practice area of Urban Health Centre (UHC) Ashok Nagar, which is affiliated to Department of Community Medicine, K. L. E. University's, Jawaharlal Nehru Medical College, Belagavi, Karnataka, India.

SOCIO-DEMOGRAPHIC PROFILE OF STUDY PARTICIPANTS

Table 1: Distribution of Study Participants according to Age

In the present study, participants were fairly distributed between all age groups. More than half women belonged to age above 50 years. Overall the mean menopausal age among study subjects was 52.04 ± 5.58 years.

A study done in Punjab in 2014 among 180 women aged 40-60 years, had similar age wise distribution of post-menopausal women, with majority between 50-60 years of age.²⁹ However, similar but hospital based study of Udupi, 2009 among 350 postmenopausal women had majority women in 45-50 years age group.⁶¹

Tables 2-4: Distribution of Study Participants according to their Religion and Category and Family Type

As per the socio-cultural demographics of the study area, majority of the participants were Hindus of General Category belonging to nuclear family.

More than half of the participants were Hindus followed by Muslims, while negligible women belonged to other religions like Christianity, Jainism, etc. Among the 200 Hindu participants, more than half belonged to General Category and one-fourth to Other Backward Caste. Participants belonging to Scheduled Castes were 30 (15%), while 16 (8%) were in Scheduled Tribes. The present study in urban Belagavi had more than two-third of the participants from nuclear families, while less than one-third belonged to joint families. Participants from broken families were very few.

Proportion of nuclear family was lower in the current study area as compared to a study done in Pune in 2011 where three-fourth women were from nuclear families.⁶

Table 5: Distribution of Study Participants according to their Educational Status

In the present study, out of 345 study participants, more than three fourth were literates. Among them, around two-third had studied only up to 10th standard. Remaining one-fifth of participants were illiterates.

A similar study done in Mangalore, 2014 among 110 women of 40-65 years had 28.3% illiterates and 61% educated till high school.⁸⁶ Other studies done in Delhi and Jammu, however, had still higher illiteracy rate at 31-32%.^{28,60}

Table 6: Distribution of Study Participants according to Occupation and Socio-Economic Status

In the present study, more than two-third of the women were home makers, while one-tenth were labourers.

It is similar to the studies done in urban Pune⁶ and Chandigarh¹⁶ which had 67% and 63.9% housewives respectively but less than the other study done in Udupi, Karnataka.⁸⁶

Table 7: Distribution of Study Participants according to Socio Economic Status

As per Modified B. G. Prasad's Classification, about three-fourth of study participants belonged to Class II to Class IV with highest number belonging to Class IV. Class I had the least number of study participants at 8.7%.

Another study conducted in Hubli in 2016 had around four-fifth participants in SES Class II -SES Class IV.⁶⁹

Tables 8-10: Distribution of Study Participants according to their Food Habits, Personal Habits, Substance Abuse

In keeping with the eating practices prevalent in the study area, around two-third of participants took mixed diet in contrast to the Pan India study published in 2016 in which more than half were vegetarians.³³ Most of the participants (91%) were consumed tea. Less than one-fifth of the participants were habituated to chewing tobacco. No woman was habituated to alcohol or smoking in accordance with the cultural practices of the area.

Table 11: Distribution of Study Participants according to Body Mass Index

In this study, just less than half of study participants had normal BMI, while more than half were overweight or obese.

A study done in urban Vellore in 2013 also had 51.3% participants as obese or overweight.⁴⁴ Similar studies done in Uttarakhand and Kerala had 67.44% and 69.2%

persons with normal BMI respectively.^{30,91} Another study done among 542 postmenopausal Saudi women had 92% participants above BMI of 25.⁵⁸

Some variation in distribution of participants as per their BMI in the present study is possibly due to the newer Asian Classification followed in this study.⁹⁰

OBSTETRIC AND GYNAECOLOGY PROFILE OF STUDY PARTICIPANTS

Table 12: Distribution of Study Participants according to Marital Status

In the present study, around three-fourth of the participants were married, while one-fifth were widows, less than one-fifth were separated or divorced. Only 5 (1.4%) participants were unmarried.

Another study done among post-menopausal women in Karnataka among women of 40-65 years had 67.3% married, 28.2% widows and 3.6% unmarried as study participants⁸⁶. Similar study done in Shimla in 2008, had majority 84% married women.⁶²

Table 13: Distribution of Study Participants according to Age at Menarche

Among 345 participants, around two-third reported normal age at menarche. Around one-fourth had history of delayed menarche, while remaining had early menarche.

A study done in Urban Calcutta in 2012 among postmenopausal women, had one-sixth women with early menarche and delayed menarche each, while majority had normal age at menarche.⁶⁶ A study done in Mangalore among women participants aged 40-60 years had majority with normal age at menarche, one-fifth with early menarche and rest

with late menarche.⁹² Shanghai Women's Health Study done in 2008 had just more than half women participants with normal menarche.²³

Tables 14-15: Distribution of Study Participants according to Age at Marriage and Age at First Pregnancy

Out of 340 ever married participants, almost three-fourth were married in age group of 15-24 years, while one-sixth were married in less than 15 years.

Similar study done in Calcutta among postmenopausal women reported 24 years as median age at marriage in their study group.⁶⁶ A study done in Kerala had majority most participants were married between 19-25 years.⁹¹

In the present study, among 330 study participants who ever got pregnant, more than three-fourth had their first pregnancy between 15-24 years of age with maximum women having it between 20-24 years of age.

Similar findings were seen in the Germany study done in 2005 where maximum number of postmenopausal women had first pregnancy between 20-26 years.²² Another Iran based study done in 2016 had the mean age of first pregnancy as 16.3 years.²⁷

Tables 16-20: Distribution of Study Participants according to Obstetric Score

Among 345 participants, only 4.3% of the participants were nulliparous. Overall median parity was 3. More than two-third had a parity of 2-4. Just 5.2% women had parity of one in the present study. Among 330 ever parous participants, about 2.4% had no living child. Overall median of living children was 3. In the current study, 3 or more living children were found in more than half of the participants. Around one-fourth of women had history of previous abortions.

In the study conducted in urban Calcutta in 2009 among 180 menopausal women, around half of women had parity of 2-4 and one-third had parity of one.⁹ An Iranian study done in 2011 had one-fourth and another one done in Hubli in 2016 had around two-fifth women with 3 or more living children.^{52,69} An Iranian study done in 2016, had 15.4% of participants with history of abortion.²⁷

Higher obstetric score in the current study could be due to lesser awareness and poor practices regarding contraception prevalent across all religious groups especially Muslims in our study area.

Tables 21-22: Distribution of Study Participants according to their of Elder Sister's and Mother's Age at Menopause

Only 127 (36.8%) participants out of 345 knew about the age at menopause of their mother. Mothers of one-fifth had premature menopause, while 6 (4.7%) had delayed menopause. The mean of age at menopause of mother was 45.01 ± 4.26 years.

Another study done among 201 post-menopausal women in Delhi in 2005 the mean age of participant's mother was 47.5 years²⁸. Another study done in Pondicherry in 2016, in post-menopausal women, had 45.17 years as the mean menopausal age of the mothers of the study subjects.⁶⁴ A study done in United Arab Emirates had the mean age of menopause of mother as 48.59 ± 2.61 years.²⁰

Just around one-third participants, knew about the age at menopause of their elder sisters. Classifying as per mean menopausal age of elder sisters, 19 (14.5%) had premature menopause, while 10 (7.6%) had delayed menopause. The mean age at menopause of elder sisters was 45.36 ± 4.26 years.

Another study done in Pondicherry in 2016, had 45.17 years as the mean menopausal age of the sisters of the study group.⁶⁴ Similar study done in United Arab Emirates had the mean age of menopause of sister as 48.19 ± 2.56 years.²⁰

Table 23: Distribution of Study Participants according to their Age at Menopause

In the current study, more than four-fifth study subjects had normal menopause, 12.8% had premature menopause, while 6.1% had delayed menopause. The mean age at menopause among the study participants was 45.53 ± 4.34 years.

As per the study done in Manipal in 2016 on postmenopausal women, the mean age at menopause was found to be 45.32 ± 2.79 years.⁹² According to a study done in Pondicherry in 2016 mean menopausal age was 45 years.⁶⁴ As per a Pan India Survey done in 2016, natural menopause age of Indian women was 46.2 ± 4.9 years. Region-wise determination of natural menopause age for South India was 46.1 ± 5.6 years.³³ Similar study done in Pune had mean age at menopause for the subjects to be 48.3 years.⁶ Another study done in Calcutta in 2012 among post-menopausal women had mean age at menopause as 45.95 ± 2.58 years.⁶⁶ Similar study done in Saudi Arabia had the recalled mean age of women at menopause as 49 ± 4.7 years.⁵⁸

Table 24: Distribution of Study Participants according to the Duration since Menopause

In the present study, around half of the participants had duration of less than 5 years since final menstrual period, while one-fifth had a duration of 5-10 years. Mean duration since menopause among study participants was 6.51 ± 5.06 years.

In contrast, another study done in Calcutta in 2012 had just below one-third of participants with less than 5 years duration, 37.2% with 5–10 years duration.⁶⁶ Another study done in Riyadh in 2016, had 39.1% participants with less than 5 years duration, and one-fourth with 6-10 years duration.⁵⁸ An Iranian Study had two-fifth women participants with menopause less than 5 years ago.⁵²

Tables 25-26: Distribution of Study Participants according to history of Contraception and Breast Feeding Practices

Among 345 study participants, one-third never used any contraception. More than half used permanent method only, while 9.3% used temporary method only. Few participants 5.8% used both of them.

A study done in Italy reported oral contraceptive use in 23.6% of study participants.⁴⁷ In contrast, the study done in Delhi among 350 participants had less than 1% women who ever used oral contraceptive pills.²⁸ The Shanghai women's study had 23.85% participants who ever used pills, 28.8% used IUDs and around 28.3% were sterilized.²³ Another study done in West Bengal in 2014 had 24.1% participants having undergone sterilization.⁶⁷

Lesser contraceptive usage in present study is due to poor family planning practices prevalent in the study population.

Out of 345 study participants, majority had breast fed their child. Around one-fourth did breast feeding for 1-2 years followed by one-fifth each for 6-12 months and >2 years. Only one-fifth participants breast fed for less than less than 6 months.

Similarly, the Shanghai Study had 9.4% women who had never breast fed, about half who fed for less than 2 years and 40% fed for more than 2 years.²³ Duration of breast feeding of study participants of study in urban Bengal ranged from 26.6 to 35 months.³¹ Another Bengal Study found that more than half breast fed for more than 1 year.⁹

The higher prevalence and duration of breast feeding is attributed to the traditional child rearing practices in the study population.

Tables 27-31: Distribution of Study Participants according to Menstrual History

Among 345 study participants, more than four-fifth had regular menstrual cycles. Around three-fourth had menstrual cycle of normal length of 21-35 days. Most women had normal bleeding of less than 7 days. Almost two-third study subjects had normal discharge. One-fifth had profuse bleeding and abnormal lower abdominal pain each.

Similar study conducted among postmenopausal women in Bengal found that most women had regular cycles and 17.1% had scanty discharge similar to the present study. In contrast to present study, just around half had menstrual bleeding. About 54.25% women had pain, while 35.7% had heavy bleeding.⁹ Yet another study conducted in Bengal reported less than one-fifth participants had heavy discharge and one-tenth had scanty discharge with overall mean duration of bleeding as 4.84 ± 1.8 days.⁶⁷ Another study done among postmenopausal women in Manipur, 68% women had regular bleeding which is much lesser than the findings of present study.³⁴

MENOPAUSAL SYMPTOMS AMONG STUDY PARTICIPANTS AS PER MENQOL QUESTIONNAIRE

Table 32: Frequency of Menopausal Symptoms among Study Participants

In the present study, among 345 participants, the most common symptoms were of physical domain - 'Feeling Tired or Worn Out' (75.7%) followed by 'Aching in Muscles and Joints' (72.8%), 'Decrease in Stamina' (65.8%), 'Low Backache' (64.1%) followed by Psychosocial domain – 'Feeling Depressed, Down or Blue' (63.9%) to Vasomotor Domain - 'Sweating' (63.5%). Least common symptoms were 'Increased Facial Hair' (25.5%) to 'Dry skin' (34.2%), 'Decrease in Sexual Desire' (36.2%) to 'Changes in Appearance, Texture or Tone of Skin' (38.6%).

Similar study done Karnataka in 2009 reported mostly physical and psychosocial symptoms like 'Aching in muscle and joints' (67.7%) followed by 'Gets tired easily' (64.8%), 'Poor memory' (60.5%), 'Lower backache' (58.8%) to 'Feeling Bloating' (55.1%) as the most common symptoms. Least common symptoms ranged was 'Increased Facial Hair' (15.3%) which is similar to present study.⁶¹

Another study done on post-menopausal women in Riyadh in 2017 also reported similar findings. Most commonly reported symptoms were from physical domain namely 'Aching muscles and joints' (82.1%), 'Decrease in physical strength' (76.6%), 'Feeling tired or worn out' 378 (69.7%). Least common symptoms were 'Dissatisfied with personal life' (5.5%), 'Increased facial hair' (10.7%) and 'Vaginal dryness' (11.1%)⁵⁸

Table 33: Severity of Menopausal Symptoms among Study Participants

In the present study, overall the severity of symptoms ranged highest for 'Feeling Tired or Worn Out' (4.37 ± 2.14) followed by 'Aching in Muscles and Joints' (4.23 ± 2.14) and 'Low Backache' (4.02 ± 2.41). Least severe symptoms were 'Increased Facial Hair' (1.89 ± 1.65), 'Decrease in Sexual Desire' (2.12 ± 1.57) and 'Avoiding Intimacy' (2.13 ± 1.52).

