Age at Menopause its Health Consequences and Socio-economic Determinants

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By

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Date: **Dr. Sudhirgouda H. Patil**

Place: Belagavi

LIST OF ABBREVIATIONS

AAM	Age at Menopause
ANM	Axillary Nursing Midwives
ANOVA	Analysis of Variance
ASHA	Accredited Social Health Activist
ASM	Age Specific Menopause
BMI	Body Mass Index
BP	Blood Pressure
CI	Confidence Interval
CNS	Central Nervous System
DBP	Diastolic Blood pressure
DNA	Deoxyribonucleic Acid
HRT	Hormonal Replacement Therapy
LR	Logistic Regression
MI	Myocardial Infraction
OR	Odds Ratio
PHC	Primary Health Center
PPA	Post-Partum Amenorrhea
PPBS	Post Prandial Blood Sugar
PPS	Proportion to Population Size
RBC	Red Blood Cell
RBS	Random Blood Sugar
RCT	Randomized Control Trial
SBP	Systolic Blood Pressure
SD	Standard Deviation
SPM	Survival Probability of Menopause
TV	Tele Vision
WBC	White Blood Cell
WHO	World Health Organization

ABSTRACT

Background: Menopause is the most prominent event occurring during the middle age of women and represents the end of a woman's reproductive life. Perimenopause symptoms are the bases for healthcare providers and public health personnel to enable appropriate healthcare, including improving the physiological and psychological makeup of women.

Objective: To study age at menopause along with its health consequences and socio-economic determinants affecting the quality of life.

Methodology: Cross-sectional study has been carried out from October 2016 to April 2017 to investigate factors affecting perimenopausal age and their symptoms using Proportional to Population Size (PPS) Inverse Cluster Sampling. A total of 712 perimenopausal women in the age group of 40-55 years, including 550 menopausal and 40 Surgically Induced Menopause (SIM) women were analyzed for age at menopause by life table method and symptoms of menopause, effects of household and individual characteristics by using Cox proportional hazard model and Logistic Regression Analysis.

Results: Average age at menopause was 48.8 years, varied with 'age at first child' groups < 20 and 20+ years with respective age at menopause 48.38 and 49.36 years, whereas, 'age at last child' groups <25 and 25+ years with age at menopause 48.48 and 49.05 years. Average ages at menopause in illiterate/informal, primary, and secondary & higher were 51.01, 48.9 and 50.26 years respectively. However, for 'age at menarche' <13 years, 13 years and 14+ years the respective figures were 52.0, 48.2, and 49.0 years. Hot flushes were significantly higher in menopause group as compared to non-menopause groups.

SIM was significantly higher in the BMI group <25. The differences of SIM were significantly different in groups of regularity of the menstrual cycle. Similar results were observed for menstrual flow, sexual problems, blood spotting between periods, blood spotting after intercourse, physical and mental exhaustion, pain in periods, heart discomfort,

sleep problem, dryness of the vagina and irritability. Knowledge about menopause anomalies in the pre-menopausal period and care during menopause had significantly lower menopausal problems.

Conclusions: Average age at menopause was 48.8 years, which is higher than other studies conducted in India, reason may be methodological. Psycho-physiological changes were associated with irritability, heart discomfort, decreased sexual desire, anxiety, depressive mood, hot flushes, physical and mental exhaustion, sleep problems and dryness of the vagina. Bivariate analysis of surgical menopause by its covariates and regression model provides a reference for the diagnosis of surgical menopause anomalies and can be used to pacify patients for consequences of the prognosis. Well planned and calibrated health education and necessary symptomatic treatment must always be arranged for the welfare of perimenopause women for better quality of life.

Keywords: Menopause; Household survey; Surgical induced menopause; Health care; Socio-economic determinants.

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Chapter 1: INTRODUCTION

1.1 Backgrounds

Menopause is a physiological process, signifying completion of the reproductive life of a woman, with reducing ability of ovaries to respond to Follicle Stimulating Hormone (FSH), Luteinizing Hormone (LH), and reduced Estrogen and Progesterone production. With the increasing age of women, some primary ovarian follicles develop into vesicular ovarian follicles with every menstrual cycle, and ultimately they degenerate. As the number of primary follicles reduce, production of estrogens by ovary decreases, resulting in onset of the menopause process, Tortora. However, natural menopause is defined by World Health Organization (WHO) as, 'at least twelve months of successive amenorrhea, not due to surgery or any other cause'. Therefore, it is a retrospective diagnosis.

Menopause is the most prominent event happening during the middle age of females and characterizes the end of a female's reproductive life. The word "Menopause" originated from the Greek words 'meno' means month (reference to menstruation in the formation of compound words 'Menopause') and 'pauses' means pause. Therefore, the literal definition is the end of monthly cycle of menstrual bleeding. Menopause grows in response to reduced estrogen levels and disturbance of the hormonal cycle related with ovulation [1]. Nearing to menopause age, most women experience a change in their normal menstrual cycle, resulting in complete cessation of the menstrual cycle at the post-menopause period. It occurs progressively and shows the transition from reproductive to the post-productive era of females' life. During menopause, women's reproductive capacity ceases because of the end of ovarian function [2].

The years preceding menopause are characterized by significant hormonal variability. Though there is a normal level of estrogen secretion, estrogen becomes depleted and exhibits resistance to FSH growth. The FSH levels increase throughout the cycle, and they are related to decreasing ovarian production of molecules called inhibits, which are believed to inhibit pituitary production of FSH. At the time of menopause, a large proportion of women notice dramatic changes due to fluctuations in estradiol (E2) and progesterone levels [3].

Before the onset of menopause, symptoms of hormonal imbalance arise; manifesting 2 or 3 years before the actual menopause commence and continue for 2 to 5 years after cessation of menses. A small portion of women encompasses it asymptomatically or with less intense symptoms. However, in some women, symptomatic conditions become alarming. This phase is associated with physiological and psychological changes. The frequent physiological changes related to menopause are hot flashes, cold sweats, dizziness, edema, headache, nausea, migraine, weight gain, bloating, anorexia nervosa, pelvic discomforts, skin and hair disorders and change in bowel habit. And the most common psychological symptoms include depression, anxiety, irritability, insomnia, panic attacks, mental confusions, the feeling of stress, loneliness and fatigue. Behavioral changes include lowered work performance, avoiding social activities etc. All these physiological, psychological and behavioral changes increase the risk for various chronic diseases like osteoporosis and heart diseases. After attaining menopause, women's risk of heart disease grows to almost equal to that of men [4-8]. The alterations in sexual hormones affect compositional changes in bones, making women prone to osteoporosis. The other associated metabolic changes include hypercholesterolemia that tends to increase the risk of heart attacks [5-8].

Being a significant cause of morbidity like osteoporosis and heart disease etc, in the post-menopausal life of females, menopause and its related hormonal changes cause symptoms that disturb quality of life. Generally informed symptoms comprise depression, anxiety, poor memory, urinary problems, night sweats, vaginal dryness, hot flushes and sleep disturbances [9-10]. Though, the difference in the prevalence of menopausal symptoms was observed in Indian females from different regions, Shah et al. stated muscle and joint pains are the common symptoms, whereas Sharma et al. have described lack of energy and fatigue are most common menopausal symptoms [11-12]. In another study, Bagga has observed that tightness in the head and loss of interest are the most common menopausal symptoms [13]. Other studies from western countries on menopause have observed a greater prevalence of psychological and physical symptoms around menopause [14-15].

Menopause symptoms could be classified as severe, moderate and mild, with the classic symptom of hot flushes. Menopause can affect the quality of life of women's due to cardiovascular diseases and osteoporosis [16]. Numerous other studies reported osteoporosis and cardiovascular diseases to be more prevalent in early menopause [17-18], and the association of endometrial and breast cancers with delayed menopause [19].

Whelan (1990) stated that, early menopause enlarged the risk of osteoporosis and cardiovascular disease in women, while, late menopause is related with the amplified threat of endometrial and breast cancer [20]. Lynne (2010) reported that the women with an early menopause (ages 40-45 years) or premature menopause (before age 40 years) experienced an increased threat of whole mortality due to neurological disorders, cardiovascular diseases, osteoporosis, psychiatric diseases etc. [21]. The

consequences of menopause (flushing, sleeplessness, headache, lack of concentration) are invaluable for public health workers and healthcare providers to enable suitable healthcare [22], as menopause alters the biochemical, physiological and psychological makeup of a woman.

Menopause occurs in 3 phases:

1) Pre-menopause; i.e. the preliminary ovarian dysfunction exhibiting physiological symptoms, initiated while menstrual cycle continue to be regular and few symptoms begin to appear.
2) Peri-menopause (climacteric); i.e. the transition period leading to actual event of menopause where endocrinological, biological and clinical features of upcoming menopause begin, and they are characteristically practiced for a period of 5 to 10 years. Most of the women start becoming conscious of menopausal transition in their mid to late 40's, during perimenopause. During the perimenopause period, monthly flow becomes irregular with enhancing fluctuations in duration, heaviness and periods of spotting. The number of hopped menses often increased towards end of perimenopause.
3) Postmenopause; i.e. the stage when the menstrual cycle ends for longer than twelve months and drop in level of estrogen and progesterone [2].

Numerous studies reported that the natural menopausal process starts during the 45-55 years of age in most of women world over, depending upon their genetic and socio-economic makeup, general health, nutritional status, physical activity, and altitude level [2-8, 23-31]**.** It is generally accepted that the mean age at menopause is around 51 years for developed countries [2, 23-24], and for developing countries, age at menopause ranged from 43-49 years [25]. Palacios (2010) itemized that in Europe,

median age at menopause ranged 50.1 to 52.8 years; however, 43.8-53 years in Latin America, 50.5-51.4 years in North America and in Asia 42.1-49.5 years [30].

The distribution of usually reported menopausal symptoms and their consequences (diseases) were; hot flashes (76.4%), night sweats (83.2%), vaginal dryness (71.4%), mood swings (72.5%), fatigue (66.8%), irritability (67.5%) and loss of libido (66.4%). Jacob Setorglo (2012) reported that the joint pain (64.4%), irregular menstrual cycle (62.9%), headaches (62.5%), weight gain (59.3%), memory lapses (53.6%) and sleep disorders (50.7%) are the symptoms in the pre-menopausal period [32].

1.2 Review of Literature

Danielle (2014) studied lifestyle, socio-economic causes and Age at Natural Menopause (ANM): a orderly review and meta-analyses of studies in six areas, identified 46 studies through 24 countries, with average age at natural menopause was 48.8 years, with 95% CI (Confidence Interval) 48.3, 49.2. Between-study, heterogeneity was partially explained by geographical regions. Auxiliary Nursing Midwives (ANM) was highest in Europe, Australia and USA, and lowest in Latin American, Asian, African and Middle Eastern countries. Education had a positive association with ANM. A similar relationship was also perceived with the occupation. Smoking was related with the one year reduction of Auxiliary Nursing Midwives (WMD: -0.91, 95% CI: –1.34, –0.48) [33].

Bromberger (1997) studied age at menopause in USA during 1983-85 on 185 healthy women, revealed age at menopause varied from 42.5-47.5 years [34]. After a baseline examination (1983-1985) and follow up of 7-9 years, the median age at menopause was estimated 51.5 years for the entire sample. Average age at menopause was prior

for women, who reported irregular menstrual cycles at study entry (50.2 years), smokers (50.6 years), African-American (49.3 years) and currently on a weight fall diet (50.5 years) [35].

Gold (2001) conducted a study in the US during 1995-1997 on factors associated with age at natural menopause, observed the relation of lifestyle factors to age at natural menopause, as studied in seven US centers and five ethnic /racial groups. All features were self-stated by women aged 40 to 55 years (n= 14,620). Median age at natural menopause was estimated as 51.4 years, later adjustment for marital status, smoking, employment, education, parity, history of heart disease, race/ethnicity and prior usage of oral contraceptives. Lower educational, current smoking, being separated/ divorced /widowed, unemployment and history of heart disease were all independently related with prior natural menopause, while prior use of oral contraceptives, and Japanese ethnicity/race, parity were related with later age at natural menopause [34].

Bansal (2014) reported determinants of age at natural menopause from rural Punjab on 180 women of 40-60 years; revealed that the mean age at menopause was 45.9 years (SD - 3.5 years). The average age at menopause increased consistently by height, but the differences were not statistically significant. A similar relationship was stated with BMI and with no trend with education. They also reported an insignificant positive correlation between age at natural menopause and age at menarche. The women with age at menarche below 13 years, got menopause relatively prior (44 years) than the women of age at menarche above 13 years (46.22 years). The association between women's age at the birth of last child and age at natural menopause was not significant. Married women informed age at natural menopause

approximately two years prior than widows, but the differences were not statistically significant [36].

Setorglo (2012) studied determinants of menopausal symptoms in Ghanaian women revealed a great diversity in menopausal signs and symptoms from different tribes. The most frequently reported menopausal symptoms were vaginal dryness (71.4%), mood swings (72.5%), hot flashes (76.4%) and night sweats (83.2%). Increasing age was related with decreased threat of suffering night sweats. Per unit rise in body weight reduced the threat of having night sweats. As body fat increased, there was a reduced threat of suffering hot flashes. Married and single women did not have any significant association with hot flashes [32].

Thomas (2001) studied determinants of menopause and variability based on two European cohort studies conducted between 1998 to 2002; revealed the age at natural menopause was 54.3 years, estimated by the Kaplan-Meier method. The most significant determinant of age at natural menopause was present smoking. The 25th percentiles revealed variability through nations, ranging from 50.1-52.8 years. The reported age at natural menopause of smokers was two years lesser than that of non-smokers. Low physical activity and obesity were considerably related with prior menopause. Having smoked formerly, being high physical activity or being underweight was of borderline of significance. Among the reproductive factors, older age at menarche and higher parity were related with later timing of menopause. Later, menopause was related with age at birth [37].

Shuster (2010) studied long period health consequences in early or premature menopausal women and revealed that, women who experienced early menopause (40-45 years of ages) or premature menopause (before age 40 years) experienced

increased threat of total mortality, osteoporosis, neurological diseases, cardiovascular diseases and psychiatric diseases. The risk of antagonistic outcomes increased with prior age at menopause. Some of the adverse outcomes might have been prohibited by estrogen management began after the start of menopause. Yet, only estrogen does not stop all long-standing consequences due to other likely hormonal mechanisms [21].

Joseph (2014) conducted a study in several outreach clinics of the Kasturba Medical College (KMC), Mangalore, included females of 40-65 years by convenient sampling method. Average age of attainment of menopause was estimated as 48.4 ± 4.5 years. Most frequent symptoms reported were physical and mental exhaustion, muscular and joint discomfort was seen in 85.4% respondent (participants). Literate females reported significantly more number of symptoms ($P<0.05$). Urogenital and somatic symptoms were more in perimenopausal females and somatic symptoms in postmenopausal females. Fifty-eight percent respondents had 1 or more severe symptoms. The severe symptoms were maximum among premenopausal females [38].

Makara (2014) studied the percentage of menopausal symptoms living in the continents of the Australia, Americas, Europe and Africa. In African, the prevalence of menopausal symptoms was uncomfortably high. South America women complain about the occurrence of sexual discomfort and dysfunctions (69.8%), depressive mood (82%) associated with joint aches and muscle pain (78%). Most symptoms stated by the women in United States (US) are pains related to joints and muscles. Australia females suffer mostly because of sexual dysfunction and vasomotor symptoms (82.3%), whereas females surveyed in the Asia was observed an upsurge in proportion of females reporting the depressive disorders (49%). In Europe, higher incidence was

observed in depressive disorders (85%) and sleep disorders (73%). In world, females suffer from sicknesses characteristic for the menopausal period irrespective of traditional origin, socio-demographic factors or skin color [39].

Pathak (2018) studied menopausal symptoms in post-menopausal women; the average age among study respondent was 52.04 ± 5.58 years. The majority were literates (77.1%) and Hindus (58%). The most frequently reported menopausal symptoms were physical (75.7% – 25.5%) followed by psychosocial (63.9% – 49.3%) to vasomotor domain (63.5% – 55.4%), whereas least was sexual domain (42.3% – 36.2%) [40].

Ceylan (2015) Studied factors related with age at menopause like mother's age, age at menarche, use of oral contraceptives, gestational age, irregular menstrual cycle, body mass index, number of pregnancies, physical activity, use of alcohol and tobacco, serum lead levels, unilateral Oophorectomy, consumption of polyunsaturated fat, educational level and socio-economic status. During this period, biochemical and hormonal changes give rise to numerous signs and symptoms in female's body. In menopause period, psychological, physical, sexual and social changes had adverse effect on quality of life [41].

Punia (2017) conducted a study among rural females aged 40-60 years and assessed the average age of menopause 46.2 ± 1.61 years. The most recurrent menopausal symptoms were muscular and joint discomfort (77.5%), hot flushes (62.0%), sleep problems (76.5%), bladder problems (54.5%) and irritability (58.5%). Knowledge about these difficulties was insufficient [42].

Capistrano (2015) assessed menopausal side effects; females with moderate to extreme indications were 57.7%. Obesity was not related with the seriousness of menopausal manifestations. Age was inversely related to moderate to severe symptoms. Females within 6 to 10 years of menopause were nearly 1.4 times higher prevalence of symptoms (moderate to severe) than those with eleven plus years of menopause. Jobless females and housewives showed a higher prevalence of symptoms of menopausal than working females. Tobacco was related with a higher prevalence of symptoms (moderate to severe) as compared to non-tobacco users ($p < 0.01$) [43].

Delavar (2011) studied age at menopause and its symptoms and indicates 48 years as median age at menopause. The five most pervasive symptoms were fractious qualities (72.1%), joint agonies (70.6%), spinal pain (61.2%), hot flushes (49.3%) and migraine (49.2%) during the fourteen days preceding the investigation. Over 60% of ladies experienced hot flushes. Oral contraceptive use, low educational level and early age at menarche were significantly related with hot flushes [44].

Chedraui (2007) surveyed 300 women reporting, menopausal status of women were pre-menopause (40.6%), perimenopause (48%) and post-menopause (11.4%). Sixty-two percent of women were not sexually dynamic, and 8.3% had less than 12 years of education. The five most frequent symptoms of total 11 variates comprising the Menopause Rating Scale (MRS) were joint and muscle problems (77%), sexual problems (69.6%), depressive mood (74.6%), sleeping disorders (45.6%) and hot flushes (65.5%). Peri-menopausal and postmenopausal females had significantly more rates of menopausal signs and symptoms as compared to premenopausal women [45].

Donati (2009) surveyed women of age 45–60 years from five Italian areas, indicating more than 90% women of menopause as a normal phase in their life and more than 40% reported it as a good experience for a female. Nevertheless, more than half of the women did not obtain any knowledge about menopause and probable treatments, and those who did consistently rated it as poor and contrasting. Moreover, clinicians who prescribed Hormone Therapy (HT), reported risks (39%), disadvantages (22%) and advantages (94%) in relation to treatment. Lack of information was related to women's low educational level and no or occasional attitude towards attending health services [46].

Noroozi (2013) conducted a cross-sectional study on 400 non-menopaused and healthy women aged 40 to 45 years to evaluate attitude and knowledge. The average attitude score was estimated as 61.21 ± 12.73, and the average knowledge score of subjects was 63.57 ± 10.79. In this study, 68% had moderate knowledge, 38.5% had good knowledge, and 8% had poor knowledge. Meanwhile, 81.5% of the females had confidence towards menopause attitude [47].

1.3 Statement of the problem

Menopause is a milestone incident in a woman's life, giving rise to changes in the hormonal profile, as well as making her susceptible to chronic or acute diseases such as cardiovascular diseases and osteoporosis. The episodes of menopause encompass a period of 5 to 10 years within which physiological, psychological and behavioral catastrophic events accompany temporarily. The trail of symptoms related to menopause varies in individuals. The distress, which woman experiences is of grave concern to health and nutritional professionals. Several studies have been conducted to comprehend the dynamics in the course of perimenopausal periods.

Nevertheless, there are still missing links to have a clear perception of the onset and characteristics of the events and factors influencing menopause events. It is of prime importance to strategically design approaches to improve the distresses of women and undergo in the distressful menopause period with ease. Therefore, the study has been undertaken the objectives:

1.4 Objectives

1) To study the age at menopause and its health and socio-economic determinants and

2) To study the knowledge and attitude towards menopausal health consequences.

Chapter 2. MATERIALS AND METHODS

This chapter presents the materials and methods that were used to collect the data for covering the objectives of this study. More specifically, it deals with the significance of the study design, data sources, importance of the study, profile of the study, rationale of the study, target population, inclusion and exclusion criteria for sample selection, sample size determination, sampling design and data collection tools and techniques. It highlights the analysis plan of the study. Further, it presents a brief discussion on the instruments and measurements of selected variables generated for the study. Finally, this chapter concludes with ethical issues, a discussion on the problems of data management, data processing and methods for data analysis of the study.

2.1 Study Design

A Cross-sectional Study design was used to collect the data from rural females of age 40 to 55 years from Belagavi Taluqu from district Belagavi, Karnataka.

2.2 Source of Data

The data has been collected in pre-coded and pretested performa in Belagavi district from October 2016 to April 2017. A semi-structured interview schedule was developed covering General Information (individual characteristics), Socio-Demographic, Reproductive Information, Menstrual History, Source of Information, Disease History, Contraceptive History, Habits, Anthropometric Measurements, Knowledge and Attitude of Menopause. Data were collected from 24 villages (clusters) (Botramatti, Gadihal, Ukkud, Sutgatti, Hosavantamuri, Jarakiholi, Parlgatti, Hosur, Halehosur, Bomanatti, Halbhavi, Iranbhabi, Sonatti, Jumnal, Chikkaldinni, Bennali, Katabli, Shivapur, Mutyanatti, Kakati, Honaga, Shahabandra, Islampur and

Vantmuri) in rural Belagavi. As per the objective of the study, information was collected from women of age 40-55 years to estimate age at menopause along with socio-economic determinants and consequences.

2.3 Selection of Study Area

The study area was Belgaum (Belagavi) District, Karnataka, India, located in northern part along the Western Ghats.[1] As per 2011 census, Belagavi consists of 9.57 lakh population, out of these 3.6 lakh (37.6%) Marathi-speaking, 3 lakh (31.3%) Kannada-speaking and 1.7 lakh (17.8%) are Urdu-speaking.

As per Census 2011 of India, the population of Belagavi district was 47, 79,661, this includes 76% of population from rural areas. The literacy rate of Belagavi was 78%, higher than the national averages of 65% of those literates, 54% were males and 46% were females. According to the given demographic background, the study was undertaken to study 'age at menopause'.

2.4 Sampling Method

2.4.1 Inclusion Criteria

All women of age 40-55 years with permanent residence, consented to participate in the study clusters.

2.4.2 Sample Size Determination

Sample size was computed by using the following formula with 95% CI, 15% error in estimate and 10% attrition.

$$n = \frac{Z_{1-\alpha}^2\, pq}{d^2} \times 1.1$$

Where, p = prevalence of symptoms
q =1-p
d = precision = 15% of p

[1] Only 98 cities instead of 100 announced: All questions answered about the smart cities project". *Firstpost*. 28 August 2015

Using the above formula, sample size has been computed for all the symptoms and consequences of the menopause as under:

Symptoms (n=280)	Percent Distribution	Sample size at 95% CI &15% of p as acceptable error	10% Attrition	Total sample size
Night sweats	83.2	34	3.4	37.4
Hot flashes	76.4	53	5.3	58.3
Mood swings	72.5	65	6.5	71.5
Vaginal dryness	71.4	68	6.8	74.8
Irritability	67.5	82	8.2	90.2
Fatigue	66.8	85	8.5	93.5
Loss of libido	66.4	86	8.6	94.6
Joint pain	64.6	94	9.4	103.4
Irregular bleeding	62.9	101	10.1	111.1
Headache	62.5	102	10.2	112.2
Weight gain	59.3	117	11.7	128.7
Difficulty in concentrating	57.1	128	12.8	140.8
Incontinence	55	140	14	154
Memory lapses	53.6	148	14.8	162.8
Dizziness	53.2	150	15	165
Hair loss	50.7	166	16.6	182.6
Sleep disorder	50.7	166	16.6	182.6
Irregular heartbeats	50.7	166	16.6	182.6
Anxiety	50	171	17.1	188.1
Depression	43.9	218	21.8	239.8
Itchy skin	32.5	355	35.5	390.5
Osteoporosis	27.1	459	45.9	504.9

2.4.3 Sampling

The sampling technique was Simple Random Sampling with Probability Proportion to Size (PPS). For this purpose, sampling has been taken from Vantmuri PHC, teaching PHC of Jawahar Lal Nehru Medical College (JNMC) comprising of 149 villages. Out of 149 villages with proportion to population size, 24 villages (clusters) were randomly selected.

Inverse Cluster Sampling was planned because in the review articles samples have been collected from menopause women. Data were collected from 30 women of age 40-55 years from each village (cluster) till 505 menopausal women information were collected. Data regarding menopausal consequences (ICD-10, N95) was collected verbally by the research scholar, along with ASHA's and one female supervisor.

Ethical Clearance: KLE ethical committee clearance (Ref.No.KLE/Ethic/2015-16/D-118)

Consent: Written consent was obtained in a prescribed format.

Standard Operating Procedures: Training was imparted to Accredited Social Health Activists (ASHA's) of the respective study area and a female supervisor for collection of the necessary information, for pretesting, and standardizing questions in performa and their coding. All ASHA's and female supervisor along with research scholar filled-up at least five questionnaires from the field area as part of the training and pretesting. The data collected was analyzed for data consistency, sufficiency and validity as part of pretesting. In case of failure on these accounts, the questionnaires were revised accordingly.

2.5 Data Collection and Survey Tools

2.5.1 Data Collection

ASHA workers are collected data under the supervision of the female supervisor and research scholar. After the collection of the necessary information about knowledge, attitude and health problems in the age group of 40 to 55 years of women, 20% of data were rechecked for errors and for examining inconsistencies.

2.5.2 Survey Tools

The interview agenda was divided into two sections. The first section covered basic information about household characteristics and the second section covered the individual information of the respondents. Household information i.e. general characteristics of the households such as caste, religion, occupational level, type of family, family size, family income, household members including the number of family member's children, father and mother were collected.

Participant information regarding age, age at marriage, educational attainment, the status of economic independence/dependence, occupation/working status, sources of income, age at menarche, marital status, age at last menstruation, number of children by age and sex, family type, family size, type of house, disease history, age at first child's birth, contraceptive history, anthropometric measurements, knowledge and attitude of menopause were collected. Information relating to the consumption of alcohol and tobacco, health status and pregnancy/birth was also collected.

2.6 Outcome Variables

Ages at menopause, menopausal symptoms/ signs/ diseases were the major outcome variables of the study.

2.7 Explanatory Variables

Knowledge/perception and attitude towards menopause were taken as the significant predictors whose association was examined with age at menopause.

Socio-demographic (age, place of residence, caste, religion, education, per capita income, and occupation), Reproductive information (age at menarche, mother's age at menopause, children ever live-born, children living, age at last menstruation, operation/ sickness before menopause, average length of post-partum amenorrhea), Menstrual history, Source of information, Disease history, Contraceptive history, Habits (tobacco and alcohol), Anthropometric measurements, Knowledge and Attitude of menopause were selected, based on the extensive reviews of literature that could affect respondents 'age at menopause'.

Chapter 3. DATA ANALYSIS

3.1 Statistical Methods for Data Analysis

Bivariate tables were made to study the variation in menopausal status by selected household and individual characteristics. Similar statistical procedures were used to examine the level of knowledge/perception and attitude. A Chi-square test, with a 95% Confidence Interval (CI) was used to study the statistical significance. To study the effects of household and individual characteristics on menopausal status, multivariate analysis namely, Logistic Regression Analysis and Cox Proportional Hazard Model were used. Description of each of these statistical methods is as under:

3.1.1 Life Table Method

Life table method for estimation of the average age at menopause is computed as:

$$SurvivalProbabilityofMenopause\ (SPM) = \frac{2\ Menopausedwomen}{3\ Menopausedwomen + 2\ NotyetMenopaused}$$

The 95% Confidence Interval (95% CI) of Survival Probability of Menopause (SPM) was computed as,

$$95\%\ CI = e^{(log_e(SPM) \pm 1.96\sqrt{\frac{1}{a} - \frac{1}{a+b}})}$$

Where, ‘a’ is the menopausal women and

‘b’ is not menopausal.

$$\text{Age at menopause} = L_l + 2 \sum_{L_l}^{L_u} \text{Survival probability from } L_l \text{ to } L_u$$

Where, L_l and L_u are lower and upper limits of the group

The menopausal symptoms, as determinants of menopausal risk were analyzed using the Cox Proportional Hazard Model and the Risk Ratios were compared with unstandardized results.

