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AN EPIDEMIOLOGICAL STUDY ON PREVALENCE OF CHRONIC DISEASES IN POST-MENOPAUSAL WOMEN IN MUMBAI AND KARACHI

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ABSTRACT: Introduction: Menopause, or the permanent cessation of menstruation, is one of the significant stages in the normal development in a woman's life. During menopause, women undergo series of endocrinal and biological changes that are associated with increased prevalence of chronic conditions such as type 2 diabetes mellitus, hypertension, osteoporosis, dyslipidemia, and obesity. **Objective:** Present study explores the prevalence of chronic diseases and the probable role of socioeconomic conditions in post-menopausal women in Mumbai and Karachi. **Methods:** A prospective cross-sectional study was done in a total of 295 post-menopausal women from Mumbai (n=150) and Karachi (n=145) to assess the prevalence of chronic diseases and their socioeconomic conditions. **Results:** Hypertension was the most prevalent chronic disease in post-menopausal women from Mumbai (n=28; 18.6%) as well as from Karachi (n=18; 12.4%). Type II diabetes mellitus was found to be the second most prevalent chronic disease among post-menopausal women from Mumbai (n=27; 18%) and Karachi and (n=17; 11.7%). No graduation, the income of 20,000 to 50,000 per month (Indian Rupee or Pakistan Rupee), and marital dissolution were associated with a higher prevalence of chronic diseases among post-menopausal women both from Mumbai and Karachi.

Keywords: Menopause, Indian women, Pakistani women, Chronic disease, Metabolic syndrome

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INTRODUCTION: Menopause, or the permanent cessation of menstruation, is one of the significant stages in the normal development in a woman's life[1].

Resulting from a series of irreversible changes, it represents the end of a woman's reproductive life [2]. It is described as a stage when the menstrual cycle stops for 12 months or longer and is considered "normal" or "spontaneous" if it does not cause any pathological etiology [3].

The average age at onset of natural menopause is believed to be 48 years in poor and non-industrialized nations and 51 years in industrialized nations [4]. During menopause there is a fall in the levels of estrogen and progesterone, two of the

most important hormones in the female body, increased levels of follicle-stimulating hormone (FSH) and decreased levels of inhibit [4]. Women thus undergo a series of endocrinal and biological changes that invariably have an effect on their health.[1] These changes during the menopausal period are associated with increased prevalence of chronic conditions such as type 2 diabetes mellitus, hypertension, osteoporosis, dyslipidemia, and obesity [5].

In 1990, there were about 467 million post-menopausal women worldwide, and this figure is expected to rise to 1200 million by 2030 out of which 76% will be living in the developing countries [6]. India's population has crossed the 1 billion mark with 71 million people over 60 years of age and the number of menopausal women about 43 million. It is believed that by 2026 the population in India will be 1.4 billion, people over 60 years 173 million, and the menopausal population 103 million [7].

Similarly, in Pakistan, the current life expectancy for women is 65 years. Women are now expected to live one-third of their adult lives beyond menopause [8]. This has resulted in a shift of focus toward postmenopausal women by women's health researchers and health policy planners since recent trends suggest an increase in their numbers and life expectancy [9]. There is still a scarcity of information on the prevalence of chronic diseases and the role of socioeconomic conditions in postmenopausal women in India and Pakistan. We through our University research collaborations in Mumbai, India, and Karachi, Pakistan wish to explore the prevalence of chronic diseases and the probable role of socioeconomic conditions in post-menopausal women in Mumbai and Karachi.

METHODS:
Study Design and Participants: A prospective cross-sectional study was designed based on a validated survey questionnaire. The present study was conducted in Mumbai, India, and Karachi, Pakistan. The study protocol was approved by V.V. research Independent Ethics Committee, Mumbai, India and IEC, University of Karachi, Pakistan.

Information about households and family members was acquired from the office of Mumbai Municipal Corporation and Karachi Metropolitan Corporation.

From their database, 300 houses having females of age 35 years and above were selected randomly for Mumbai as well as Karachi. These houses were visited by trained pharmacy students to find the existence of a menopausal woman. In Mumbai, 250 houses had menopausal woman, 200 females from these houses agreed to participate, but only 150 were selected based on inclusion and exclusion criteria. In Karachi, 240 houses had menopausal woman, 180 females from these houses agreed to participate, but only 145 were selected based on inclusion and exclusion criteria.