According to a study conducted among urban postmenopausal women in West Bengal in 2014, the most severe symptom as per MENQOL was 'Sweating' (6.32 ± 0.10) followed by 'Vaginal Dryness' (6.22 ± 0.14). The least severe symptoms were 'Increased Facial Hair' ($1.13 \pm .05$) and Weight Gain (2.55 ± 0.19).⁹³

Similar study done in Turkey in 2012 reported 'Hot flushes' (4.3 ± 2.2), 'Feeling anxious or nervous' (3.9 ± 2.3) and 'Night Sweats' (3.9 ± 2.1) as the most severe symptoms. Symptoms with least score were 'Increased facial hair' (2.3 ± 2.0) and 'Accomplishing less than I used to' (2.2 ± 1.9).⁵¹

Table 34: Domain Specific and Total Mean MENQOL Score

In the present study, highest domain wise mean score was 3.74 ± 2.42 , for Vasomotor followed by Psychosocial and Physical domain. Least score was 2.16 ± 1.37 for Sexual domain. Overall mean MENQOL score was 3.16 ± 1.25 .

Similar study done in United States in 2008 reported that mean scores obtained for each MENQOL domain were highest for physical: 3.5 ± 1.5 and least for sexual: 2.9 ± 2.1 .⁴⁹ Another study done in Turkey in 2012 reported highest mean score 3.8 ± 1.9 for vasomotor domain and least 2.7 ± 1.9 for sexual domain.⁵¹

PHYSICAL ACTIVITY AMONG STUDY PARTICIPANTS AS PER IPAQ

Table 35: Distribution of Study Participants as per IPAQ Physical Activity Levels

In the present study, more than half had moderate activity level followed by one-fourth with low activity level and one-fifth with high activity level.

In contrast, similar study done from Turkey reported that more than half women had low activity, 37.7% had moderate activity and very few had high activity.⁷⁵ Another study done among post-menopausal women in Vellore, in 2015, reported that more than half of the study participants had low physical activity, whereas one-fourth and one-fifth had high and moderate physical activity, respectively.⁴⁴

Tables 36-37: Distribution of Study Participants as per Type of Physical Activity and IPAQ Domains

Almost all women did moderate type of activity. Majority did walking and had physical activity in domestic domain and in transportation domain. Few participated in leisure domain while below one-third had activity in job related domain.

DETERMINANTS OF AGE AT MENOPAUSE

Table 38: Association of Sociodemographic Variables (Religion, Category, Family Type) with Menopausal Age of Study Participants

Age at menopause was highest for participants of other religion at 46.50 ± 2.74 years followed by Hindus at 46.19 ± 4.43 years and least for Muslims 44.540 ± 4.10 years ($p=0.002$). Among the 200 Hindu study participants, age at menopause ranged from 48.50

± 5.85 for Schedule Caste followed by general category and OBCs to least 44.13 ± 1.20 for Schedule Tribes ($p = 0.002$). Women residing in joint family had higher ANM than those residing in nuclear family members. Menopausal age least for ones with broken families ($p < 0.001$).

A study based on data from the Indian District Level Household Survey (DLHS) 2007-2008 reported that compared to Hindus, Muslims had higher risk of menopause; and 'other' religious groups had lower risk of natural menopause.³⁵

Table 39: Association of Sociodemographic Variables (Education, Occupation, Socio-economic Status) with Menopausal Age of Study Participants

Among 345 study participants, age of menopause was significantly associated ($p < 0.001$) with higher age at higher education level among literates with ANM being 44.51 ± 4.03 years for 1st - 5th Standard to 46.60 ± 2.06 years for Graduates / Postgraduates. Illiterates, however had highest ANM at 47.34 ± 5.19 years.

Similar findings were reported in the Shanghai Women's Health Study, 2008 where the age at menopause increased significantly with educational status of the participant. Similar findings were reported from a Pan India study done in 2014, which found that more educated women have a significantly higher menopausal age ($p = 0.028$). The menopausal age in illiterate women was 46.1 ± 5.3 years, while in primary educated was 45.7 ± 4.8 , matriculate was 45.8 ± 4.8 , and graduate and above was 47.2 ± 4.4 years.³³

No significant variation in mean age at menopause was found among women belonging to different occupational categories, although there was a decreasing age of menopause from housewife to labourer.

This is in contrast to the Study of Women's Health Across the Nation (SWAN) study, where employed women were significantly associated with later age at the FMP. With respect to the type of job, it showed that increasing occupation level is associated with increasing ANM.³

With respect to association of socio-economic status with menopausal age, present study shows significant association of higher age at menopause with better socio-economic class.

A Pan India study reported similar findings that women belonging to upper SES have a higher menopausal age of 48.1 ± 4.2 years, as compared to 46.1 ± 5.2 years in poor economic background.³³

Table 40: Association of Sociodemographic Variables (Food Habits, Personal Habits, Substance Abuse, BMI) with Menopausal Age of Study Participants

Vegetarian participants had higher ANM at 47.04 ± 4.58 years, while participants consuming mixed food had menopausal age of 44.56 ± 3.89 years ($p < 0.001$).

It is similar to the report published by India Menopause Society in 2014 that said vegetarian diet with high intake of fruits and vegetables delays the onset of menopause because of the presence of antioxidants in fruits and vegetables that counteracts the adverse effects of reactive oxygen species on the number and quality of ovarian follicles.⁷

Participants consuming tea had lesser ANM at 45.22 ± 4.22 years, while those taking coffee had higher menopausal age at 52.40 ± 3.81 years as compared to participants taking none of these with ANM of 46.86 ± 3.57 years ($p < 0.001$).

This contradicts the previous findings that regular tea consumption delays the ANM probably due to the antioxidant and nonsteroidal estrogenic effects of flavonoids that counteract the degenerative processes of ovarian follicles.⁷ The higher ANM with coffee intake is in contrast to previous study done in Norway in 2007 among postmenopausal women, which found that coffee drinking is associated with early menopause.⁹⁴

Tobacco chewers had lesser age at menopause 44.82 ± 2.98 years as compared to others 45.67 ± 4.59 years even though the association was not significant ($p=0.141$).

Though no previous literature was found regarding chewing tobacco and menopausal age, tobacco smoking was significantly associated with early menopause in the Norway study.⁹⁴

In the present study, non-significant trend with increase in ANM with rise in BMI was observed. Menopausal age was least for underweight 43.67 ± 3.39 years and highest 46.24 ± 5.50 years for obese participants.

Similar findings were seen in an Iranian study done among 960 menopausal women, which reported least menopausal age for $BMI \leq 24.9$ and highest for $BMI \geq 30$.²⁷

Women with higher BMI have delayed menopause either because they have higher levels of estradiol (E1) and estrone (E2) in their body or they lose follicles at a slower rate because of longer menstrual cycles.

Table 41: Association of Obstetrics and Gynecology Variables with Menopausal Age of Study Participants

In the present study, marital status had significant association with ANM ($p < 0.001$) with married women and widows having higher ANM, while unmarried and divorced/separated women had lesser ANM.

Earlier study done on the data from the Indian District Level Household Survey (DLHS) 2007-2008 reports not just divorced or separated but even widowed women had a higher risk of natural menopause compared to currently married women.³⁵

As per the present study, age at menarche had a significant association with menopausal age. ANM is being less for women with early menarche than in women with late menarche ($p < 0.001$).

Similar findings were reported in a study done in Manipur in 2016, which reported that women who attained early menarche had an early onset of menopause, while women who attained menarche at a later age attained menopause at a later age ($p\text{-value} < 0.001$).³⁴ Similar findings were seen in other studies done in Punjab and Shanghai.^{23,29}

Early menarche leads to early exhaustion of ovarian follicles and attainment of menopause at an earlier age, while later age at menarche results in late menopause.

Study participants with age at early marriage had ANM of 46.57 ± 3.29 years, while it was 43 ± 1.24 years among those who married late ($p < 0.001$). In the current study, study participants with age at first pregnancy less than 15 years had lower ANM as compared to those who got pregnant at beyond 30 years ($p = 0.018$)

The present study showed a significant association of menopausal age among different groups classified as per duration since menopause. There was a trend of increase in ANM with it being maximum 46.37 ± 4.86 years for less than 5 years duration to least 41.6 ± 2.12 years for group with a duration of 15-20 years ($p < 0.001$).

This may be attributed to better health facilities availed by the younger lot of menopausal women and also better lifestyle and nutrition as compared to the older women.

Table 42: Correlation of Mother's & Sister's Age at Menopause with Age at menopause of Study Participants

Mean age of mother and elder sister's age at menopause significantly correlated with age of menopause of the participant in this study. ($p < 0.001$)

Similar study done in UAE reported that age of the menopause was significantly related to that of the mother and older sister.²⁰ A study studying the heritability of age of menopause reported in 2005 that 50% of the variation in age at natural menopause between family can be explained by genetic factors in women apart from lifestyle factors such as diet and exercise or other household exposures shared among family members which might have influenced menopausal age.⁹⁵

Table 43: Association of Contraception and Breast Feeding with Menopausal Age of Study Participants

In the current study, breast feeding was found to be significantly associated with ANM. Menopausal age of the participants increased with duration of breast feeding from 43.58 ± 3.18 years for no breast feeding to highest ANM of 47.54 ± 4.11 years for women who breast fed for 1-2years ($p < 0.001$).

A German study done on 1009 women with natural menopause reported that breast feeding was associated with older age at menopause.²² The Shanghai Women's Health Study, 2008 reported similar findings that longer duration of breast-feeding was associated with slightly delayed menopause and more reproductive years ($p < 0.01$).²³

An increased duration of breastfeeding is known to prevent follicle depletion and preserve ovarian function and thereby delay the onset of menopause.

Contraception was significantly associated with ANM. Participants who had used temporary contraceptive methods had higher ANM, as compared to those using none. Women who opted for permanent methods also had slightly higher ANM, as compared to non-users ($p < 0.001$). The Shanghai Women's Health Study, 2008 reported that use of birth control methods (e.g., oral contraceptive pill, intrauterine device, tubal ligation) was positively associated with the timing of menopause (p values < 0.01) for all methods.²³ Later menopausal age with contraceptive usage can be due to anovular effects, with subsequent saving of the oocytes leading to higher age at menopause.

Table 44: Association of Obstetric Score with Menopausal Age of Study Participants

In this study, both parity of less than 3 as well as less than 3 living children were significantly associated with lower ANM as compared to those having higher parity/living children. ($p < 0.001$).

Similar findings were concluded from the study among 714 Korean women in 2012, where there was significant positive association with increase in menopausal age with each subsequent pregnancy.²⁵ UAE study done among 742 women aged 40 years and above also reported that a higher parity was significantly positively associated with late

menopause.²⁰ Shanghai study found that number of live births was positively associated with later menopause and extended reproductive span ($p < 0.01$).²³

Repeated pregnancies lead to subsequent saving of the oocytes thus prolonging the menopausal age.

Table 45: Association of Menstrual Cycle Variables with Menopausal Age of Study Participants

In the present study, length of menstrual cycle was significantly associated with age at menopause. Women with smaller cycle had lower ANM at 43.52 ± 4.05 years, as compared to women with normal cycle. ANM was highest for women with prolonged cycle with menopausal age of 48.78 ± 2.31 years.

Longer duration of each cycle leads to lesser cycles over time and hence lower oocyte utilization thus prolonging the menopause.

Irregular cycles, bleeding duration ≥ 7 days had higher menopausal age though the association were not significant.

In a study conducted in Manipur, 2016, menstrual cycle regularity had significant association with ANM with women with regular menstrual cycle having an earlier age at menopause, as compared to women with irregular menstruation ($p < 0.001$).³⁴

DETERMINANTS OF FREQUENCY AND SEVERITY OF MENOPAUSAL SYMPTOMS

Table 46: Association of menopausal symptoms with duration since menopause

Significant association was seen between menopausal symptoms and duration since menopause except for 2 physical symptoms. All menopausal symptoms of all the domains were seen most commonly in less than 5 years duration since menopause and least for women with 15-20 years duration since menopause.

Most common symptoms in less than 5 years duration since menopause were vasomotor, in 5-10 years since menopause most common symptoms were psychosocial, in 10-15 years since menopause psychosocial and physical symptoms were more common, while for duration of 15 - 20 years since menopause, symptoms were mainly psychosocial.

Table 47: Association of Sociodemographic Variables (Religion, Category, Family Type) with MENQOL Scores of Study Participants

Muslims had higher vasomotor and sexual score, as compared to other religion, while Hindus had more severe symptoms in psychosocial domain. Other religion participants had higher physical score. Study participants of SC and ST category had higher domain sub-score and MENQOL total score as compared to OBCs and General category women. Participants of nuclear family had more vasomotor symptoms, while physical symptoms were more in women from joint family. Women from broken and nuclear family in our study reported higher psychosocial symptoms.