3.1.2 Logistic Regression Analysis

Logistic Regression has been used to assess effect of deterministic variates of perimenopause symptoms. Exponential of coefficient of Logistic Regression Estimates (e^b) is defined as the Odds Ratio in favor of the symptoms in menopause as compared to pre-menopause. The model for estimation of the effect of menopausal symptoms on age at menopause was as:

$$log_e\left(\frac{p}{q}\right) = f(x) = b_0 + b_1x_1 + b_2x_2 + b_3x_3 + \cdots \ldots \ldots + b_nx_n$$

Where,

b_0 is constant,

$x_1, x_2, x_3, \ldots\ldots x_n$ are menopause symptoms,

$b_1, b_2, b_3, \ldots. b_n$ are coefficients and

n is number of explanatory variables (symptoms).

$$p = \frac{e^{f(x)}}{1 + e^{f(x)}}$$

95% Confidence Interval (CI) was computed as:

$$\text{95\% CI of Odds Ratio (OR)} = e^{\left(\log_e(OR) \pm 1.96\sqrt{\frac{1}{a} + \frac{1}{b} + \frac{1}{c} + \frac{1}{d}}\right)}$$

Where,

a - menopausal female

b - not menopausal female in the reference group and

c & d are alike figures for Odds Ratio

3.1.3 Cox Proportional Hazard Model

In Cox Proportional Hazards Model, hazard rate h(t) is expressed as;

$$h(t) = \frac{f(t)}{1 - F(t)} = \frac{f(t)}{S(t)}$$

Where, S (t)=1-F(t), is the proportion of surviving, expressed as a survival function.

Integrating the function with respect to‘t’, the hazard function;

λt = - Ln[S(t)] and

Cox Proportion Hazard Model;

$$h(t,x) = h_0(t)\, e^{X\beta}$$

Where, ‘x’ is event of interest, coded as ‘0’, i.e. no-event and ‘1’ as the event’s occurrence.

Model is non-parametric because $h_0(t)$ is not specified.

In the baseline hazard ‘$h_0(t)$’, there is a time but the hazard is constant and in the exponential model, there is only explanatory variables and no time.

3.1.4 Chi-square Test

Chi-square (χ^2) test was used to assess the association between two qualitative variates as under:

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

Where, O = Observed frequency of menopause and

E = Expected menopause frequency

3.1.5 Probability of Surgical Induced Menopause

Probability of Surgical Induced Menopause was computed as: P = $\frac{e^{f(x)}}{1+e^{f(x)}}$ and

The Logistic Regression Model = $log_e\left(\frac{p}{q}\right) = f(x) = a_0 + \sum_1^k a_i x_i$,

Where,

k - Number of explanatory variables

a_i - Coefficients

p - Probability of surgical induced menopause

q = 1- p, probability of not surgical induced menopause

ROC curve has given along with modulated probabilities; to be used by healthcare provider has a reference example.

3.2 Ethical Consent

Ethical clearance was taken from Students Research Ethics Committee, KLE University (23rd March 2015) before collecting data. Furthermore, before conducting each interview, consent was obtained from each of the respondents in the study. The required ethical concerns of the study were read out to the respondents and any doubts that were raised with regard to the interview were cleared and the study was addressed. The information collected from respondents was kept strictly confidential and used only for research.

3.3 Preparation of the Field Work

After completing the preparatory work for data collection, that is, selection of study area, study population, sample selection, training of field investigators, preparation and pre-testing of proforma, the final data collection was started. After two weeks of training for field investigators (ASHA worker with one female investigator) data collection was started in October 2016 and completed in April 2017. Proper training, along with pretesting about the study objectives of proforma, the process of the data collection was started.

Training of female supervisor and ASHA workers

Data collection of study participant

Data collection of study participant

Data collection of study participant

Data collection of study participant

Chapter 4: RESULTS

Age at Menopause its Health and Socio-economic Determinants

Table 4.1a: Age distribution of surgical induced and menopause

Age (years)	Surgically Induced	n	Menopause (ASM*)	95% CI of ASM*	
				LL	UL
40-41	1	20	0 (0)	-	-
42-43	0	25	2 (8.00)	6.67	9.33
44-45	3	22	13 (59.09)	58.74	59.44
46-47	7	41	18 (43.90)	43.56	44.25
48-49	14	103	78 (75.73)	75.62	75.84
50-51	6	161	154 (95.65)	95.62	95.69
52-53	1	176	165 (93.75)	93.71	93.79
54-55	8	124	120 (96.77)	96.74	96.81
Total	40	672	550 (81.85)		

Note: *Age Specific Menopause (ASM), 95% CI of MAM has been computed using 95% CI of ASM

Table 4.1b: Mean age at menopause at different ages

Age (years)	Mean Age at Menopause (MAM) $=L_l + 2\sum_{L_l}^{L_u}$ Survival probability from L_l to L_u MAM (LL, UL)	95% CI of MAM*	
		LL	UL
40-41	-	-	-
42-43	42.16	42.13	42.18
44-45	43.08	43.04	43.09
46-47	43.80	43.75	43.82
48-49	44.90	44.85	44.92
50-51	46.20	46.14	46.21
52-53	47.48	47.42	47.49
54-55	48.78	48.72	48.80

Table 4.1a, reveals that menopausal women in age group of 48-49 years were 75.7 percent, whereas, a similar figure in age group of 54-55 years was 96.8%. The average ages at menopause below the age of 46, 54, 55 years were 43.1, 47.5 and 48.8 years respectively (Table 4.1b).

Fig. 4.1: Distribution of menopause status

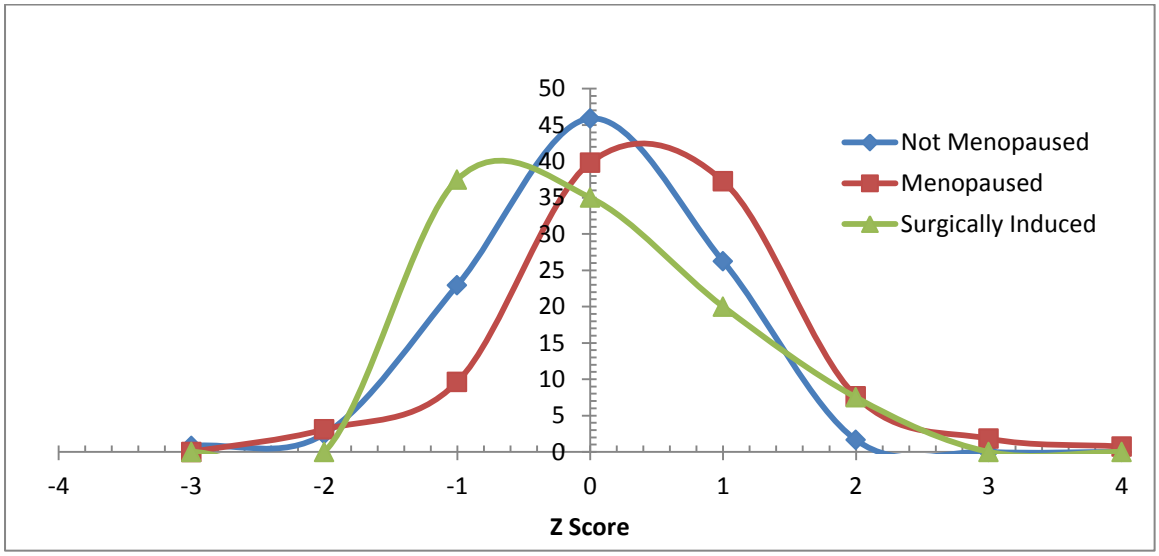

Fig. 4.1, age distribution of menopause status reveals that the distribution of menopause and surgical menopause were not normal, however, not menopause groups followed exactly normal distribution, indicating menopause as physiological process disturbed by surgical induced menopause.

Table 4.2: Age at menopause status by age at marriage

Age at Marriage	n_1	Menopause	Average age at Menopause	n_2	Surgical		95% CI	
					n_3	Rate	LL	UL
<15	116	108	51.38	134	18	13.4	8.7	20.6
15-16	161	125	51.56	169	8	4.7	2.4	9.3
17-18	169	130	48.2	174	5	2.9	1.2	6.8
19-20	176	146	51.09	177	1	0.6	0.1	4.0
21+	50	41	50.39	58	8	13.8	7.3	26.3
Total	672	550	48.78	712	40	5.6	4.2	7.6

Note: n_1= Number of subjects exposed to menopause,
n_2= Number of subjects exposed to Surgical Induced Menopause

Table 4.2, age at menopause in groups of age at marriage reveals that the age at menopause was higher in lower and higher age at marriage, but not statistically significant. Surgically induced menopause was also higher in lower and higher age at marriage ($p>0.05$), but may not be random variations.

Table 4.3: Menopause attained by age at first and last child

Age/Menopause status	Not Menopause		Menopause		Average age at Menopause	Surgically Induced		Total	
	n	%	n	%		n	%	n	%
Total	122	17.18	548	77.18	48.78	40	5.63	710	100
Age at First Child									
<20	76	17.47	333	76.55	48.38	26	5.98	435	100
20+	46	16.73	215	78.18	49.36	14	5.09	275	100
Age at Last Child									
< 25	69	16.3	323	76.2	48.48	32	7.5**	424	100
25+	53	18.5	225	80.9	49.05	8	2.8**	286	100

Note: **; Z=2.92; p<0.01

Table 4.3, menopause attained by age at first and last child reveals that the age at first child and last child less than 20 and 25 years, the respective average age at menopause were 48.38 and 48.48 years, as compared to in respective age at menopause 49.36 and 49.05 years in higher age groups of first and last child. The surgical operations were lower 2.8% when the last child was born in age group 25 years and above, as compared to 7.5% when the last child was born in age less than 25 years (p<0.01).

Table 4.4: Menopause attained by education

Education	n_1	Menopause	Average age at Menopause	n_2	Surgically Induced		95% CI	
					n_3	%	LL	LL
Illiterate/Informal	179	161	49.01	187	8	$4.3^{+,@}$	2.2	8.4
Primary	282	225	48.90	313	31	$9.9^{+,***}$	7.1	13.8
Secondary & Higher	211	164	48.24	212	1	$0.5^{@,***}$	0.1	3.7
Total	672	550	48.78	712	40	5.6	4.2	7.6

Note: +; Z=2.50; p<0.05, @; Z=2.46; p<0.05, ***; Z=5.38; p<0.001

Table 4.4, menopause attained by education reveals that the age at menopause decreased consistently from 49 years in illiterates/informal education group to 48.24 years in secondary and higher education. Surgically induced menopause was highest (p<0.001) in primary education as compared to secondary and higher, and as compared to illiterate/informal (p<0.05).

Table 4.5: Menopause attained by household size

Household Members	Menopause		Average age at Menopause	Surgically Induced***		Total	
	No	Attain		n	%	n	%
<5	27	183	48.93	5	2.33	215	30.20
5	55	164	50.26	6	2.67	225	31.60
6+	40	203	48.33	29	10.66	272	38.20
Total	122	550	48.76	40	5.62	712	100.00

Note: ***Chi-Square=22.49; df = 2; p<0.001

Table 4.5, menopause attained by household size reveals that the surgical induced menopause changed at p<0.001, with maximum induced menopause 10.7 percent in 6+ household size as compared to less than 3 percent in smaller household size groups, however, mean age at menopause was highest 50.3 years in medium size family as compared to other two groups.

Table 4.6: Menopause attained by type of family

Type of Family	Not Menopause	Menopause	Average age at Menopause	Surgically Induced***		Total	
	N	N		n	%	n	%
Nuclear	105	437	48.72	11	1.99	553	77.67
Joint	17	113	51.05	29	18.24	159	22.33
Total	122	550	48.76	40	5.62	712	100.00

Note: ***Chi-Square=61.5; df=1; p<0.001

Table 4.6, menopause attained by type of family reveals that the age at menopause was higher in joint family 51years as compared to 48.7 in nuclear. Surgical induced menopause changed significantly at p<0.001, with maximum surgical induced menopause 18.2 percent in joint families as compared to only 2 percent in nuclear.

Table 4.7: Menopause status by religion

Religion	Menopause		Average age at Menopause	Surgically Induced		Total
	No	Attained		n	%	n
Hindu	55	313	50.91	25	6.36	393
Muslim	53	159	48.61	14	6.19	226
Christian/Others	14	78	53.1	1	1.08***	93
Total	122	550	48.76	40	5.62	712

Note: ***; Z=3.6; p<0.001

Table 4.7, menopause status by religion reveals that age at menopause was least 48.6 years in Muslims as compared to other religion groups. Surgical induced menopause was least 1.08 percent (p<0.001) in Christens as compared to Hindus and Muslims together each 6 percent.

Table 4.8: Menopause attained by income

Income in Rs	Menopause		Average age at Menopause	Surgically Induced*		Total
	No	Attained		n	Per 100	n
<4000	30	155	48.82	14	7.04	199
4000-	56	245	48.67	20	6.23	321
6000+	36	150	49.19	6	3.13*	192
Total	**122**	**550**	48.76	**40**	5.62	**712**

Note: *; Z=2.05; p<0.05, between surgical induced menopause in income group less than Rs 6000 and Rs 6000+

Table 4.8, average age at menopause did not vary significantly by income. Surgical induced menopause did not vary between income groups less than Rs 4000 and Rs 4000 to Rs 5999. However, the surgical induced menopause was higher in less than Rs 6000 income group as compared to 6000+ (p<0.05).

Table 4.9: Age at menopause by age at menarche

Age at Menarche	Menopause status			Average age at Menopause	Surgically Induced Menopause		Total
	Not Attained	Attained	Per 100		n	Per 100	
<13	21	63	75.00	52.00	1	1.18	85
13-***	52	140	72.92	48.20	5	2.54	197
14+***	49	347	87.63	49.00	34	7.91	430
Total	122	550	81.85	48.80	40	5.62	712

Note: ***Z=3.13; p<0.001 (Surgically Induced Menopause)

Table 4.9, age at menopause by age at menarche reveals that the rate of menopause (87.6/100) was also higher in women with age at menarche 14 years and above. The average age at menopause was lowest (48.2 years) in women who attained menarche in 13-14 years. The women attaining age at menarche at age 14 and above had significantly higher (p<0.001) surgical induced menopause i.e 7.9 percent.

Table 4.10: Age at menopause by children ever born

Children Ever Born	Not Menopause	Menopause		Average age at Menopause	Surgically Induced*		Total
≤ 2*	80	292	78.49	48.70	29	7.23	401
3+*	42	258	86.00	49.30	11	3.54	311
Total	122	550	81.85	48.78	40	5.62	712

Note: Six women did not have child, hence separate group is not made
*Z=2.27; p<0.0 5

Table 4.10, age at menopause by children ever born reveals that the average age at menopause was highest (49.3 years) for women with '3+' children ever born and 48.7 years with children ever born less or equal to '2'. Surgically induced menopause were 7.3 per 100 mothers with children ever born '≤ 2', as compared to 3.5 in '3+' group (p<0.05).

Table 4.11: Age at menopause by duration of menstruation

Menstrual days	Menopause Attained		Average Age at Menopause	Surgically Induced		Total
	No	Yes		n	Per 100	
≤ 3	43	192	49.20	14	5.62	249
4-5	51	273	49.05	16	4.71	340
6+	28	85	48.09	10	8.13	123
Total	122	550	48.76	40	5.62	712

Table 4.11, age at menopause by duration of menstruation reveals that, as menstruation duration increased, the menopause age decreased consistently from 49.2 years in duration less than 3 days to 48.1 years in 6+ days. However, surgical induced menopause was higher (8.13/100) in the group of menstruation 6+ days, though the differences were not statistically significant.

Table 4.12: Menopause status by menstrual history

Variables	Menopause Attained			Surgically Induced		Total
	No	Yes	per 100	n	per 100	
Regularity of menstruation; Chi-square (df=2) = 16.93; p<0.001						
No	63	223	78.0	6	2.1	292
Yes	59	327	84.7	34	8.1	420
Menstrual flow; Chi-square (df=4) = 17.52; p<0.01						
Light	25	79	76.0	1	1	105
Moderate	63	366	85.3	25	5.5	454
Heavy	34	105	75.5	14	9.2	153
Blood spotting between periods; Chi-square (df=2) = 6.8; p<0.05						
No	82	410	83.3	35	6.6	527
Yes	40	140	77.8	5	2.7	185
Blood spotting after intercourse; Chi-square (df=2) = 21.53; p<0.001						
No	98	419	81.0	18	3.4	535
Yes	24	131	84.5	22	12.4	177
Pain in periods; Chi-square (df=4) = 26.97; p<0.001						
No	13	42	76.4	12	17.9	67
Yes	94	402	81.0	19	3.7	515
Occasionally	15	106	87.6	9	6.9	130

Table 4.12, menopause status by menstrual history reveals that the quality of menstruation had significant impact on age at menopause and surgical induced menopause; regularity of menstruation (p<0.001), menstrual flow (p<0.01), blood spotting between periods (p<0.05), blood spotting after intercourse (p<0.001) and pain in periods (p<0.001).

Table 4.13: Menopause status by diabetes

Diabetes	Menopause			Surgically Induced		Total
	Not attained	Attained (%)	Total	n	Per 100	
No	94	375 (79.96)	469	25	5.06	494
Yes without treatment	5	30 (85.71)	35	0	0	35
Yes with treatment	23	145 (86.31)	168	15	8.2	183
Total	122	550 (81.85)	672			

Table 4.13, menopause status by diabetes reveals that the menopause did not differ by treatment behavior. However, surgical induced menopause was not observed in diabetic subjects without treatment, though with treatment prevalence was 8 per 100 as compared to 5 in without diabetes.

Table 4.14a: Menopause attained by systolic BP Z score group

Systolic BP Z Score Group	***Not Menopause		***,**Menopa-use		**Surgically Induced		Total	
	n	%	n	%	n	%	n	%
-2-(-1)	1	0.82	14	2.55	0	0.00	15	2.11
(-1)-0	72	59.02	263	47.82	12	30.00	347	48.74
0-1	33	27.05	251	45.64	28	70.00	312	43.82
1-2	15	12.30	21	3.82	0	0.00	36	5.06
2-	1	0.82	1	0.18	0	0.00	2	0.28
Total	122	100.00	550	100.00	40	100.00	712	100.00

Note: ***Chi square (df=2)=24.55; p<0.001, **Chi square (df=2)=9.44; p<0.01

Table 4.14a, menopause attained by systolic BP Z score group reveals Z scores for menopause status groups to standardize the systolic BP levels, so that the distributions of systolic BP are studied by menopause status.

Fig. 4.2: Distributions of systolic BP by menopausal status

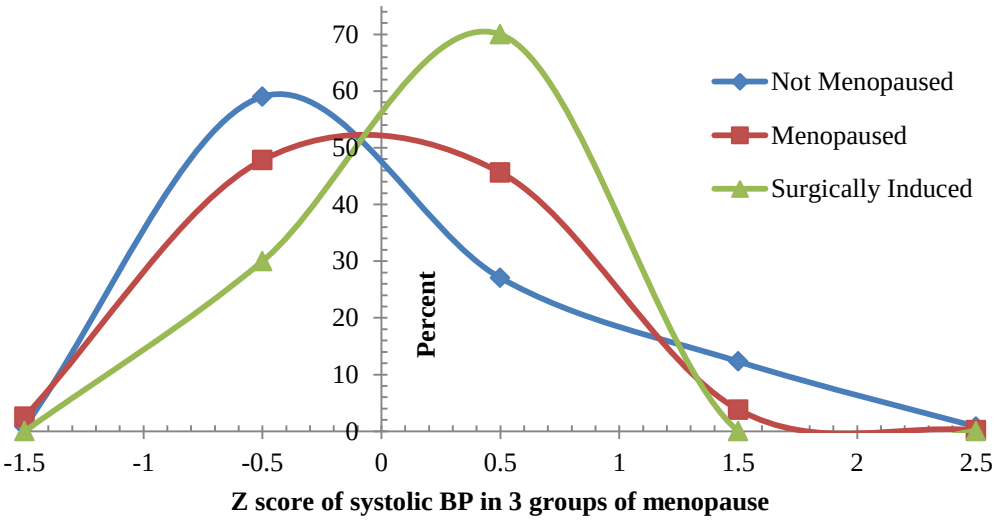

Fig. 4.2, distributions of systolic BP by menopause status reveals that the not menopause distribution is right skewed, indicating abnormally late menopause in some women, whereas menopause women exhibited left truncated and surgical induced moderately normal distribution. The average systolic BP was highest in surgical menopause group followed by menopause and not menopause groups.

Table 4.14b: Menopause attained by diastolic BP Z score groups

Diastolic BP Z Score Group	Not Menopaused		Menopaused		Surgically Induced		Total	
	n	%	N	%	n	%	n	%
-3-(-2)	0	0.00	1	0.18	0	0.00	1	0.14
-2-(-1)	1	0.82	35	6.36	0	0.00	36	5.06
(-1)-0	54	44.26	235	42.73	20	50.00	309	43.40
0-1	49	40.16	207	37.64	13	32.50	269	37.78
1-2	11	9.02	38	6.91	3	7.50	52	7.30
2-3	6	4.92	34	6.18	2	5.00	42	5.90
3-4	1	0.82	0	0.00	2	5.00	3	0.42
Total	122	100.00	550	100.00	40	100.00	712	100.00

Note: Mean=89.06, SD=12.77

Table 4.14b, menopause attained by diastolic BP Z score group reveals Z scores for menopause status groups to standardize the diastolic BP levels, so that the distributions of diastolic BP are studied by menopause status.

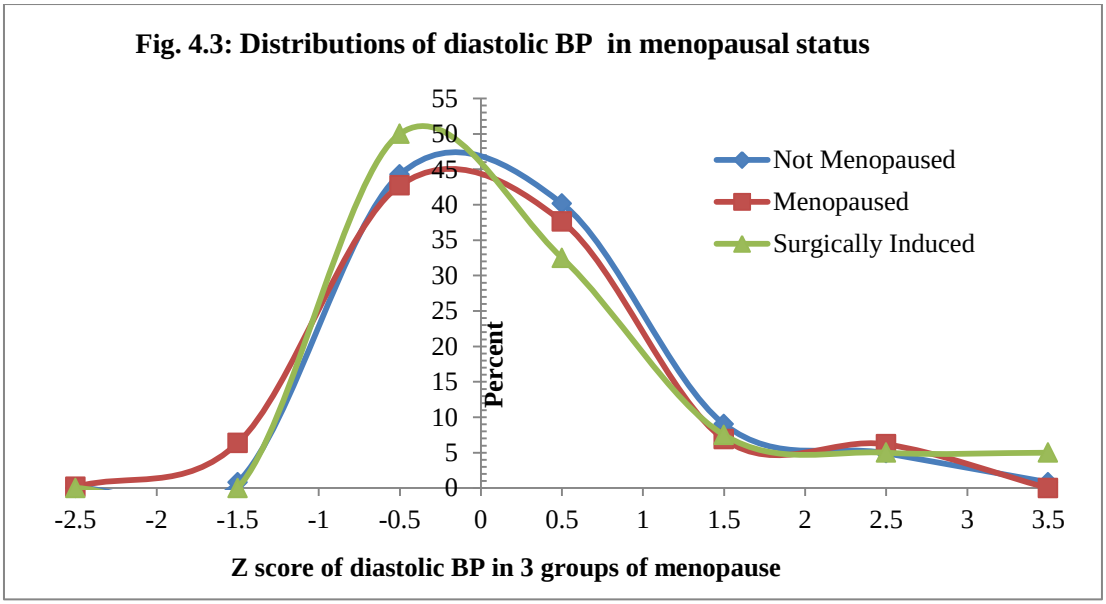

Figure 4.3, Distributions of diastolic BP by menopause status reveals that the distributions of diastolic BP did not change significantly in three groups of menopause (not menopause, menopause and surgically induced menopause).

Table 4.14c: Menopause status by hypertension

Hypertension Treatment	Menopause Attained					Surgically Induced	
	No		Yes		Total	n	Per 100
Hypertension	n	%	n	%			
No	53	43.44	230	41.89	283	17	5.67
Yes without treatment	15	12.30	26	4.74	41	0	0.00
Yes with treatment	54	44.26	293	53.37	347	23	6.22
Total	122	100.00	549	100.00	671	40	5.63

Table 4.14c, menopause status by hypertension reveals that the hypertension with treatment was higher (53.4%) in menopause women as compared to 41.9 percent in no hypertension group. The finding is usual as menopause women are expected to be older than no menopause. Surgical induced menopause was higher in hypertension groups with treatment and without hypertension, whereas there was no surgical induced menopause in hypertensive women without treatment.

Table 4.14d: Menopause status of diabetes by hypertension

Hypertension Treatment	Menopause Attained				Surgically Induced		Total
	Not Attained	%	Attained	%	n	Per 100	
a. Hypertension without Diabetes							
No Hypertension	47	50.00	188	50.27	14	5.62	249
Hypertension without treatment	7	7.45	13	3.48	0	0.00	20
Hypertension with treatment	40	42.55	173	46.26	11	4.91	224
Sub Total	94	100.00	374	100.00	25	5.07	493
b. Hypertension and Diabetes without treatment							
No Hypertension	0	0.00	15	50.00	0	0.00	15
Hypertension without treatment	1	20.00	10	33.33	0	0.00	11
Hypertension with treatment	4	80.00	5	16.67	0	0.00	9
Sub Total	5	100.00	30	100.00	0	0.00	35
c. Hypertension and Diabetes with treatment							
No Hypertension	6	6.38	24	6.42	3	9.09	33
Hypertension without treatment	7	7.45	3	0.80	0	0.00	10
Hypertension with treatment	10	10.64	118	31.55	12	8.57	140
Sub Total	94	100.00	374	100.00	25	5.07	493
All groups							
No Hypertension	53	43.44	227	41.35	17	5.72	297
Hypertension without treatment	15	12.30	26	4.74	0	0.00	41
Hypertension with treatment	54	44.26	296	53.92	23	6.17	373
Grand Total	122	100.00	549	100.0	40	5.63	711

Table 4.14d, menopause status of diabetes by hypertension reveals hypertension with treatment was higher (46.3%) in menopause women with no diabetic as compared to diabetic women without treatment (16.7%), whereas similar figure in diabetic with treatment women was 31.6%. Though, there was no difference in surgical induced menopause in hypertensive and diabetic women, however, there was no case of surgical induced menopause in women who did not receive treatment for either hypertension or diabetes.

Table 4.14e: Hypertension by age at menopausal groups

Age at Menopause	Normal	Hypertension			Total
		Pre	Stage-1	Stage-2	
<45					
N	2	47	24	16	89
%	2.2	52.8	27.0	18.0	100.0
45-49					
N	4	137	133	91	365
%	1.1	37.5	36.4	24.9	100.0
50+					
N	0	34	37	25	96
%	0.0	35.4	38.5	26.0	100.0
Total					
N	6	218	194	132	550
%	1.1	39.6	35.3	24.0	100.0

Table 4.14e, hypertension by age at menopausal groups reveals that as age at menopause increased, the proportion of hypertension in stage I increased from 27 percent in age groups less than 45 years to 38.5 percent in 50 years and above, the similar figures for stage II hypertension were 18 and 26 percent respectively.