The inclusion criteria were any woman, aged 30 years and above, who had menopause in recent or remote past and who gave written informed consent to participate in the study. Menopause was defined as at least 12 consecutive months of amenorrhea with no other medical cause. This was determined by the self-reported menstrual history of the subjects. Exclusion criteria were women with surgical menopause, chemoradiotherapy, seriously ill women.

Study Instrument: A survey questionnaire with 12 close-ended multiple choice questions was prepared in English after reviewing literature for similar studies. The questionnaire was translated into Hindi and Urdu (local language) by the experienced translator and back-translated to English to ensure the content uniformity by another experienced translator. The validity of the questionnaire was evaluated in pilot studies, in a subsample of 25 postmenopausal women in Mumbai and Karachi to ensure that the questionnaire would be appropriate, and understandable among the prospective respondents. The pilot testing allowed wording modifications in questions and also gave an estimate of the average time required for interview and filling of the questionnaire.

Collection of Data: Each selected house was visited by trained pharmacy student to collect the data. The purpose of the research was explained to the participant. Anonymity and confidentiality were guaranteed and maintained. The researchers complied with the international ethical guidelines for research. In the socio-demographic characteristics section, participants were asked to provide data on age, education, family members,

and income. The medical history section, included questions on age at menopause, chronic diseases, and health insurance. Data was recorded into predesigned case report form (CRF) by interviewers.

Data Entry and Analysis: Collected data from individual CRF was entered into Microsoft Excel and was verified by the authors other than interviewers. The data were analyzed by Microsoft Excel for finding out relevant statistics (Mean, standard deviation, frequencies, and percentage). Qualitative variables were analyzed statistically, presented as frequencies and percentages to observe their relationship with chronic diseases.

RESULTS: Table 1 shows the socio-demographic parameters of post-menopausal women in Mumbai and Karachi under study. A total of 295 (150 from Mumbai and 145 from Karachi) postmenopausal women were studied. For the Mumbai cohort, the mean age was 57.9 ± 8.8 years, and the mean age at menopause was 46.6 ± 4.51 years. For Karachi cohort, the mean age was 53 ± 4.7 years and the mean age at menopause was 44 ± 4 years. Marital status, education level and occupation of the post-menopausal women are shown in **Table 1**. Eighty percent of the respondents from Mumbai and 37.2% of the respondents from Karachi had a household income of > 50,000 INR and > 50,000 PKR respectively.

TABLE 1: SOCIO-DEMOGRAPHIC PARAMETERS OF POST-MENOPAUSAL WOMEN IN MUMBAI AND KARACHI

Parameter	Mumbai, India. N=150	Karachi, Pakistan. N=145
Mean age (Years)	57.9 ± 8.8	53 ± 4.7
Mean age at menopause	46.6 ± 4.51	44 ± 4
	Frequency (%)	
	Age at menopause (years)	
31-35	3 (2)	0 (0)
36-40	15 (10)	35 (24.1)
41-45	35 (23.3)	62 (42.8)
46-50	64 (42.7)	32 (22.1)
51-55	33 (22)	14 (9.7)
56-60	0 (0)	2 (1.4)
	Marital Status	
Unmarried	3 (2)	29 (20)
Married	117 (78)	98 (67.5)
Divorced	4 (2.6)	6 (4.1)
Widowed	26 (17.3)	10 (6.9)
Separated	0 (0)	2 (1.4)
	Education	
Illiterate	0 (0)	2 (1.37)
Primary School	7 (4.6)	19 (13.1)
High School	20 (13.3)	13 (8.9)
Graduation	123 (82)	111 (76.5)
	Occupation	
Unemployed	101 (67.3)	111 (76.5)
Employed	49 (32.7)	34 (23.4)
Household Income/month	Indian Rupee (INR)	Pakistan Rupee (PKR)
Less than 20,000	7 (4.7)	26 (17.9)
20,000 to 50,000	23 (15.3)	65 (44.8)
More than 50,000	120 (80)	54 (37.2)
Health Insurance		
Yes	132 (88)	31 (21)
No	18 (12	114 (79)