A study done in Hubli in 2017, reported higher score among Muslims in all domains.⁶⁹ A Pune study done in 2011, found that respondents living in nuclear families faced significantly more ($p < 0.01$) psychological symptoms.⁶

Table 48: Association of Sociodemographic Variables (Age, Education) with MENQOL Scores of Study Participants

Vasomotor and Sexual symptoms were more severe in less than 45 years of age and decreased significantly with increase in age. Psychosocial and physical domain had more symptoms with increase in age but results were not significant. Total score showed a significant decrease with increase in age ($p < 0.001$).

Similar study done in United States in 2008 among postmenopausal women aged 40–65 years had highest score in all domains in younger age group with the scores decreasing with age.⁴⁹ Another study done in Hubli in 2017, reported highest score for all domains except physical domain in the lower age groups.⁶⁹

According to the present study, vasomotor, sexual and total score were significantly more in participants who studied from 6th Standard to PUC/Diploma. No significant variation was seen for other domains.

In contrast, a study done Turkey done in 2014 among women, aged 40–59 years had highest MENQOL domain sub-scores and total score among illiterates.⁵⁴

Table 49: Association of Sociodemographic Variables (Occupation, Socioeconomic Scale) with MENQOL Scores of Study Participants

Farmers and labourers reported more scores than other occupational categories but findings were significant only for sexual domain score and overall score ($p < 0.001$). In the present study, homemakers had lesser score across all domains.

In contrast, a study done in Turkey in 2014 higher scores were seen among non-working participants as compared to working women.

According to present study, participants of poorer socio-economic class had significantly higher psychosocial and sexual scores as compared to other socio-economic class. Results were not significant for other domains with respect to socio-economic class.

Similarly, an Iranian Study reported significant association of more severe symptoms among poorer participants.⁵² The Study of Women's Health across the Nation (SWAN) also showed that most of the indicators of the low socioeconomic status with difficulty in paying for the basic necessities, were associated with a significantly increased reporting of most of the postmenopausal symptoms.⁹⁶

Table 50: Association of Sociodemographic Variables (Food Habits, Personal Habits, Substance Abuse) with MENQOL Scores of Study Participants

As per the present study, regarding food habits, participants with mixed food diet had significantly more score than vegetarians in vasomotor domain and overall score. Other domains had similar but non-significant findings.

However, in the multiethnic sample in the Study of Women's Health Across the Nation (SWAN) in United States, no significant association about diet with vasomotor symptoms could be concluded.⁹⁶

Participants not consuming any tea or coffee had significantly higher physical and psychosocial score. Coffee intake was associated with higher vasomotor sub score.

Similarly, findings of an earlier US based study reported higher significant vasomotor score among caffeine users.⁵⁵ Another study done in Libya, concluded that postmenopausal symptoms were significantly inversely associated with tea or coffee consumption as women who drink tea or coffee reported fewer physical, psychosocial and sexual, but not vasomotor symptoms than those who never drink tea or coffee.⁵³

Tobacco chewers had significantly lesser vasomotor score than others ($p=0.042$).

No literature studying the association of chewing tobacco and menopausal symptoms was available. But United States based review done in 2006, reported greater rates of vasomotor symptom in smokers than in nonsmokers.⁴⁶

Table 51: Association of Sociodemographic Variables (BMI) with MENQOL Scores of Study Participants

In the present study, obese and overweight participants had more severity of symptoms across all domains except psychosocial domain and overall ($p<0.001$). Underweight participants had more psychosocial symptoms 4.21 ± 1.3 ($p<0.001$).

Similar findings were reported in a Turkish study done in 2014, which revealed that revealed that obese women had the highest scores in the vasomotor and physical domains whereas underweight women had the highest scores in the psychosocial and

sexual domains.⁵⁴ Another study conducted in Riyadh, 2017 among postmenopausal Saudi women found a significant association between obesity and menopausal symptoms, particularly in the vasomotor and physical domains.⁵⁸

It is postulated that peripheral conversion of androgens into estrogens in adipose tissue in overweight and obese women lead to increased climacteric symptoms.⁵⁶

Table 52: Association of Obstetrics and Gynecology Variables with MENQOL Scores of Study Participants

Divorced or separated women had higher symptoms in vasomotor and psychosocial domain, while married women had more severe physical and sexual symptoms. Unmarried women had least severity across all domains ($p < 0.001$).

A similar study conducted in Turkey in 2014 reported higher scores across all domains among divorced, separated and widowed women ($p < 0.01$).⁵⁴

In the present study, women with marriage above 30 years had more total MENQOL score, while those married at less than 15 years had least MENQOL Score. ($p = 0.025$) Participants with first child birth after 30 had significant higher vasomotor and psychosocial score than others.

Table 53: Association of Obstetrics and Gynaecology Variables with MENQOL Scores of Study Participants

In the present study, participants with late menopause beyond 55 years had higher symptoms across all domains except psychosocial domains. Participants with menopausal duration less than 5 years had significant higher symptoms across all domains.

Similar findings were seen in an Iranian study, 2015 among postmenopausal women aged 40–60 years with higher severity among < 5 years duration since FMP.⁵⁷

Table 54: Association of Obstetric Score with MENQOL Scores of Study Participants

Women with parity less than 3 had significantly higher vasomotor, psychosocial, sexual and overall score as compared to women with higher parity.

It is similar to findings of Turkey study, 2011 where higher scores were seen in all four domains and overall among women with lesser parity.⁵⁴

Table 55: Association of Contraception and Breast Feeding with MENQOL Scores of Study Participants

As per the current study, women who never breastfed had significantly higher MENQOL score, as compared to others. Significant association of decrease in severity of symptoms with increase in duration of breast feeding was seen in vasomotor and sexual domain ($p < 0.001$). No significant association was found between menopausal symptoms and contraceptive usage though temporary contraceptive usage had highest score in all domains except psychosocial domain. Vasomotor and sexual symptoms were seen more with use of temporary contraceptives, while physical symptoms were more seen with sterilization.

Similarly, the study done in Bengal in 2014 reported that history of use of oral contraceptive pills, duration of breastfeeding of the last child and history of sterilization increased the likelihood of vasomotor symptoms like hot flushes and night sweats.⁶⁷

Table 56: Association of Menstrual Cycle Variables with MENQOL Scores of Study Participants

In the present study, women with regular cycles had more physical domain score ($p < 0.001$). Participants with more duration of bleeding, having scanty discharge and abnormal pain had higher MENQOL score across all four domains.

The Bengal study, 2014 reported that scanty discharge is significantly associated with higher significant association with night sweats and vaginal dryness.⁶⁶

ASSOCIATION OF PHYSICAL ACTIVITY WITH MENOPUSAL AGE AND SYMPTOMS

Table 57: Association of IPAQ Physical Activity Levels with Menopausal Age of Study Participants

In the present study, participants with low activity (46.47 ± 5.22 years) had higher menopausal age than women with high activity level (44.92 ± 4.50 years) moderate activity (44.90 ± 3.66 years). ($p = 0.013$)

A study done in Uttarakhand in 2009, similarly reported a significant association ($p < 0.05$) between lifestyle and ANM where sedentary lifestyle had higher ANM (50.50 y) as compared to active (44.65 y) and least for hectic lifestyle (44.44 y).³⁰ A Korean study conducted in 2017 also found that participants with regular exercise had lower ANM of 50.6 ± 0.3 years as compared to 51.1 ± 0.2 years among inactive women.²⁵

In this current study, women doing walking or moderate activity had higher menopausal age ($p=0.036$), while those doing vigorous activity had lesser age at menopause ($p=0.057$).

This is in agreement with earlier review by Indian Menopause Society, 2014 that proposes that vigorous exercise accelerates ANM by suppressing the ovarian function thus lowering serum estrogens.⁷ However, Breakthrough study, 2011 of United Kingdom found that strenuous exercise was associated with a slightly later menopause after accounting for BMI and other factors.²⁴

Table 58: Association of IPAQ Physical Activity Levels with MENQOL Score of Study Participants

In the current study, significant association was found between domain scores and level of physical activity ($p < 0.001$). Both low and high physical activity were associated with more severe menopausal symptoms in respective domain score when compared to moderate physical activity level. Total score also showed significant association with lowest score in moderate activity level than in other two levels. Thus, relationship between sub scores and total scores and physical activity had a U-shaped trend.

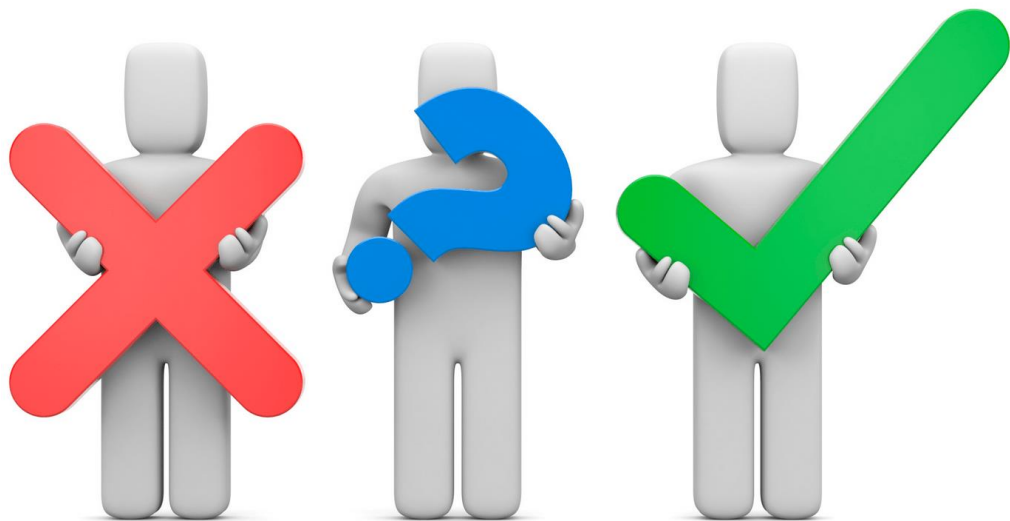
Similar study done in Korea in 2014 reported that physical activity was significantly associated with the total MENQOL score, psychosocial and physical sub scores. The moderately active group had the lowest total, psychosocial and physical scores, followed by the highly active group and the low activity group. However, physical activity level was not significantly associated with the vasomotor or sexual sub scores.⁷⁶

Tables 59-60: Multiple linear regression analysis of the relationship MENQOL Scores (Total score and Domain Scores) and IPAQ physical activity levels.

Among the 345 participants included in this analysis, compared to the low activity group, women with a moderate level of physical activity had significantly lower MENQOL Total Scores ($\beta=-1.950$, $p<0.001$) in contrast to women with high activity who reported more MENQOL Total Score ($\beta= 0.354$, $p <0.001$). These women with moderate activity also reported significantly lower scores in all four MENQOL domains than the low physical activity group. Women with high level of activity reported more symptoms than the reference group in total scores and all domain scores except psychosocial domain.

After adjustment for age, BMI, marital status, family income, education and parity, participants with moderate activity still had significantly lower scores in total and all four MENQOL than the low physical activity group.

A Korean Study done 2014 reported that women with a moderate level of physical activity had significantly lower MENQOL total scores ($\beta=-0.306$, $p=0.028$), psychosocial ($\beta=-0.414$, $p=0.012$) and physical symptoms ($\beta=-0.446$, $p=0.002$) than the low physical activity group after adjustment for age, BMI, marital status, family income, education and parity. By contrast, a high level of physical activity did not influence the MENQOL total score and sub scores relative to the low activity group. No associations were observed between physical activity and the vasomotor and sexual symptoms in any group.⁷⁶



CONCLUSION

CONCLUSION

The present study is an attempt to assess the prevalence of menopausal symptoms in 345 post-menopausal women aged 40-60 years and to study the association of physical activity with menopausal symptoms. A pre-designed structured proforma was developed on the basis of socio-demographic, obstetrics and gynecology, MENQOL and IPAQ variables and administered to the study participant.

The data thus collected was analysed, results were discussed and the following conclusions were made:

The mean age at menopause among study participants residing in the urban area of Belagavi, Karnataka was 45.53 ± 4.34 years. More than half of the participants had duration of less than five years since final menstrual period with the mean duration since menopause among study participants as 6.51 ± 5.06 years. ANM had a significant correlation with menopausal age of mother and elder sister.

Higher menopausal age was found to be significantly associated with better education level among literates, other religion, joint family, schedule castes, better socio-economic class, vegetarian diet, coffee intake, overweight or obese, currently married, delayed menarche, first child after 30 years, less than five years since menopause, use of contraceptive use (temporary more than permanent), longer duration of breast feeding, greater parity or living children, prolonged cycles. Lower menopausal age had significant association with tea drinking, Muslims, ST, broken families, underweight, poorer

economic status, unmarried, divorced/ separated, early menarche, late marriage (> 30 y), stillbirth and shorter menstrual cycle.

The most common symptoms were of physical domain (75.7% - 25.5%) followed by psychosocial domain (63.9% - 49.3%) to vasomotor domain (63.5% - 55.4%) and least common sexual domain (42.3% - 36.2%).

Domain wise mean score was 3.74 ± 2.42 , 3.55 ± 1.37 , 3.19 ± 1.15 , 2.16 ± 1.37 for Vasomotor, Psychosocial, Physical and Sexual domains respectively. Overall mean MENQOL score was 3.16 ± 1.25 .