Table 4.15. Cox Proportional Hazard analysis for Menopause determinants

Variables		Cox Proportional Hazard Model	Unstandardized	
	n	Exp.(B)(95% CI)	Menopausal (/100)	RR(95% CI)
Occupation		**; p<0.01		
Home maker	203	Reference	169 (83.3)	Reference
Labour	159	0.92 (0.7, 1.21)	138 (86.8)	1.04 (0.96, 1.14)
Farmer	121	0.84 (0.62, 1.14)	98 (81.0)	0.97 (0.87, 1.08)
Professional	36	1.41 (0.85, 2.34)	29 (80.6)	0.97 (0.81, 1.15)
Business	46	1.77 (1.17, 2.68)**	38 (82.6)	0.99 (0.86, 1.15)
Others	107	0.79 (0.57, 1.1)	78 (72.9)	0.88 (0.77, 1.00)
Hot Flushes				$,#,@,*; p<0.05
None	156	Reference	103 (66.0)	Reference
Mild	200	1.16 (0.86, 1.56)	160 (80.0)	1.21 (1.06, 1.38)$

Moderate	218	1.29 (0.94, 1.76)	199 (91.3)	1.38 (1.23, 1.56)#
Severe	60	0.98 (0.64, 1.5)	53 (88.3)	1.34 (1.16, 1.55)@
Very Severe	31	1.28 (0.78, 2.11)	30 (96.8)	1.47 (1.29, 1.67)*
Don't know	7	0.28 (0.09, 0.83)	5 (71.4)	1.08 (0.67, 1.75)
Sleep Problem		*,+,@; p<0.05		
None	79	Reference	63 (79.7)	Reference
Mild	165	0.84 (0.6, 1.17)	148 (89.7)	1.12 (1, 1.27)
Moderate	292	1.24 (0.9, 1.71)	240 (82.2)	1.03 (0.91, 1.17)
Severe	114	0.74 (0.5, 1.08)	82 (71.9)	0.9 (0.77, 1.06)
Very Severe	17	0.46 (0.24, 0.91)+	16 (94.1)	1.18 (1, 1.39)
Don't know	5	8.4 (1.08, 65.59)@	1 (20.0)	0.25 (0.04, 1.45)
Depressive Mood		+; p<0.05		*,@,#; p<0.05
None	204	Reference	168 (82.4)	Reference
Mild	146	1.1 (0.81, 1.51)	110 (75.3)	0.91 (0.82, 1.02)
Moderate	198	1.11 (0.83, 1.48)	182 (91.9)	1.12 (1.03, 1.2)*
Severe	88	0.75 (0.49, 1.14)	60 (68.2)	0.83 (0.71, 0.97)@
Very Severe	21	2.32 (1.17, 4.61)+	20 (95.2)	1.16 (1.03, 1.3)#
Don't know	15	1.2 (0.52, 2.77)	10 (66.7)	0.81 (0.56, 1.16)
Irritability		+++; p<0.001		*,@,#,$; p<0.001
None	243	Reference	183 (75.3)	Reference
Mild	195	1.18 (0.91, 1.53)	170 (87.2)	1.16 (1.06, 1.27)*
Moderate	143	0.98 (0.73, 1.31)	116 (81.1)	1.08 (0.97, 1.2)
Severe	60	0.47 (0.32, 0.7)+++	52 (86.7)	1.15 (1.02, 1.3)@
Very Severe	12	1.4 (0.74, 2.66)	12 (100.)	1.33 (1.24, 1.43)#
Don't know	19	0.92 (0.46, 1.85)	17 (89.5)	1.19 (1, 1.41)$
Anxiety		***; p<0.001		*,@,$,#; p<0.05
None	277	Reference	210 (75.8)	Reference
Mild	204	0.99 (0.76, 1.27)	174 (85.3)	1.13 (1.03, 1.23)*
Moderate	127	0.92 (0.68, 1.24)	112 (88.2)	1.16 (1.06, 1.28)@
Severe	42	0.8 (0.52, 1.23)	32 (76.2)	1 (0.84, 1.21)
Very Severe	16	4.49 (2.51, 8.03)***	16 (100.)	1.32 (1.23, 1.41)#
Don't know	6	1.58 (0.61, 4.06)	6 (100.)	1.32 (1.23, 1.41)$

Sexual Problem		+; p<0.05, **; p<0.01		*; p<0.05
None	298	Reference	238 (79.9)	Reference
Mild	202	1.33 (1.05,1.69)+	181 (89.6)	1.12 (1.04, 1.21)*
Moderate	117	1.06 (0.79, 1.41)	90 (76.9)	0.96 (0.86, 1.08)
Severe	29	1.2 (0.72, 2)	23 (79.3)	0.99 (0.82, 1.21)
Very Severe	10	0.74 (0.31, 1.75)	8 (80.0)	1 (0.73, 1.37)
Don't know	16	2.5 (1.22, 5.12)**	10 (62.5)	0.78 (0.53, 1.15)
Dryness Vagina		***; p<0.001, **; p<0.01		
None	346	Reference	280 (80.9)	Reference
Mild	182	0.66 (0.52, 0.84)***	151 (83.0)	1.03 (0.94, 1.11)
Moderate	83	0.79 (0.58, 1.07)	69 (83.1)	1.03 (0.92, 1.15)
Severe	29	1.03 (0.64, 1.67)	24 (82.8)	1.02 (0.86, 1.22)
Very Severe	12	0.33 (0.14, 0.74)**	8 (66.7)	0.82 (0.55, 1.23)
Don't know	20	1.18 (0.67, 2.09)	18 (90.0)	1.11 (0.95, 1.3)
Blood Spotting between Periods				
No	492	Reference	410 (83.3)	Reference
Yes	180	1.26 (0.99, 1.59)	140 (77.8)	0.93 (0.86, 1.02)
Blood Spotting after intercourse		**; p<0.01		
No	517		419 (81.0)	Reference
Yes	155	1.42 (1.13,1.79)**	131 (84.5)	1.04 (0.96, 1.13)

Note: The variables considered for determinants of Menopausal status, and could not exhibit significant effect are Type of Family, Heart Discomfort, Physical & Mental Exhaustion, Bladder Problem, Regularity of Menstruation, and Menstrual flow.

Table 4.15 Cox Proportional Hazard analysis for Menopause determinants reveals that the standardized Risk Ratios for Menopausal status by Cox Proportional Hazard Model were higher in Business group (1.77) as compared to Homemakers at $p<0.01$, the similar figures in women with Hot Flushes were significant at $p<0.05$, though none of the group as individual exhibited significant differences. The other significant differences in menopausal status were seen in Depressive Mood, Dryness Vagina, Irritability, Sexual Problem, Sleep Problem, Anxiety and Blood Spotting after intercourse. Unstandardized Risk Ratios for menopausal status were also not significantly different with respect to comparable reference groups in all the determinants of menopause except in Depressive Mood (Moderate, Severe, Very Severe; $p<0.05$), Sexual Problem (Mild; $p<0.05$), Anxiety (Mild, Moderate, Very severe; $p<0.05$), and Irritability (Mild, Severe, Very severe; $p<0.05$).

Fig. 4.4: Survival function at mean of covariates for menopause

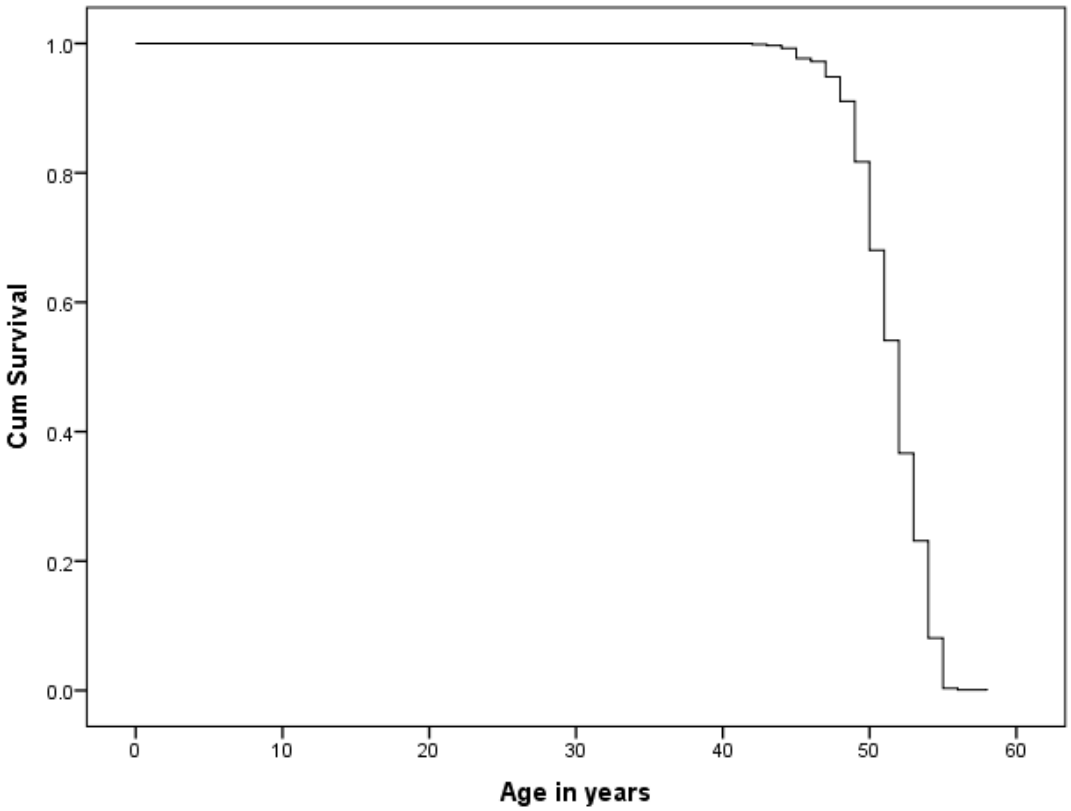

Fig. 4.4, survival function at mean of covariates for menopause describes the survival function of Cox proportional hazard model.

Table 4.16: Coordinates of ROC curve for diagnostic evaluation of Cox proportional hazard model

Probability of Positive attribute if less than or equal to	Sensitivity	Specificity	Determinant Attributes	N
0.078	0.142	0.992	4,37,40,44,74	14
0.087	0.145	0.984	48,	4
0.111	0.164	0.975	11,47,61,	6
0.145	0.209	0.967	14, 33,95	4
0.201	0.247	0.959	5,42,49,56,92	26
0.287	0.349	0.934	9,10,16,18,26,59,66, 67, 71, 72, 77, 85, 86, 87, 89	111
0.416	0.496	0.926	3,6,7,12,13,19,22,24,27, 28,31,35,36,43,45,62,78, 83,97	167
0.534	0.58	0.893	29,98	3

0.546	0.584	0.885	23,32,41,50,51,63,64,68, 88,93 94,99	117
0.587	0.655	0.877	1,17,21,34,38,58,65,81, 82,84	98
0.666	0.718	0.861	30	11
0.675	0.736	0.852	8,91	23
0.699	0.744	0.844	2,25,57,69,73,75,76,96	46
0.808	0.856	0.828	90	6
0.816	0.865	0.82	52,	8
0.827	0.871	0.803	15,20,55,	4
0.866	0.904	0.738	46,	4
0.877	0.909	0.721	39	3
0.902	0.924	0.713	54	5
0.951	0.958	0.59	80	1
0.952	0.967	0.549	53,	2
0.974	0.971	0.434	60,70,79	9

Note: Details of Codes in Column title 'Determinants Attributes' are in Appendix Table 1

Fig. 4.5: ROC Curve for Survival Function for Menopause (Area 0.88, 95% CI: 0.84-0.92)

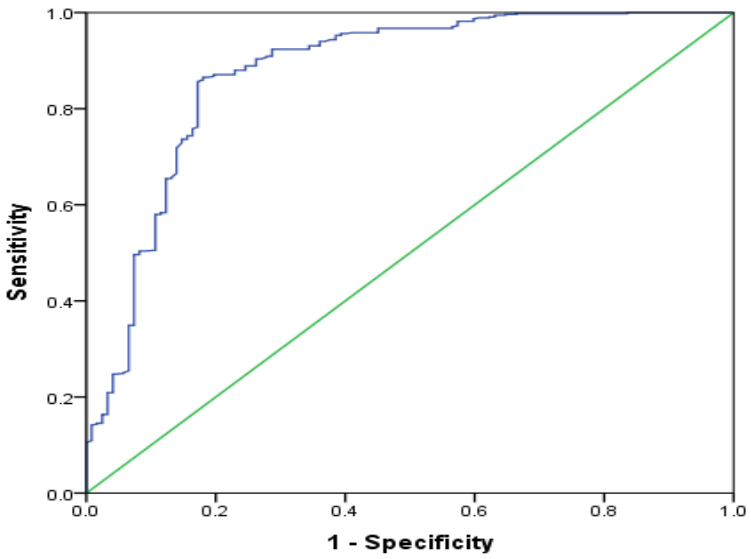

Fig 4.5, ROC Curve for survival function for menopause describes the sensitivity and specificity along with positive attributes causing the menopause symptoms using the Cox proportional hazard model. The most appropriate sensitivity and specificity of the Cox proportional hazard model were 85.6 and 82.8 percent respectively. However,

different sensitivity and specificity for screening and diagnostic purpose can be used from the table 4.16 as per the need of the research.

The probability for specific diagnostic levels can be read by entering the positive attribute of the symptoms of the menopause that is '1' in Cox proportional hazard model, to use the model for diagnostic purposes, as for attributes 29 (Labor, mild irritability, mild dryness of the vagina, and spotting of blood) and 98 (Others (other than house maker, labor, farmer, professional and business), severe irritability, mild dryness of the vagina, spotting of blood**).** The sensitivity of the model is 0.58 and specificity 0.893 with cutoff point p (Probability) = 0.534 (Table 4.16).

Table 4.17: Surgical induced menopause by its determinants

Variable	**Non-Surgical Induced Menopause**		**Surgical Induced Menopause**		**Total**
	n_1	**%**	n_2	**%**	**N**
Total	672	94.38	40	5.62	712
Religion	Chi-square =4.17;df =2;p = 0.124;NS				
Hindu	368	93.64	25	6.36	393
Muslim	212	93.81	14	6.19	226
Others	92	98.92	1	1.08	93
BMI Groups	Chi-square =7.87;df =2;p<.05				
18.5-24.9	104	90.43	11	9.57	115
25-29.9	461	94.27	28	5.73	489
30+	107	99.07	1	0.93	108
Sexual Problem	Chi-square =5.88;df =3;p = 0.118;NS				
None	314	96.32	12	3.68	326
Mild	202	93.09	15	6.91	217
Moderate	117	93.60	8	6.40	125
Severe	39	88.64	5	11.36	44
R**egularity of Menstruation**	Chi-square =11.85;df =1;p<.001				
No	286	97.95	6	2.05	292
Yes	386	91.90	34	8.10	420
Menstrual Flow	Chi-square =7.92;df =2;p<.05				
Light	104	99.05	1	0.95	105
Moderate	429	94.49	25	5.51	454
Heavy	139	90.85	14	9.15	153
Blood Spotting after Intercourse	Chi-square =20.61;df =1;p<.001				
No	517	96.64	18	3.36	535

Yes	155	87.57	22	12.43	177
Blood Spotting between Periods	Chi-square =4.01;df =1;p<.05				
No	492	93.36	35	6.64	527
Yes	180	97.30	5	2.70	185
Pain in Periods	Chi-square =23.12;df =2;p<.001				
No	55	82.09	12	17.91	67
Yes	496	96.31	19	3.69	515
Occasionally	121	93.08	9	6.92	130
Physical and Mental Exhaustion	Chi-square =63.35;df =3;p<.001				
None	181	97.31	5	2.69	186
Mild	151	97.42	4	2.58	155
Moderate	239	97.15	7	2.85	246
Severe	83	84.69	15	15.31	98
Very Severe	18	66.67	9	33.33	27
Heart Discomfort	Chi-square =15.03;df =1;p<.001				
None	309	90.88	31	9.12	340
Mild	363	97.58	9	2.42	372
Hot Flushes	Chi-square =5.37;df =2;p = 0.07;NS				
None	163	92.09	14	7.91	177
Mild	200	93.02	15	6.98	215
Moderate and Severe	309	96.56	11	3.44	320
Sleep Problem	Chi-square =10.19;df =3;p<.05				
None	84	98.82	1	1.18	85
Mild	165	97.63	4	2.37	169
Moderate	292	92.11	25	7.89	317
Severe	131	92.91	10	7.09	141
Depressive Mood	Chi-square =2.07;df =3;p = 0.558;NS				
None	219	94.40	13	5.60	232
Mild	146	92.99	11	7.01	157
Moderate	198	96.12	8	3.88	206
Severe	109	93.16	8	6.84	117
Irritability	Chi-square =35.92;df =3;p<.001				
None	262	97.76	6	2.24	268
Mild	195	97.01	6	2.99	201
Moderate	143	92.26	12	7.74	155
Severe	72	81.82	16	18.18	88
Anxiety	Chi-square =2.78;df =2;p = 0.25;NS				
None	283	94.97	15	5.03	298
Mild	204	92.31	17	7.69	221
Moderate	185	95.85	8	4.15	193
Dryness of Vagina	Chi-square =10.71;df =2;p<.01				
None	366	91.96	32	8.04	398
Mild	182	98.38	3	1.62	185
Moderate	124	96.12	5	3.88	129

Table 4.17, reveals that the maximum 6.4 percent Hindu females had surgical induced menopause followed by Muslim caste 6.2 percent and others 1.1 percent, the differences were not significant. Surgical induced menopause was significantly greater (9.6%, $p< 0.05$) in body mass index group less than 25 and decreased to 0.9 percent in body mass index group 30 and above. The differences in surgical induced menopause in regularity of menstruation were significant ($p<0.001$). Similar results were observed in sexual problem ($p< 0.01$), blood spotting after intercourse ($p<0.001$), menstrual flow ($p<0.05$), pain in periods ($p<0.001$), spotting between periods ($p<0.05$), physical and mental exhaustion ($p<0.001$), sleep problem ($p<0.05$), heart discomfort ($p<0.001$), dryness of vagina ($p<0.01$) and irritability ($p<0.001$).

Table 4.18: Adjusted and comparable unadjusted Odds Ratio estimate by Logistic Regression

Variables	Logistic Regression Estimate			Unadjusted OR (95% CI)
	Exp(B)	95% C.I. for EXP(B)		
		Lower	Upper	
BMI	Chi-square =17.62;df =2;p<0.001			
18.5-24.9	1.00	-	-	1.00
25-29.9	0.22	0.05	1.05	0.57(0.28,1.19)
30+	0.00	0.00	.02	0.09(0.01,0.7)
Sexual Problem	Chi-square =14.46;df =3;p<0.01			
None	1.00	-	-	1.00
Mild	15.01	2.45	91.87	1.94(0.89,4.24)
Moderate	8.81	1.60	48.65	1.79(0.71,4.49)
Severe	93.12	7.05	1230.67	3.35(1.12,10.03)
Problem of Regularity of Menstruation	Chi-square =9.19;df =1;p<0.01			
No	1.00	-	-	1.00
Yes	31.96	3.40	299.98	4.2(1.74,10.14)
Menstrual Flow	Chi-square =11.31;df =2;p<0.01			
Light	1.00	-	-	1.00
Moderate	33.36	1.89	587.48	6.06(0.81,45.24)
Heavy	1.70	0.08	36.44	10.47(1.36,80.93)
Blood Spotting after Intercourse	Chi-square =11.85;df =1;p<0.01			
No	1.00	-	-	1.00
Yes	24.18	3.94	148.32	4.08(2.13,7.8)
Blood Spotting between Intercourse	Chi-square =8.3;df =1;p<0.01			
No	1.00	-	-	1.00
Yes	0.04	0.00	0.35	0.39(0.15,1.01)

Physical and Mental Exhaustion	Chi-square =25.75;df = 4;p<0.001			
None	1.00	-	-	1.00
Mild	5.33	0.37	77.73	0.96(0.25,3.63)
Moderate	15.92	1.17	217.50	1.06(0.33,3.39)
Severe	763.31	38.34	15197.43	6.54(2.3,18.6)
Very severe	15.44	0.83	286.54	18.1(5.47,59.84)
Heart Discomfort	Chi-square =15.03;df =1;p<0.01			
None	1.00	-	-	1.00
Mild	0.02	0.00	0.13	0.25(0.12,0.53)
Hot Flushes	Chi-square =6.73;df =2;p<0.05			
None	1.00	-	-	1.00
Mild	0.55	0.10	3.21	0.87(0.41,1.86)
Moderate and Severe	0.05	0.01	0.52	0.41(0.18,0.93)
Sleep Problem	Chi-square =12.45;df =3;p<0.05			
None	1.00	-	-	1.00
Mild	0.78	0.03	23.04	2.04(0.22,18.51)
Moderate	14.19	0.78	256.66	7.19(0.96,53.86)
Severe	62.10	2.11	1824.95	6.41(0.81,51.01)
Irritability	Chi-square =14.63;df =3;p<0.01			
None	1.00	-	-	1.00
Mild	0.58	0.05	6.60	1.34(0.43,4.23)
Moderate	68.59	4.42	1063.90	3.66(1.35,9.97)
Severe	42.97	2.59	712.66	9.7(3.66,25.7)
Anxiety	Chi-square =12.7;df =2;p<0.01			
None	1.00	-	-	1.00
Mild	0.25	0.04	1.57	1.57(0.77,3.22)
Moderate	0.01	0.00	0.10	0.82(0.34,1.96)
Dryness of Vagina	Chi-square =14.17;df =2;p<0.01			
None	1.00	-	-	1.00
Mild	0.00	0.00	0.08	0.19(0.06,0.62)
Moderate	0.06	0.01	0.52	0.46(0.18,1.21)

Table 4.18, adjusted and comparable unadjusted odds ratio estimate by logistic regression reveals Odds Ratio (OR) estimate by Logistic Regression (LR) and its comparable unadjusted OR. The Odd Ratio differences by groups of BMI were statistically significant at p<0.001, though unadjusted OR did not display any significant differences. Sexual activity considerably hampered (p<0.01) after surgical induced menopause, unadjusted OR were not in the line of adjusted. With the regularity of menstruation problem, surgical induced menopause increased significantly (p<0.01) as indicated by unadjusted and adjusted OR. Similar result were seen by blood spotting after intercourse and menstrual flow (p<0.01). Surgical

induced menopause by unadjusted and adjusted OR were similar in another determinant.

4.2 Knowledge and Attitude of Menopausal Health

Table 4.19: Menopause status by perception of care pre and during menopause

Perception	Menopause status				Surgically Induced	
	No		Yes			
	n	%	N	%	N	%
Care during pre-menopause to prevent menopausal problems; χ_3^2 = 10.51; p<0.05						
No	17	13.9	78	14.2	0	0
Some of them	51	41.8	188	34.2	13	32.5
All	9	7.4	106	19.3	1	2.5
Don't know	45	36.9	178	32.4	26	65
Lack of care during menopause predisposes menopausal problems; χ_3^2 = 12.17; p<0.01						
No	29	23.8	79	14.4	8	20.0
Some of them	43	35.2	218	39.6	17	42.5
All	2	1.6	45	8.2	2	5.0
Don't know	48	39.3	208	37.8	13	32.5
Total	122	100	550	100	40	100

Note: Menopause problems: Hot flashes, Sweating, Dryness of vagina, Heart discomfort, Depressive mood, Irritability, Sleep problem, Anxiety, Sexual problem, Bladder problem, Physical and Mental exhaustion

Table 4.19, menopause status by perception of care pre and during menopause reveals that the perception in pre-menopausal period and lack of care during menopause were considerably higher with p<0.5 and p<0.01 respectively in menopausal period, as compared to pre-menopause period.

Table 4.20: Prevalence of menopause symptoms by peri-menopause perception/ knowledge

Peri-menopause Perception	Total	Heart Discomfort	Hot Flushes	Physical and Mental Exhaustion	Sexual Problem	Dryness of Vagina
A. Menopause perception/ knowledge per 100 women in not menopause						
No	17	52.9	52.9	76.5	47.1	35.3
Some of them	51	29.4	39.2	58.8	27.5	33.3
All	9	33.3	77.8	77.8	33.3	33.3
Don't know	45	66.7	68.9	77.8	68.9	62.2
B. Menopause perception/ knowledge per 100 women in menopause						
No	79	65.8	74.7	62.0	60.8	55.7
Some of them	218	58.3	83.5	78.0	55.5	37.6
All	45	40	64.4	75.6	48.9	55.6
Don't know	208	52.4	82.7	73.6	53.4	48.6
Z - test values						
No		0.98	1.67	-1.25	1.03	1.59
Some of them		4.01***	6.08***	2.58*	3.94***	0.58
All		0.39	-0.86	-0.14	0.90	1.28
Don't know		-1.83	1.87	-0.61	-2.01*	-1.70

Note: *; p<0.05, ***; p<0.001

Table 4.20, prevalence of menopause symptoms by peri-menopause perception/ knowledge reveals that the perception/ knowledge increased significantly ($p < 0.001$) in menopause women with knowledge of some of the menopause symptoms. However, with perception/ knowledge about the entire menopause symptoms did not show significant differences in perception/ knowledge between pre and menopause groups.

Table 4.21: Menopausal psychological disposition by peri-menopausal perception/ knowledge

Peri-menopause Perception	Total	Sleep problem	Depressive Mood	Irritability	Anxiety
A. Menopause perception/ knowledge per 100 women in not menopause					
No	17	88.2	52.9	41.2	23.5
Some of them	51	76.5	66.7	23.5	23.5
All	9	77.8	55.6	88.9	11.1
Don't know	45	91.1	73.3	73.3	84.4
B. Menopause perception/ knowledge per 100 women in menopause					
No	79	77.2	58.2	70.9	53.2
Some of them	218	89.4	63.8	61.0	67.9
All	45	84.4	88.9	64.4	46.7
Don't know	208	92.3	70.7	63.5	59.1
Z - test values					
No		-1.20	0.40	2.29*	2.53
Some of them		2.05*	-0.39	5.52***	6.60***
All		0.44	1.93	-1.93	2.77**
Don't know		0.26	-0.36	-1.33	-3.96***

Note: *; p<0.05, **; p<0.01, ***; p<0.001

Table 4.21, menopausal psychological disposition by peri-menopausal perception/ knowledge reveals that the perception/ knowledge increased significantly ($p < 0.001$) in menopause women with knowledge of menopausal symptoms in categories of irritability, anxiety and sleep problems with significantly varying from $p<0.05$ to $p<0.001$. However, with perception/ knowledge about all the menopause symptoms did not show significant differences in perception/ knowledge between pre and menopause groups except in anxiety ($p<0.01$).

Table 4.22: Menopausal status by attitudes/awareness towards menopause

Attitude	Menopause					Surgically Induced	
	No		Yes		Z-test		
	n	%	n	%		Count	Column N %
Attitude about meaning of menopause							
Disease	2	1.6	67	12.2	1.09	4	10
Physiological	69	56.6	269	48.9	-1.15	16	40
Freed from menstrual agony	45	36.9	174	31.6	-0.66	20	50
None of the above	6	4.9	40	7.3	0.25	0	0
Attitude about consequences of menopause							
Yes	19	15.6	97	17.6	0.22	13	32.5
No	45	36.9	244	44.4	0.95	3	7.5
Don't know	58	47.5	209	38	-1.29	24	60
Consequences of disclosure of menopause							
No***	60	49.2	76	13.8	-4.68	1	2.5
Yes	39	32	210	38.2	0.76	10	25
Don't know	23	18.9	264	48	3.34	29	72.5
Health education of menopause							
Yes	79	64.8	382	69.5	0.80	37	92.5
No*	42	34.4	86	15.6	-2.26	1	2.5
Don't know	1	0.8	82	14.9	1.45	2	5
Preparedness of menopause							
Yes	46	37.7	199	36.2	-0.19	12	30
No	11	9	99	18	0.95	5	12.5
Don't know	65	53.3	252	45.8	-1.08	23	57.5
Feeling of isolation							
Yes	24	19.7	104	18.9	-0.09	17	42.5
No	75	61.5	318	57.8	-0.59	18	45
Don't know	23	18.9	128	23.3	0.49	5	12.5

Note: *; p<0.05, ***; p<0.001

Table 4.22, menopausal status by attitudes/awareness towards menopause reveals that the attitude of women regarding discloser, disease and other consequences varied differently in pre-menopause, menopause and surgically induced menopause.

Table 4.23: Source of menopause related information among women aged 40-55 years in North Karnataka

Source of menopausal information	Total	Percent
No Information	76	13.8
Husband	77	14.0
Family Member	57	10.4
Friends	10	1.8
Health Personnel	11	2.0
Social Media	43	7.8
More than one	276	50.2
Total	550	100.0

Table 4.23, source of menopause related information among women aged 40-55 years in North Karnataka reveals that, around 50% women have got the menopausal information by more than one source, however, only 2% from health personnel.

Chapter 5. DISCUSSION

5.1 Age at Menopause and Associated Symptoms

This study described average age at menopause in a sample of 712 females of age 40-55 years from Northern Karnataka, India. Age at menopause has been computed by life table method using information, whether the women have achieved menopause or not at the current age, whereas in most of the studies actual age at menopause has been recorded and used for computing the age at menopause [48-54]. Using the actual age of women at menopause might have resulted in a lapse of memory and more likely deliberate reporting lesser age, as usual in case of women.

The menopausal females in 48-49 years of age were 75.7 percent, whereas the similar figures in age group of 54-55 years was 96.8 percent, concluding in positively skewed distribution of menopause, resulting in fast achieving the menopausal status, giving no time to the women to be ready for consequences. Findings are in line reported from developing and developed countries [55-56].

The result of this study shows the average age at menopause around 49.3 years. However, the worldwide estimated age at menopause is around 50 years [57]. In the literature, studies have revealed differences in the average age of natural menopause such as 45 years in Thailand, 46 years in South Africa, 48 years in Ghana and 51 years in the USA [58-61].

The average ages at menopause below the age of 46, 54, 55 years were 43.1, 47.5 and 48.8 years respectively, whereas, the age at menopause in developing countries has been reported 45 to 55 years and in developed countries 50 to 53 years [62-71]. standardized risk ratios for menopausal status by Cox proportional hazard model were statistically significant and higher in business group as compared to homemakers, and hot flushes against with no hot flushes. The other significant differences were

observed by sleep problem, irritability, depressive mood, anxiety, sexual problem, dryness vagina and blood spotting after intercourse. However, Fabio Parazzini (2007) did not observe any difference in age at menopause by menopausal symptoms. However, the symptoms of menopause varied significantly by age at menopause.

5.2 Menopause Status and its Determinants

Menopause symptoms in order of extent, varied with most common hot flushes, followed by vaginal dryness, night sweat, and mood swings [32]. Symptoms and their consequences of menopause deliver invaluable input for healthcare providers and public health personnel to enable appropriate healthcare/ healthcare education [22]. Hence, the study has taken an objective to study the menopause determinants, so that the necessary care for menopause women are planned and arranged.

Odds Ratio of menopausal women in other than 'Hindus' and 'Muslims' were significantly higher as compared to Hindus, while, the similar figure was as least as 0.6 times in 'Muslims', whereas, the study from the west as also reported significant differences by religion, though they did not have similar classification [72].