Frequencies and % prevalence of the chronic disease in these respondents are presented in **Table 2**. The maximum prevalence of chronic diseases was found to be in the women who had menopause in the age range of 51-55 years & 46-50 years for Mumbai and Karachi respectively, as shown in **Fig. 2**.
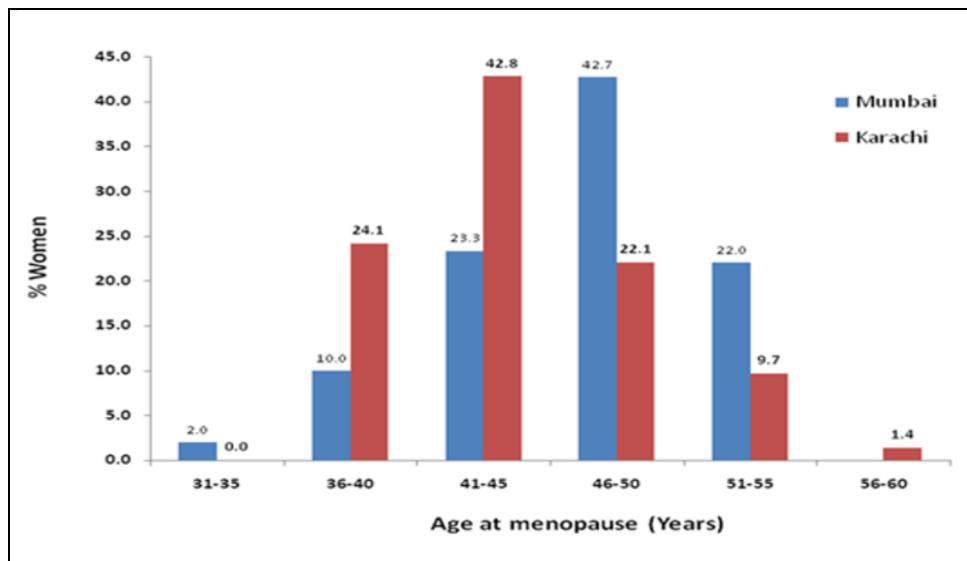
FIG. 1: REPRESENTS THE PERCENTAGE DISTRIBUTION OF WOMEN BY THE AGE AT MENOPAUSE. MAXIMUM NUMBER OF FEMALES ATTAINED MENOPAUSE AT THE AGES BETWEEN 46-50 YEARS (42.7 %) AND 41-45 YEARS (42.8%) FOR MUMBAI AND KARACHI RESPECTIVELY

TABLE 2: AGE AT MENOPAUSE AND PREVALENCE OF CHRONIC DISEASES

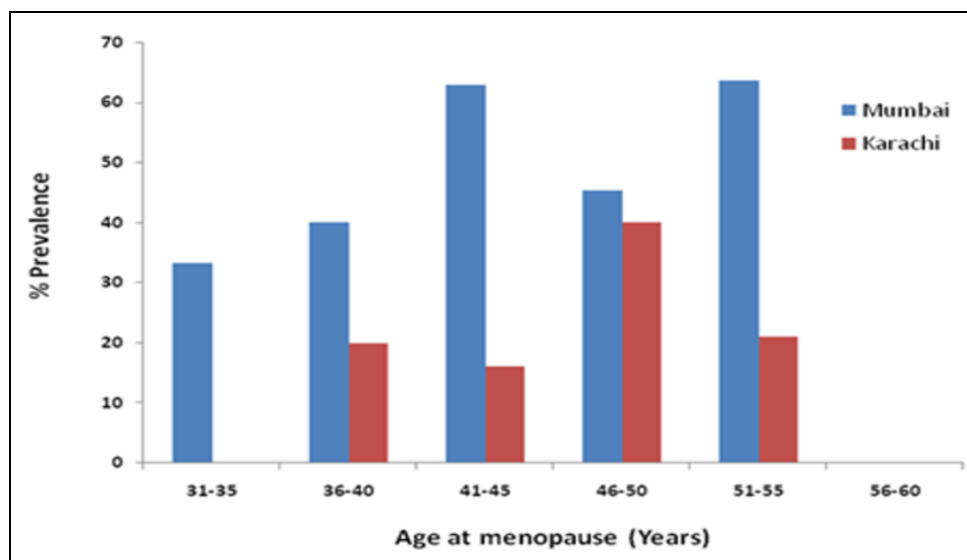| Age (years) at menopause	Frequency (number of females with chronic disease)		Prevalence Percentage (frequency of chronic disease/number of females with menopause in the respective age range) × 100	
	Mumbai, India	**Karachi, Pakistan**	**Mumbai, India**	**Karachi, Pakistan**
31-35	1	0	33.3	0
36-40	6	7	40	20
41-45	22	10	62.8	16
46-50	29	13	45.3	40
51-55	21	3	63.6	21
56-60	0	0	0	0