Significant association was seen between frequency of menopausal symptoms and duration since menopause (except for two physical symptoms). All menopausal symptoms of all domains were most commonly seen in less than five years duration since menopause. Most common symptoms in less than five years of age were vasomotor, while in later years after menopause most common symptoms were psychosocial and physical.

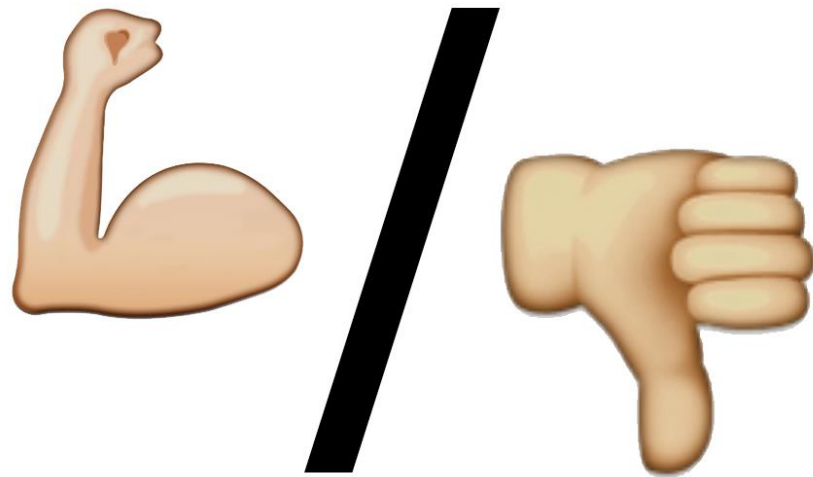
Lower mean MENQOL score was significantly associated with low educational status, unmarried, increasing duration of breast feeding, normal duration of bleeding. Higher mean MENQOL score was found to be significantly associated among participants of lesser age, schedule tribe, labourers, mixed diet, obese, divorced or separated, delayed menarche, age at marriage more than 30, higher age at first pregnancy, delayed menopause, relatives with delayed menopause, higher parity, scanty discharge and abnormal lower abdominal pain. Duration of < 5 years since final menstrual period had highest severity in all domains and total MENQOL score.

Participants with low activity had significantly higher menopausal age than women with high activity level and moderate activity level. Women doing domestic work

were associated with significantly higher menopausal age. Women doing walking or moderate activity had higher menopausal age, while those doing vigorous activity had lesser age at menopause.

Significant association was found between domain scores and level of physical activity. Low and high physical activity was associated with more severe menopausal symptoms in respective domain score and overall when compared to moderate physical activity level.

Multiple linear regression reported that moderate activity has significantly lower scores in all four MENQOL domains and lower overall MENQOL mean score than the reference group (low physical activity). After adjustment for age, BMI, marital status, family income, education and parity, participants with moderate activity had significantly lower scores in overall MENQOL score ($\beta=-1.86$) and all four MENQOL domains - Vasomotor ($\beta=-2.23$), Psychosocial ($\beta=-1.94$) Physical symptoms ($\beta=-1.49$) and Sexual ($\beta=-1.80$, $p < 0.001$) than the low physical activity group. By contrast, high level of physical activity had higher but non-significant MENQOL total score and sub scores relative to the low activity group in all domain scores except psychosocial domain.



STRENGTHS & LIMITATIONS

STRENGTHS AND LIMITATIONS

The strengths and limitations of this study on postmenopausal women are as follows:

STRENGTHS:

1. Use of pre-designed, pretested and validated questionnaire with standard MENQOL and IPAQ proformas to assess the menopausal symptoms and physical activity respectively.
2. Provides extensive knowledge about various determinants of menopausal age and menopausal symptoms.
3. Despite extensive research, this study appears to be first one to assess the association of regular physical activity of post-menopausal women with menopausal age and symptoms among Indian women.

LIMITATIONS

1. Recall bias may have been present among study participants about few obstetrics and gynecology variables.
2. Missing data was present regarding age at menopause of elder sisters and mother as many participants had no accurate knowledge about it as they were part of different families now and resided at separate places.
3. Physical activity was estimated based on the history given by the participant and was not actually observed/measured by the investigator.
4. A cross-sectional study could only measure the association instead of causal relationship of different variables on menopausal symptoms and menopause age.



RECOMMENDATIONS

RECOMMENDATIONS

Based on the findings of present study to study about menopausal symptoms in post-menopausal women, following recommendations are being suggested:

At Individual Level

All the women in reproductive age group should be counselled about the hormonal transition during menopause and accompanying symptoms as a result of this transition. As one of the main complaints among menopausal women is not knowing what to expect during menopause, this knowledge may help them be better prepared mentally and physically to deal with this profound change in their body.

The role of genetic factors and other modifiable lifestyle and socio-demographic variables in determining menopausal age and severity of symptoms should be out in public domain for general awareness of women. Women can be made aware so that they can plan for their transition right from reproductive age group by adopting better lifestyle measures.

Physical activity has been found to have beneficial impact on the age and symptoms of menopause in our study. Women must be told that incorporation of regular moderate exercise even for a small time in their daily routine will pay rich dividends in their post-menopausal life in attenuation of transition menaces like hot flushes, depression, incontinence apart from providing increased strength and better cardiovascular health.

At Family Level

Most family members have no knowledge about the menopausal symptoms and various psychological and physical complications accompanying this transition. Creating awareness among family members will enable them to empathize with the women thus creating a favourable atmosphere for her at home.

The elder relatives can shed inhibitions and help tackle the lack of knowledge among climacteric women by sharing their experiences and create a support system for better adaptation to the newer phase of life.

At Community Level

Information Education Communication activities both to increase awareness about menopause related health problems among general public and to counsel middle aged female population should be undertaken.

Post-menopausal groups can be developed as a package covering counselling and mental health, general checkup, screening and health education about lifestyle measures. Self-help groups and Mahila Mandals can help in this initiative so as to have desired impact among large group of individuals.

Group activities can be undertaken by various residential societies and parks to promote physical activity among middle aged women and cultivate it as a habit for better tomorrow.

At District Level

There is a growing need of menopausal clinics at all levels of healthcare to cater to the large group of middle aged women. Wellness centres can be developed for these pre-geriatric women where physicians can counsel and treat them for various complications.

At State and National Level

Reproductive and Child Health-II and National Health Mission only addresses women in the reproductive age group, ignoring those who have passed their reproductive stage. It should be extended to include post-menopausal women.

Health care in India, pays little importance to the menopausal health problems. It can be altered to pay greater attention to the menopause related complications.

With early age at menopause and increasing life expectancy leading to women spending almost one-third to half on their life battling various menopausal symptoms and other health ailments as a consequence of transition, a public health programme, focusing exclusively on post reproductive age group is very much needed in India.

Future Research

With better resources and more staff, a multi-centric randomized controlled trial with large sample size can be planned to compare the effect of different lifestyle modifications including diet, physical activity, etc. on menopausal symptoms.



SUMMARY

SUMMARY

This community based cross-sectional study was conducted in 2016 among 345 post-menopausal women age 40-60 years residing in the field practice area of Urban Health Centre (UHC) Ashok Nagar, which is affiliated to Department of Community Medicine, KLE University's, Jawaharlal Nehru Medical College, Belagavi, Karnataka.

The objective of this study was to know the prevalence of menopausal symptoms and to study the association of physical activity with menopausal symptoms.

Key results are summarized as follows:

Socio-demographic profile of the study participants

In the present study conducted among 345 participants, highest number of participants 95 (27.5%) were in the age group of 51-55 years. Least number of participants 66 (19.1%) belonged to the age group of 40-45 years. Overall, the mean age at menopause among study participants was 52.04 ± 5.58 years.

Majority 200 (58%) were Hindus, while 139 (40.3%) were Muslims. Participants belonging to any other religion (Christian, Jain, Sikh, Etc.) were 6 (1.7%). Among the 200 Hindu participants, 103 (51.5%) were of General Category followed by 51 (25.5%) of Other Backward Castes. Participants belonging to Scheduled Castes were 30 (15%), while 16 (8%) were in Scheduled Tribes. 221 (64.1%) of the participants had nuclear families, while 106 (30.7%) belonged to joint families. Participants from broken families were 18 (5.2%).

Out of 345 study participants, 266 (77.1%) were literates. Among them, most of the participants 136 (39.4%) had studied up to 6th - 10th standard, followed by 73 (21.2%) up to 1st - 5th standard. About 37 (10.7%) participants studied up to 11th - 12th standard/Diploma and 20 (5.8%) were Graduate/ Post-Graduates. Remaining 79 (22.9%) participants were illiterate. Majority of the participants 232 (67.2%) were homemakers. 39 (11.3%) women worked as farmer/labourer followed by 28 (8.1%) who were self-employed. Government Employee and Private Employee were 26 (7.5%) and 20 (5.8%) respectively. 201 (58.2%) belonged to SES class IV and SES class III combined, while just 30 (8.7%) belonged to SES class I socio-economic status as per the Modified B. G. Prasad's Classification.

Majority of the study participants 210 (60.9%) had mixed food habits, while 135 (39.1%) consumed only vegetarian food. 314 (91%) of the participants consumed tea, while coffee drinkers were 10 (2.9%). None of the participants consumed aerated drinks. Most of the participants 280 (81.2%) had no history of substance abuse ever. Only 65 (18.8%) women had ever been tobacco chewers. None of the participants was ever habituated to smoking or alcohol.

Among the 345 study participants classified as per Asian Standards of BMI, 143 (41.4%) had normal BMI. 103 (29.9%) women were overweight followed by 87 (25.2%) obese. Only 12 (3.5%) were underweight.

Obstetrics and Gynaecology profile of the study participants

Majority of the participants 251(72.8%) were currently married, while 71 (20.6%) were widows. 12 (3.5%) women were divorced/separated from their partners. Only 5 (1.4%) participants were unmarried.

Out of 345, 218 (63.2%) reported normal age at menarche. 80 (23.2%) had history of delayed menarche, while 47 (13.6%) had early menarche. Among the 340 (98.5%) who ever married, 252 (74%) were married in age group of 15-25 years. 59 (17.4%) were married in < 15 years of age, while 8 (2.4%) women got married above the age of 30 years. Among 330 study participants who ever got pregnant, 147 (44.6%) had first pregnancy in the age group of 20-24 years, followed by 111 (33.6%) in the age group of 15-19 years and 48 (14.5%) in age group 25 – 29 years. 18 (5.5%) had first pregnancy in < 15 years of age, while 6 (1.8%) had in > 30 years.

Among 345 participants, majority 237 (68.7%) had a parity of 2-4. About 15 (4.3%) of the participants did not have children. Overall median parity was 3 i.e. 3 children per woman. Out of 330 participants who were ever pregnant, majority 250 (72.5%) had 2-4 living children. About 8 (4.3%) of the participants had no child alive. Overall median was 3 living children per woman. Majority 264 (76.5%) women did not have history of previous abortions, 312 (90.4%) of the women did not have history any child death and 341 (98.8%) of the women did not have history of stillbirth.

Only 127 (36.8%) participants out of 345 knew about the age at menopause of their mother. Mothers of 95 (74.8%) had normal menopause, 26 (20.5%) had premature menopause, while 6 (4.7%) had delayed menopause. The mean of age at menopause of mother (as reported by the study subjects) was 45.01 ± 4.26 years. Only 131 (36.8%) out of 345 participants, knew about the age at menopause of their elder sisters. Classifying as per mean menopausal age of elder sisters 102 (77.9%) had normal menopause, 19 (14.5%) had premature menopause, while 10 (7.6%) had delayed menopause. The mean of mean age at menopause of women's elder sisters was 45.36 ± 4.26 years.

Among 345 study participants, 280 (81.2%) had normal menopause, 44 (12.8%) had premature menopause, while 21 (6.1%) had delayed menopause. The mean age at menopause among study participants was 45.53 ± 4.34 years. Majority 175 (50.7%) of the participants had duration of <5 years since final menstrual period, followed by 78 (22.6%) with a duration of 5-10 years. 67 (19.4%) women had 10-15 years duration since FMP, while only 25 (7.2) women had duration of 15- 20 years. Mean duration since menopause among study participants was 6.51 ± 5.06 years.

Among 345 study participants 115 (33.3%) women never used any contraception in the past. 178 (51.6%) used permanent methods only, while 32 (9.3%) used temporary method only. Few participants 20 (5.8%) used both methods.

Out of 345 study participants, only 309 (89.6%) had ever breast fed. 95 (27.5%) did breast feeding for 1-2 years, followed by 74 (21.4%) each for 6-12 months and >2 years. Only 66 (19.1%) participants breast fed for less than less than 6 months.

Among 345 study participants, 291 (84.3%) women had regular menstrual cycles, while 54 (15.7%) had irregular menstrual cycle in their past. Majority 261 (75.7%) women had normal menstrual cycle of 21 - 35 days. 66 (19.1%) had shorter menstrual cycles, while 18 (5.2%) had prolonged cycles during past menstrual cycles. 308 (89.3%) had normal bleeding duration, while 37 (10.7%) had prolonged bleeding duration in their past menstrual cycles. 222 (64.3%) had normal menstrual discharge. 71 (20.6%) had profuse bleeding, while 52 (15.1%) had scanty bleeding in their past menstrual cycles. Only 71 (20.6%) had abnormal lower abdominal pain in their past menstrual cycles.