Odds Ratio of menopausal women in BMI 18.5-24.9 was higher than BMI groups of greater than or equal to 25; this is a note that the study population was rural, not obsessed for diet control or fast food; subsequent in slimness or obesity. Hence, results are not in the line of urban people, as study comprising of only menopause women indicated, that the menopause transition was related to changes in body fat composition [73].

Odds Ratio of menopausal women in 'mild sexual desire' was highest when compared with 'no sexual desire' problem, while the sexual desire reduced in other two groups (moderate & severe), whereas, 67.5% menopausal women were described sexually inactive by the study from the northern part of India using clinic-based data [74].

Odds Ratios in dryness of vagina and hot flushes were seen significantly higher at $p<0.05$ than without hot flushes and dryness of vagina, with the significant different distribution of the subjects in menopause and non-menopausal groups by sexual desire problem and hot flushes. Whereas, 76.4% hot flushes, 42.3% vaginal dryness, and decrease in sexual desire i.e. 36.2% have been reported. Similar results with varying proportion have been described in symptoms as vaginal dryness and fatigue symptoms [32, 75].

Odds Ratio of menopausal women was highest in 'mild' physical and mental exhaustion as compared to 'none'; the similar findings have been reported by other researchers. Odds Ratio in 'moderate' depressive mood was found significantly higher than 'none', the similar findings (mood swings i.e. 66.8%) have been stated during menopause. Other study indicated 77.9% mood swings during menopause [76].

In Anxiety group, the Odds Ratio of menopause was significantly higher in 'severe' anxiety group, 'mild' sleep problem and in 'mild' irritability as compared to 'none' anxiety, 'no' sleep problem and 'none' irritability groups respectively, whereas the similar results were seen for anxiety (50%), sleep disorder (57.1%) and irritability (67.5%) [32].

5.3 Surgical Induced Menopause

Menopause symptoms (heart discomfort, anxiety, hot flushes, physical and mental exhaustion, sleep problem, irritability, depressive mood, vaginal dryness) vary contrarily in perimenopause age with utmost common hot flushes, followed by vaginal dryness, night sweat, and mood swings [77]. Menopause symptoms and its consequences reason a lot of adversity in physiological process of reaching menopause, providing priceless input for healthcare providers and public health personnel to enable suitable healthcare/ health education [78].

The proportion of surgical induced menopause was higher (about 6.4%) in Hindu females followed by Muslims. Surgical induced menopause was considerably higher in the BMI group less than 25 and reduced consistently with BMI. The differences of surgical induced menopause in 'regularity of menstruation' groups were considerably different ($p<0.001$), similar outcomes were saw in 'sexual problem', 'blood spotting after intercourse', 'dryness of vagina', 'menstrual flow', 'blood spotting between periods', 'mental and physical exhaustion', 'sleep problem', 'irritability', 'heart discomfort' and 'pain in periods'. Results were in line of observed in another studies in developed and developing world [79-80].

The results of the effect of menopausal symptoms on surgical induced menopause are encouraging with Nagelkerke Square (Accuracy of model = 0.98, $R^2 = 0.69$, 95% CI: 0.97 - 0.99, $p<0.001$), detecting 96.6% non-surgical and surgical menopause females correctly. Findings are in harmony with results of another study [81-82]. Probable sensitivity and specificity of logistic model built for usage of healthcare providers were 92.5 and 90.8 percent respectively. Though, specificity and sensitivity can be adjusted as per the condition of research objectives (for screening or diagnosis purposes).

Chapter 6. SUMMARY

6.1 Age at Menopause and its Determinants

Menopausal females in age group of 48-49 years were 75.7 percent. The average ages at menopause below the age of 46, 54, 55 years were 43.1, 47.5 and 48.8 years, respectively. Age at menopause was higher in lower and higher age at marriage, but not statistically significant. Surgically induced menopause was also higher in lower and higher age at marriage, not statistically significant, but may not be random variations. Age at first child less than 20 years and for the last child less than 25 years, the average age at menopause were less 48.38 and 48.48 years as compared to in respective higher age groups 49.36 and 49.05 years, though the differences were not statistically significant.

The surgical operations were lower 2.8%, when the last child was born in age 25 years and above, than in age less than 25 years (7.5%, $p<0.01$). Age at menopause was higher in lower and higher education groups. Surgically induced menopause was highest in primary as compared to secondary and highly educated women. Illiterate and higher education had a higher median age at menopause 47.6 years and 48.8 years respectively as compared to primary education. Surgical induced menopause changed with maximum induced menopause 10.7 percent in 6+ household sizes as compared to less than 3 percent in smaller household size groups. However, Mean age at menopause was the highest i.e. 50.3 years in the medium size family as compared to the other two groups.

Age at menopause changed by the type of family i.e age at menopause was higher in joint family (51.05 years) when compared with nuclear family (48.72 years). However, surgical induced menopause changed significantly with maximum induced menopause (18.2%) in joint families as compared to nuclear (2%). Age at menopause

was least in Muslims (48.6 years). Surgical induced menopause was least in Christens and others as compared to Hindus and Muslims together. Average age at menopause did not vary significantly by income. Surgical induced menopause did not differ significantly in income groups less than Rs.4000 and between Rs.4000-5999. However, the surgical induced menopause was higher in less than Rs.6000 income group as compared to Rs.6000+.

Females attaining age at menarche at age 14 years and above had significantly higher surgical induced menopause. The rate of menopause (87.6/100) was also higher in women with age at menarche 14 years and above. The average age at menopause was lowest (48.2 years) in women attained menarche in 13-14 years and higher in less than 13 or at age 14 years and above.

Surgically induced menopause was significantly higher in mothers with children ever born '1-2' as compared to 3+ children. The average age at menopause was highest (51.3 years) in the women, with 3+ child ever born. No visible relationship has been seen in age at menopause in groups of menstruation. However, surgical induced menopause was higher in the group of menstruation 6+ days, though the differences were not statistically significant.

The quality of menstruation had affected significantly to menopause status, except menstrual flow and blood spotting between periods. However, the surgical induced menopause was higher in all abnormal groups of menstrual history, except in menopause women with regular menstruation, where, surgical induced menopause was higher in women who reported regular menstrual period. Surgical induced menopause increased with lifestyle diseases, more so in groups with the treatment of

hypertension and diabetes. However, hypertension and diabetes without treatment didn't have any surgical induced menopause.

Standardized risk ratios for menopausal status were higher in business group (1.77) as compared to homemakers at $p<0.01$, the similar figures in women with hot flushes were significant at $p<0.05$, though none of the group as individual exhibited significant differences. The other significant differences in menopausal status were seen in depressive mood, sleep problem, anxiety, irritability, sexual problem, dryness of vagina and blood spotting after intercourse. However, unstandardized risk ratios for menopause status were significantly different with respect to comparable reference groups in all the determinants of menopause except in 'severe' sleep problem, 'moderate' depressive mood and 'mild' irritability**.**

Diagnostic sensitivity and specificity along with positive attribute causing the menopause symptoms to occur. The most appropriate sensitivity and specificity of the Cox proportional hazard model were 85.6 and 82.8 percent respectively. The probability for specific diagnostic levels can be read by entering the positive attribute of the symptoms of the menopause that is '1' in Cox proportional hazard model, to use the model for diagnostic purposes**.**

Maximum 6.4 percent Hindu females had surgical induced menopause followed by Muslim (6.2%) and others (1.1%), difference was not significant. Surgical induced menopause was considerably higher (9.6%, $p< 0.05$) in BMI group less than 25 and diminished to 0.9 percent in BMI group 30 plus. Differences in surgical induced menopause in regularity of menstruation were significant. Alike results were seen in menstrual flow, sexual problem, mental and physical exhaustion, blood spotting after intercourse, pain in periods, blood spotting between periods, sleep problem, heart discomfort, dryness of vagina and irritability.

Sexual activity significantly hampered after surgical induced menopause. With the regularity of menstruation problem, the surgical induced menopause increase significantly, as indicated by unadjusted and adjusted OR, a similar result were perceived by blood spotting after intercourse and menstrual flow. Surgical induced menopause by unadjusted and adjusted OR was similar in another determinant. Though, all determinants in model inclined set of surgical induced menopause.

6.2 Knowledge and Attitude towards Menopausal Health Consequences

Perception in the pre-menopausal period and lack of care during menopause was significantly higher in the menopausal period, as compared to pre-menopausal period. Perception/ knowledge increased significantly in menopause women with knowledge of some the menopause symptoms. However, with perception/ knowledge about all the menopause symptoms did not show significant differences in perception/ knowledge between pre-menopause and menopause groups.

Perception/ knowledge increased significantly in menopause women with knowledge of menopausal symptoms in categories irritability, anxiety and sleep problems. However, with perception/ knowledge about all the menopause symptoms did not show significant differences in perception/ knowledge between pre and menopause groups except in anxiety.

Chapter 7. CONCLUSION

7.1 Conclusions

The average ages at menopause in women below the age of 46, 54, 55 years were 43.1, 47.5 and 48.8 years respectively. Average age at menopause in women with age at first child and last child less than 20 and 25 years were 48.38 and 48.48 years respectively, as compared to in higher age groups of first and last child. The age at menopause decreased consistently from 49 years in illiterates/informal education to 48.24 years in secondary and higher education groups. Mean age at menopause was highest 50.3 years in middle size family groups as compared to other two groups. Age at menopause was higher in joint family 51 years as compared to 48.7 in nuclear. Age at menopause was least 48.6 years in Muslims as compared to other religion groups. The average age at menopause was highest (49.3 years) for women with '3+' children ever born and 48.7 years in less or equal to '2' children ever born. Menopause age decreased consistently from 49.2 years in menstruation duration less than 3 days to 48.1 years in 6+ days.

The average age at menopause was lowest (48.2 years) in women who attained menarche in 13-14 years as compared to lower and higher age groups at menarche. Average age at menopause and its symptoms did not change by income groups. Age at menopause and surgically induced menopause was higher in lower and higher ages at marriage.

The age distributions of menopause and surgical induced menopause were not normal, however, women who did not achieve menopause followed normal distribution, indicating menopause as physiological process terminating in surgical induced and natural menopause. The quality of menstruation had significant impact on age at

menopause and surgical induced menopause. Regularity of menstruation, menstrual flow, blood spotting between periods, blood spotting after intercourse and pain in periods had the impact on age at menopause. No surgical induced menopause was observed in women without diabetic treatment.

Hypertension with treatment was higher (53.4%) in menopause women as compared to 41.9 percent in no hypertension group. The finding is usual as menopause women are expected to be older than who did not achieve menopause. Hypertension with treatment was higher (46.3%) in menopause women with no diabetes as compared to diabetic women without treatment (16.7%), with similar figures in diabetic with treatment. As age at menopause increased the proportion of stage I hypertension increased from 27 percent in age groups less than 45 years to 38.5 percent in 50 years and above, with similar trends in stage II hypertension.

The Risk ratios for menopausal status by Cox proportional hazard model were higher in business group (1.77) as compared to homemakers; the similar figures in women with hot flushes were significant. The other significant differences in menopausal status were seen in depressive mood, dryness of vagina, irritability, sexual problem, sleep problem, anxiety and blood spotting after intercourse. Unstandardized risk ratios for menopausal status were significantly different with respect to comparable reference groups in all the determinants of menopause, except in severe sleep problem, moderate depressive mood and mild irritability**.**

Surgical induced menopause was significantly greater (9.6%, $p< 0.05$) in body mass index group less than 25 and decreased to 0.9 percent in body mass index group 30 and above. The differences in surgical induced menopause with regularity of menstruation were significant. Similar results were observed in sexual problem

groups, blood spotting after intercourse, menstrual flow, pain in periods, spotting between periods, physical and mental exhaustion, sleep problem, heart discomfort, dryness of vagina and irritability.

Sexual activity considerably hampered after surgical induced menopause. With the regularity of menstruation problem, surgical induced menopause increased significantly as indicated by unadjusted and adjusted OR, similar result were seen by blood spotting after intercourse and abnormal menstrual flow.

Perception of menopause symptoms and consequences in the pre-menopausal period and lack of care during menopause were considerably higher with $p<0.5$ and $p<0.01$ respectively in menopausal period as compared to pre-menopause period. Perception/ knowledge increased significantly $p< 0.001$ in menopause women with knowledge of menopause symptoms. Furthermore, the attitude of women regarding discloser of menopause and its symptoms varied in pre-menopause, menopause and surgically induced menopause groups.

7.2 Limitations

Women of the age of 40-55 years from rural areas of North Karnataka formed the study group. Hence, the results of the study may need to be further calibrated for their applicability in other age groups and areas. Hypertension was measured by a digital BP apparatus, calibrated every day; the findings may need assessment.

7.3 Policy Implication

The study provides necessary scientific evidence on age at menopause, menopause symptoms and health consequences for healthcare planners for policy formation and to arrange necessary healthcare and health education services.

7.4 Recommendations

The study was conducted in rural North Karnataka. Hence, there is scope for similar studies in urban and other parts of the country.

The study is also required for the financial and socio-psychological burden on menopause women, family and society at large.

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Table 1: Determinant Attributes

1=Home maker;	51=Farmer, Moderate (Irrit.)
2=Home maker, Yes (Blood)	52=Farmer, Moderate (Irrit.), Yes (Blood)
3=Home maker, Mild (Dry.)	53=Farmer, Moderate (Irrit.), Mild (Dry.)
4=Home maker, Mild (Dry.), Yes (Blood)	54=Farmer, Moderate (Irrit.), Mild (Dry.), Yes (Blood)
5=Home maker, Moderate (Dry.)	55=Farmer, Moderate (Irrit.), Moderate (Dry.)
6=Home maker, Mild (Irrit.)	56=Farmer, Severe (Irrit.)
7=Home maker, Mild (Irrit.), Yes (Blood)	57=Farmer, Severe (Irrit.), Mild (Dry.)
8=Home maker, Mild (Irrit.), Mild (Dry.)	58=Farmer, Severe (Irrit.), Moderate (Dry.)
9=Home maker, Mild (Irrit.), Mild (Dry.), Yes (Blood)	59=Professional
10=Home maker, Mild (Irrit.), Moderate (Dry.)	60=Professional, Yes (Blood)
11=Home maker, Mild (Irrit.), Moderate (Dry.), Yes (Blood)	61=Professional, Mild (Dry.)
12=Home maker, Moderate (Irrit.)	62=Professional, Moderate (Dry.)
13=Home maker, Moderate (Irrit.), Mild (Dry.)	63=Professional, Mild (Irrit.)
14=Home maker, Moderate (Irrit.), Mild (Dry.), Yes (Blood)	64=Professional, Mild (Irrit.), Yes (Blood)
15=Home maker, Moderate (Irrit.), Moderate (Dry.)	65=Professional, Mild (Irrit.), Mild (Dry.)
16=Home maker, Moderate (Irrit.), Moderate (Dry.), Yes (Blood)	66=Professional, Moderate (Irrit.)
17=Home maker, Severe (Irrit.)	67=Professional, Moderate (Irrit.), Moderate (Dry.)
18=Home maker, Severe (Irrit.), Yes (Blood)	68=Business
19=Home maker, Severe (Irrit.), Moderate (Dry.)	69=Business, Mild (Dry.)
20=Home maker, Severe (Irrit.), Moderate (Dry.), Yes (Blood)	70=Business, Moderate (Dry.), Yes (Blood)
21=Labour	71=Business, Mild (Irrit.)
22=Labour, Yes (Blood)	72=Business, Mild (Irrit.), Mild (Dry.)
23=Labour, Mild (Dry.)	73=Business, Mild (Irrit.), Mild (Dry.), Yes (Blood)
24=Labour, Moderate (Dry.)	74=Business, Mild (Irrit.), Moderate (Dry.)
25=Labour, Moderate (Dry.), Yes (Blood)	75=Business, Moderate (Irrit.)
26=Labour, Mild (Irrit.)	76=Business, Moderate (Irrit.), Moderate (Dry.), Yes (Blood)
27=Labour, Mild (Irrit.), Yes (Blood)	77=Business, Severe (Irrit.)
28=Labour, Mild (Irrit.), Mild (Dry.)	78=Business, Severe (Irrit.), Mild (Dry.)
29=Labour, Mild (Irrit.), Mild (Dry.), Yes (Blood)	79=Business, Severe (Irrit.), Mild (Dry.), Yes (Blood)

30=Labour, Mild (Irrit.), Moderate (Dry.)	80=Business, Severe (Irrit.), Moderate (Dry.)
31=Labour, Moderate (Irrit.)	81=Others
32=Labour, Moderate (Irrit.), Mild (Dry.)	82=Others, Yes (Blood)
33=Labour, Moderate (Irrit.), Mild (Dry.), Yes (Blood)	83=Others, Mild (Dry.)
34=Labour, Moderate (Irrit.), Moderate (Dry.)	84=Others, Mild (Dry.), Yes (Blood)
35=Labour, Moderate (Irrit.), Moderate (Dry.), Yes (Blood)	85=Others, Moderate (Dry.)
36=Labour, Severe (Irrit.)	86=Others, Mild (Irrit.)
37=Labour, Severe (Irrit.), Yes (Blood)	87=Others, Mild (Irrit.), Yes (Blood)
38=Labour, Severe (Irrit.), Mild (Dry.)	88=Others, Mild (Irrit.), Mild (Dry.)
39=Labour, Severe (Irrit.), Moderate (Dry.)	89=Others, Mild (Irrit.), Mild (Dry.), Yes (Blood)
40=Labour, Severe (Irrit.), Moderate (Dry.), Yes (Blood)	90=Others, Mild (Irrit.), Moderate (Dry.)
41=Farmer	91=Others, Moderate (Irrit.)
42=Farmer, Yes (Blood)	92=Others, Moderate (Irrit.), Yes (Blood)
43=Farmer, Mild (Dry.)	93=Others, Moderate (Irrit.), Mild (Dry.)
44=Farmer, Mild (Dry.), Yes (Blood)	94=Others, Moderate (Irrit.), Moderate (Dry.)
45=Farmer, Moderate (Dry.)	95=Others, Moderate (Irrit.), Moderate (Dry.), Yes (Blood)
46=Farmer, Mild (Irrit.)	96=Others, Severe (Irrit.)
47=Farmer, Mild (Irrit.), Yes (Blood)	97=Others, Severe (Irrit.), Mild (Dry.)
48=Farmer, Mild (Irrit.), Mild (Dry.)	98=Others, Severe (Irrit.), Mild (Dry.), Yes (Blood)
49=Farmer, Mild (Irrit.), Mild (Dry.), Yes (Blood)	99=Others, Severe (Irrit.), Moderate (Dry.)
50=Farmer, Mild (Irrit.), Moderate (Dry.)	

Note: Variable details in parenthesis - Dry- Dryness of Vagina, Irrit- Irritability, Blood- Blood spotting after intercourse, Others – other than House maker, Labour, Farmer, Professional and Business, in the model all these attributes need to be entered as '1', then the model will give values of Odds Ratios against normal attributes.

List of Annexures Attached

1. Ethical clearance
2. Participant information sheet
3. Participant consent
4. Questionnaire and SOP
5. Conferences
   A) Paper presentation in XVIII Bhopal seminar on "Contribution in deterministic model for age at menopause: A rural cross-sectional study in North Karnataka" in 2019
   B) Delegate and member of organizing committee in 33rd annual conference of ISMS by KLE University, Belagavi in 2015
6. Workshop
   A) Sample size and multivariate analysis by SPSS/Excel
   B) Biostatistics and research with SPSS/Excel spreadsheet
   C) Pre-conference workshop in 33rd annual conference of ISMS by KLE University, Belagavi
   D) Complex sampling and multivariate techniques in health research with SPSS 22
7. Training program
   A) ICMR sponsored training program on 'Good Laboratory Practices' organized by KLE University, Belagavi
   B) 5th Training course on 'Basic Biotechnology Techniques' organized by Dept. of Biotechnology, KLE Society's Dr. Sheshgiri College of Engineering & Technology, Belagavi

8. National CME

   National CME on ‘Public Health Informatics’ organized by KLE University, Belagavi

9. Publication

   A) Age at menopause and associated symptoms: A study from rural North Karnataka

   B) Menopause status and its determinants in rural North Karnataka

   C) Determinants of surgically induced menopause in rural North Karnataka

ANNEXURES

Animal ethical committee approval letter

KLE UNIVERSITY
(Formerly known as KLE Academy of Higher Education & Research, Belagavi)
[Declared as Deemed-to-be-University u/s 3 of the UGC Act, 1956 vide Government of India Notification No.F.9-19/2000-U.3(A)]
'Accredited 'A' Grade by NAAC Placed in Category 'A' by MHRD (GoI)
Director, Academic Affairs
JNMC Campus, Nehru Nagar, Belagavi-590 010, Karnataka State, India
☎: 0831-2444444/2493779 FAX: 0831-2493777 Web: http://www.kleuniversity.edu.in E-mail: info@kleuniversity.edu.in

Ref.No.KLEU/Ethic/2015-16/D- 118 Date: 14-7-2015.

To,
Dr. Sudhirgouda H. Patil
Dept. of MPH,
KLE University, Belagavi
Ph.D. Scholar 2014-15

Dear Research Scholar,

Sub:- Regarding Ethical Clearance.

The KLE University **Ethics Committee on Human Subjects** for Ph. D Research Project met on **23rd March 2015** to consider your application for approval of the research project **"Age at Menopause-its Health consequences and Socio-economic determinants".**

As there are no ethical issues involved in your proposed research project, the committee has provided approval for this research project.

You are requested to report to Ethical Committee in case of the following:

1. Any deviation from or change of the protocol.
2. All serious adverse events.
3. Any changes in study documents.

(Dr. Anita Dalal)
Member Secretary,
Ph.D. Ethical Committee(Human),
K.L.E. University,
Belagavi.

DIRECTOR ACADEMIC AFFAIRS KLE UNIVERSITY

(Dr. Anil Hogade)
Chairman
Ph.D. Ethical Committee(Human),
K.L.E. University,
Belagavi.

CC to: - The Director Academic Affairs, KLE University, Belagavi.
- The Director Research Foundation, KLE University, Belagavi.
- The Registrar, KLE University, Belagavi

PARTICIPANT INFORMATION SHEET

Title: "**Age at Menopause - its Health Consequences and Socio-economic Determinants"**

Name of the researcher: Dr. Sudhirgouda H. Patil

Affiliation and contact details: Department of Public Health, KLE University, Nehru Nagar, Belagavi -590010, Karnataka. Ph: 0831-2444444 Extension: 4327

This is a document which gives you information about the study, procedures involved, possible benefits and anticipated harms, confidentiality, withdrawal and legal rights. Please it carefully and understand it. We encourage you to think about it and discuss it with your family and friends before deciding to take part in the study. If you have any queries or do not understand any part of the sheet, we urge you to ask as many questions as possible to the researcher/ people listed later on in this sheet to explain it to you. If you decide to take part, you will be asked to sign an assent/consent form. The researcher and an impartial witness will also sign the form with you. We will provide you with a copy of the signed form, and instructions whom to contact in case of any queries.

Voluntary nature of the study: Taking part in this research is entirely voluntary. In case you wish to participate in this research, you must carefully read the information sheet and sign on the consent sheet.

1. Objective/ Purpose of Study:

This is a research study. You are being invited to participate in this research study on **Age at Menopause - its Health Consequences and Socio-economic Determinants"**. Menopause is a end of reproductive life of a women, and occurs on an average of 40 to 55 years of age. Evidence suggests that a disturbance in age at menarche predisposes the woman to many morbidities and a definite risk of chronic diseases (obesity, diabetes, heart problems, risk of cancer (breast and endometrium)). Thus, studying the genetic and environmental contributing factors becomes important. We think the information collected from this study will give us important and much needed insights about what really determines menopausal age, its consequences and

its socio-economic determinants, which is currently missing from rural Belagavi. Thus, we are conducting this study among women aged 40 to 55 years to understand what is the average age of menopause occurs, what could be the potential factors which determine the age at menopause. This study is not funded.

2. Research procedures:

If you decide to participate in this research study, you will be asked to sign this consent form, once all your questions have been answered to your satisfaction. You will be interviewed by the researcher using a questionnaire/ form either at your residence or at the Sub Centre/ Anganwadi/ Primary Health Centre. The researcher will ask you some simple questions about your menopausal status, socio-demographic characteristics (e.g. your education, family size, etc), eating behaviour, disease history, lifestyle and habits, gynaecological and psychological health, quality of life, health literacy, problems faced during menstruation, perceptions and barriers about menopause, Knowledge and attitude towords the menopausal health consequences.

Time required: *The entire procedure is expected to ran*ge from 40 to 50 minutes, and is expected to be completed at one stretch. If at all, due to unforeseen circumstances, it does not complete at a stretch, we will request you to spare some more time to provide the remaining information then or at another time, subject to your convenience.

We do not encourage or require you to stop any work/ school activities for the research. The researcher will contact you and collect the information at a time when you will be free (or) convenient for you.

3. Possible Benefits: *What are the possible benefits to me from this study?*

You will be provided educational pamphlets/flyers and will receive health education related to menopausal consequences. Further, if, during data collection, we find that you may be suffering from any health problems, we will refer and guide you to appropriate health facilities for the same. Indirectly, you will be helping researchers and policy makers learn about the factors and problems associated with deviations in menopausal age which will help many women like you in future.

4. Anticipated harms: *Are there any risks to me from this study?*

During investigations, you may experience a mild discomfort/ pressure sensation/ tightness in your arm due to inflation of the cuff while measuring your blood pressure using the blood pressure machine. This is completely temporary which disappears as soon as the arm cuff is deflated and removed, and generally leads to no complications or long term effects.

5. Alternatives:

The only other alternative is not to participate in this study. Your participation is entirely voluntary. You are free to choose not to participate. Your signature will be required should you choose to participate. You can withdraw at any time without consequences of any kind.

If any new information, which may affect your decision to participate, comes up during the study, you will be informed immediately.

6. Withdrawal/ Removal from the study:

You can freely withdraw from the study at any point of time, even after joining without giving any reason/explanation for the same. Your decision to do so will not affect any of your current rights/ cause any penalties to you. The researcher may also sometimes withdraw you from the study in your best interest. By participating/ withdrawing from the study, there will be no loss of legal rights.

7. Privacy and Confidentiality:

The information that we collect from you and other participants totally will be compiled and analyzed to bring out the important trends, relations and findings. These findings will be published as a scholarly work with prior permission from you. You or any of the other participants will NOT be identified. Each participant will be given a unique number which cannot be linked to any of their identifiers like name, contact details or other personal identifying details. Moreover, the information collected from all the participants will be put together and a summary will be computed, there will be no possibility of identification. Your name will not be mentioned anywhere. Your records will be kept under lock and key accessible only to the researchers involved directly in the study. The electronic records will be password protected, known only

to the researcher who interviews you/your parent(s). . All research records and data will be stored and kept private and confidential restricted to the laws of the local and national guidelines. Your privacy and confidentiality will not be disclosed without your consent. Some of the bodies which may mandate access to research records for review purposes include:

- The KLE Institutional Review Board/ Ethics Committee
- Other regulatory bodies of State/ National government for overseeing/ auditing research

8. Institution/ Sponsor's Policy:

In case of any injuries as a result of your participation in the study, you will be provided standard hospital care as per the Institution's policy.

9. Financial Incentives for participation:

There will be no costs to you for taking part in the study. There will be no payment provided taking part in this study.

10. Contact Details:

We encourage you to contact the researcher in case of any further question. Further, you can also contact the authorities listed below at any point of time in case of any queries so as to understand the scope and procedures of the study better.

Name	Designation & Affiliation	Phone Number
Dr. N.K Tyagi	Professor & Head, KLE University Department of Epidemiology and Biostatistics, KLE University, Nehru Nagar, Belagavi -590010, Karnataka	0831-2444444 Extension:4058
Dr. Mubashir Angolkar	Associate Professor & I/C Head, Department of Public Health, JNMC, KLE University, Nehru Nagar, Belagavi -590010, Karnataka	0831-2444444 Extension: 4327
Dr. Niranjana S. Mahantashetti	Principal, J.N.Medical College, KLE University, Nehru Nagar, Belagavi -590010, Karnataka	0831-2444444 Extension: 4067

Authorization to Publish Results:

The results of this research will be presented at seminars and conference. The researchers retain the right to use and publish non-identifiable data. If the results of this research are published or discussed in conferences, no information will be included that would reveal your identity.

INFORMED ASSENT/ CONSENT FORM

By signing the form below, I agree that I have read/ been read the information sheet and the consent form *dated* ____/_____/_____, and completely understand the research including potential harms and benefits. I also consent to knowing that my participation is entirely voluntary and it is my own decision to take part in this study. I understand that I can withdraw my consent at any point of time without giving any reasons for the same. The researcher has explained to me the study and , I have been given enough time to clarify all doubts about the study and my rights as a research participant. I have been given information about whom to contact in case of any queries/ problems.

My refusal to participate will not involve any penalty or loss of rights to which I am entitled. I have been informed about my rights as a respondent, and I voluntarily give my consent to participate in this study.