FIG. 2: MENOPAUSAL AGE AND PERCENTAGE PREVALENCE OF CHRONIC DISEASES

Table 3 shows frequencies and % prevalence of various reported chronic diseases in the postmenopausal women. Hypertension was the most prevalent chronic disease in post-menopausal respondents from Mumbai (n=28; 18.6%) as well as from Karachi (n=18; 12.4%). Type II Diabetes Mellitus was found to be the second most prevalent chronic disease among post-menopausal women from Mumbai (n=27; 18%) and Karachi and (n=17; 11.7%).

TABLE 3: PREVALENCE OF VARIOUS CHRONIC DISEASES AMONG POST-MENOPAUSAL WOMEN

Chronic disease	Frequency (%)	
	Mumbai, India (N=150)	Karachi, Pakistan (N=145)
Type II Diabetes Mellitus	27 (18)	17 (11.7)
Hypertension	28 (18.6)	18 (12.4)
Dyslipidemia	12 (8)	2 (1.4)
Osteoarthritis	9 (6)	3 (2)
Thyroid disorders	6 (4)	0 (0)
Osteoporosis	1 (0.6)	0 (0)

Table 4 shows marital status, frequencies & % prevalence of chronic diseases in the post-menopausal women. As seen in **Fig. 3**, in Mumbai cohort only widowed population (61%) had the highest prevalence of chronic disease. While for Karachi cohort, divorced females (66%) had a higher prevalence of the chronic disease.

TABLE 4: PREVALENCE OF CHRONIC DISEASES AND MARITAL STATUS AMONG POST-MENOPAUSAL WOMEN

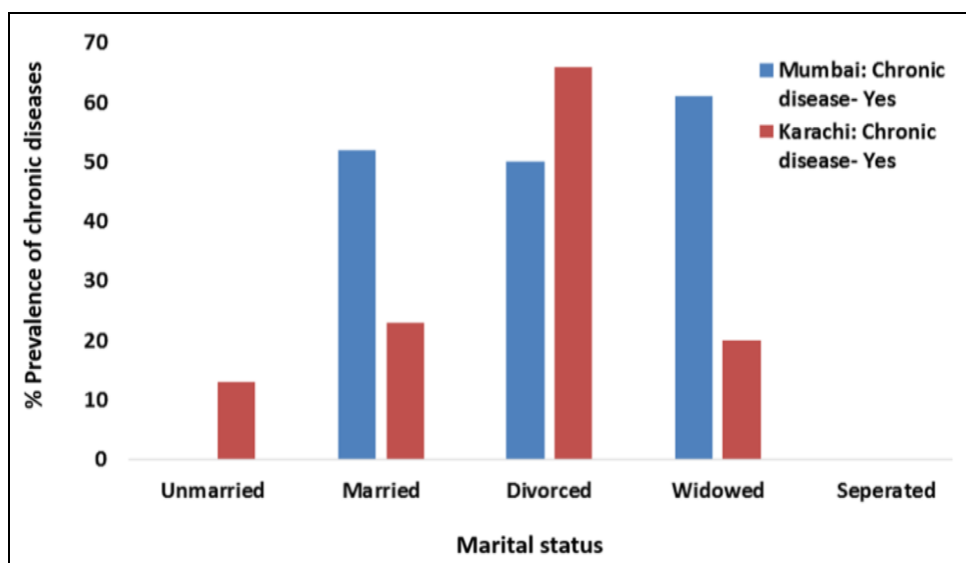|	Mumbai: Chronic disease- yes	Karachi: Chronic disease- yes
Marital Status	Frequency (%)	
Unmarried	0 (0)	4 (13)
Married	61 (52)	23 (23)
Divorced	2 (50)	4 (66)
Widowed	16 (61)	2 (20)
Separated	0 (0)	0 (0)

FIG. 3: MARITAL STATUS AND PERCENTAGE PREVALENCE OF CHRONIC DISEASES

Table 5 shows education status, frequencies & % prevalence of chronic diseases in the post-menopausal women. As seen in **Fig. 4**, in Mumbai cohort graduate females (51%) had the least prevalence of chronic diseases while for Karachi cohort females with primary school education (16%) and graduate females (23%) had a lesser prevalence of chronic diseases as compared to other categories.