Menopausal symptoms among study participants as per MENQOL questionnaire

In the present study, the most common menopausal symptoms were of physical domain - 'Feeling Tired or Worn Out' 261 (75.7%) followed by 'Aching in Muscles and Joints' 251 (72.8%), 'Decrease in Stamina' 228 (65.8%), 'Low Backache' 64.1% followed by the psychosocial domain – 'Feeling Depressed, Down or Blue' 217 (63.9%) to vasomotor domain - 'Sweating' 219 (63.5%). Least common symptoms were 'Increased Facial Hair' 88 (25.5%), 'Dry skin' 118 (34.2%), 'Decrease in Sexual Desire' 126 (36.2%) and 'Changes in Appearance, Texture or Tone of Skin' 133 (38.6%).

Domain wise frequency of vasomotor symptoms varied from 219 (63.5%) for 'Sweating' to 191 (55.4%) for 'Hot flushes'. Among psychosocial symptoms most commonly seen were 'Feeling Depressed, Down or Blue' 217 (63.9%) to 170 (49.3%) for 'Feeling Anxious or Nervous'. In the physical symptoms, maximum frequency was for 'Feeling tired or worn out' 261 (75.7%) and the least frequent symptom was 'Increased facial hairs' 88 (25.5%). Overall Sexual domain had lesser frequency of symptoms ranging from 146 (42.3%) for 'Dryness of vagina' to 125 (36.2%) for 'Decreased sexual desire'.

In the present study, overall the severity of symptoms ranged highest for 'Feeling Tired or Worn Out' (4.37 ± 2.14) followed by 'Aching in Muscles and Joints' (4.23 ± 2.14) and 'Low Backache' (4.02 ± 2.41). Least severe symptoms were 'Increased Facial Hair' (1.89 ± 1.65), 'Decrease in Sexual Desire' (2.12 ± 1.57) and 'Avoiding Intimacy' (2.13 ± 1.52).

Domain wise the severity of vasomotor symptoms varied from 3.957 ± 2.58 for 'Sweating' to 3.50 ± 2.37 for 'Night sweats'. Among psychosocial symptoms the severity

ranged from 3.94 ± 2.37 for 'Feeling Depressed' to 3.14 ± 2.28 for 'Feeling Anxious or Nervous'. In the physical symptoms, maximum severity 4.36 ± 2.14 was for 'Feeling Tired or Worn Out', while the minimum 1.89 ± 1.65 was for 'Increased Facial Hair'. Severity of sexual symptoms ranged from 2.24 ± 1.65 for 'Vaginal Dryness' to 2.12 ± 1.57 for 'Decrease in Sexual Desire'.

Physical activity among study participants as per IPAQ

Among 345 participants, majority 181 (52.5%) had moderate activity level followed by 91 (26.4%) for low activity level and 73 (21.2%) for high activity level. 341 (98.8%) did moderate type of activity and 317 (91.9%) did walking. Only 20 (5.79%) participated in vigorous type of activity. 337 (97.7%) women did activity in domestic domain and 277 (80.3%) in transportation domain. 131 (5.79%) women participated in leisure domain, while only 100 (28.9%) had activity in job related domain.

Determinants of age at menopause

Age at menopause was highest for participants of other religion at years followed by Hindus and least for Muslims ($p = 0.002$). Among the 200 Hindu study participants, age at menopause ranged from 48.50 ± 5.85 years for Schedule Caste followed by 46.33 ± 4.37 years for general category and 45.19 ± 3.62 years for OBCs and least 44.13 ± 1.20 years for Schedule Tribes ($p = 0.002$). Women belonging to joint family had higher ANM followed by women of nuclear family and least for ones with broken families ($p < 0.001$).

Among 345 study participants, age of menopause was significantly associated ($p < 0.001$) with higher age at higher education level among literates. Age at Menopause was 44.51 ± 4.03 years for 1st - 5th Standard and 46.60 ± 2.06 years for Graduates / Postgraduates. No significant variation in mean age at menopause was found among

women belonging to different occupational categories. In this study, association of socioeconomic status with menopausal age was significantly observed with highest ANM for SES Class I to least for SES Class V ($p = 0.031$).

Vegetarian participants had higher ANM, while participants consuming mixed food had lesser menopausal age ($p < 0.001$). Participants habitual to taking tea had lesser ANM, while those taking coffee had higher menopausal age as compared to participants taking none of these ($p < 0.001$). Tobacco Chewers had lesser age at menopause as compared to others ($p = 0.141$). Non-significant trend with increase in ANM with rise in BMI was observed with least ANM for underweight and highest for obese participants.

Marital status had significant association with ANM ($p < 0.001$). Married women and widows had higher menopausal age, while unmarried and divorced/separated women had lower ANM. In the present study, age at menarche had a significant association with menopausal age with lesser ANM for women with early menarche and late for women with late menarche ($p < 0.001$). Study participants with age at marriage < 15 years had ANM of 46.57 ± 3.29 years, while it was 43.00 ± 1.238 among those who married at more than 30 Years ($p < 0.001$).

In the current study, study participants with age at first pregnancy < 15 years had lower ANM as compared to those who got pregnant at > 30 Years ($p = 0.018$). In this study, parity of less than 3 and those with less than 3 living children, were significantly associated with lower ANM as compared to women with higher parity and more living children respectively. ($p < 0.001$) No significant association was found with abortion or dead child but women with stillbirth had much lesser mean menopausal age ($p < 0.001$).

In the present study, length of menstrual cycle was also significantly associated with age at menopause. Women with < 21 days menstrual cycle had lower ANM as compared to women with normal cycle. ANM was highest for women with > 35 days cycle. Other variables of menstrual cycle had no significant association with ANM.

The present study showed a significant association of menopausal age among different groups classified as per duration since menopause. There was a trend of increase in ANM with it being maximum 46.37 ± 4.86 years for < 5 years duration to least 41.6 ± 2.12 years for group with a duration of 15-20 years ($p < 0.001$). Mother's and mean of elder sister's age at menopause significantly correlated with age of menopause of the participant in this study ($p < 0.001$).

Breast feeding was found to be significantly associated with ANM. Participants who had not breast fed had lesser ANM in contrast to highest ANM for women who breast fed 1-2 years ($p < 0.001$). Contraception was significantly associated with ANM. Participants who had used temporary contraceptive methods had higher ANM as compared to those using none 45.18 ± 4.16 years. ANM of 45.23 ± 4.19 years was found in women who opted for permanent methods ($p < 0.001$).

Determinants of frequency and severity of menopausal symptoms

All menopausal symptoms of all domains were seen most commonly in < 5 years duration since menopause. Most common symptoms in less than 5 years were of vasomotor domain, while in 5-20 years, psychosocial and physical symptoms were more common. Vasomotor symptoms were more severe in less than 45 years of age and decreased significantly with increase in age. Psychosocial and physical domain had more symptoms with increase in age, but results were not significant. Sexual symptoms were

also significantly associated with age - more severity at < 45 years and least in women >55 years. Total score showed a significant decrease with increase in age ($p < 0.001$).

Muslims had higher vasomotor and sexual score as compared to other religions. Hindus had more severe symptoms in psychosocial domain, while other religion participants had higher physical score. None of the associations were found significant. Study participants of SC and ST category had significant higher vasomotor and MENQOL total score as compared to OBCs and General category women. Participants of nuclear family had more vasomotor symptoms, while physical symptoms were more in women from joint family. Other domains had non-significant association with family types. Women from broken and nuclear family reported higher psychosocial symptoms ($p = 0.202$).

Vasomotor, sexual and total score were significantly more in participants who studied from 6th standard to PUC/Diploma. No significant variation was seen for other domains. Farmers and labourers reported more scores than other occupational categories, but findings were significant only for sexual domain score and overall score. ($p < 0.001$) Regarding socio-economic status, Class V had significantly higher psychosocial and sexual scores as compared to other socio-economic class. Results were not significant for other domains with respect to socio-economic class.

Participants with mixed food diet had significantly more score than vegetarians in vasomotor domain and overall mean score. Participants not consuming tea or coffee had significantly higher physical and psychosocial score. They also reported non-significant but higher vasomotor score. Tobacco chewers had significantly lesser vasomotor score than others ($p = 0.042$). Obese participants had more severity of symptoms across

vasomotor, physical and sexual domains and overall ($p < 0.001$), while underweight participants had more psychosocial symptoms ($p < 0.001$).

Divorced or separated women had higher symptoms in vasomotor and psychosocial domain, while married women had more severe physical and sexual symptoms. Unmarried had least severity across all domains ($p < 0.001$). As per the present study, women with late marriage above 30 years had more total score, while those married at < 15 years had least MENQOL Score ($p = 0.025$). Participants with first child birth after 30 years had significantly higher vasomotor, psychosocial score.

Women with parity less than 3 had significantly higher overall score as compared to women with higher parity. No significant association was seen with living child except higher score in sexual domain among women of less living children ($p = 0.009$). Among women with history of death of a child, higher non-significant score was found in psychosocial and physical domain.

As per the current study, women who never breastfed had significantly higher MENQOL score as compared to others. Significant association of decrease in severity of symptoms with increase in duration of breast feeding was seen in vasomotor and sexual domain ($p < 0.001$). No significant association was found between menopausal symptoms and contraceptive usage though temporary contraceptive usage was associated with highest score in all domains except psychosocial domain, while physical symptoms of more severity were seen with sterilization.

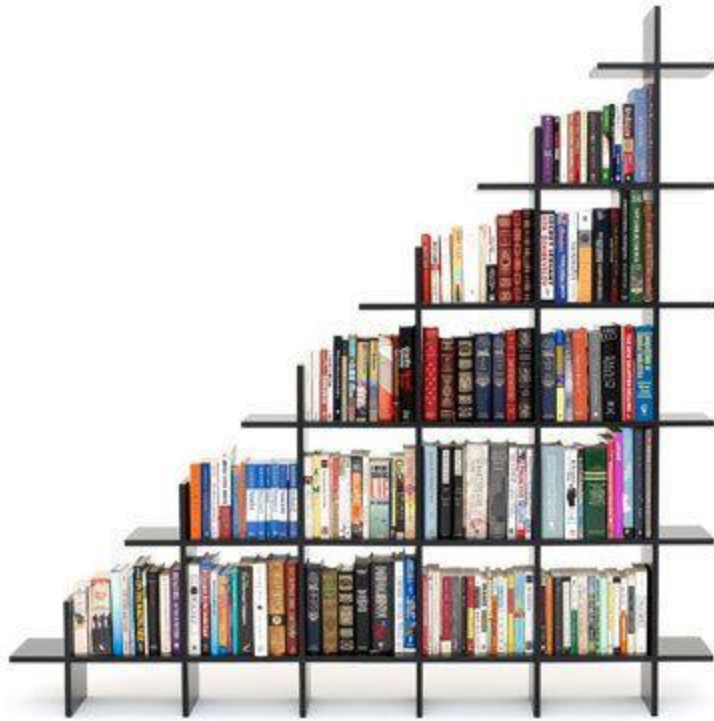
In the present study, women with regular cycles had more physical domain score ($p < 0.001$). Participants with more duration of bleeding of ≥ 7 Days, having scanty discharge and abnormal pain had higher MENQOL score across all four domains.

Participants with late menopause had significant higher symptoms across all domains ($p < 0.001$). Duration of < 5 years since final menstrual period had highest severity in all domains and total MENQOL score ($p < 0.001$) and it decreased with time.

Association of physical activity with menopausal age and symptoms

Women doing walking or moderate activity had higher menopausal age ($p=0.036$), while those doing vigorous activity had lesser age at menopause ($p=0.057$). Women doing domestic work were significantly associated with higher menopausal age. Participants with low activity had higher menopausal age than women with high activity level and moderate activity level ($p= 0.013$).

Significant association was found between domain scores and level of physical activity ($p<0.001$). Both low and high physical activity were associated with more severe menopausal symptoms in respective domain score when compared to moderate physical activity level. After adjustment for age, BMI, marital status, family income, education and parity, participants with moderate activity had significantly lower scores in total and all four MENQOL domains. By contrast, a high level of physical activity had higher but non-significant MENQOL total score and sub scores relative to the low activity group in all domain scores except psychosocial domain.



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ANNEXURES

ANNEXURE I**INSTITUTIONAL ETHICAL CLEARANCE**

K.L.E. UNIVERSITY'S
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To,
 BD0115004,
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 J.N.Medical College,
 BELAGAVI.

Sub: Institutional Ethical Clearance for the study.

With reference to the above, we wish to inform you that your proposed research project titled
**“MENOPAUSAL SYMPTOMS AMONG POST MENOPAUSAL WOMEN AGED 40-60
 YEARS RESIDING IN AN URBAN AREA OF BELAGAVI – A COMMUNITY BASED
 CROSS - SECTIONAL STUDY”**, is ethical and justifiable. The proposed research project has
 been cleared by the JNMC Institutional Ethics Committee on Human Subjects Research.

(Dr. Arathi Darshan)
 Member Secretary
 JNMC Institutional Ethics Committee
 on Human Subjects Research,
 J.N.Medical College, Belagavi.

(Dr. Ganga Pilli)
 Chairman,
 JNMC Institutional Ethics Committee
 on Human Subjects Research,
 J.N.Medical College, Belagavi.