Name of the Respondent giving consent in BLOCK LETTERS

Place

Phone: _____

☐ *I wish to be contacted when any menopausal related studies happen in the future for participation.*

_____ _____/_____/__

Signature/ left thumb impression of Participant

Date

I certify that the Respondent mentioned above had sufficient time to consider this information, had opportunity to ask questions, and has voluntarily agreed to be in the study. I have explained the research to the Respondent and answered all questions.

_____

Name of the interviewer explaining the consent in BLOCK LETTERS

Place

_____ _____/_____/____

Signature of the interviewer explaining the consent Date

As an impartial third party I am witness to the full assent discussion and signature of the respondent on this form. I certify that this form has been completely read to the respondent named above. This person had sufficient time to consider this information, has opportunity to ask questions and he/she has voluntarily agreed to be in this study.

_____

Name of the witness in BLOCK LETTERS

Place

_____ ____/_____/_____

Signature/ left thumb impression of the witness Date

Informed consent form

"Age at Menopause its Health Consequences and

Socio-economic Determinants"

INVESTIGATOR: Dr.Sudhirgouda H.Patil (Ph.D Scholar)

INTRODUCTION:

Study is planned to know the age at menopause and its health consequences. So that timely care is extended to the vulnerable group of aging women to pass pleasurable old age.

Study is cross-sectional in nature, providing valuable information about hormonal and health changes occurring in pre-menopausal and menopausal women.

EXPLANATION OF PROCEDURE:

The study is carried out house to house in the rural population of Belagavi district. Study does not involve any invasive or psychological depressive investigation.

POSSIBLE BENEFITS:

Symptoms and sighs of psychological nature along with consequences of them will be evaluated in the menopausal women. This will help them, to cope up with the unpleasant situation, faced during and after the menopausal period.

CONFIDENTIALITY:

As per protocol, the research data are confidential, and the same will be maintained throughout the study.

WITHDRAWAL:

Participants will have to give written consent for inclusion in the study. Participant will also be free to withdraw from the study.

COSTS OF PARTICIPATON:

The cost of the study will be borne by the researcher scholar.

PAYMENT TO PARTICIPANTS:

There will be no incentives given to participants in the study.

QUESTIONS:

In case of dispute or any complaint participants can approach to Dr. Sudhirgouda H. Patil, Contact no-9743585260, E-mail: drsudhirhp@gmail.com, or Dr. N.K Tyagi, Professor and Head, Dept of Biostatistics and Epidemiology (Supervisor), KLE University, Belgaum.

LEGAL RIGHTS:

Consent is necessary to be taken from the participants; however participants will have every right to present their case in any legal forum, in case of any physical, mental or psychological harm to them.

CONSENT STATEMENT:

I volunteer & consent to participate in this study, I have read the consent or it has been read to me in my own language. The study has been fully explained to me & I may ask questions at any time.

……	.....……
Name of participant	Signature / left hand thumb impression
…….	…….
Name of investigators	Signature of investigator
…….	……..…
Name of Witness	Signature / left hand thumb impression

Date:

ಭಾಗೀದಾರ ಮಾಹಿತಿ ಹಾಳೆ

"ಋತುಬಂಧದ ವಯಸ್ಸು ಅದರ ಆರೋಗ್ಯದ ಮೇಲೆ ಪರಿಣಾಮಗಳು ಮತ್ತು ಸಾಮಾಜಿಕ–ಆರ್ಥಿಕ ನಿರ್ಣಾಯಕ ಅಂಶಗಳ ಕುರಿತ ಅಧ್ಯಾಯನ"

ಸಂಶೋಧಕರು: ಡಾ॥ ಸುಧೀರಗೌಡಾ ಹೊ. ಪಾಟೀಲ

ಭಾಗೀದಾರ ಹೆಸರು: **ದಿನಾಂಕ** .

ಜನ್ಮ ದಿನಾಂಕ: . **ವಯಸ್ಸು**

ನಿಮ್ಮ ಸಹಿ ಹಾಕುವ ಮುನ್ನ ದಯವಿಟ್ಟು ಇದನ್ನು ಓದಿಕೊಳ್ಳಿ

1) ಈ ಅಧ್ಯಯನ ಕುರಿತ ಭಾಗೀದಾರ ಮಾಹಿತಿ ಹಾಳೆಯನ್ನು ನಾನು ಓದಿ ಅರ್ಥ ಮಾಡಿಕೊಂಡಿದ್ದೇನೆ ಮತ್ತು ನನ್ನಿಂದ ಏನನ್ನು ನಿರೀಕ್ಷಿಸಲಾಗಿದೆ ಹಾಗೂ ಇದರಲ್ಲಿ ಪಾಲ್ಗೊಂಡರೆ ನನಗೆ ಏನಾಗುತ್ತದೆ ಎಂದೂ ನಾನು ಅರ್ಥಮಾಡಿಕೊಂಡಿದ್ದೇನೆ.
2) ಈ ಅಧ್ಯಯನ ಕುರಿತ ನನ್ನ ಪ್ರಶ್ನೆಗಳನ್ನು.....ಅವರು ಉತ್ತರಿಸಿರುತ್ತಾರೆ.
3) ಯಾವುದೇ ಕಾರಣ ನೀಡದೆ ಹಾಗೂ ನನ್ನ ಸಾಮಾನ್ಯ ಆರೈಕೆ ಹಾಗೂ ನಿರ್ವಹಣೆ ಮೇಲೆ ಯಾವುದೇ ತೊಂದರೆಯಾಗದೆ ನಾನು ಯಾವಾಗ ಬೇಕಾದರೂ ಈ ಅಧ್ಯಯನದಿಂದ ಹಿಂದೆ ಸರಿಯಬಹುದು ಎಂದು ನಾನು ಅರ್ಥಮಾಡಿಕೊಂಡಿದ್ದೇನೆ.
4) ಈ ಅಧ್ಯಯನದಲ್ಲಿ ನನ್ನ ಪಾಲ್ಗೊಳ್ಳುವಿಕೆಯನ್ನು ನಿಲ್ಲಿಸಿದರೂ ಸಹ, ಪ್ರಸ್ತುತ ನಡೆಸುತ್ತಿರುವ ಸಂಶೋಧನೆಗೆ ಹಾಗೂ ಅದಕ್ಕೆ ಸಂಬಂಧಿಸಿದಂತೆ ಭವಿಷ್ಯದಲ್ಲಿ ನಡೆಯಬಹುದಾದ ಸಂಶೋಧನೆಗೆ ಸಂಬಂಧಿಸಿದಂತೆ ನನನ್ ಆರೋಗ್ಯ ಸಂಬಂಧಿತ ದಾಖಲೆಗಳನ್ನು ನೋಡಲು ಸಂಶೋಧಕರು ಹಾಗೂ ಅಧಿಕಾರಿಗಳಿಗೆ ನನ್ನ ಅನುಮತಿಯ ಅವಶ್ಯಕತೆ ಇಲ್ಲ ಎಂದು ಅರ್ಥಮಾಡಿಕೊಂಡಿದ್ದೇನೆ.
5) ನನ್ನನ್ನು ಪತ್ತೆ ಹಚ್ಚುವ ಗುರುತನ್ನು ನನಗೆ ಸಂಬಂಧಿಸಿದ ಯಾವುದೇ ಮಾಹಿತಿ ಮೂಲಕ ಇನ್ಯಾರಿಗೂ ಬಹಿರಂಗಪಡಿಸುವುದಿಲ್ಲ ಎಂದು ಅರ್ಥ ಮಾಡಿಕೊಂಡಿದ್ದೇನೆ.
6) ಈ ಅಧ್ಯಯನದಿಂದ ಹೊರಬರುವ ಯಾವುದೇ ಮಾಹಿತಿ ಮತ್ತು/ಅಥವಾ ಫಲಿತಾಂಶಗಳು, ವೈಜ್ಞಾನಿಕ ಉದ್ದೇಶಕ್ಕಾಗಿ ಬಳಸುವವರೆಗೆ, ಅಂತಹ ಮಾಹಿತಿ ಮತ್ತು ಫಲಿತಾಂಶದ ಬಳಕೆಗೆ ನಾನು ನಿರ್ಬಂಧ ಹಾಕುವುದಿಲ್ಲ ಎಂದು ಒಪ್ಪಿರುತ್ತೇನೆ.
7) ಈ ನಮೂನೆಗೆ ಸಹಿ ಮಾಡುವ ಮೂಲಕ ನನಗೆ ಈ ಅಧ್ಯಯನ ಕುರಿತ ಮಾಹಿತಿ ಹಾಳೆ ಹಾಗೂ ಸಹಿ ಮಾಡಿದ ಒಪ್ಪಿಗೆ ನಮೂನೆಯ ಒಂದು ಪ್ರತಿಯನ್ನು ನೀಡಲಾಗಿದೆ

ಮತ್ತು ಸಹಿ ಮಾಡುವ ಮೂಲಕ ನನ್ನ ಯಾವುದೇ ಕಾನೂನು ಹಕ್ಕುಗಳನ್ನು ಬಿಟ್ಟುಕೊಟ್ಟಿರುವುದಿಲ್ಲ.

೮) ಈ ಅಧ್ಯಯನದಲ್ಲಿ ಪಾಲ್ಗೊಳ್ಳಲು ನಾನು ಸಮ್ಮತಿಸುತ್ತೇನೆ.

ಭಾಗೀದಾರರ ಹೆಸರು **ಸಹಿ/ಹೆಬ್ಬೆಟ್ಟಿನ ಗುರುತು**

ನಿಷ್ಪಕ್ಷಪಾತ ಸಾಕ್ಷಿಯ ಹೆಸರು **ಸಹಿ/ಹೆಬ್ಬೆಟ್ಟಿನ ಗುರುತು**

ಸಂಶೋಧಕರ ಹೆಸರು **ಸಹಿ**

ಸ್ತ್ರೀರೋಗತಜ್ಞರ ಹೆಸರು **ಸಹಿ**

सूचित सहमति प्रपत्र

"रजोनिवृत्ति पर आयु इसके स्वास्थ्य परिणाम और सामाजिक-आर्थिक निर्धारक "

शोधकर्ता:- _____

भाग लेने वाले का नाम:-..... **दिनांक:-**.....

जन्म की तारीख:-..... **आयु:-**.....

सामने अपने हस्ताक्षर करने से पहले कृपया निम्न को पढ़ें

1) मैंने इस अध्ययन से संबंधित प्रतिभागी जानकारी शीट को पढ़ा और समझा है और मुझे ज्ञात है कि अगर मैं भाग लूँ मुझे क्या करना होगा और मेरे साथ क्या होगा।

2) इस अध्ययन संबंधित मेरे सवालों से जवाब दिया गया है।

3) मुझे मुझे ज्ञात है कि मैं किसी भी समय बिना कारण बताए और अपने सामान्य देखभाल और प्रबंधन को प्रभावित किए बिना इस अध्ययन से हट सकता/ती हूँ।

4) मैं समझता/ती हूं कि शोधकर्ता और अधिकारियों को इस वर्तमान अध्ययन और आगे के किसी अध्ययन, जो इसके संबंध में आगे किया जा सकता है, दोनों के लिए मेरे स्वास्थ्य अभिलेखों पर नजर डालने के लिए अनुमति की आवश्यकता पड़ सकती है चाहे मैं अपने आप को अध्ययन से अलग कर लूँ तब भी।

5) मैं समझता/ती हूं कि किसी अन्य से संबंधित किसी सूचना में मेरी पहचान को प्रकट नहीं किया जाएगा.

6) मैं किसी भी डेटा या इस अध्ययन से उभर कर सामने आने वाले किन्हीं परिणामों के उपयोग पर पाबंदी न लगाने पर सहमत हूं बशर्ते उस तरह का उपयोग केवल वैज्ञानिक उद्देश्य (उद्देश्यों) से हो.

7) मुझे सूचना पत्र और सहमति फार्म की एक प्रति रखने के लिए दी गई है; इस फार्म पर हस्ताक्षर करके मैंने अपने कानूनी अधिकार का त्याग नहीं किया है।

8) मैं अध्ययन में भाग लेने के लिए सहमत हूँ।

भाग लेने वाले का नाम	**हस्ताक्षर / अंगूठे का निशान**
निष्पक्ष गवाह का नाम	**हस्ताक्षर / अंगूठे का निशान**
शोधकर्ता का नाम	**हस्ताक्षर**
स्त्री रोग विशेषज्ञ का नाम	**हस्ताक्षर**

सूचित संमती फॉर्म

"रजोनिवृत्तीचे वय त्याचे आरोग्य परिणाम आणि सामाजिक-आर्थिक निर्धारक "

संशोधक _____

सहभागीचे नाव:-..... **दिनांक:-**.....

जन्मदिनांक:-..... **वय:-**.....

कृपया तुमची स्वाक्षरी करण्यापूर्वी खालील मजकूर वाचा

1) मी या अभ्यासाबाबतचे सहभागीसाठीचे माहितीपत्रक वाचले असून ते मला समजले आहे, आणि मी भाग घेतल्यास मी काय करणे आवश्यक आहे आणि माझ्याबाबतीत काय होईल, हे मला समजले आहे.

2) अभ्यासाबाबतच्या माझ्या प्रश्नांची उत्तरे यांनी दिली आहेत:

3) मला कल्पना आहे की मी या अभ्यासामधून केव्हाही, कोणतेही कारण न देता आणि माझ्या नेहमीच्या निगा व व्यवस्थापनावर काहीही परिणाम न होता माघार घेऊ शकेन.

4) मला कल्पना आहे की मी जरी अभ्यासामध्ये भाग घेण्याचे थांबवले, तरी संशोधकांना आणि अधिकाऱ्यांना, सध्याच्या अभ्यासासाठी तसेच पुढे केले जाऊ शकेल अशा पुढील संशोधनासाठी माझ्या आरोग्य नोंदी पाहण्यासाठी माझ्या परवानगीची आवश्यकता लागणार नाही.

5) मला कल्पना आहे की माझी माहिती इतर कोणालाही उघड केली जाणार नाही.

6) माझी माहिती किंवा या अभ्यासाचे निष्कर्ष यांचा उपयोग जर फक्त शास्त्रीय कारणांसाठीच होणार असेल, तर अशा उपयोगावर कोणतीही बंधने न घालण्याचे मी मान्य करत आहे.

7) मला या माहिती पत्रकाची व संमती प्रपत्राची एक प्रत माझ्याकडे ठेवण्यासाठी देण्यात आली आहे, या प्रपत्रावर स्वाक्षरी करून मी माझे कोणतेही कायदेशीर हक्क सोडून दिलेले नाहीत.

8) मी या अभ्यासात भाग घेण्याचे मान्य करत आहे.

सहभागीचे नाव	**स्वाक्षरी/अंगठ्याचा ठसा**
निष्पक्ष साक्षीदाराचे नाव	**स्वाक्षरी/अंगठ्याचा ठसा**
संशोधकांचे नाव	**स्वाक्षरी**
स्त्रीरोग तज्ञाचे नाव	**स्वाक्षरी**

STANDARD OPERATING PROCEDURE

AGE AT MENOPAUSE - ITS HEALTH CONSEQUENCES AND SOCIO-ECONOMIC DETERMINANTS

Note: I undertake that the information contained in the questionnaire is confidential, and will be used only for research purposes.

(1) GENERAL INFORMATION:

Date of Interview:
*Date of interview in the format of dd/mm/yyyy

Participant ID: ☐☐☐☐☐
(Village no (2), Family no (2), Individual (1)

***Participant ID:** A unique identification code participants has been generated, with village no. (2 digits, 1 to 20), family no.(2 digit, 1 to 30) and individual no.(1 digit, 1 to 9), as per subscript rules of mathematics.

Attained menopause? Yes/ No/ surgically induced (To be written after detailed confirmation) ☐
*Have you attained menopause? Whether the women has attained menopause at the time of interview? Keep it blank, to be filled by research scholar after scrutinizing the Performa.

If yes, age at menopause in completed: Years ☐☐ **Months** ☐☐
***Age at menopause** (00 for not attained): in completed years and months.
The women will be asked to recall her menopause to the exact date (day, month and year). If she does not recollect correctly, age at menopause will be estimated by asking duration of menopausal symptoms and signs?

(2) SOCIO-DEMOGRAPHIC:

a.	**Age in completed year** (Date of birth, if available): ***Date of birth**: The day, month and year of birth of the women will be recorded by asking the women to recall her date of birth. If she is unable to recall her date of birth, then by calculating the age at marriage, age at first child and age of her last child can be asked to establish the correct age in completed years.	☐☐
b.	**Age at marriage** (Date of marriage, if available):	☐☐
c.	**Age at first child** (Date at first child birth, if available):	☐☐
d.	**Age at the birth of last child:**	☐☐
e.	**Education:** Illiterate / Primary / Secondary/ Higher *Education is asked by recalling the education levels completed viz. ***Illiterate** –No schooling ***Non-formal education** – Can read and write with understanding ***Primary** – Passed VIIth std ***Secondary** – Passed X std	☐

	***Pre**-university – Passed XII std ***Higher** – Graduation and above
f.	**Total number of household members:** ☐ *Household members are considered, those use the common kitchen.
g.	**Type of family:** Single/ Nuclear/ Joint/ Extended ☐ *Type of family has been classified as under: Single: Living alone Nuclear: Head with/without Spouse with unmarried children Joint: Head with/without spouse with married brother(s)/ sister(s)/son(s)/ daughter(s) and their Spouses, and sharing the same kitchen Extended: family that extends beyond the immediate family, consisting of mother side and other relatives and sharing the same kitchen- not included in joint family.
h.	**Religion:** Hindu /Muslim/ Christian / Others ☐
i.	**Marital status :** Single/ Married/ Divorced/ Separated ☐
j.	**Per Capita Income (Total/depended family members)** ☐☐☐☐☐ *It is computed though inquiring of total expenditure and savings. And thereafter computed as: Total Family income / Dependent family members.
k.	**Occupation:** Home maker/ labour/ Former/ Professional/ Business/ Service grade A and B/Others ☐ ***House maker-** Women who are working in their own home. ***Labour** – A person working in a Private set up ***Farmer** – A person employed in cultivation of land ***Professional** – Doctors/ Engineers/ other professionals- Earning from their profession. ***Business** – Engaged in buying/ selling ***Service grade A and B** ***Others** – Other services

(3) Reproductive Information:

l.	**Age at menarche:** (If available in completed years, corrected up to 0.5 years) ☐☐ *Noted in the format of dd/mm/yyyy. The women will be asked to recall her age at menarche, and noted.
m.	**Mother's age at menopause**: ☐☐ *Mother's age at menarche, If not known then it will be noted as 99.
n.	**Children ever live born**: ☐ **Children living** ☐
o.	**Age at last menstruation** (in completed years) ☐☐ *If the women are menopause, then she will be asked the age at last menstruation occurred, and noted in years and months.
p.	**Did you have any operation/ sickness before menopause:** ☐ No/Gynacological Operation/Other than gynacological operations *Gynacological Operation- Operations causing/ may cause menopause *Other than gynacological operations – Operations with no bearing on reproductive behaviour
q.	**Average length of Post-Partum Amenorrhea (In weeks)** ☐☐ *Time period between the end of pregnancy and the resumption of menstruation.

Menopausal symptoms/ signs/ disease and knowledge assessment.

*To menopausal women, 1 is the menopausal symptoms or signs or diseases.

*If not menopausal, 2 is the knowledge about the menopausal symptoms/ signs/ disease (by asking do you know that in menopausal condition they may occur?) (Data collector will tick from the list)

a.	1. Hot flushes, sweating (episodes of sweating): ☐ **None/ Mild/ Moderate/Severe/Very severe** 2. Do you know the hot flushes, sweating can be the symptoms of menopause? **None/ Mild/ Moderate/Severe/Very severe**
b.	1.Heart discomfort (unusual awareness of heart beat, heart skipping, heart racing, tightness): ☐ **None/ Mild/ Moderate/Severe/Very severe** 2. Do you know the heart discomfort (unusual awareness of heart beat, heart skipping, heart racing, tightness) can be the symptoms/ disease of the menopause? **None/ Mild/ Moderate/Severe/Very severe**
c.	1.Sleep problems (difficulty in falling asleep, difficulty in sleeping through, waking up early): ☐ **None/ Mild/ Moderate/Severe/Very severe** 2. Do you know the sleep problems (difficulty in falling asleep, difficulty in sleeping through, waking up early) can be the symptoms/ disease of the menopause? **None/ Mild/ Moderate/Severe/Very severe**

d.	1.Depressive mood (feeling down, sad, on the verge of tears, lack of drive, mood swings): ☐ **None/ Mild/ Moderate/Severe/Very severe** 2. Do you know the Depressive mood (feeling down, sad, on the verge of tears, lack of drive, mood swings) can be the symptoms/ disease of the menopause? **None/ Mild/ Moderate/Severe/Very severe**
e.	1.Irritability (feeling nervous, inner tension, feeling aggressive): ☐ **None/ Mild/ Moderate/Severe/Very severe** 2. Do you know the irritability (feeling nervous, inner tension, feeling aggressive) can be the symptoms/ disease of the menopause? **None/ Mild/ Moderate/Severe/Very severe**
f.	1.Anxiety (inner restlessness, feeling panicky): ☐ **None/ Mild/ Moderate/Severe/Very severe** 2. Do you know the anxiety (inner restlessness, feeling panicky) can be the symptoms/ disease of the menopause? **None/ Mild/ Moderate/Severe/Very severe**
g.	1.Physical and mental exhaustion (general decrease in performance, impaired memory, decrease in concentration, forgetfulness): **None/ Mild/ Moderate/Severe/Very severe** ☐ 2. Do you know the physical and mental exhaustion (general decrease in performance, impaired memory, decrease in concentration, forgetfulness) can be the symptoms/ disease of the menopause? **None/ Mild/ Moderate/Severe/Very severe**
h.	1.Sexual problems (change in sexual desire, in sexual activity and satisfaction): ☐ **None/ Mild/ Moderate/Severe/Very severe** 2. Do you know the sexual problems (change in sexual desire, in sexual activity and satisfaction) can be the symptoms/ disease of the menopause? **None / Mild/ Moderate/Severe/Very severe**
i.	1.Bladder problems (difficulty in urinating, increased need to urinate, bladder incontinence) : ☐ **None/ Mild/ Moderate/Severe/Very severe** 2. Do you know the bladder problems (difficulty in urinating, increased need to urinate, bladder incontinence) can be the symptoms/ disease of the menopause? **None/ Mild/ Moderate/Severe/Very severe**
j.	1.Dryness of vagina (sensation of dryness or burning in the vagina, difficulty while intercourse): ☐ **None/ Mild/ Moderate/Severe/Very severe** 2. Do you know the dryness of vagina (sensation of dryness or burning in the vagina, difficulty while intercourse) Joint and muscular discomfort (pain in the joints, rheumatoid complaints): **None/ Mild/ Moderate/Severe/Very severe**

(4) MENSTRUAL HISTORY:

a. Duration of bleeding: _____ days ☐

*Number of days in which the menstrual flow occurs in every month.

b. Regularity of menstruation: No/ Yes ☐

*Menstruation occurs in how many days in-between?)

c. Menstrual flow is usually: Light/ Moderate / Heavy ☐

*As revealed by the women

d. Does bleeding or spotting occur between periods? Yes / No ☐

*Does bleeding or spotting occur between the menstrual cycles?

e. Does bleeding or spotting occur after intercourse? Yes / No ☐

f. Is pain associated with periods? Yes/ No/ Occasionally ☐

*You have pain abdomen or any other menstrual pain in every menstrual day?

(5) SOURCE OF INFORMATION:

(a) Source of menopausal-related information before menopause: ☐

No information/ Family member/Friends/Health personnel/ Internet/T.V/ More than one

(b) Do you discuss menopausal related matters with?

No discussion/ Husband/ Family members/ Friends/ Health personnel/ More than one ☐

(6)Disease History:

a. Hypertension: No /Don't know /Yes without treatment/Yes with treatment ☐

b. Diabetes: No /Don't know /Yes without treatment/Yes with treatment ☐

c. Heart disease: No /Don't know /Yes without treatment/Yes with treatment ☐

d. Kidney disease: No /Don't know /Yes without treatment/Yes with treatment ☐

e. Respiratory disease: No /Don't know /Yes without treatment/Yes with treatment ☐

f. Hormonal replacement therapy: No /Don't know /Yes without treatment/Yes with treatment ☐

g. Others**:** No /Don't know /Yes without treatment/Yes with treatment ☐

(7) Contraceptive history:

Have you ever used any contraceptives?

No/Oral pills/ Copper T/ Condoms/ Coitus-Interruptus / Multiple ☐

*You have ever used any family planning methods? If yes then specify. Investigator will mark the correct answer

(8) HABITS:

a) TOBACCO:

a. Does anyone in your house smoke cigarettes/ bidi/ hukka? No/ Self/ Husband/others ☐☐
Number of cigarette per day:

b. Have you ever used any form of tobacco products other than cigarettes? No/ Yes ☐
If yes, Details

b) ALCOHOL:

a. Does anyone in your family drink alcohol? Yes/ No ☐
b. Do you consume alcohol? No/ occasionally/ More than twice per week ☐

(9) Anthropometric Measurements:

i. **Height in cm:** ☐☐☐☐

Procedure: Standing height is measured with a fixed stadiometer with a vertical backboard

- Subject is asked to remove hair ornaments, ponytails, buns, braids, etc, and shoes.
- Subject is asked to stand on the floor with the heels of both feet together and the toes pointed slightly outward.
- Body Weight is evenly distributed, and both feet are flat on the floor are checked before taking the height, also check the position of the heels, buttocks, shoulder blades, and the back of the head for contact with the vertical backboard.
- Align the subject's head in the Frankfort horizontal plane (the horizontal line from the ear canal to the lower border of the orbit of the eye is parallel to the floor, and perpendicular to the vertical backboard.
- Arms should hang free at the sides with palms facing the thighs.
- Measurer's eyes should be level with the headboard. Measurer should stand on a stool/ladder if the subject is taller.
- Lower the headboard and instruct the patient to take a deep breath and stand as tall as possible. Subject should look straight ahead, take a deep breath, and hold that position while the horizontal headboard is brought down firmly on top of the head.
- Position the headboard firmly on top of the head with sufficient pressure to compress the hair.
- The measurement is recorded to the nearest 0.5cm.
- Repeat for a total of three measurements and record average.

ii. **Weight in Kg:** ☐☐☐

Procedure: Weight is measured with a calibrated, electronic digital scale or beam balance (Machine is calibrated by 5 kg weight every day before going for data collection).

- Subject is to be explained the procedure before taking the weight.
- Electronic machine is calibrated, and procedure is standardised for measuring age up to the accuracy of 100 grams.
- Place a clean paper towel on the scale foot stand and adjust for Zero reading.

- Instructions for taking the weight:
- Subject should be in usual cloths, extra cloths like Shawls etc should be removed. Wedding ring and mangal sutra are only permitted but not glasses.
- Subjects should be weighed at the same time of the day to avoid overloading.
- Subject should stand in the middle of the platform, with his/her head erect and eyes looking straight, with weight evenly distributed on both feet.
- Read and record the weight accurately corrected up to 100 grams.

iii. Hip circumference in Cm: ☐☐☐

Procedure

- Care necessary for measuring hip circumference (corrected up to 0.5 cm).
- Hip circumference will be measured in minimal usual clothing's, without Shawls.
- Flexible plastic tape will be used for measuring maximum hip circumference, by taking at least three readings from surroundings, i.e. at the level of the greatest protrusion of the gluteal (buttock) muscles.
- For measurement the participant will stand erect with their weight evenly distributed on both feet and legs slightly parted, making sure not to tense the gluteal (buttock) muscles.
- The investigator or delegated person will ensure that the hip circumference measurement is taken at the level of the greatest protrusion of the gluteal (buttock) muscles.
- The investigator or delegated person will ensure the tape is not too tight or too loose, is lying flat on the skin, and is horizontal.

iv. Abdominal girth in Cm: ☐☐☐

Procedure:

- Care necessary for measuring abdominal girth (corrected up to 0.5 cm).
- Abdominal girth will be measured in minimal usual clothing's, without Shawls.
- Flexible plastic tape will be used for measuring maximum abdominal girth, by taking at least three readings from surroundings, i.e. at the umbilicus (navel) level, the least is considered as abdominal circumference
- For measurement the participant will stand erect with their weight evenly distributed on both feet and legs slightly parted, making sure not to tense the gluteal (buttock) muscles.
- The investigator or delegated person will ensure that the abdominal circumference measurement is taken at the level of umbilicus (navel).
- The investigator or delegated person will ensure the tape is not too tight or too loose, is lying flat on the skin, and is horizontal.

Blood Pressure:

a. Systolic blood pressure in mmHg ☐☐☐

b. Diastolic blood pressure in mmHg ☐☐☐

Procedure:

- The three readings of systolic and diastolic blood pressure in comfortable sitting position after 5 min of asking basic questions will be taken, and the average will be considered as, the readings.
- The Investigator or delegated person will obtain the blood pressure recording under the same conditions each time with a digital blood pressure machine.
- The machine will be checked in the morning every day by measuring the BP of the investigator.
- The investigator or delegated person will position the arm to be used at participant's heart level and ensure the arm is well supported with the palm of the hand facing upwards.
- The investigator or delegated person will ensure all tight or restrictive clothing is removed from the arm.
- The investigator or delegated person must ensure that a cuff which covers 80 % of the circumference of the arm is used to take the blood pressure reading.
- The investigator or delegated person must position the tubes of the metre at the upper side keeping the palm up.