TABLE 5: PREVALENCE OF CHRONIC DISEASES AND EDUCATION STATUS AMONG-POST MENOPAUSAL WOMEN

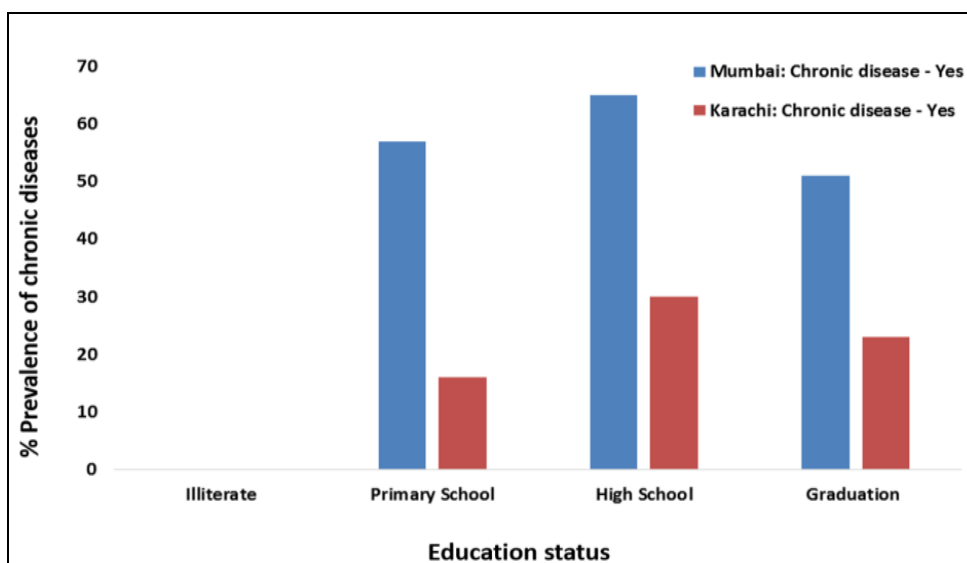|	Mumbai: Chronic disease- yes	Karachi: Chronic disease- yes
Education Status	Frequency (%)	
Illiterate	0 (0)	0 (0)
Primary School	4 (57)	3 (16)
High School	13 (65)	4 (30)

FIG. 4: EDUCATION STATUS AND PERCENTAGE PREVALENCE OF CHRONIC DISEASES

Table 6 shows occupation status, frequencies & % prevalence of chronic diseases in the post-menopausal women. As seen in **Fig. 5**, in Mumbai cohort, employed females (59%) showed a higher prevalence of chronic diseases while for Karachi cohort unemployed females (27%) showed a higher prevalence of chronic diseases.