ANNEXURE II**INFORMED CONSENT****“MENOPAUSAL SYMPTOMS AMONG POST MENOPAUSAL WOMEN AGED 40-60 YEARS RESIDING IN AN URBAN AREA OF BELAGAVI – A COMMUNITY BASED CROSS-SECTIONAL STUDY.”**

Investigator: BD0115004

Introduction:

Menopause is the permanent cessation of menstruation resulting from the loss of follicular activity of the ovaries. According to the WHO (1981), natural menopause is defined as no menses for 12 consecutive months with no obvious intervening cause, such as pregnancy, lactation, exogenous hormone use, dietary deficiencies, or surgical removal of the uterus or ovaries. ¹The onset of this physiological development not only marks the end of women's reproductive function but also introduces them to a new phase of life. During the menopause, women may experience vasomotor, psychosomatic, physical as well as sexual dysfunction. You are being invited to participate in this study to find out about your menopausal symptoms. This study aims to know the prevalence of menopausal symptoms and association of physical activity with menopausal symptoms in postmenopausal women in the field practice area of Urban Health Centre, Ashok Nagar, Belagavi.

Methodology:

You will be interviewed using a pre-designed and pre-tested questionnaire to find out about the menopausal symptoms. Height will be measured using measuring tape. Weight will be taken on adult weighing scale. No laboratory investigations will be done.

Possible benefits:

You will be benefitted by the health education given during the study regarding appropriate management available. In case of requirement of treatment, you are eligible for the free services available at UHC Ashok Nagar, Belagavi, and if necessary, can be referred to Dr. Prabhakar Kore Charitable Hospital, Belagavi for further management.

Possible risks:

Methods applied to do the study are safe. No risk is involved in the study.

Cost of participation:

The cost of the study will be entirely borne by the researcher. You will not have any costs attached to your participation. You will not be eligible for any kind of monetary benefits by virtue of your participation in the study.

Legal rights:

By signing this consent form, you are not waiving off any of your legal rights.

Privacy and Confidentiality:

Your personal identity will not be revealed. All information collected will be coded so that no one other than the investigator will know your identity.

Withdrawal from the study:

You can withdraw from the study at any time if you wish to do so without assigning any reason.

Authorization to publish the results:

The researcher may use the information gathered from this study for presentation in conferences /publication in scientific journals. However your personal identity will not be revealed.

Questions:

If you have any questions about rights as a research participant you can contact:

Dr. (Mrs.) Ganga S. Pilli. Chairperson, Institutional Ethics Committee on Human Subjects' Research, JNMC. Belagavi-590010 Phone no. 0831-2471701 OR Dr. (Mrs.) N. S. Mahantashetti, Principal, J. N. Medical College, Belagavi – 590010, Karnataka, Phone no. 0831-2471350

CONSENT STATEMENT

“I have been explained all the contents of this consent form in my local language and have understood and clarified all my queries about the study to the best of my knowledge. Furthermore, I recognise that I have the complete right to withdraw this consent at any point during the study. I understand that the information given by me will be confidential and will be used for research purpose only, further I am aware that the result of this research will be presented/published without disclosing any personal identification of the participants.

I hereby give my voluntary consent for participation in the study. I do sign the informed consent form in front of an eyewitness whom I recognize.”

Name of the Participant

Signature/ left thumb impression of the participant

Name of the eyewitness

Signature of the eyewitness

Name of the researcher

Signature of the researcher

Date: _____

Place: _____

ANNEXURE III**PROFORMA****“MENOPAUSAL SYMPTOMS AMONG POST MENOPAUSAL WOMEN AGED 40-60 YEARS RESIDING IN AN URBAN AREA OF BELAGAVI – A COMMUNITY BASED CROSS-SECTIONAL STUDY”****Investigator:**

[Note: All the personal information provided during this study will be kept confidential.
Only aggregated data will be published.]

SOCIO-DEMOGRAPHIC QUESTIONNAIRE

1. Name of the participant: _____
2. Age of the participant: _____ Yrs.
3. Religion-
 - a. Hindu ☐
 - b. Muslim ☐
 - c. Others (Christian/Jain/Sikh/Etc.) ☐
4. Category-
 - a. SC ☐
 - b. ST ☐
 - c. OBC ☐
 - d. General ☐

5. Family Type-

- a. Nuclear ☐
- b. Joint ☐
- c. Broken ☐

6. Educational status-

- a. Illiterate ☐
- b. 1st to 5th Standard ☐
- c. 6th to 10th Standard ☐
- d. 11th to 12th Standard/Diploma ☐
- e. Graduate/Postgraduate ☐

7. Occupation-

- a. Homemaker ☐
- b. Govt. Employee ☐
- c. Private Employee ☐
- d. Self Employed ☐
- e. Farmer/Labourer ☐

8. Total Family Income (Rs. /month): _____

9. Family Size: _____

10. Per Capita Income (Rs. /month): _____

11. Socio-economic status (Modified B.G. Prasad's Classification): I/II/III/IV/V_____

12. Food habits-

a. Vegetarian ☐b. Mixed ☐

13. Personal Habits-

a. Tea Consumption (Yes/No) ☐b. Coffee Consumption (Yes/No) ☐c. Aerated drinks Consumption (Yes/No) ☐

14. Substance Abuse (ever - past or present)

a. Smoking (Yes/No) ☐b. Alcohol (Yes/No) ☐c. Tobacco Chewer (Yes/No) ☐

15. Anthropometry

a. Weight: _____ Kilograms.

b. Height: _____ Metres.

c. BMI: _____ Kg/m²

OBSTETRIC AND GYNAECOLOGY QUESTIONNAIRE

1. Marital Status - Married/Unmarried/Widow/Divorced or Separated? _____
2. Age at menarche? _____yrs.
3. Age at marriage? _____yrs.
4. Obstetric Score: P___ L___A___ D___ S___
5. Age at first pregnancy? _____yrs.
6. Age at menopause of mother? _____yrs.
7. Age at menopause of elder sister? _____yrs.
8. Age at menopause? _____yrs.
9. Duration since Final Menstrual Period? _____yrs.
10. Contraception Use (Past)? Yes/No ☐. If yes, then temporary/permanent method?
11. Breast Feeding? Yes/No ☐. If yes, then duration for the last child _____months.
12. Usual Menstrual Cycle (Before Menopause)
 - a. Regular/irregular? _____
 - b. Length of menstrual cycle? _____
 - c. Duration of bleeding-<7days/>7days? _____
 - d. Vaginal Discharge-scanty/ normal/ profuse? _____
 - e. Lower Abdominal Pain-normal/abnormal? _____

MENQOL QUESTIONNAIRE

The Menopause-Specific Quality of Life questionnaire (MENQOL) asks the woman to “indicate whether you have experienced the problem in the PAST MONTH preceding the survey”

Not at all Bothered
→
 Extremely Bothered

0 1 2 3 4 5 6

1.	HOT FLUSHES OR FLASHES	☐ No	☐ → Yes	☐	☐	☐	☐	☐	☐	☐	☐
				0	1	2	3	4	5	6	
2.	NIGHT SWEATS	☐ No	☐ → Yes	☐	☐	☐	☐	☐	☐	☐	☐
				0	1	2	3	4	5	6	
3.	SWEATING	☐ No	☐ → Yes	☐	☐	☐	☐	☐	☐	☐	☐
				0	1	2	3	4	5	6	
4.	DISSATISFACTION WITH PERSONAL LIFE	☐ No	☐ → Yes	☐	☐	☐	☐	☐	☐	☐	☐
				0	1	2	3	4	5	6	
5.	FEELING ANXIOUS OR NERVOUS	☐ No	☐ → Yes	☐	☐	☐	☐	☐	☐	☐	☐
				0	1	2	3	4	5	6	
6.	POOR MEMORY	☐ No	☐ → Yes	☐	☐	☐	☐	☐	☐	☐	☐
				0	1	2	3	4	5	6	

7.	ACCOMPLISHING LESS THAN USED TO	☐ No	☐ → Yes	☐	☐	☐	☐	☐	☐	☐	☐
				0	1	2	3	4	5	6	
8.	FEELING DOWN DEPRESSED, BLUE	☐ No	☐ → Yes	☐	☐	☐	☐	☐	☐	☐	☐
				0	1	2	3	4	5	6	
9.	BEING IMPATIENT WITH OTHER PEOPLE	☐ No	☐ → Yes	☐	☐	☐	☐	☐	☐	☐	☐
				0	1	2	3	4	5	6	
10.	FEELINGS OF WANTING TO BE ALONE	☐ No	☐ → Yes	☐	☐	☐	☐	☐	☐	☐	☐
				0	1	2	3	4	5	6	
11.	FLATULANCE (WIND) OR GAS PAINS	☐ No	☐ → Yes	☐	☐	☐	☐	☐	☐	☐	☐
				0	1	2	3	4	5	6	
12.	ACHING IN MUSCLES AND JOINTS	☐ No	☐ → Yes	☐	☐	☐	☐	☐	☐	☐	☐
				0	1	2	3	4	5	6	
13.	FEELING TIRED OR WORN OUT	☐ No	☐ → Yes	☐	☐	☐	☐	☐	☐	☐	☐
				0	1	2	3	4	5	6	
14.	DIFFICULTY SLEEPING	☐ No	☐ → Yes	☐	☐	☐	☐	☐	☐	☐	☐
				0	1	2	3	4	5	6	

15.	ACHES IN BACK OF NECK OR HEAD	☐ No	☐ → Yes	☐	☐	☐	☐	☐	☐	☐	☐
				0	1	2	3	4	5	6	
16.	DECREASE IN PHYSICAL STRENGTH	☐ No	☐ → Yes	☐	☐	☐	☐	☐	☐	☐	☐
				0	1	2	3	4	5	6	
17.	DECREASE IN STAMINA	☐ No	☐ → Yes	☐	☐	☐	☐	☐	☐	☐	☐
				0	1	2	3	4	5	6	
18.	LACK OF ENERGY	☐ No	☐ → Yes	☐	☐	☐	☐	☐	☐	☐	☐
				0	1	2	3	4	5	6	
19.	DRY SKIN	☐ No	☐ → Yes	☐	☐	☐	☐	☐	☐	☐	☐
				0	1	2	3	4	5	6	
20.	WEIGHT GAIN	☐ No	☐ → Yes	☐	☐	☐	☐	☐	☐	☐	☐
				0	1	2	3	4	5	6	
21.	INCREASED FACIAL HAIR	☐ No	☐ → Yes	☐	☐	☐	☐	☐	☐	☐	☐
				0	1	2	3	4	5	6	
22.	CHANGES IN APPEARANCE, TEXTURE OR TONE OF SKIN	☐ No	☐ → Yes	☐	☐	☐	☐	☐	☐	☐	☐
				0	1	2	3	4	5	6	

23.	FEELING BLOATED	☐ No	☐ → Yes	☐ 0	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
24.	LOW BACKACHE	☐ No	☐ → Yes	☐ 0	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
25.	FREQUENT URINATION	☐ No	☐ → Yes	☐ 0	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
26.	INVOLUNTARY URINATION WHEN LAUGHING OR COUGHING	☐ No	☐ → Yes	☐ 0	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
27.	DECREASE IN SEXUAL DESIRE	☐ No	☐ → Yes	☐ 0	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
28.	VAGINAL DRYNESS	☐ No	☐ → Yes	☐ 0	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
29.	AVOIDING INTIMACY	☐ No	☐ → Yes	☐ 0	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6

INTERNATIONAL PHYSICAL ACTIVITY QUESTIONNAIRE

Long Last 7 Days IPAQ (Preceding the survey)

READ: I am going to ask you about the time you spent being physically active in the last 7 days. Please answer each question even if you do not consider yourself to be an active person. Think about the activities you do at work, as part of your house and yard work, to get from place to place, and in your spare time for recreation, exercise or sport.

PART 1: JOB-RELATED PHYSICAL ACTIVITY

READ: The first questions are about your work. This includes paid jobs, farming, volunteer work, course work and any other unpaid work that you did outside your home. Do not include unpaid work you might do around your home, like housework, backyard work, general maintenance, and caring for your family. I will ask you about these later.

1. Do you currently have a job or do any unpaid work outside your home?

[WORK; Yes=1, No=0; 8, 9]

_____Yes

_____No [*Skip to PART 2*]

8. Don't Know/Not Sure [*Skip to PART 2*]

9. Refused [*Skip to PART 2*]

Interviewer clarification: This also includes paid and unpaid classes or course work. It also includes volunteer work and time spent looking for work. It does not include unpaid house or backyard work, nor caring for dependents, this will be asked in a later section.]

READ: The following questions are about all the physical activity you did as part of your paid or unpaid work. This does not include traveling to and from work.

READ: First, think about all the *vigorous* activities which take *hard physical effort* that you did as part of your work. Vigorous activities make you breathe much harder than normal. These may include things like heavy lifting, digging, heavy construction work, or climbing up stairs. Think about only those vigorous physical activities that you did for at least 10 minutes at a time.

2. During the **last 7 days**, on how many days did you do **vigorous** physical activities as part of your work? [OVDAY; Range 0-7, 8, 9]

_____ Days per week *[If respondent answers 0, skip to Question 4]*

8. Don't Know/Not Sure *[Skip to Question 4]*

9. Refused *[Skip to Question 4]*

[Interviewer clarification: Think about only those physical activities that you did for at least 10 minutes at a time.]

[Interviewer clarification: Work includes paid and unpaid work as well as course work. Include all jobs and volunteer work.]