(10) KNOWLEDGE OF Menopause:	
(1) What is menopause? a. 12 month of amenorrhea b. If M.C is irregular c. If the age reached 45 or more d. None of the above	☐
(2) What is the normal age for menopause? a. Less than 40 age group b. Between 40-55 age group c. More than 55 age group d. None of the above	☐
(3) Why does menopause occur? a. It's a natural phenomenon b. It is one of the disease c. Ageing process d. None of the above	☐
(4) When do you call, that a woman is menopausal? a. Less than one year from last menstruation b. Between 1st month – 1 year c. More than one year d. None of the above	☐
(5) Can care during pre-menopausal period prevent menopausal problems? No/ Some of them/All/ / Don't know	☐
(6) Does lack of care during menopause predisposes to many diseases? No/ Some of them/All/ / Don't know	☐
(11)ATTITUDE:	
(1) What does menopause mean to you? a. It is a disease b. Physiological c. Freed from menstrual agony d. None of the above	☐
(2) Do you think menopause is good?	Yes / No/ Don't know ☐
(3) Do you feel non discloser regarding menopause is good for the women?	Yes / No / Don't know ☐
(4) Do you think menopause related health education should be given in advance?	Yes / No/ Don't know ☐
(5) Do you think women need to be prepared for menopause?	Yes / No/ Don't know ☐
(6) Do you feel sometimes, that you are the only one facing difficulties during menopause?	Yes/ No/ Not applicable/ Don't know ☐

Interview completion quality: Non cooperation/ Satisfactorily Completed ☐

QUESTIONNAIRE

"AGE AT MENOPAUSE - ITS HEALTH CONSEQUENCES AND SOCIO-ECONOMIC DETERMINANTS"

Note: I undertake that the information contained in the questionnaire is confidential, and will be used only for research purposes.

(1) GENERAL INFORMATION:

Date of Interview: **Participant ID:** ☐☐☐☐☐

Attained menopause? No/ Yes/ Surgically induced (To be written after detailed confirmation) ☐

If yes, age at menopause in completed: Years ☐☐ Months ☐☐

(2) SOCIO-DEMOGRAPHIC:

a.	**Age in completed year** (Date of birth, if available):	☐☐
b.	**Age at marriage** (Date of marriage, if available)**:**	☐☐
c.	**Age at first child** (Date at first child birth, if available)**:**	☐☐
d.	**Age at the birth of last child:**	☐☐
e.	**Education:** Illiterate / Primary / Secondary/ Higher	☐
f.	**Total number of household members:**	☐
g.	**Type of family:** Single/ Nuclear/ Joint/ Extended	☐
h.	**Religion:** Hindu /Muslim/ Christian / Others	☐
i.	**Marital status :** Single/ Married/ Divorced/ Separated/Widow	☐
j.	**Per Capita Income (Total/depended family members)**	☐☐☐☐☐
k.	**Occupation:** Home maker/ labour/ Former/ Professional/ Business/ Service grade A and B/Others	☐

(3) REPRODUCTIVE INFORMATION:

l.	**Age at menarche:** (If available, in completed years)	☐☐
m.	**Mother's age at menopause**:	☐☐
n.	**Children ever live born**: ☐ **Children living** ☐	
o.	**Age at last menstruation (**in completed years), if women is in menopause stage.	☐☐
p.	**Did you have any operation/ sickness before menopause:** No/ Gynacological Operation/ Other than gynacological operations/ Both	☐
q.	**Average length of Post-Partum Amenorrhea (In weeks)**	☐☐

Menopausal symptoms/ signs/ disease and knowledge assessment.

Pre-menopausal Assessment- Marker and early ovarian declaim **(If the women is not menopausal)**

1. Current menstrual cycle length (the usual number of day from the 1st day of start & menses to the next 1st day) ☐☐
2. Amount of menstrual flow. (Light, Moderate, Moderately heavy, Heavy) ☐
3. Is your menstrual regular? (Predictable within 10 day) (No/ Yes) ☐

To menopausal women, 1 is the menopausal symptoms or signs or diseases.

If not menopausal, 2 is the knowledge about the menopausal symptoms/ signs/ disease (by asking- do you know that, in menopausal condition these symptoms/signs/disease may occur?)

a.	1. Hot flushes, sweating (episodes of sweating): **None/ Mild/ Moderate/Severe/Very severe/Don't know** 2. Do you know the hot flushes, sweating can be the symptoms of menopause? **None/ Mild/ Moderate/Severe/Very severe/Don't know**	☐
b.	1.Heart discomfort (unusual awareness of heart beat, heart skipping, heart racing, tightness): **None/ Mild/ Moderate/Severe/Very severe/Don't know** 2. Do you know the heart discomfort (unusual awareness of heart beat, heart skipping, heart racing, tightness) can be the symptoms/ disease of the menopause? **None/ Mild/ Moderate/Severe/Very severe/Don't know**	☐

c.	1.Sleep problems (difficulty in falling asleep, difficulty in sleeping through, waking up early): ☐ **None/ Mild/ Moderate/Severe/Very severe/Don't know** 2. Do you know the sleep problems (difficulty in falling asleep, difficulty in sleeping through, waking up early) can be the symptoms/ disease of the menopause? **None/ Mild/ Moderate/Severe/Very severe/Don't know**
d.	1.Depressive mood (feeling down, sad, on the verge of tears, lack of drive, mood swings): ☐ **None/ Mild/ Moderate/Severe/Very severe/Don't know** 2. Do you know the Depressive mood (feeling down, sad, on the verge of tears, lack of drive, mood swings) can be the symptoms/ disease of the menopause? **None/ Mild/ Moderate/Severe/Very severe/Don't know**
e.	1.Irritability (feeling nervous, inner tension, feeling aggressive): ☐ **None/ Mild/ Moderate/Severe/Very severe/Don't know** 2. Do you know the irritability (feeling nervous, inner tension, feeling aggressive) can be the symptoms/ disease of the menopause? **None/ Mild/ Moderate/Severe/Very severe/Don't know**
f.	1.Anxiety (inner restlessness, feeling panicky): ☐ **None/ Mild/ Moderate/Severe/Very severe/Don't know** 2. Do you know the anxiety (inner restlessness, feeling panicky) can be the symptoms/ disease of the menopause? **None/ Mild/ Moderate/Severe/Very severe/Don't know**
g.	1.Physical and mental exhaustion (general decrease in performance, impaired memory, decrease in concentration, forgetfulness): **None/ Mild/ Moderate/Severe/Very severe/Don't know** ☐ 2. Do you know the physical and mental exhaustion (general decrease in performance, impaired memory, decrease in concentration, forgetfulness) can be the symptoms/ disease of the menopause? **None/ Mild/ Moderate/Severe/Very severe/Don't know**
h.	1.Sexual problems (change in sexual desire, in sexual activity and satisfaction): ☐ **None/ Mild/ Moderate/Severe/Very severe/Don't know** 2. Do you know the sexual problems (change in sexual desire, in sexual activity and satisfaction) can be the symptoms/ disease of the menopause? **None / Mild/ Moderate/Severe/Very severe/Don't know**
i.	1.Bladder problems (difficulty in urinating, increased need to urinate, bladder incontinence) : ☐ **None/ Mild/ Moderate/Severe/Very severe/Don't know** 2. Do you know the bladder problems (difficulty in urinating, increased need to urinate, bladder incontinence) can be the symptoms/ disease of the menopause? **None/ Mild/ Moderate/Severe/Very severe/Don't know**
j.	1.Dryness of vagina (sensation of dryness or burning in the vagina, difficulty while intercourse): ☐ **None/ Mild/ Moderate/Severe/Very severe/Don't know** 2. Do you know the dryness of vagina (sensation of dryness or burning in the vagina, difficulty while intercourse) Joint and muscular discomfort (pain in the joints, rheumatoid complaints): **None/ Mild/ Moderate/Severe/Very severe/Don't know**

(4) MENSTRUAL HISTORY:

a. Duration of bleeding: _____ days ☐
b. Regularity of menstruation: No/ Yes ☐
c. Menstrual flow is usually: Light/ Moderate / Heavy ☐
d. Does bleeding or spotting occur between periods? No/ Yes ☐
e. Does bleeding or spotting occur after intercourse? No/ Yes ☐
f. Is pain associated with periods? No/ Yes/ Occasionally ☐

(5) SOURCE OF INFORMATION:

(a) Source of menopausal-related information before menopause:

No information/ Husband/ Family member/Friends/Health personnel/ Social media/ More than one ☐

(b) Do you discuss menopausal related matters with?

No discussion/ Husband/ Family members/ Friends/ Health personnel/ More than one ☐

(6)DISEASE HISTORY:

a. Hypertension: No /Don't know /Yes without treatment/Yes with treatment ☐
b. Diabetes: No /Don't know /Yes without treatment/Yes with treatment ☐
c. Heart disease: No /Don't know /Yes without treatment/Yes with treatment ☐
d. Kidney disease: No /Don't know /Yes without treatment/Yes with treatment ☐
e. Respiratory disease: No /Don't know /Yes without treatment/Yes with treatment ☐
f. Hormonal replacement therapy: No /Don't know /Yes without treatment/Yes with treatment ☐
g. Others**:** No /Don't know /Yes without treatment/Yes with treatment ☐

(7) CONTRACEPTIVE HISTORY:

Have you ever used any contraceptives?

No/ Oral pills/ Copper T/ Condoms/ Coitus-Interruptus / Multiple ☐

(8) HABITS:

a) TOBACCO:

a. Does anyone in your house smoke Cigarettes/ Bidi/ Hukka? No/ Self/ Husband/ Both/ Others ☐☐
Number of cigarette per day:

b. Have you ever used any form of tobacco products other than cigarettes? No/ Yes ☐
If yes, Details:

b) ALCOHOL:

a. Does anyone in your family drink alcohol? No/ Yes ☐

b. Do you consume alcohol? No/ occasionally/ More than twice per week ☐

(9) ANTHROPOMETRIC MEASUREMENTS:

a. Height in cm:	☐☐☐
b. Weight in Kg:	☐☐☐
c. Hip circumference in Cm:	☐☐☐
d. Abdominal girth in Cm:	☐☐☐

Blood Pressure:

a. Systolic blood pressure in mmHg	☐☐☐
b. Diastolic blood pressure in mmHg	☐☐☐

(10) KNOWLEDGE OF MENOPAUSE:

(1) What is menopause? a. 12 month of amenorrhea b. If M.C is irregular c. If the age reached 45 or more d. None of the above	☐
(2) What is the normal age for menopause? a. Less than 40 age group b. Between 40-55 age group c. More than 55 age group d. None of the above	☐

(3) Why does menopause occur? a. It's a natural phenomenon b. It is one of the disease c. Ageing process d. None of the above		☐
(4) When do you call, that a woman is menopausal? a. Less than one year from last menstruation b. Between 1st month – 1 year c. More than one year d. None of the above		☐
(5) Can care during pre-menopausal period prevent menopausal problems? No/ Some of them/ All / Don't know		☐
(6) Does lack of care during menopause predisposes to many diseases? No/ Some of them/ All / Don't know		☐
(11)ATTITUDE:		
(1) What does menopause mean to you? a. It is a disease b. Physiological c. Freed from menstrual agony d. None of the above		☐
(2) Do you think menopause is good?	No/ Yes / Don't know	☐
(3) Do you feel non discloser regarding menopause is good for the women?	No/ Yes / Don't know	☐
(4) Do you think menopause related health education should be given in advance?	No/ Yes / Don't know	☐
(5) Do you think women need to be prepared for menopause?	No/ Yes / Don't know	☐
(6) Do you feel sometimes, that you are the only one facing difficulties during menopause?	No/ Yes/ Don't know	☐

Interview completion quality: Non cooperative/ Satisfactorily Completed ☐

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This is to certify that
Sudhirgouda H. Patil
participated in
XVIII Bhopal Seminar 2020
POPULATION AND SOCIAL PROTECTION IN INDIA
and presented the paper
Age at menopause and associated symptoms: a study from rural north Karnataka

Aalok Ranjan Chaurasia
CONVENOR
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This is to Certify that DR. SUDHIRGOUDA. H. PATIL.

has ~~Chaired a Session~~ / ~~Delivered Invited Talk~~ / ~~Paper Presentation~~ / ~~Poster Presentation~~ /
Delegate / Member of Organizing Committee in the 33rd Annual Conference of Indian Society for Medical Statistics organized by KLE University Department of Epidemiology & Biostatistics, Belagavi during 14th to 16th October 2015

Dr. N. K. Tyagi	Dr. B. S. Kodkany	Dr. A. Indrayan	Dr. V. D. Patil
Organizing Secretary & Convenor	Organizing Chairman	President ISMS	Registrar

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KLE University Department of Epidemiology and Biostatistics

Workshop on

Sample Size and Multivariate Analysis by SPSS/ EXCEL

Date: 22nd to 26th August 2016

CERTIFICATE

This to Certify that Dr. Sudhirgouda H. Patil

has participated as a Delegate in Workshop

"Sample Size and Multivariate Analysis by SPSS / EXCEL"

at KLE University, Belagavi

Dr. N. K. Tyagi
Organizing Secretary
Prof. & Head, KLE University Department of Epidemiology & Biostatistics, Belagavi

Dr. B. S. Kodkany
Director
KLE University Research Foundation, Belagavi

Dr. V. D. Patil
Registrar
KLE University, Belagavi

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KLE University Department of Epidemiology and Biostatistics

in collaboration with

Department of Education for Health Professionals (UDEHP)

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This is to certify that Dr.Sudhirgouda Patil
has participated as a Delegate in the workshop on
"Biostatistics & Research with SPSS/EXCEL Spreadsheet"
held from 20th to 22nd February 2017 at KLE University, Belagavi.

N K Tyagi		for Padmaja Co-ordinator, UDEHP.	
Dr. N. K. Tyagi	Dr. B. S. Kodkany	Dr. Padmaja Walvekar	Dr. V. D. Patil
Prof.& Head, KLE University Department of Epidemiology & Biostatistics	Director, Research Foundation, KLE University, Belagavi	Director, KLE University Department of Education for Health Professionals	Registrar, KLE University, Belagavi

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has Participated in Pre Conference Workshop / ~~Discipline Specific Symposia~~ in the
33rd Annual Conference of Indian Society for Medical Statistics organized by
KLE University Department of Epidemiology & Biostatistics, Belagavi
on 13th October 2015

Dr. N. K. Tyagi	Dr. B. S. Kodkany	Dr. A. Indrayan	Dr. V. D. Patil
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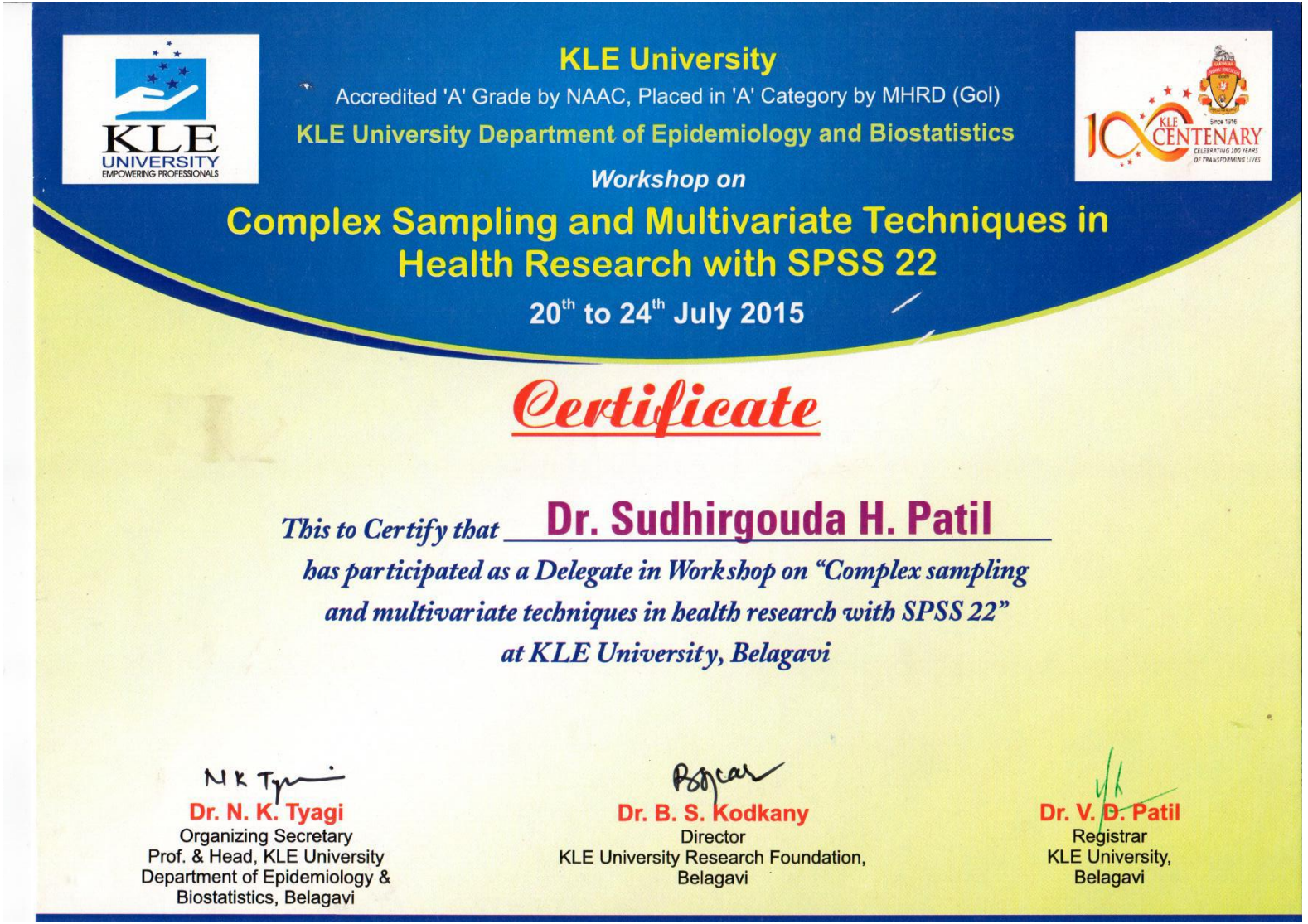

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KLE University Department of Epidemiology and Biostatistics

Workshop on

Complex Sampling and Multivariate Techniques in Health Research with SPSS 22

20th to 24th July 2015

Certificate

This to Certify that **Dr. Sudhirgouda H. Patil**

has participated as a Delegate in Workshop on "Complex sampling and multivariate techniques in health research with SPSS 22" at KLE University, Belagavi

Dr. N. K. Tyagi
Organizing Secretary
Prof. & Head, KLE University
Department of Epidemiology & Biostatistics, Belagavi

Dr. B. S. Kodkany
Director
KLE University Research Foundation,
Belagavi

Dr. V. D. Patil
Registrar
KLE University,
Belagavi

ICMR Sponsored Training Program on
Good Laboratory Practices
Organised by
KLE University's J. N. Medical College, Belagavi

Certificate of Participation

Dr./Mr./Mrs./Miss SUDHIRGOUDA .H. PATIL *has*

Participated as Delegate in a ICMR DHR Sponsored Training Program on "GOOD LABORATORY PRACTICES"

conducted by KLE University's J. N. Medical College, Belagavi, Karnataka. vide letter No. V-25011/25/2013-HR

held from 15/12/2014 *to* 02/01/2015

Dr. Ganga S. Pilli
Training Program Co-ordinator
J N Medical College, Belagavi

Dr. N.S. Mahantshetti
Principal
J N Medical College, Belagavi

Dr. V. D. Patil
Registrar
KLE University, Belagavi

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Web site : www.bmkayurveda.org, www.kleayurveda.org, ayurveda.kleuniversity.edu.in ; e-mail : bmkayurveda@rediffmail.com

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Certificate

This is to certify that Dr. Sudhirgouda H. Patil has successfully undergone the State level Training programme held on 29th & 30th January 2014. His / Her active participation was appreciable.

Dr. S. C. Mali	Dr. P. G. Jadar	Dr. K. S. Gudaganatti	Dr. S. C. Pilli	Dr. B. S. Prasad
H.O.D.	Professor	H.O.D.	Principal	Principal
Dept of Biotechnology	Dept of Rasashastra & BK	Dept of Rasashastra	KLES Dr. M. S. S.	KLEU Shri. B. M. K.

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Department of Public Health, J.N.M.C.

&

IPHA Karnataka State Chapter

National CME

on

PUBLIC HEALTH INFORMATICS

Certificate of Participation

This is to certify that Dr. Sudhirgouda H. Patil

has participated as a delegate in the National CME on Public Health Informatics on 13.12.2014 organized by Department of Public Health at J.N.Medical College, KLE University, Belagavi

Signature
Organizing Secretary

Signature
Principal (J. N. Medical College, Belgavi)

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Age at Menopause and associated symptoms: A study from Rural North Karnataka

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Abstract: Peri-menopause symptoms are the basis for healthcare providers and public health personnel to enable appropriate healthcare, including improving psychological makeup of woman. Hence, the study was conducted with an objective to study age at menopause along with factors affecting quality of life. Cross-sectional study has been carried out to investigate the factors affecting peri-menopausal age and symptoms, during October 2016 to April 2017, by Proportional to Population Size Inverse Cluster Sampling. A total of 712 peri-menopausal women in the age group of 40 to 55 years, including 550 menopausal women were analyzed for age at menopause by life table method, and symptoms of menopause using Cox Proportional Hazard Model. Average age at menopause was 49.3 years, however, average age at menopause by age of the women have been given in detail for the comparison. Standardized Risk Ratios for Menopausal status by Cox Proportional Hazard Model were higher in Business group as compared to Homemakers (RR=1.8, $p<0.01$), Hot Flushes were significant at $p<0.05$ etc. However, un-standardized Risk Ratios were significantly different with respect to comparable reference groups in all the determinants of Menopause, except in severe Sleep Problem, Moderate Depressive Mood, and Mild Irritability. The finding of the study concludes, to enhance the healthcare and health education to peri-menopausal women for better quality of life.

Keywords: Age at Menopause, Household survey, Menopause Symptoms, Sensitivity and specificity

Introduction

Age at Menopause as a physiological condition, is defined as the cessation of menstruation for a period of last 12 months due to loss of follicular activity of the ovaries (Dasgupta and Ray, 2009). Signs and symptoms of menopause were reported as vaginal dryness, hot flashes, night sweats, disturbed sleep, urinary problems, emotional changes etc., and they may alsobe present before attaining the menopause (Nordqvist, 2019).Several studies reported that the natural menopausal age vary from 45 to 55 years in most of the women, depending upon their genetic and socio-economic makeup, general health, nutritional status, physical activity etc (Danker-Hopfe, and Delibalta,1990; Kaprio et al.,1995; Treloar et al.,1998; Belmaker, 1982; Luoto et al.,1994; Parazzini et al., 1992; Brown et al., 1996; Osteria, 1983; Riley,1994; Simondon et al., 1997; Boldsen and Jeune, 1990; Malina, 1983; Baker, 1985; Beall, 1983;

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Gonzales, 1996).Palacios (2010) stated that the median age at menopause in Europe ranged from 50.1 to 52.8 years, in North America from 50.5 to 51.4 years, in Latin America 43.8 to 53 years, and in Asia 42.1 to 49.5 years (Palacios et al., 2010).

The distribution of commonly reported menopausal symptoms and their consequences (diseases) were night sweats (83.2%), hot flashes(76.4%), mood swings (72.5%), vaginal dryness (71.4%), irritability (67.5%), fatigue (66.8%) and loss of libido (66.4%), (ICD-10, 2010).Jacob Setorglo (2012) reported joint pain (64.4%), irregular menstrual cycle (62.9%), headaches (62.5%), weight gain (59.3%), memory lapses (53.6%) and sleep disorders (50.7%) as symptoms and their consequences in the perimenopause period (Setorglo et al., 2012).Whelan (1990) stated that an increased risk of cardiovascular disease and osteoporosis as the outcome of early menopause among the women, whereas, delayed menopause was associated with increased risk of breast cancer and endometrial cancer. Shuster (2010) reported, women with premature menopause (before age 40 years) or early menopause (between ages 40 and 45 years) experienced an increased risk of overall mortality due to cardiovascular diseases, neurological disorders, psychiatric diseases, osteoporosis etc. Symptoms and their consequences during menopause visibly flushing, sleeplessness, headache, lack of concentration provide invaluable symptoms for healthcare providers and public health personnel to enable appropriate healthcare (World Health Organization, 2016). Hence, the study was undertaken with an aim to understand the menopausal agonies, with the objective to study the age at menopause and factors affecting quality of life.

Materials and Methods

Cross-sectional study comprising of 712 rural women of age 40 to 55 years were subjected to pre-coded and pre-tested data collection schedule during October 2016 to April 2017, Belagavi District of North Karnataka, using Inverse Cluster Sampling. Data on Age at menopause along with socio-economic, anthropometric visibly weight, height, waist and hip circumference, menopausal symptoms and associated diseases were collected, to study age at menopause and its associated symptoms. Data about menopausal symptoms, psychological changes were collected in 5-point scale as None, Mild, Moderate, Severe, Very Severe (Appendix, Table 2), to make it feasible to compute indices. Pilot survey was carried out to standardize the data collection schedule.

Statistical Methods

Sample Size was computed for all the signs and symptoms of the menopause, after evaluating the feasibility the study was carried out for 95 percent Confidence Interval and 10 percent expected error in the estimates.

Life table method for estimation of average age at menopause is computed as:

$$Probability of Menopause\ (PM) = \frac{2\ \times Menopause\ women}{3\ \times Menopause\ women + 2\ \times Not\ yet\ Menopause}$$

The Menopause probability was calculated, as Death Probability in Life Table is computed from Age Specific Death Rate. The 95% Confidence Interval (95%CI) of Probability of Menopause were computed as

$$95\%\ CI = e^{(log_e(SPM) \pm 1.96\sqrt{\frac{1}{a} - \frac{1}{a+b}})}$$

Where, 'a' is the menopausal women and 'b' is not menopausal.

$$\text{Age at menopause} = L_l + 2\sum_{L_l}^{L_u} \text{Probability of menopause from } L_l \text{ to } L_u$$

Where, L_l and L_u are the Lower and Upper Limits of the group

The menopausal symptoms as determinants of menopausal risk (probability of achieving menopause status from fertile period as age x_i to x_i+1 years, where, i = 42 to 55 years) were analyzed using Cox Proportional Hazard Model, and the Risk Ratios were compared with unstandardized results. Further, the Risk Ratio has been converted into probability of achieving menopause status from age x_i to x_i+1 using IBM SPSS-20 version. Data were analyzed by using Excel and SPSS-20 version.

Results

A house to house survey covering 712 women of age 40-55, comprising of 550 menopausal and 40 'surgically induced menopause' were covered, using Inverse Cluster Proportion to Population Size sampling. Hence, for the analysis 672 perimenopause women excluding surgical induced menopause were considered.

Table 1: Age at menopause by age in years

Age (in Years)	Surgically Induced	n	Menopause (ASM*)	95% CI of ASM*		Mean Age at menopause
				LL	UL	
40-41	1	20	0 (0)	-	-	-
42-43	0	25	2 (8.00)	2.12	30.23	42.16
44-45	3	22	13 (59.09)	41.74	83.66	43.08
46-47	7	41	18 (43.90)	31.06	62.05	43.80
48-49	14	103	78 (75.73)	67.88	84.48	44.90
50-51	6	161	154 (95.65)	92.55	98.85	46.20
52-53	1	176	165 (93.75)	90.24	97.40	47.48
54-55	8	124	120 (96.77)	93.71	99.93	48.78
Total	**40**	**672**	**550 (81.85)**			

Note: *Age Specific Menopause (ASM)

Table 1 reveals that the menopausal women in the age group of 48-49 years were 75.7 percent, whereas, the similar figure in the age group of 54-55 years was 96.8%. The average age at menopause below the age of 46, 54, 56 years were 43.2, 47.9 and 49.3 years, respectively. Table 2, reveals that the standardized Risk Ratios for Menopausal status by Cox Proportional Hazard Model were higher in Business group (1.77) as compared to Homemakers at $p<0.01$, the similar figures in women with Hot Flushes were significant at $p<0.05$, though none of the group as individual exhibited significant differences. The other significant differences in menopausal status were seen in Sleep Problem, Depressive Mood, Irritability, Anxiety, Sexual Problem, Dryness Vagina and Blood Spotting after intercourse. However, unstandardized Risk Ratios for menopausal status were significantly different with respect to comparable reference groups in all the determinants of menopause except in severe Sleep Problem, Moderate Depressive Mood, and

Mild Irritability**.** Table 2 and Fig. 1 describe the detail of the Cox proportional Hazard model and Survival function of the model. Models efficacy are details in ROC curve.