3. How much time did you usually spend on one of those days doing **vigorous** physical activities as part of your work?

____ Hours per day [OVDHRS; Range 0-16]

____ Minutes per day [OVDMIN; Range 0-960, 998, 999]

998. Don't Know/Not Sure

999. Refused

[Interviewer clarification: Think about only those physical activities you did for at least 10 minutes at a time.]

[Interviewer probe: An average time per day is being sought. If the respondent can't answer because the pattern of time spent varies widely from day to day, or includes time spent doing a variety of paid and unpaid work, ask: "What is the total amount of time you spent **over the last 7 days** doing vigorous physical activities as part of your work?"

____ Hours per week [OVWHRS; Range 0-112]

____ Minutes per week [OVWMIN; Range 0-6720, 9998, 9999]

9998. Don't Know/Not Sure

9999. Refused

READ: Now think about activities which take *moderate* physical effort that you did as part of your work. Moderate physical activities make you breathe somewhat harder than normal and may include activities like carrying light loads. Do not include walking. Again, think about only those moderate physical activities that you did for at least 10 minutes at a time.

4. During the **last 7 days**, on how many days did you do **moderate** physical activities **as part of your work**? [OMDAY; Range 0-7, 8, 9]

____ Days per week [*If respondent answers 0, skip to Question 6*]

8. Don't Know/Not Sure [*Skip to Question 6*]

9. Refused [*Skip to Question 6*]

[Interviewer clarification: Think about only those physical activities that you did for at least 10 minutes at a time.]

[Interviewer clarification: Work includes paid and unpaid work as well as course work. Include all jobs.]

5. How much time did you usually spend on one of those days doing **moderate** physical activities as part of your work?

____ Hours per day [OMDHRS; Range 0-16]

____ Minutes per day [OMDMIN; Range 0-960, 998, 999]

998. Don't Know/Not Sure

999. Refused

[Interviewer clarification: Think about only those physical activities you did for at least 10 minutes at a time.]

[Interviewer probe: An average time per day is being sought. If the respondent can't answer because the pattern of time spent varies widely from day to day, or includes time spent doing a variety of paid and unpaid work, ask: "What is the total amount of time you spent **over the last 7 days** doing moderate physical activities as part of your work?"

____ Hours per week [OMWHRS; Range 0-112]

____ Minutes per week [OMWMIN; Range 0-6720, 9998, 9999]

9998. Don't Know/Not Sure

9999. Refused

READ: Now think about the time you spend *walking* for at least 10 minutes at a time as part of your work. Please do not count any walking you did to travel to or from work.

6. During the **last 7 days**, on how many days did you **walk as part of your work**?

[OWDAY; Range 0-7, 8, 9]

____ Days per week [*If respondent answers 0, skip to PART 2*]

8. Don't Know/Not Sure [*Skip to PART 2*]

9. Refused [*Skip to PART 2*]

[Interviewer clarification: Think about only the walking that you did for at least 10 minutes at a time.]

[Interviewer clarification: Include all jobs.]

7. How much time did you usually spend on one of those days **walking** as part of your work?

____ Hours per day [OWDHRS; Range 0-16]

____ Minutes per day [OWDMIN; Range 0-960, 998, 999]

998. Don't Know/Not Sure

999. Refused

[Interviewer clarification: Think about only the walking you did for at least 10 minutes at a time.]

[Interviewer probe: An average time per day is being sought. If the respondent can't answer because the pattern of time spent varies widely from day to day, or includes time spent doing a variety of paid and unpaid work, ask: "What is the total amount of time you spent walking **over the last 7 days** as part of your work?"

____ Hours per week [OWWHRS; Range 0-112]

____ Minutes per week [OWWMIN; Range 0-6720, 9998, 9999]

9998. Don't Know/Not Sure

9999. Refused

PART 2: TRANSPORTATION PHYSICAL ACTIVITY

READ: Now, think about how you traveled from place to place, including to places like work, stores, movies and so on.

8. During the **last 7 days**, on how many days did you **travel in a motor vehicle** like a train, bus, car or tram? [TMDAY; Range 0-7, 8, 9]

_____ Days per week [*If respondent answer 0, skip to Question 10*]

8. Don't Know/Not Sure [*Skip to Question 10*]

9. Refused [*Skip to Question 10*]

9. How much time did you usually spend on one of those days **traveling** in a car, bus, train or other kind of motor vehicle?

____ Hours per day [TMDHRS; Range 0-16]

____ Minutes per day [TMDMIN; Range 0-960, 998, 999]

998. Don't Know/Not Sure

999. Refused

[Interviewer probe: An average time per day is being sought. If the respondent can't answer because the pattern of time spent varies widely from day to day, ask: "What is the total amount of time you spent **over the last 7 days** traveling in a motor vehicle?"

____ Hours per week [TMWHRS; Range 0-112]

____ Minutes per week [TMWMIN; Range 0-6720, 9998, 9999]

9998. Don't Know/Not Sure

9999. Refused

READ: Now think only about the *bicycling* you did to travel to and from work, to do errands, or to go from place to place. Only include bicycling that you did for at least **10 minutes at a time**.

10. During the **last 7 days**, on how many days did you **bicycle** to go from place to place? [TBDAY; Range 0-7, 8, 9]

_____ Days per week [*If respondent answers 0, skip to Question 12*]

8. Don't Know/Not Sure [*Skip to Question 12*]

9. Refused [*Skip to Question 12*]

[Interviewer clarification: Think only about the bicycling that you did for at least 10 minutes at a time.]

11. How much time did you usually spend on one of those days **to bicycle** from place to place?

_____ Hours per day [TBDHRS; Range 0-16]

_____ Minutes per day [TBDMIN; Range 0-960, 998, 999]

998. Don't Know/Not Sure

999. Refused

[Interviewer clarification: Think about only the bicycling that you did for at least 10 minutes at a time.]

[Interviewer probe: An average time per day is being sought. If the respondent can't answer because the pattern of time spent varies widely from day to day, ask: "What is the total amount of time you spent bicycling **over the last 7 days** to travel from place to place?"

_____ Hours per week [TBWHRS; Range 0-112]

_____ Minutes per week [TBWMIN; Range 0-6720, 9998, 9999]

9998. Don't Know/Not Sure

9999. Refused

READ: Now think only about the *walking* you did to travel to and from work, to do errands or to go from place to place. Only include walking that you did for at least 10 minutes at a time.

12. During the **last 7 days**, on how many days did you **walk to go from place to place**?

[TWDAY; Range 0-7, 8, 9]

_____ Days per week *[If respondent answers 0, skip to PART 3]*

8. Don't Know/Not Sure *[Skip to PART 3]*

9. Refused *[Skip to PART 3]*

[Interviewer clarification: Think only about the walking that you did for at least 10 minutes at a time.]

13. How much time did you usually spend on one of those days **walking from place to place**?

____ Hours per day [TWDHRS; Range 0-16]

____ Minutes per day [TWDMIN; Range 0-960, 998, 999]

998. Don't Know/Not Sure

999. Refused

[Interviewer clarification: Think about only the walking that you did for at least 10 minutes at a time.]

Interviewer probe: An average time per day is being sought. If the respondent can't answer because the pattern of time spent varies widely from day to day, ask: "What is the total amount of time you spent **over the last 7 days** walking from place to place?"

____ Hours per week [TWWHRS; Range 0-112]

____ Minutes per week [TWWMIN; Range 0-6720, 9998, 9999]

9998. Don't Know/Not Sure

9999. Refused

PART 3: HOUSEWORK, HOUSE MAINTENANCE AND CARING FOR FAMILY

READ: Now think about the physical activities you have done in the last 7 days in and around your home, like housework, gardening, backyard work, general maintenance work, and caring for your family.

READ: First think about *vigorous* activities which take hard physical effort that you did in the garden or yard. Vigorous activities make you breathe much harder than normal and may include heavy lifting, chopping wood or digging. Again, think about only those vigorous physical activities that you did for at least 10 minutes at a time.

14. During the **last 7 days**, on how many days did you do **vigorous** physical activities in the garden or yard? [GVDAY; Range 0-7, 8, 9]

_____ Days per week [If respondent answers 0, skip to Question 16]

8. Don't Know/Not Sure [Skip to Question 16]

9. Refused [Skip to Question 16]

[**Interviewer clarification:** Think about only those physical activities that you did for at least 10 minutes at a time.]

15. How much time did you usually spend on one of those days doing **vigorous** physical activities in the garden or yard?

____ Hours per day [GVDHRS; Range 0-16]

____ Minutes per day [GVDMIN; Range 0-960, 998, 999]

998. Don't Know/Not Sure

999. Refused

[Interviewer clarification: Think about only those physical activities that you did for at least 10 minutes at a time.]

[Interviewer probe: An average time per day is being sought. If the respondent can't answer because the pattern of time spent varies widely from day to day, ask: "What is the total amount of time you spent **over the last 7 days** doing vigorous physical activities in the garden or yard?"

____ Hours per week [GVWHRS; Range 0-112]

____ Minutes per week [GVWMIN; Range 0-6720, 9998, 9999]

9998. Don't Know/Not Sure

9999. Refused

READ: Now think about activities which take *moderate* physical effort that you did in the garden or backyard. Moderate physical activities make you breathe somewhat harder than normal and may include carrying light loads, sweeping, washing windows and raking. Again, include only those moderate physical activities that you did for at least 10 minutes at a time.

16. During the **last 7 days**, on how many days did you do **moderate** activities in the **garden or yard**? [GMDAY; Range 0-7, 8, 9]

____ Days per week [*If respondent answers 0, skip to Question 18*]

8. Don't Know/Not Sure [*Skip to Question 18*]

9. Refused [*Skip to Question 18*]

[Interviewer clarification: Think about only those physical activities that you did for at least 10 minutes at a time.]

17. How much time did you usually spend on one of those days doing **moderate** physical activities in the garden or yard?

____ Hours per day [GMDHRS; Range 0-16]

____ Minutes per day [GMDMIN; Range 0-960, 998, 999]

998. Don't Know/Not Sure

999. Refused

[**Interviewer clarification:** Think about only those physical activities that you did for at least 10 minutes at a time.]

[**Interviewer probe:** An average time per day is being sought. If the respondent can't answer because the pattern of time spent varies widely from day to day, ask: "What is the total amount of time you spent **over the last 7 days** doing moderate physical activities in the garden or yard?"

____ Hours per week [GMWHRS; Range 0-112]

____ Minutes per week [GMWMIN; Range 0-6720, 9998, 9999]

9998. Don't Know/Not Sure

9999. Refused

READ: Now think about activities which take at least *moderate* physical effort that you did *inside your home*. Examples include carrying light loads, washing windows, scrubbing floors, and sweeping. Include only those moderate physical activities that you did for at least 10 minutes at a time.

[**Interviewer clarification:** Moderate activities make you breathe somewhat harder than normal.]

18. During the **last 7 days**, on how many days did you do **moderate** activities **inside your home**? [HMDAY; Range 0-7, 8, 9]

_____ Days per week *[If respondent answers 0, skip to PART 4]*

8. Don't Know/Not Sure *[Skip to PART 4]*

9. Refused *[Skip to PART 4]*

[Interviewer clarification: Think about only those physical activities that you did for at least 10 minutes at a time.]

[Interviewer clarification: During the last 7 days, on how many days did you do activities that take **at least moderate** effort inside your home?]

19. How much time did you usually spend on one of those days doing **moderate** physical activities inside your home?

_____ Hours per day [HMDHRS; Range 0-16]

_____ Minutes per day [HMDMIN; Range 0-960, 998, 999]

998. Don't Know/Not Sure

999. Refused

[Interviewer clarification: Think about only those physical activities that you did for at least 10 minutes at a time.]

[Interviewer probe: An average time per day is being sought. If the respondent can't answer because the pattern of time spent varies widely from day to day, ask: "What is the total amount of time you spent **over the last 7 days** doing moderate physical activities inside your home?"

_____ Hours per week [HMWHRS; Range 0-112]

_____ Minutes per week [HMWMIN; Range 0-6720, 9998, 9999]

9998. Don't Know/Not Sure

9999. Refused

PART 4: RECREATION, SPORT, AND LEISURE-TIME PHYSICAL ACTIVITY

READ: Now, think about all the physical activities that you did in the last 7 days solely for recreation, sport, exercise or leisure. Please do not include any activities you have already mentioned.

20. Not counting any walking you have already mentioned, during the **last 7 days**, on how many days did you **walk** for at least 10 minutes at a time **in your leisure time**?

[LWDAY; Range 0-7, 8, 9]

_____ Days per week *[If respondent answers 0, skip to Question 22]*

8. Don't Know/Not Sure *[Skip to Question 22]*

9. Refused *[Skip to Question 22]*

[Interviewer clarification: Think about only the walking that you did for at least 10 minutes at a time.]

21. How much time did you usually spend on one of those days **walking** in your leisure time?

_____ Hours per day [LWDHRS; Range 0-16]

_____ Minutes per day [LWDMIN; Range 0-960, 998, 999]

998. Don't Know/Not Sure

999. Refused

[Interviewer clarification: Think about only the walking that you did for at least 10 minutes at a time.]

[Interviewer probe: An average time per day is being sought. If the respondent can't answer because the pattern of time spent varies widely from day to day, ask: "What is the total amount of time you spent **over the last 7 days** walking in your leisure time?"