Table 2: Cox Proportional Hazard Model for Menopausal Risk as compared to unstandardized

Variables	**Cox Proportional Hazard Model**		**Unstandardized**	
	Exp.(B)(95% CI)	**n**	**Menopausal (/100)**	**RR(95% CI)**
Occupation**	**, ++; p<0.01			
Home maker (Ref)		203	169 (83.3)	
Labour	0.92 (0.7, 1.21)	159	138 (86.8)	0.82 (0.67, 0.99)
Farmer	0.84 (0.62, 1.14)	121	98 (81.0)	0.58 (0.47, 0.72)
Professional	1.41 (0.85, 2.34)	36	29 (80.6)	0.17 (0.12, 0.25)
Business++	1.77 (1.17, 2.68)	46	38 (82.6)	0.22 (0.16, 0.31)
Others	0.79 (0.57, 1.1)	107	78 (72.9)	0.46 (0.36, 0.59)
Hot Flushes*	*,+; p<0.05			
None (Ref)		156	103(66.0)	
Mild	1.16(0.86,1.56)	200	160(80.0)	1.55(1.25,1.93)
Moderate	1.29(0.94,1.76)	218	199(91.3)	1.93(1.57,2.38)
Severe	0.98(0.64,1.5)	60	53(88.3)	0.51(0.38,0.7)
Very Severe	1.28(0.78,2.11)	31	30(96.8)	0.29(0.2,0.43)
Don't know+	0.28(0.09,0.83)	7	5(71.4)	0.05(0.02,0.12)
Sleep Problem*	*,+,@; p<0.05			
None (Ref)		79	63(79.7)	
Mild	0.84(0.6,1.17)	165	148(89.7)	2.35(1.79,3.08)
Moderate	1.24(0.9,1.71)	292	240(82.2)	3.81(2.96,4.9)
Severe	0.74(0.5,1.08)	114	82(71.9)	1.3(0.96,1.77)
Very Severe+	0.46(0.24,0.91)	17	16(94.1)	0.25(0.15,0.43)
Don't know@	8.4(1.08,65.59)	5	1(20.0)	0.02(0,0.11)
Depressive Mood*	*,+; p<0.05			
None (Ref)		204	168(82.4)	
Mild	1.1(0.81,1.51)	146	110(75.3)	0.65(0.53,0.81)
Moderate	1.11(0.83,1.48)	198	182(91.9)	1.08(0.91,1.29)
Severe	0.75(0.49,1.14)	88	60(68.2)	0.36(0.27,0.47)
Very Severe+	2.32(1.17,4.61)	21	20(95.2)	0.12(0.08,0.19)
Don't know	1.2(0.52,2.77)	15	10(66.7)	0.06(0.03,0.11)
Irritability***	***,+++; p<0.001			
None (Ref)		243	183(75.3)	
Mild	1.18(0.91,1.53)	195	170(87.2)	0.93(0.78,1.1)
Moderate	0.98(0.73,1.31)	143	116(81.1)	0.63(0.52,0.77)
Severe+++	0.47(0.32,0.7)	60	52(86.7)	0.28(0.21,0.38)
Very Severe	1.4(0.74,2.66)	12	12(100.)	0.07(0.04,0.12)
Don't know	0.92(0.46,1.85)	19	17(89.5)	0.09(0.06,0.15)
Anxiety***	***,+++; p<0.001			
None (Ref)		277	210(75.8)	
Mild	0.99(0.76,1.27)	204	174(85.3)	0.83(0.7,0.97)
Moderate	0.92(0.68,1.24)	127	112(88.2)	0.53(0.44,0.65)
Severe	0.8(0.52,1.23)	42	32(76.2)	0.15(0.11,0.22)
Very Severe+++	4.49(2.51,8.03)	16	16(100.)	0.08(0.05,0.12)
Don't know	1.58(0.61,4.06)	6	6(100.)	0.03(0.01,0.06)
Sexual Problem*	*'+; p<0.05, **; p<0.01			
None (Ref)		298	238(79.9)	
Mild+	1.33(1.05,1.69)	202	181(89.6)	0.76(0.65,0.89)
Moderate	1.06(0.79,1.41)	117	90(76.9)	0.38(0.31,0.47)
Severe	1.2(0.72,2)	29	23(79.3)	0.1(0.06,0.15)
Very Severe	0.74(0.31,1.75)	10	8(80.0)	0.03(0.02,0.07)
Don't know**	2.5(1.22,5.12)	16	10(62.5)	0.04(0.02,0.08)

Dryness Vagina*	***; p<0.001, **; p<0.01			
None (Ref)		346	280(80.9)	
Mild***	0.66(0.52,0.84)	182	151(83.0)	0.54(0.46,0.63)
Moderate	0.79(0.58,1.07)	83	69(83.1)	0.25(0.19,0.31)
Severe	1.03(0.64,1.67)	29	24(82.8)	0.09(0.06,0.13)
Very Severe**	0.33(0.14,0.74)	12	8(66.7)	0.03(0.01,0.06)
Don't know	1.18(0.67,2.09)	20	18(90.0)	0.06(0.04,0.1)
Blood Spotting between Periods				
No (Ref)		492	410(83.3)	
Yes	1.26(0.99,1.59)	180	140(77.8)	0.34(0.29,0.4)
Blood Spotting after intercourse**	**'++; p<0.01			
No		517	419(81.0)	
Yes++	1.42(1.13,1.79)	155	131(84.5)	0.31(0.27,0.37)

Note: The variables considered for determinants of Menopausal status, and could not exhibits significant effect are Type of Family, Heart Discomfort, Physical & Mental Exhaustion, Bladder Problem, Regularity of Menstruation, and Menstrual flow.

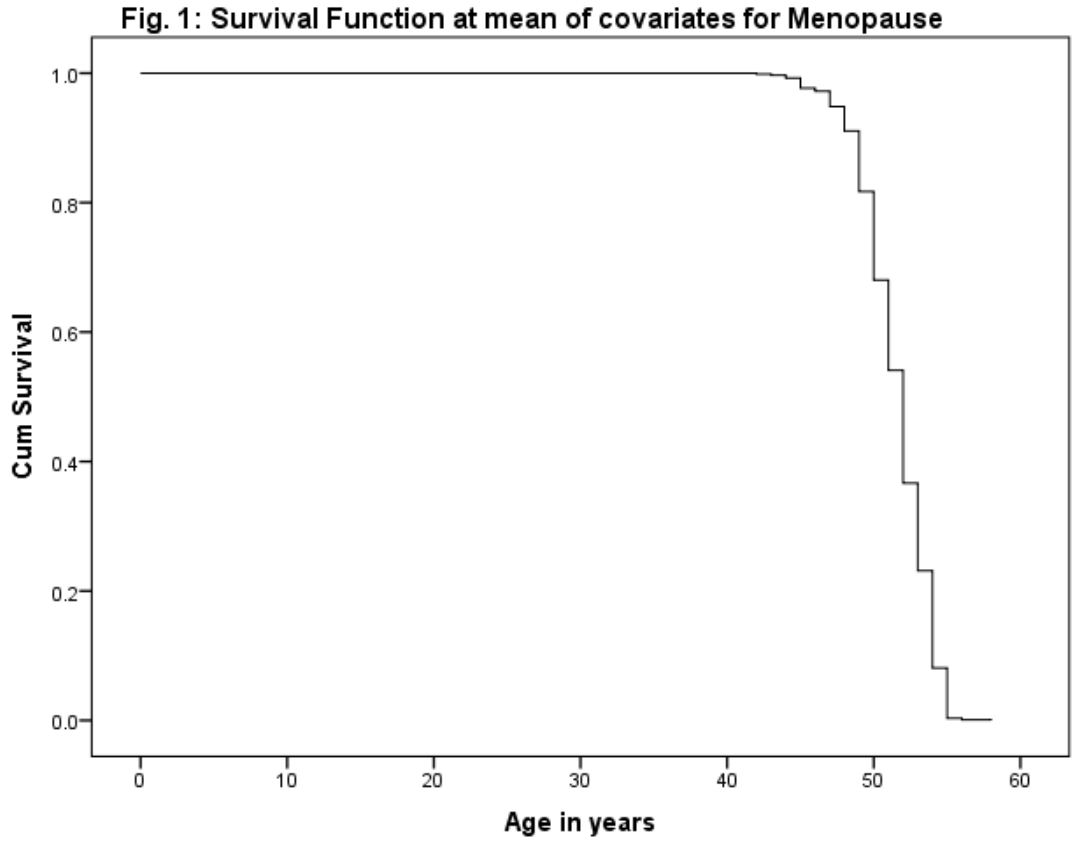


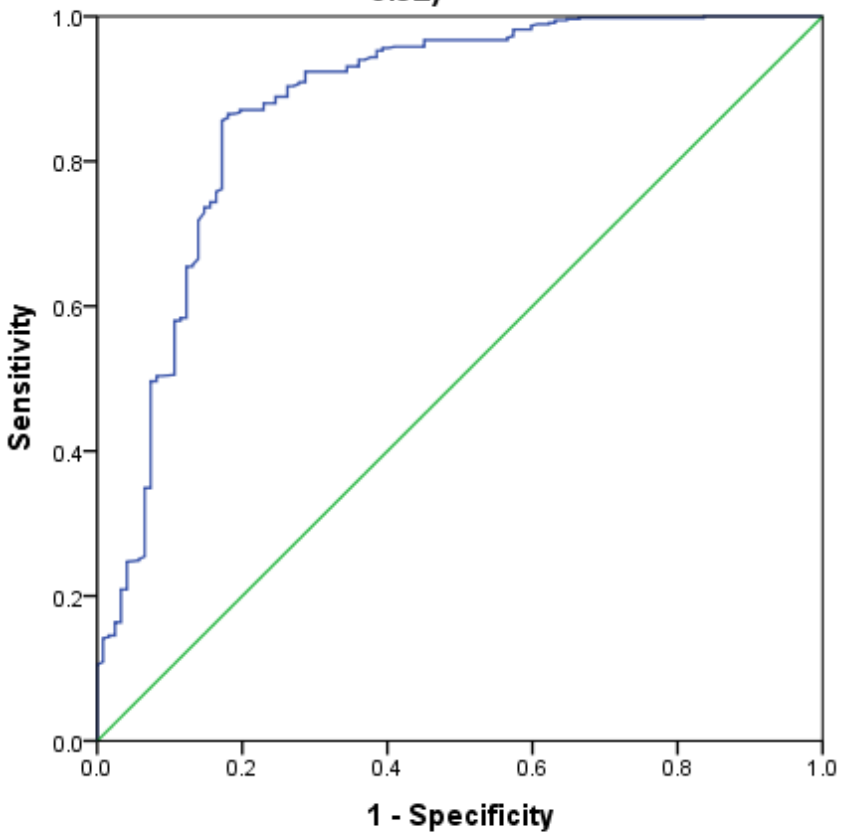
Table 3: Diagnostic evaluation of Cox Proportional Hazard Model

Probability of Positive attribute if Less Than or Equal To	Sensitivity	Specificity	Determinant Attributes	n
0.078	0.142	0.992	4,37,40,44,74	14
0.087	0.145	0.984	48,	4
0.111	0.164	0.975	11,47,61,	6
0.145	0.209	0.967	14, 33,95	4
0.201	0.247	0.959	5,42,49,56,92	26
0.287	0.349	0.934	9,10,16,18,26,59,66, 67, 71, 72, 77, 85, 86, 87, 89	111
0.416	0.496	0.926	3,6,7,12,13,19,22,24,27,28,31,35,36,43, 45,62,78, 83,97	167
0.534	0.58	0.893	29,98	3
0.546	0.584	0.885	23,32,41,50,51,63,64,68,88,93 94,99	117
0.587	0.655	0.877	1,17,21,34,38,58,65,81, 82,84	98
0.666	0.718	0.861	30	11
0.675	0.736	0.852	8,91	23
0.699	0.744	0.844	2,25,57,69,73,75,76,96	46
0.808	0.856	0.828	90	6
0.816	0.865	0.82	52,	8
0.827	0.871	0.803	15,20,55,	4
0.866	0.904	0.738	46,	4
0.877	0.909	0.721	39	3
0.902	0.924	0.713	54	5
0.951	0.958	0.59	80	1
0.952	0.967	0.549	53,	2
0.974	0.971	0.434	60,70,79	9

Note: Details of Codes in Column title 'Determinants Attributes' are in Appendix Table 1

Table 3 and Fig 2, Diagnostic evaluation of Cox Proportional Hazard Model reveals the diagnostic sensitivity and specificity along with positive attribute causing the menopause symptoms to occur. The most appropriate sensitivity and specificity of the Cox Proportional Hazard model were 85.6 and 82.8 percent respectively. However, different sensitivity and specificity for screening and diagnostic purpose can be used from the table as per the need of the research. The probability for specific diagnostic levels can be read, by entering the positive attribute of the symptoms of the menopause that is '1'in Cox proportional Hazard model, to use the model for diagnostic purposes, as for attributes 29 (Labour, Mild Irritability., Mild Dryness of vagina, and Spotting of Blood), and 98(Others (other than House maker, Labour, Farmer, Professional and Business), Severe Irritability, Mild Dryness of vagina, Spotting of Blood). The sensitivity of the model is 0.58, and specificity 0.893 with cut off point p (Probability) =0.534.

Fig. 2: ROC Curve of Survival Function for Menopause (Area = 0.88, 95% CI; 0.84 - 0.92)



Discussion

In a cross-sectional survey covering 712 women of age 40-55, comprising of 550 menopausal and 122 non-menopausal women were surveyed with an objective to study the health consequences of menopause, so that the necessary care (health education and medical care) for menopausal women are arranged. Furthermore, to provide necessary data on age at menopause and health consequences for Healthcare planners (policy formation) to arrange necessary health services. In the present study, the age at menopause has been computed using information, whether the women have achieved menopause or not at the current age, whereas, in most of the studies actual age at menopause has been recorded and used for computing the age at menopause (Ahuja, 2016; Luoto et al., 1994; Kaur and Talwar, 2009; Bromberger et al., 1997; Jacobsen, et al., 2003; OlaOlorun and Lawoyin, 2009; Parazzini and Progetto, 2007). Using actual age of women at menopause might have resulted in lapse of memory, and more likely deliberate reporting lesser age, as usual in case of women. The menopausal women in the age group of 48-49 years were 75.7 percent, whereas, the similar figures in the age group of 54-55 years was 96.8 percent, concluding in Positively Skewed Distribution of menopause, resulting in fast achieving the menopausal status, giving no time to the women to be ready for consequences. Findings are in line reported from developing and developed countries (Kaw et al., 1994; Thomas et al., 2001).

The average ages at menopause below the age of 46, 54, 56 years were 43.2, 47.9 and 49.3 years respectively, whereas, the age at menopause in developing countries has been reported 45 to 55 years, and in developed countries 50 to 53 years (Parazzini et al., 1992; Brown et al., 1996; Osteria, 1983; Riley,1994; Simondon et al., 1997; Boldsen and Jeune, 1990; Malina, 1983; Baker, 1985; Beall, 1983; Gonzales, 1996; Palacios et al., 2010). Standardized Risk Ratios for Menopausal status by Cox Proportional Hazard Model were statistically significant and higher in Business group as compared to Homemakers, Hot Flushes against with no Hot flushes. The other significant differences were observed by Sleep Problem, Depressive Mood, Irritability, Anxiety, Sexual Problem, Dryness Vagina and Blood Spotting after intercourse. Though, Fabio Parazzini (2007) in the similar study did not observe any difference in age at menopause by menopausal symptoms, however, the symptoms of menopause varied significantly by age at menopause.

Conclusion

The average age at menopause by indirect method, questioning whether, age at menopause has been achieved or not, was 49.3 years. The average age at menopause has been given for different ages, so that the findings are useful for further comparisons and for perimenopausal care. Almost all menopausal symptoms exhibited significant differences in categories by reference groups. However, Cox Proportional Hazard model could detect significant differences only in symptoms Hot Flushes, Sleep Problem, Depressive Mood, Irritability, Anxiety, Sexual Problem, Dryness of Vagina, and Blood Spotting after intercourse with respect to reference groups. Hence, the perimenopause women need psychological and medical care to minimize the menopausal agony.

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Appendix Table 1: Determinant Attributes

1=Home maker;	51=Farmer, Moderate (Irrit.)
2=Home maker, Yes (Blood)	52=Farmer, Moderate (Irrit.), Yes (Blood)
3=Home maker, Mild (Dry.)	53=Farmer, Moderate (Irrit.), Mild (Dry.)
4=Home maker, Mild (Dry.), Yes (Blood)	54=Farmer, Moderate (Irrit.), Mild (Dry.), Yes (Blood)
5=Home maker, Moderate (Dry.)	55=Farmer, Moderate (Irrit.), Moderate (Dry.)
6=Home maker, Mild (Irrit.)	56=Farmer, Severe (Irrit.)
7=Home maker, Mild (Irrit.), Yes (Blood)	57=Farmer, Severe (Irrit.), Mild (Dry.)
8=Home maker, Mild (Irrit.), Mild (Dry.)	58=Farmer, Severe (Irrit.), Moderate (Dry.)
9=Home maker, Mild (Irrit.), Mild (Dry.), Yes (Blood)	59=Professional
10=Home maker, Mild (Irrit.), Moderate (Dry.)	60=Professional, Yes (Blood)
11=Home maker, Mild (Irrit.), Moderate (Dry.), Yes (Blood)	61=Professional, Mild (Dry.)
12=Home maker, Moderate (Irrit.)	62=Professional, Moderate (Dry.)
13=Home maker, Moderate (Irrit.), Mild (Dry.)	63=Professional, Mild (Irrit.)
14=Home maker, Moderate (Irrit.), Mild (Dry.), Yes (Blood)	64=Professional, Mild (Irrit.), Yes (Blood)
15=Home maker, Moderate (Irrit.), Moderate (Dry.)	65=Professional, Mild (Irrit.), Mild (Dry.)
16=Home maker, Moderate (Irrit.), Moderate (Dry.), Yes (Blood)	66=Professional, Moderate (Irrit.)
17=Home maker, Severe (Irrit.)	67=Professional, Moderate (Irrit.), Moderate (Dry.)
18=Home maker, Severe (Irrit.), Yes (Blood)	68=Business
19=Home maker, Severe (Irrit.), Moderate (Dry.)	69=Business, Mild (Dry.)
20=Home maker, Severe (Irrit.), Moderate (Dry.), Yes (Blood)	70=Business, Moderate (Dry.), Yes (Blood)
21=Labour	71=Business, Mild (Irrit.)
22=Labour, Yes (Blood)	72=Business, Mild (Irrit.), Mild (Dry.)
23=Labour, Mild (Dry.)	73=Business, Mild (Irrit.), Mild (Dry.), Yes (Blood)
24=Labour, Moderate (Dry.)	74=Business, Mild (Irrit.), Moderate (Dry.)
25=Labour, Moderate (Dry.), Yes (Blood)	75=Business, Moderate (Irrit.)
26=Labour, Mild (Irrit.)	76=Business, Moderate (Irrit.), Moderate (Dry.), Yes (Blood)
27=Labour, Mild (Irrit.), Yes (Blood)	77=Business, Severe (Irrit.)
28=Labour, Mild (Irrit.), Mild (Dry.)	78=Business, Severe (Irrit.), Mild (Dry.)
29=Labour, Mild (Irrit.), Mild (Dry.), Yes (Blood)	79=Business, Severe (Irrit.), Mild (Dry.), Yes (Blood)
30=Labour, Mild (Irrit.), Moderate (Dry.)	80=Business, Severe (Irrit.), Moderate (Dry.)
31=Labour, Moderate (Irrit.)	81=Others
32=Labour, Moderate (Irrit.), Mild (Dry.)	82=Others, Yes (Blood)
33=Labour, Moderate (Irrit.), Mild (Dry.), Yes (Blood)	83=Others, Mild (Dry.)
34=Labour, Moderate (Irrit.), Moderate (Dry.)	84=Others, Mild (Dry.), Yes (Blood)
35=Labour, Moderate (Irrit.), Moderate (Dry.), Yes (Blood)	85=Others, Moderate (Dry.)
36=Labour, Severe (Irrit.)	86=Others, Mild (Irrit.)
37=Labour, Severe (Irrit.), Yes (Blood)	87=Others, Mild (Irrit.), Yes (Blood)
38=Labour, Severe (Irrit.), Mild (Dry.)	88=Others, Mild (Irrit.), Mild (Dry.)
39=Labour, Severe (Irrit.), Moderate (Dry.)	89=Others, Mild (Irrit.), Mild (Dry.), Yes (Blood)
40=Labour, Severe (Irrit.), Moderate (Dry.), Yes (Blood)	90=Others, Mild (Irrit.), Moderate (Dry.)
41=Farmer	91=Others, Moderate (Irrit.)
42=Farmer, Yes (Blood)	92=Others, Moderate (Irrit.), Yes (Blood)
43=Farmer, Mild (Dry.)	93=Others, Moderate (Irrit.), Mild (Dry.)
44=Farmer, Mild (Dry.), Yes (Blood)	94=Others, Moderate (Irrit.), Moderate (Dry.)
45=Farmer, Moderate (Dry.)	95=Others, Moderate (Irrit.), Moderate (Dry.), Yes (Blood)
46=Farmer, Mild (Irrit.)	96=Others, Severe (Irrit.)
47=Farmer, Mild (Irrit.), Yes (Blood)	97=Others, Severe (Irrit.), Mild (Dry.)
48=Farmer, Mild (Irrit.), Mild (Dry.)	98=Others, Severe (Irrit.), Mild (Dry.), Yes (Blood)
49=Farmer, Mild (Irrit.), Mild (Dry.), Yes (Blood)	99=Others, Severe (Irrit.), Moderate (Dry.)
50=Farmer, Mild (Irrit.), Moderate (Dry.)	

Note: Variable details in parenthesis - Dry- Dryness of Vagina, Irrit- Irritability, Blood- Blood spotting after Intercourse, Others – other than House maker, Labour, Farmer, Professional and Business, in the model all these attributes need to be entered as '1', then the model will give values of Odds Ratios against normal attributes.

Appendix Table 2: Menopausal symptoms, psychological changes

Hot Flushes	None, Mild, Moderate, Severe, Very Severe
Heart discomfort	None, Mild, Moderate, Severe, Very Severe
Sleep problems	None, Mild, Moderate, Severe, Very Severe
Depressive mood	None, Mild, Moderate, Severe, Very Severe
Irritability	None, Mild, Moderate, Severe, Very Severe
Anxiety	None, Mild, Moderate, Severe, Very Severe
Physical and mental exhaustion	None, Mild, Moderate, Severe, Very Severe
Sexual problem	None, Mild, Moderate, Severe, Very Severe
Bladder problems	None, Mild, Moderate, Severe, Very Severe
Dryness of vagina	None, Mild, Moderate, Severe, Very Severe

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Menopause status and its determinants in rural North Karnataka

Sudhirgouda H. Patil, Naresh K. Tyagi, Jang Bahadur Prasad

Abstract:

BACKGROUND: Perimenopause symptoms need attention of health-care providers and public health personnel to enable the appropriate healthcare, including improving psychological makeup and for planning for further studies. Hence, the study was undertaken with an objective to study the menopause along with factors affecting the quality of life.

MATERIALS AND METHODS: A cross-sectional study has been carried out to investigate the factors affecting/related with perimenopausal symptoms, during February to July 2016, using proportional to population size inverse cluster sampling. The present study was conducted covering 712 women of age 40-55 years, comprised of 550 menopause, 40 surgical induced menopause and 122 yet to achieve menopause.

RESULTS: The odds ratio (OR) of menopaused women in other than "Hindus" and "Muslims" were found higher than the reference group (Hindus). OR of menopause groups was statistically significant with "Mild" heart discomfort, "Mild" sexual desire, dryness of vagina, hot flushes, physical and mental exhaustion, depressive mood, anxiety, sleep problem, and irritability as compared with their respective reference groups (absence of symptoms). Similar results were exhibited by "Mild" physical and mental exhaustion (OR = 2.22; $P < 0.05$), "Moderate" depressive mood women (OR = 2.30; $P < 0.05$), "Severe" anxiety (OR = 1.84; $P < 0.05$), "Mild" sleep problem (OR = 2.31; $P < 0.05$), and "Mild" irritability (OR = 1.86; $P < 0.05$).

CONCLUSION: Psycho-physiological changes were seen by heart discomfort, sexual desire problem, irritability, depressive mood, anxiety, hot flushes, sleep problems, physical and mental exhaustion, and dryness of vagina exhibited significantly higher in perimenopause women. Hence, well-planned and calibrated health education and necessary symptomatic treatment must always be arranged for the welfare in the perimenopause period.

Keywords:

Emotional changes, menopause, psycho-medical anomalies, rural cross-sectional survey

Introduction

Menopause is a physiological condition, defined as the cessation of menstruation for the past 12 months due to the loss of follicular activity of the ovaries.[1] Signs and symptoms of menopause were reported as vaginal dryness, hot flashes, disturbed sleep, urinary problems, and emotional changes.[2]

The distribution of commonly reported menopausal symptoms and their consequences (diseases) was night sweats (83.2%), hot flushes (76.4%), mood swings (72.5%), vaginal dryness (71.4%), irritability (67.5%), fatigue (66.8%), and loss of libido (66.4%).[3] Setorglo *et al.* reported joint pain (64.4%), weight gain (59.3%), memory lapses (53.6%), and sleep disorders (50.7%) as symptoms and their consequences in the perimenopause period.[4]

Perimenopause period causes physiological changes, with a lot of agony to the women. Hence, the perimenopause women with symptoms, including psychological

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changes, need the care from healthcare providers and public health personnel. Symptoms and their consequences during menopause visibly flushing, sleeplessness, headache, lack of concentration provide invaluable symptoms for health-care providers and public health personnel to enable the appropriate healthcare.[3] Hence, the study was undertaken with an aim to understand the menopausal agonies, with the objective to study the contribution of socio-psycho and menopause agonies during perimenopause period from 40 to 45 years.

Materials and Methods

A cross-sectional study comprising 712 rural women age 40–55 years were surveyed, using pre-coded and pre-tested data collection instruments from October 2016 to April 2017, in Rural Belagavi District of North Karnataka, by inverse cluster sampling. Pilot survey was carried out to standardize the data collection schedule.

Data on menopause anthropometric, menopausal symptoms, and associated psycho-social and menopause symptoms were collected, to study the menopause and its determinants.

Menopause symptoms including vaginal dryness have been graded as none, mild, moderate, severe, and very severe with respect to the status of the patient before perimenopause phase, as perceived by the patients and graded as per Likert's scale. The Ethical Clearance was obtained from Institutional Ethical Clearance Committee via reference number KLEU/Ethic/2015-16/D-118, Dated : 14-07-2015.

Statistical methods

The sample size was computed for anthropometric, menopausal symptoms, and associated psycho-social and menopause symptoms, keeping in mind the feasibility. The sample size was computed assuming 95% confidence interval (CI) and 10% expected error in the estimates.

The logistic regression analysis has been used to assess the impact of deterministic variates of perimenopause symptoms. Exponential of the coefficient of logistic regression estimates (e^b) is defined as odds ratio (OR) in favor of the symptoms in menopause as compared to premenopause.

95% CI was computed as:

$$95\%\ \text{CI of OR} = e^{\left(\log_e(\text{OR}) \pm 1.96\sqrt{\frac{1}{a}+\frac{1}{b}+\frac{1}{c}+\frac{1}{d}}\right)}$$

where, "a" is the menopausal women, "b" is not menopausal in reference group, and "c" and "d" are the similar figures for the study group for OR.

Data were cleaned for errors using Microsoft Excel, and analysis was carried out using theIBM, SPSS-22 version, Bangalore, Karnataka, India.

Results

A home-to-home survey was carried out, covering 712 women of age 40–55, comprising 550 menopausal and 40 "surgically induced menopause," and using inverse cluster proportion to population size sampling. Hence, to study the determinants of menopause; 712 perimenopause including 40 surgicalinduced menopause women formed the study material.

In Table 1, menopause by religion reveals OR and the distribution of the study patients by religion. The OR of menopaused women in other than "Hindus'" and "Muslims" was 1.33 times ($P < 0.01$) as compared to "Hindus." The similar figure was as less as 0.6 times in "Muslims" ($P < 0.01$). The highest proportion of menopausal women was in "Others" (83.9%) and least in "Muslims" (70.35%).

In Table 2, menopause by lifestyle diseases reveal OR and the distribution of the study patients in the rural woman by lifestyle diseases. The OR of menopaused women in body mass index (BMI) groups (18.5–24.9) was higher than in BMI groups (30 + and 25–29.9). OR was significantly different at $P < 0.05$. However, the distribution of patients in menopausal groups by BMI was not statistically different. OR in "Mild" heart discomfort was significantly higher ($P < 0.001$), as compared to without any heart discomfort.