____ Hours per week [LWWHRS; Range 0-112]

____ Minutes per week [LWWMIN; Range 0-6720, 9998, 9999]

9998. Don't Know/Not Sure

9999. Refused

READ: Now think about other physical activities you did in your leisure time for at least 10 minutes at a time.

READ: First, think about *vigorous* activities which take hard physical effort that you did in your leisure time. Examples include aerobics, running, fast bicycling, or fast swimming.

[**Interviewer clarification:** Vigorous activities make you breathe much harder than normal.]

22. During the **last 7 days**, on how many days did you do **vigorous** physical activities in your leisure time? [LVDAY; Range 0-7, 8, 9]

____ Days per week [*If respondent answers 0, skip to Question 24*]

8. Don't Know/Not Sure [*Skip to Question 24*]

9. Refused [*Skip to Question 24*]

[**Interviewer clarification:** Think about only those vigorous physical activities that you did for at least 10 minutes at a time.]

23. How much time did you usually spend on one of those days doing **vigorous** physical activities in your leisure time?

____ Hours per day [LVDHRS; Range 0-16]

____ Minutes per day [LVDMIN; Range 0-960, 998, 999]

998. Don't Know/Not Sure

999. Refused

Interviewer clarification: Think about only those physical activities that you did for at least 10 minutes at a time.]

[Interviewer probe: An average time per day is being sought. If the respondent can't answer because the pattern of time spent varies widely from day to day, ask: "What is the total amount of time you spent **over the last 7 days** doing vigorous physical activities in your leisure time?"

____ Hours per week [LVWHRS; Range 0-112]

____ Minutes per week [LVWMIN; Range 0-6720, 9998, 9999]

9998. Don't Know/Not Sure

9999. Refused

READ: Now think about activities which take *moderate* physical effort that you did in your leisure time. Examples include bicycling at a regular pace, swimming at a regular pace, and doubles tennis. Again, include only those moderate activities that you did for at least 10 minutes at a time.

[Interviewer clarification: Moderate physical activities make you breathe somewhat harder than normal.]

24. During the **last 7 days**, on how many days did you do **moderate** physical activities in your leisure time? [LMDAY; Range 0-7, 8, 9]

____ Days per week [*If respondent answers 0, skip to PART 5*]

8. Don't Know/Not Sure [*Skip to PART 5*]

9. Refused [*Skip to PART 5*]

[Interviewer clarification: Think about only those physical activities that you did for at least 10 minutes at a time.]

25. How much time did you usually spend on one of those days doing **moderate** physical activities in your leisure time?

____ Hours per day [LMDHRS; Range 0-16]

____ Minutes per day [LMDMIN; Range 0-960, 998, 999]

998. Don't Know/Not Sure

999. Refused

[Interviewer clarification: Think about only those physical activities that you did for at least 10 minutes at a time.]

[Interviewer probe: An average time per day is being sought. If the respondent can't answer because the pattern of time spent varies widely from day to day, ask: "What is the total amount of time you spent **over the last 7 days** doing moderate physical activities in your leisure time?"

____ Hours per week [LMWHRS; Range 0-112]

____ Minutes per week [LMWMIN; Range 0-6720, 9998, 9999]

9998. Don't Know/Not Sure 9

999. Refused

PART 5: TIME SPENT SITTING

READ: The last question is about the time that you spent *sitting* during the last 7 days. Include time at work, at home, while doing course work and during leisure time. This may include time spent sitting at a desk, visiting friends, reading or sitting

or lying down to watch television. Do not include any time spent sitting in a motor vehicle that you have already told me about.

26. During the **last 7 days**, how much time did you usually spend **sitting** on a **weekday**?

____ Hours per day [SDHRS; Range 0-16]

____ Minutes per day [SDMIN; Range 0-960, 998, 999]

998. Don't Know/Not Sure

999. Refused

[Interviewer clarification: Include time spent lying down (awake) as well as sitting.]

[Interviewer probe: An average time per day is being sought. If the respondent can't answer because the pattern of time spent sitting varies widely from day to day, ask: "How much time in total did you spend sitting on **Wednesday**?"

____ Hours on Wednesday [SWHRS; Range 0-16]

____ Minutes per Wednesday [SWMIN; Range 0-960, 998, 999]

9998. Don't Know/Not Sure

9999. Refused

27. During the last 7 days, how much time did you usually spend **sitting** on a **weekend day**?

____ Hours per day [SEHRS; Range 0-16]

____ Minutes per day [SEMIN; Range 0-960, 998, 999]

998. Don't Know/Not Sure

999. Refused

[Interviewer clarification: Include time spent lying down (awake) as well as sitting.]

[Interviewer probe: An average time per day is being sought. If the respondent can't answer because the pattern of time spent sitting varies widely from day to day, ask: "How much time in total did you spend sitting on **Saturday**?"

____ _Hours on Saturday [SSHRS; Range 0-16]

____ _Minutes per Saturday [SSMIN; Range 0-960, 998, 999]

9998. Don't Know/Not Sure

9999. Refused

ANNEXURE IV**KEY TO MASTERCHART****SOCIO-DEMOGRAPHIC****A. Age (Numerical)****B. Age**

40-45 years	1
45-50 years	2
50-55 years	3
55-60 years	4

C. Religion

Hindu	1
Muslim	2
Others (Christian/Jain/Sikh/Etc.)	3

D. Category

Not Applicable	0
SC	1
ST	2
OBC	3

General	4
E. Family Type	
Nuclear	1
Joint	2
Broken	3
F. Educational status	
Illiterate	0
1 st to 5 th Standard	1
6 th to 10 th Standard	2
11 th to 12 th Standard/Diploma	3
Graduate/Postgraduate	4
G. Occupation	
Homemaker	1
Govt. Employee	2
Private Employee	3
Self Employed	4
Farmer/Labourer	5

H. Total Family Income (Numerical)

I. Family Size (Numerical)

J. Per Capita Income (Numerical)

K. Socio-economic Status (Modified B.G. Prasad's Classification)

Class I	1
---------	---

Class II	2
----------	---

Class III	3
-----------	---

Class IV	4
----------	---

Class V	5
---------	---

L. Food Habits

Vegetarian	1
------------	---

Mixed	2
-------	---

M. Personal Habits

None	0
------	---

Tea	1
-----	---

Coffee	2
--------	---

Aerated drinks	3
----------------	---

N. Substance Abuse (ever - past or present)

None	0
Smoking	1
Alcohol	2
Tobacco Chewer	3

O. Weight (Numerical)

P. Height (Numerical)

Q. BMI (Numerical)

R. BMI (Asian Classification)

Underweight (BMI < 18.5)	1
Normal (BMI 18.5 - 23)	2
Overweight (BMI 23 – 27.5)	3
Obese (BMI > 27.5)	4

OBSTETRIC AND GYNAECOLOGY

S. Marital Status

Married	1
Unmarried	2
Widow	3
Divorced or Separated	4

T. Age at menarche

Early (<10 years)	1
Normal (10-15 years)	2
Delayed (>15 years)	3

U. Age at marriage

<15 years	1
15-20 years	2
20-25 years	3
25-30 years	4
>30 years	5

V. Parity (Numerical)

W. Living (Numerical)

X. Dead (Numerical)

Y. Abortion (Numerical)

Z. Stillbirth (Numerical)

AA. Age at first pregnancy

<15 years	1
15-20 years	2
20-25 years	3

25-30 years	4
-------------	---

>30 years	5
-----------	---

AB. Age of mother at menopause (Numerical)

AC. Age of mother at menopause

Not Available	0
---------------	---

Premature (< 40 years)	1
------------------------	---

Normal (40-55 years)	2
----------------------	---

Late (>55 years)	3
------------------	---

AD. Age of elder sister at menopause (Numerical)

AE. Age of elder sister at menopause

Not Available	0
---------------	---

Premature (< 40 years)	1
------------------------	---

Normal (40-55 years)	2
----------------------	---

Late (>55 years)	3
------------------	---

AF. Age at menopause (Numerical)

AG. Age at menopause

Premature (< 40 years)	1
------------------------	---

Normal (40-55 years)	2
----------------------	---

Late (>55 years)	3
------------------	---

AH. Duration since final menstrual period (Numerical)

AI. Duration since final menstrual period

< 5 years	1
-----------	---

5-10 years	2
------------	---

10-15 years	3
-------------	---

>15 years	4
-----------	---

AJ. Contraception Use (Past)

No	0
----	---

Temp	1
------	---

Perm	2
------	---

Both	3
------	---

AK. Breast Feeding

None	0
------	---

< 6 months	1
------------	---

6 months – 1 years	2
--------------------	---

1-2 years	3
-----------	---

>2 years	4
----------	---

AL. Menstrual Cycle Regularity

Regular	1
Irregular	2

AM. Length of Cycle

Short (< 21 days)	1
Normal (21 - 35 days)	2
Prolonged (> 35 days)	3

AN. Duration of Bleeding

Normal (< 7 days)	1
Prolonged (≥ 7 Days)	2

AO. Discharge

Scanty	1
Normal	2
Profuse	3

AP. Lower Abdominal Pain

Normal	1
Abnormal	2

MENQOL

No	1
Yes (Likert Scale)	
0	2
1	3
2	4
3	5
4	6
5	7
6	8

AQ. Hot Flushes(V1)

AR. Night Sweats (V2)

AS. Sweating (V3)

AT. Vasomotor Domain Score (V S)

AU. Dissatisfaction with Personal Life (PSY4)

AV. Feeling Anxious or Nervous (PSY5)

AW. Poor Memory (PSY6)

AX. Accomplishing Less Than Used To (PSY7)

AY. Feeling Depressed, Down or Blue (PSY8)

AZ. Being Impatient with Other People (PSY9)

BA. Feelings of Wanting to Be Alone (PSY10)

BB. Psychosocial Domain Score (PSY S)

BC. Flatulence (Wind) Or Gas Pains (PHY11)

BD. Aching in Muscles and Joints (PHY12)

BE. Feeling Tired or Worn Out (PHY13)

BF. Difficulty Sleeping (PHY14)

BG. Aches in Back of Neck or Head (PHY15)

BH. Decrease in Physical Strength (PHY16)

BI. Decrease in Stamina (PHY17)

BJ. Lack of Energy (PHY18)

BK. Dry Skin (PHY19)

BL. Weight Gain (PHY20)

BM. Increased Facial Hair (PHY21)

BN. Changes in Appearance, Texture or Tone of Skin (PHY22)

BO. Feeling Bloating (PHY23)

BP. Low Backache (PHY24)

BQ. Frequent Urination (PHY25)

BR. Involuntary Urination when Laughing or Coughing (PHY26)

BS. Physical Domain Score (PHY S)

BT. Decrease in Sexual Desire (S27)

BU. Vaginal Dryness (S28)

BV. Avoid Intimacy (s29)

BW. Sexual Domain Score (S S)

BX. Overall Mean Score

IPAQ

Physical Activity Domains

BY. Job related Domain

BZ. Transportation Domain

CA. Domestic/Garden Domain

CB. Leisure Domain

Physical Activity Types

CC. Walking

CD. Moderate activity

CE. Vigorous activity

CF. Total Continuous Score - IPAQ

CG. Categorical Score - IPAQ

Low	1
Moderate	2
High	3

MASTER CHART

[illegible]

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[illegible]

Serial Number	SOCIO-DEMOGRAPHIC																		OBSTETRIC AND GYAECOLOGY														MENQOL																				IPAQ																																																																																																																																																																																																																																																																																																																																																																																																																																																										
	AGE - NUMERICAL	AGE	RELIGION	CATEGORY	FAMILY TYPE	EDUCATIONAL STATUS	OCCUPATION	T- FAMILY INCOME	FAMILY SIZE	PER CAPITA INCOME	SES(MOD. BGP)	FOOD HABITS	PERSONAL HABITS	ADDICTION	WEIGHT	HEIGHT	BMI - NUMERICAL	BMI	MARITAL STATUS	AGE - MENARCHE	AGE - MARRIAGE	PARITY	LIVING	ABORTION	DEAD	STILLBORN	AGE - FIRST PREGNANCY	MOTHER'S ANN - NUMERICAL	MOTHER'S ANN	SISTER'S ANN - NUMERICAL	SISTER'S ANN	AGE MENOPAUSE - NUMERICAL	AGE - MENOPAUSE	DURATION SINCE FMP - NUMERICAL	DURATION SINCE FMP	CONTRACEPTION USE	BREAST FEEDING	M- CYCLE - REGULARITY	LENGTH - M.CYCLE	DURATION - BLEEDING	VAGINAL DISCHARGE	PAIN	V1	V2	V3	V.S	PSY4	PSY5	PSY6	PSY7	PSY8	PSY9	PSY10	PSY.S	PHY11	PHY12	PHY13	PHY14	PHY15	PHY16	PHY17	PHY18	PHY19	PHY20	PHY21	PHY22	PHY23	PHY24	PHY25	PHY26	PHY.S	S27	S28	S29	S.S	OVERALL MEAN SCORE	JOB RELATED DOMAIN	TRANSPORTATION DOMAIN	DOMESTIC/GARDEN DOMAIN	LEISURE DOMAIN	WALKING	MODERATE	VIGOROUS	TOTAL CONTINUOUS SCORE	CATEGORICAL SCORE																																																																																																																																																																																																																																																																																																																																																																																																																										
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