Table 1: Menopause by religion in rural woman of Belagavi, Karnataka, 2016-2017

Variable	Not menopause (%)	Menopaused, *a* (%)	Total, *n* (%)	OR	95% CI	
					LL	UL
Total	162 (22.75)	550 (77.25)	712 (100.00)			
Religion						
Hindu	80 (20.36)	313 (79.64)	393 (55.20)	1.00	-	-
Muslim	67 (29.65)	159 (70.35)	226 (31.74)	0.61	0.56	0.65
Others	15 (16.13)	78 (83.87)	93 (13.06)	1.33	1.10	1.60
χ^2, df, *P*		9.72, 2, <0.01				

OR: Odds ratio, CI: Confidence interval, LL: Lower limit, UL: Upper limit

Table 2: Menopause by lifestyle diseases in rural woman of Belagavi, Karnataka, 2016-2017

Variable	Not menopaused (%)	Menopause (%)	Total, *n* (%)	OR	95% CI	
					LL	UL
Total	162 (22.75)	550 (77.25)	712 (100.00)			
BMI groups						
18.5-24.9	18 (15.65)	97 (84.35)	115 (16.15)	1.00	-	-
25-29.9	121 (24.74)	368 (75.26)	489 (68.68)	0.56	0.49	0.66
30+	23 (21.30)	85 (78.70)	108 (15.17)	0.69	0.54	0.87
χ^2, df, *P*	4.53, 2, 0.104					
Heart discomfort						
None	96 (28.24)	244 (71.76)	340 (47.75)	1.00	-	-
Mild	66 (17.74)	306 (82.26)	372 (52.25)	1.82	1.71	1.95
χ^2, df, *P*	11.13, 1, <0.001					

BMI: Body mass index, OR: Odds ratio, CI: Confidence interval, LL: Lower limit, UL: Upper limit

Table 3: Menopause by sexual problems in rural woman of Belagavi, Karnataka, 2016-2017

Variable	Not menopaused (%)	Menopaused, *a* (%)	Total (%)	OR	95% CI	
					LL	UL
Total	162 (22.75)	550 (77.25)	712 (100.00)			
Sexual desire						
None	78 (23.93)	248 (76.07)	326 (45.79)	1.00	-	-
Mild	36 (16.59)	181 (83.41)	217 (30.48)	1.58	1.43	1.74
Moderate	35 (28.00)	90 (72.00)	125 (17.56)	0.81	0.72	0.90
Severe	13 (29.55)	31 (70.45)	44 (6.18)	0.75	0.59	0.96
χ^2, df, *P*	8.06, 3, <0.05					
Dryness of vagina						
None	100 (25.13)	298 (74.87)	398 (55.90)	1.00	-	-
Mild	34 (18.38)	151 (81.62)	185 (25.98)	1.49	1.35	1.64
Moderate	28 (21.71)	101 (78.29)	129 (18.12)	1.21	1.08	1.36
χ^2, df, *P*	3.37, 2, 0.185					
Hot flushes						
None	69 (38.98)	108 (61.02)	177 (24.86)	1.00	-	-
Mild	55 (25.58)	160 (74.42)	215 (30.20)	1.86	1.69	2.04
Moderate and severe	38 (11.88)	282 (88.13)	320 (44.94)	4.74	4.27	5.27
χ^2, df, *P*	49.05, 2, <0.001					

OR: Odds ratio, CI: Confidence interval, LL: Lower limit, UL: Upper limit

Table 3 shows menopause status by sexual problems reveal OR and the distribution of the study patients by sexual desire, dryness of vagina, and hot flushes in the rural woman. The OR of menopaused women in "Mild" sexual desire was significantly higher (OR = 1.6; $P < 0.05$) as compared to with "None" sexual desire problem. The sexual desire decreased in the other two groups (moderate and severe) to 0.8. The ORs in the dryness of the vagina and hot flushes increased significantly at $P < 0.05$ as compared to without dryness of the vagina and hot flushes. The distribution of the patients in menopause and nonmenopausal women varied significantly by sexual desire problem ($P < 0.05$) and with hot flushes ($P < 0.001$).

In Table 4, menopause status by mental sickness exhibits OR and the distribution by physical and mental exhaustion, depressive mood, anxiety, sleep problem, and irritability in rural woman. The OR of menopausal women was higher in "Mild" (OR = 2.22; $P < 0.05$) as compared to in the absence of physical and mental exhaustion. Similarly, it was higher in "Moderate" depressive mood women (OR = 2.30; $P < 0.05$) as compared to none depressive mood women. The OR of menopausal was higher in "Severe" anxiety (OR = 1.84; $P < 0.05$), "Mild" sleep problem (OR = 2.31; $P < 0.05$), and in "Mild" irritability (OR = 1.86; $P < 0.05$) as compared to the absence of anxiety, sleep problem, and irritability groups, respectively.

Discussion

Menopause symptoms in order of extent vary with the most common hot flushes, followed by night sweat, vagina dryness, and mood swings.[4] Symptoms and their consequences of menopause provide invaluable input for health-care providers and public health personnel to enable the appropriate healthcare/health-care education.[3] Hence, cross-sectional study comprising 712 rural women of age 40–55 years were surveyed, during

Table 4: Menopause by mental sickness in rural woman of Belagavi, Karnataka, 2016-2017

Variable	Not menopaused, *b* (%)	Menopaused, *a* (%)	Total, *n* (%)	OR	95% CI	
					LL	UL
Total	162 (22.75)	550 (77.25)	712 (100.00)			
Physical and mental exhaustion						
None	42 (22.58)	144 (77.42)	186 (26.12)	1.00	-	-
Mild	18 (11.61)	137 (88.39)	155 (21.77)	2.22	1.85	2.67
Moderate	53 (21.54)	193 (78.46)	246 (34.55)	1.06	0.95	1.18
Severe	31 (31.63)	67 (68.37)	98 (13.76)	0.63	0.54	0.73
Very severe	18 (66.67)	9 (33.33)	27 (3.79)	0.15	0.10	0.21
χ^2, df, *P*		45.17, 4, <0.001				
Depressive mood						
None	54 (23.28)	178 (76.72)	232 (32.58)	1.00	-	-
Mild	47 (29.94)	110 (70.06)	157 (22.05)	0.71	0.64	0.79
Moderate	24 (11.65)	182 (88.35)	206 (28.93)	2.30	2.00	2.65
Severe	37 (31.62)	80 (68.38)	117 (16.43)	0.66	0.58	0.74
χ^2, df, *P*		24.33, 3, <0.001				
Anxiety						
None	82 (27.52)	216 (72.48)	298 (41.85)	1.00	-	-
Mild	47 (21.27)	174 (78.73)	221 (31.04)	1.41	1.29	1.53
Moderate	33 (17.10)	160 (82.90)	193 (27.11)	1.84	1.66	2.04
χ^2, df, *P*		7.64, 2, <0.05				
Sleep problem						
None	21 (24.71)	64 (75.29)	85 (11.94)	1.00	-	-
Mild	21 (12.43)	148 (87.57)	169 (23.74)	2.31	1.84	2.91
Moderate	77 (24.29)	240 (75.71)	317 (44.52)	1.02	0.87	1.20
Severe	43 (30.50)	98 (69.50)	141 (19.80)	0.75	0.62	0.90
χ^2, df, *P*		15.68, 3, <0.001				
Irritability						
None	68 (25.37)	200 (74.63)	268 (37.64)	1.00	-	-
Mild	31 (15.42)	170 (84.58)	201 (28.23)	1.86	1.66	2.09
Moderate	39 (25.16)	116 (74.84)	155 (21.77)	1.01	0.91	1.12
Severe	24 (27.27)	64 (72.73)	88 (12.36)	0.91	0.78	1.05
χ^2, df, *P*		8.73, 3, <0.05				

OR: Odds ratio, CI: Confidence interval, LL: Lower limit, UL: Upper limit

October 2016–April 2017, in North Karnataka, by inverse cluster sampling with proportion to population size with an objective, to study the menopause determinants, and hence that the necessary care for menopause women is planned and arranged.

OR of menopaused women in other than "Hindus" and "Muslims" was significantly higher as compared to reference group (Hindus), whereas the similar figure was as least as 0.6 times in "Muslims," whereas the study from West also reported significant differences by religion though they did not have similar classification.[5]

OR of menopaused women in BMI group 18.5–24.9 was higher as compared to BMI groups of more than or equal to 25, this is note that the study population was rural, not obsessed for diet control or fast food; resulting in slimness or obesity; hence, findings are not in the line of urban populations, as the study comprising only menopause women indicate that the menopause transition was associated with changes in body fat composition.[6]

OR of menopaused women in "Mild Sexual Desire" was highest as compared to with "No Sexual Desire" problem. Whereas the sexual desire decreased in other two groups (moderate and severe), whereas 67.5% of menopausal women were reported sexually inactive by the study from Northern part of India using clinic-based data.[7]

ORs in dryness of vagina and hot flushes were observed significantly higher at $P < 0.05$ as compared to without dryness of vagina and hot flushes, with significant different distribution of the patients in menopause and nonmenopausal groups by sexual desire problem and hot flushes. Whereas 76.4% hot flushes and 42.3% vaginal dryness and decrease in sexual desire 36.2% have been reported.[7] Similar findings with varying proportion have been reported in symptoms as vaginal dryness and fatigue symptoms.[4,8]

OR of menopausal women was the highest in "Mild" disturbed physical and mental exhaustion as compared to "None;" the similar findings have been reported by

other researchers.[4] OR in "Moderate" depressive mood was found significantly higher than "None," the similar findings of 66.8% mood swings have been reported during menopause.[4] Another study indicated 77.9% mood swings during menopause.[9]

In anxiety group, the OR of menopause was significantly higher in "Severe" anxiety group, "Mild" sleep problem, and in "Mild" irritability as compared to "None" anxiety, "No sleep problem," and "None Irritability" groups, respectively; whereas the similar results were for anxiety (50%), sleep disorder (57.1%), and irritability (67.5%).[4]

Conclusion

The proportion of menopausal women was higher in other than Hindu and Muslim religions. BMI could not show expected impact on menopause, maybe due to the rural setup of the study. psycho-physiological changes as seen by heart discomfort, sexual desire problem, irritability, depressive mood, anxiety, hot flushes, sleep problems, physical and mental exhaustion, and dryness of vagina exhibited significantly higher in perimenopause women; hence, well planned and calibrated health education along with necessary care are recommended to pacify perimenopause women.

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Conflicts of interest

There are no conflicts of interest.

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Original Article

Determinants of Surgically Induced Menopause in Rural North Karnataka

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Abstract

Objective: The objective of the study was to quantify the effect of surgically induced menopause (SIM) on quality of life as assessed by religion, body mass index (BMI), sexual problem, menstrual history, blood spotting after intercourse, menopausal symptoms, and psychological disorder in the age group of 40–55 years of women. **Materials and Methods:** In this cross-sectional study, 712 rural women, comprising of 40 women (aged 40–55 years) with SIM, were surveyed, by inverse cluster sampling with proportional to population size. The aim was to study SIM and its determinants; menopause anthropometric data, menopause symptoms, and associated psychosocial symptoms. The data was analyzed using bivariate and multivariate techniques. **Results:** Around 6.4% of Hindu women had SIM, followed by Muslim (6.2%) and others (1.1%). SIM was significantly high in BMI group <25. The differences of SIM in regularity of menstruation were significant. Similar results were observed in sexual problem, menstrual flow, blood spotting after intercourse, blood spotting between periods, pain in periods, physical and mental exhaustion, heart discomfort, sleep problem, irritability, and dryness of the vagina. The sexual activity significantly hampered after SIM, further, unadjusted Odds Ratios (ORs) were not in line with adjusted OR. With regularity of menstruation problem, the SIM increases significantly, as indicated by adjusted and unadjusted ORs, the similar results were seen by menstrual flow and blood spotting after intercourse. The SIM by adjusted and unadjusted ORs was similar in other determinants. The Logistic regression model has been calibrated for sensitivity and specificity above 90% and accuracy as high as 97.8%. The modulated probabilities have been provided for the users of the model. **Conclusion:** The results of the bivariate analysis of surgical menopause by its covariates and regression model constructed are valuable for health-care providers, as reference for diagnosis, and to pacify patients for consequences of the prognosis.

Keywords: Household survey, modulated probabilities, receiver operating characteristic curve, surgically induced menopause

Introduction

Surgical menopause is the cessation of menses resulting from surgical removal of the uterus, leaving one or both ovaries,[1] caused by estrogen deficiencies, arising from surgical or natural premenopausal physiological changes or due to sociopsychological changes.[2]

Most of the hysterectomies occur in the age group of 35 and 45 years and more than half by the age of 45 years. Surgical primary ovarian insufficiency is the leading cause of ovarian hormone deficiency in premenopausal women, affecting the quality of life.[3,4] The Mayo Clinic Cohort Study of Oophorectomy and Aging reported that bilateral oophorectomy risk enlarged for all-cause mortality (28%), and out of total mortality, stroke (62%), coronary heart disease (33%), cognitive impairment (60%), osteoporosis and bone fractures (50%), parkinsonism (80%), sexual dysfunction (40%–110%). In addition, these studies highlighted greater risks with earlier age at the time of surgical primary ovarian insufficiency.[5-7]

Women with surgical primary ovarian insufficiency experienced more severe and frequent menopausal symptoms than natural menopause.[7] Untreated menopause symptoms such as hot flushes, sleep disturbance, fatigue, decreased sexual desire, anxiety, and depressed mood have been observed, impacting the quality of life and increasing the risk of other diseases.[8-12] The similar results have been reported by several

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studies from developing and developed countries.[13,14] Hence, the present cross-sectional study has been carried out in the rural community of North Karnataka, with the objective to quantify the effect of surgically induced menopause (SIM) on quality of life as assessed by religion, body mass index (BMI), sexual problem, menstrual history, blood spotting after intercourse, menopausal symptoms, and psychological disorder in the age group of 40–55 years.

Materials and Methods

In this cross-sectional study, 712 rural women, comprising 40 women with SIM (aged 40–55 years) were surveyed by inverse cluster sampling with proportional to population size, using precoded and pretested data collection instrument during October 2016–April 2017 in rural Belagavi district of North Karnataka. A pilot survey was carried out to standardize the data collection instrument.

The aim was to study SIM and its determinants; anthropometric variables, menopause symptoms, and associated psychosocial and menopause symptoms.

Statistical methods

To study SIM and its determinants; the sample size was computed for anthropometric variables, menopausal symptoms, and associated psychosocial and menopause symptoms, keeping in mind the feasibility, assuming 95% Confidence Interval (CI) and 10% expected error in the estimation of the parameters.

95% CI of odds ratio (OR) was computed as:

$$95\%\ \text{CI of OR} = e^{(\log_e(\text{OR}) \pm 1.96\sqrt{\frac{1}{a}+\frac{1}{b}+\frac{1}{c}+\frac{1}{d}})}$$

where "*a*" is the number of SIM women and "*b*" is not SIM in reference group. "*c*" and "*d*" are the similar figures for study group for OR.

The probability of SIM was computed as:

$P = \frac{e^{f(x)}}{1+e^{f(x)}}$, and the logistic regression model = $log_e\left(\frac{p}{q}\right) = f(x) = a_0 + \sum_1^k a_i x_i$ where k is the number of explanatory variables, a_i is the corresponding logistic regression coefficients, and P is the probability of SIM and $q = 1 - p$, the probability of not SIM. Receiver operating characteristic (ROC) curve has been given along with modulated probabilities, to be used by health-care providers as reference example.

Data were analyzed using Excel and IBM SPSS 22, Bangalore, Karnataka, India version.

Results

Seven hundred and twelve rural women comprising 40 women with SIM and 550 women with menopause (in the age range of 40–55 years) constituted the study material.

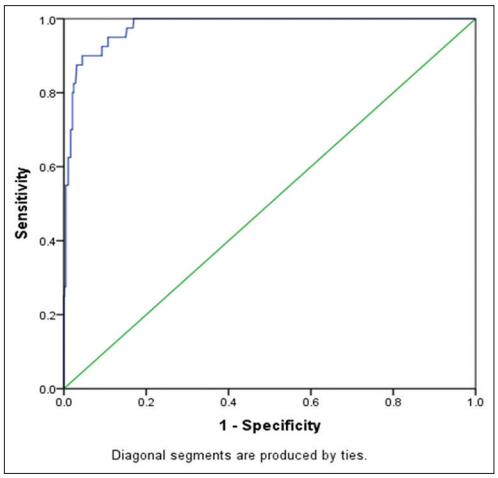

Figure 1: Receiver operating characteristic curve for surgically induced menopause, area: 97.8%, 95% confidence interval: 96.5–99.2

Table 1 reveals that maximum, i.e., 6.4%, of Hindu women had SIM, followed by Muslim (6.2%) and others (1.1%); however, the difference was not statistically significant. SIM was significantly higher (9.6%, $P < 0.05$) in BMI group <25 and decreased to 0.9% in BMI group 30 and above. The differences of SIM in regularity of menstruation were significant at $P < 0.001$; the similar results were observed in sexual problem ($P < 0.01$), menstrual flow ($P < 0.05$), blood spotting after intercourse ($P < 0.001$), blood spotting between periods ($P < 0.05$), pain in periods ($P < 0.001$), physical and mental exhaustion ($P < 0.001$), heart discomfort ($P < 0.001$), sleep problem ($P < 0.05$), irritability ($P < 0.001$), and dryness of the vagina ($P < 0.01$).

Table 2 reveals that the OR differences by BMI groups were statistically significant at $P < 0.001$; however, the similar unadjusted figure did not show any significant results. The sexual activity significantly decreased ($P < 0.01$) after SIM; however, the unadjusted OR did not exhibit statistically significant differences. With regularity of menstruation problem, the SIM increased significantly ($P < 0.01$), as indicated by adjusted and unadjusted ORs, the similar results were observed by menstrual flow and blood spotting after intercourse ($P < 0.01$). The SIM by adjusted and unadjusted ORs was not statistically significant by other covariates. However, all the factors in the model influenced the onset of SIM significantly.

Diagnostic evaluation of logistic regression model

Table 3 reveals the likely sensitivity and specificity of the model as 92.5 and 90.8%, respectively. However, sensitivity and specificity can be adjusted as per requirement of the research, as per the need for screening or diagnosis. The area under the ROC curve (accuracy) is 97.8% with 95% CI 96.5%–99.2%.

Discussion

Menopause symptoms (physical and mental exhaustion, heart discomfort, hot flushes, sleep problem, depressive mood,

Table 1: Surgically induced menopause by its covariates in women of age 40-55 years

Variable	Non-SIM, n_1 (%)	SIM, n_2 (%)	Total (n)
Total	672 (94.38)	40 (5.62)	712
Religion (χ^2; df; P)	4.17; 2; 0.124 (NS)		
Hindu	368 (93.64)	25 (6.36)	393
Muslim	212 (93.81)	14 (6.19)	226
Others	92 (98.92)	1 (1.08)	93
BMI groups (χ^2; df; P)	7.87; 2; <0.05		
18.5-24.9	104 (90.43)	11 (9.57)	115
25-29.9	461 (94.27)	28 (5.73)	489
30+	107 (99.07)	1 (0.93)	108
Sexual problem (χ^2; df; P)	5.88; 3; 0.118 (NS)		
None	314 (96.32)	12 (3.68)	326
Mild	202 (93.09)	15 (6.91)	217
Moderate	117 (93.60)	8 (6.40)	125
Severe	39 (88.64)	5 (11.36)	44
Regularity of menstruation (χ^2; df; P)	11.85; 1; <0.001		
No	286 (97.95)	6 (2.05)	292
Yes	386 (91.90)	34 (8.10)	420
Menstrual flow (χ^2; df; P)	7.92; 2; <0.05		
Light	104 (99.05)	1 (0.95)	105
Moderate	429 (94.49)	25 (5.51)	454
Heavy	139 (90.85)	14 (9.15)	153
Blood spotting after intercourse (χ^2; df; P)	20.61; 1; <0.001		
No	517 (96.64)	18 (3.36)	535
Yes	155 (87.57)	22 (12.43)	177
Blood spotting between periods (χ^2; df; P)	4.01; 1; <0.05		
No	492 (93.36)	35 (6.64)	527
Yes	180 (97.30)	5 (2.70)	185
Pain in periods (χ^2; df; P)	23.12; 2; <0.001		
No	55 (82.09)	12 (17.91)	67
Yes	496 (96.31)	19 (3.69)	515
Occasionally	121 (93.08)	9 (6.92)	130
Physical and mental exhaustion (χ^2; df; P)	63.35; 3; <0.001		
None	181 (97.31)	5 (2.69)	186
Mild	151 (97.42)	4 (2.58)	155
Moderate	239 (97.15)	7 (2.85)	246
Severe	83 (84.69)	15 (15.31)	98
Very severe	18 (66.67)	9 (33.33)	27
Heart discomfort (χ^2; df; P)	15.03; 1; <0.001		
None	309 (90.88)	31 (9.12)	340
Mild	363 (97.58)	9 (2.42)	372
Hot flushes (χ^2; df; P)	5.37; 2; 0.07 (NS)		
None	163 (92.09)	14 (7.91)	177
Mild	200 (93.02)	15 (6.98)	215
Moderate and severe	309 (96.56)	11 (3.44)	320
Sleep problem (χ^2; df; P)	10.19; 3; <0.05		
None	84 (98.82)	1 (1.18)	85
Mild	165 (97.63)	4 (2.37)	169
Moderate	292 (92.11)	25 (7.89)	317
Severe	131 (92.91)	10 (7.09)	141
Depressive mood (χ^2; df; P)	2.07; 3; 0.558 (NS)		
None	219 (94.40)	13 (5.60)	232
Mild	146 (92.99)	11 (7.01)	157
Moderate	198 (96.12)	8 (3.88)	206
Severe	109 (93.16)	8 (6.84)	117
Irritability (χ^2; df; P)	35.92; 3; <0.001		
None	262 (97.76)	6 (2.24)	268
Mild	195 (97.01)	6 (2.99)	201
Moderate	143 (92.26)	12 (7.74)	155
Severe	72 (81.82)	16 (18.18)	88
Anxiety (χ^2; df; P)	2.78; 2; 0.25 (NS)		
None	283 (94.97)	15 (5.03)	298
Mild	204 (92.31)	17 (7.69)	221
Moderate	185 (95.85)	8 (4.15)	193
Dryness of the vagina (χ^2; df; P)	10.71; 2; <0.01		
None	366 (91.96)	32 (8.04)	398
Mild	182 (98.38)	3 (1.62)	185
Moderate	124 (96.12)	5 (3.88)	129

BMI: Body mass index, NS: Not significant, SIM: Surgically induced menopause

irritability, anxiety, and dryness of the vagina) vary differently in perimenopause age with the most common hot flushes, followed by night sweat, vaginal dryness, and mood swings.[4] Menopause symptoms and their consequences cause a lot of hardship in the physiological process of attaining menopause providing invaluable input for health-care providers and public health personnel to enable appropriate health-care/health education.[3] Hence, for the present study, 712 rural women, comprising 40 women with SIM (aged 40–55 years) were surveyed by inverse cluster sampling with proportion to population size to meet the objectives of the study, from October 2016 to April 2017 in North Karnataka.

The proportion of SIM was higher (around 6.4%) in Hindu women, followed by Muslim. SIM was significantly higher in BMI group <25 and decreased consistently with BMI. The differences of SIM in "regularity of menstruation" groups were significantly different ($P < 0.001$), and the similar results were observed in "sexual problem," "menstrual flow," "blood spotting after intercourse," "blood spotting between periods," "pain in periods," "physical and mental exhaustion," "heart discomfort," "sleep problem," "irritability," and "dryness of the vagina." Findings were in line with those of other studies in developing and developed countries.[6,7]

Logistic regression analysis was carried out to study the effect of menopausal symptoms on SIM and to know the differences in direct and indirect effects of the factor affecting surgical

Table 2: Odds ratio estimate by logistic regression and comparable unadjusted

Variables	Logistic regression estimate			Unadjusted OR (95% CI)
	Exp (B)	95% CI for Exp(B)		
		Lower	Upper	
BMI (χ^2; df; *P*)		17.62; 2; <0.001		
18.5-24.9	1.00	-	-	1.00
25-29.9	0.22	0.05	1.05	0.57 (0.28-1.19)
30+	0.00	0.00	0.02	0.09 (0.01-0.7)
Sexual problem (χ^2; df; *P*)		14.46; 3; <0.01		
None	1.00	-	-	1.00
Mild	15.01	2.45	91.87	1.94 (0.89-4.24)
Moderate	8.81	1.60	48.65	1.79 (0.71-4.49)
Severe	93.12	7.05	1230.67	3.35 (1.12-10.03)
Problem of regularity of menstruation (χ^2; df; *P*)		9.19; 1; <0.01		
No	1.00	-	-	1.00
Yes	31.96	3.40	299.98	4.2 (1.74-10.14)
Menstrual flow (χ^2; df; *P*)		11.31; 2; <0.01		
Light	1.00	-	-	1.00
Moderate	33.36	1.89	587.48	6.06 (0.81-45.24)
Heavy	1.70	0.08	36.44	10.47 (1.36-80.93)
Blood spotting after intercourse (χ^2; df; *P*)		11.85; 1; <0.01		
No	1.00	-	-	1.00
Yes	24.18	3.94	148.32	4.08 (2.13-7.8)
Blood spotting between intercourse (χ^2; df; *P*)		8.3; 1; <0.01		
No	1.00	-	-	1.00
Yes	0.04	0.00	0.35	0.39 (0.15-1.01)
Physical and mental exhaustion (χ^2; df; *P*)		25.75; 4; <0.001		
None	1.00	-	-	1.00
Mild	5.33	0.37	77.73	0.96 (0.25-3.63)
Moderate	15.92	1.17	217.50	1.06 (0.33-3.39)
Severe	763.31	38.34	15,197.43	6.54 (2.3-18.6)
Very severe	15.44	0.83	286.54	18.1 (5.47-59.84)
Heart discomfort (χ^2; df; *P*)		15.03; 1; <0.01		
None	1.00	-	-	1.00
Mild	0.02	0.00	0.13	0.25 (0.12-0.53)
Hot flushes (χ^2; df; *P*)		6.73; 2; <0.05		
None	1.00	-	-	1.00
Mild	0.55	0.10	3.21	0.87 (0.41-1.86)
Moderate and severe	0.05	0.01	0.52	0.41 (0.18-0.93)
Sleep problem (χ^2; df; *P*)		12.45; 3; <0.05		
None	1.00	-	-	1.00
Mild	0.78	0.03	23.04	2.04 (0.22-18.51)
Moderate	14.19	0.78	256.66	7.19 (0.96-53.86)
Severe	62.10	2.11	1824.95	6.41 (0.81-51.01)
Irritability (χ^2; df; *P*)		14.63; 3; <0.01		
None	1.00	-	-	1.00
Mild	0.58	0.05	6.60	1.34 (0.43-4.23)
Moderate	68.59	4.42	1063.90	3.66 (1.35-9.97)
Severe	42.97	2.59	712.66	9.7 (3.66-25.7)
Anxiety (χ^2; df; *P*)		12.7; 2; <0.01		
None	1.00	-	-	1.00

Contd...

Table 2: Contd...

Variables	Logistic regression estimate			Unadjusted OR (95% CI)
	Exp (B)	95% CI for Exp (B)		
		Lower	Upper	
Mild	0.25	0.04	1.57	1.57 (0.77-3.22)
Moderate	0.01	0.00	0.10	0.82 (0.34-1.96)
Dryness of the vagina (χ^2; df; *P*)		14.17; 2; <0.01		
None	1.00	-	-	1.00
Mild	0.00	0.00	0.08	0.19 (0.06-0.62)
Moderate	0.06	0.01	0.52	0.46 (0.18-1.21)

Variable excluded by backward Likelihood Ratio regression procedure: Religion, pain in periods, physical and mental exhaustion, and depressive mood. BMI: Body mass index, CI; Confidence interval, OR: Odds ratio

Table 3: Sensitivity and specificity of the model at different cut of points

Probability (≥)	Sensitivity	Specificity	Determinants
0.027	0.975	0.847	0.153
0.049	0.950	0.893	0.107
0.071	0.925	0.908	0.092
0.170	0.900	0.955	0.045
0.201	0.875	0.969	0.031
0.205	0.850	0.970	0.030
0.267	0.825	0.976	0.024
0.286	0.800	0.979	0.021
0.312	0.700	0.984	0.016
0.437	0.625	0.990	0.010

intervention to achieve menopause. The results are encouraging with Nagelkerke square ($R^2 = 0.69$, accuracy of model = 0.98 with 95% CI: 0.97–0.99, $P < 0.001$), identifying 96.6% surgical and nonsurgical menopause women correctly. The results are in accordance with the findings of other studies.[15,16] The likely sensitivity and specificity of the logistic regression model constructed for the use of healthcare providers were 92.5% and 90.8%, respectively. However, sensitivity and specificity can be adjusted as per requirement of the research objectives (for screening or diagnosis purposes) [Figure 1].

The findings are useful for health-care providers, as reference for diagnosis, and to pacify patients for acceptance of the prognosis. These findings should be taken with care, as the study is from a rural area, with almost no obesity.

Conclusion

The results of the bivariate analysis of surgical menopause by its covariates and regression model constructed are valuable for health-care providers, as reference for diagnosis, and to pacify patients for consequences of the prognosis. However, sensitivity and specificity can be adjusted as per requirement of the research objectives (for screening or diagnosis purposes).

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Conflicts of interest

There are no conflicts of interest.

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