TABLE 6: PREVALENCE OF CHRONIC DISEASES AND OCCUPATION STATUS AMONG POST-MENOPAUSAL WOMEN

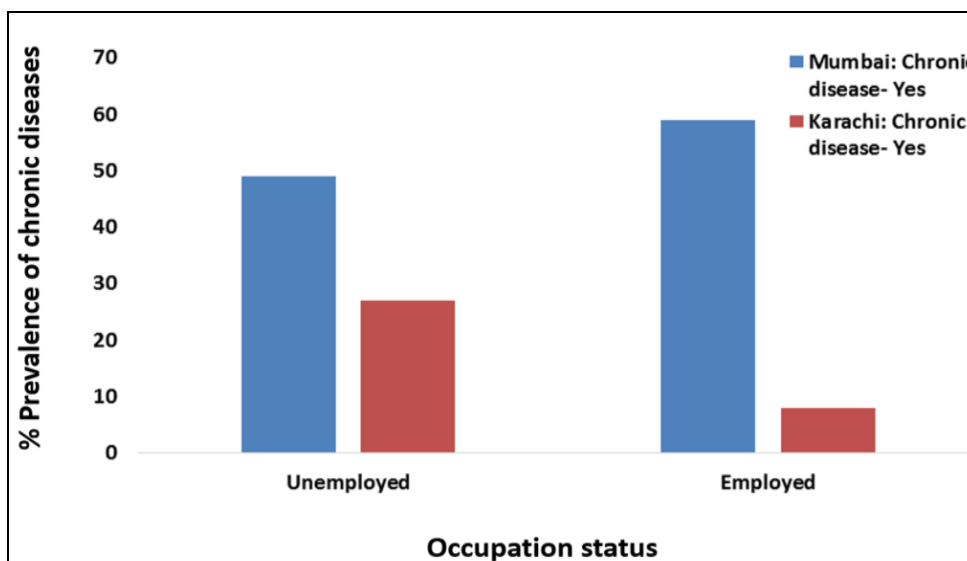|	Mumbai: Chronic disease- yes	Karachi: Chronic disease- yes
Occupation Status	**Frequency (%)**	
Unemployed	50 (49)	30 (27)
Employed	29 (59)	3 (8)

FIG. 5: OCCUPATION STATUS AND PERCENTAGE PREVALENCE OF CHRONIC DISEASES

TABLE 7: PREVALENCE OF CHRONIC DISEASES AND INCOME STATUS AMONG POST-MENOPAUSAL WOMEN

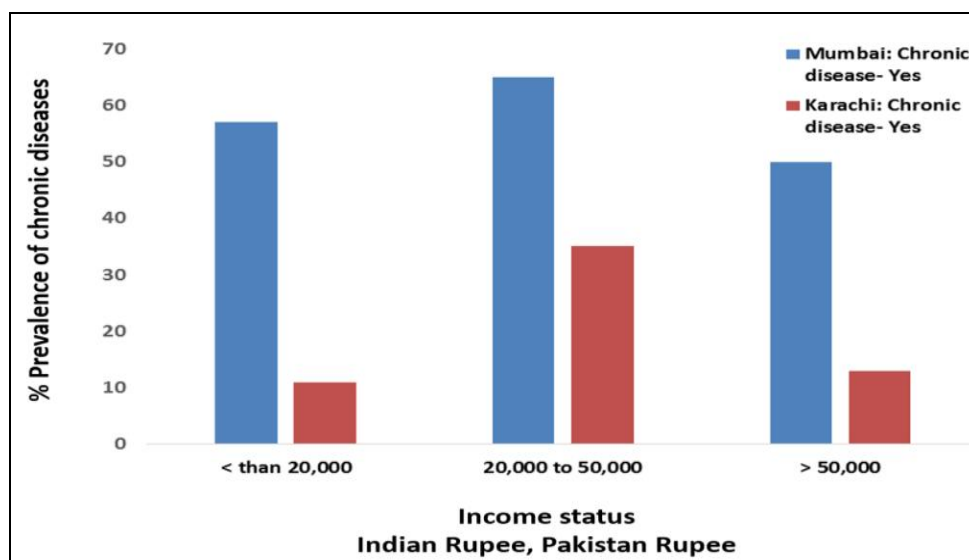|	Mumbai: Chronic disease- yes	Karachi: Chronic disease- yes
Income Status (INR/PKR)	**Frequency (%)**	
Less than 20,000	4 (57)	3 (11)
20,000 – 50,000	15 (65)	23 (35)
More than 50,000	60 (50)	7 (13)

FIG. 6: INCOME STATUS AND PERCENTAGE PREVALENCE OF CHRONIC DISEASES

Table 7 shows income status, frequencies & % prevalence of chronic diseases in the post-menopausal women. As seen in **Fig. 6**, for Mumbai and Karachi cohort post-menopausal females with house income of 20,000 to 50,000 INR/PKR showed the highest prevalence of chronic diseases.

DISCUSSION: The present study showed mean age at menopause as 46.6 years for Mumbai cohort. This is similar to that reported as 46 years [10], and 45.9 years [11] in the other studies done in urban India. A study done in Mumbai [12] has reported the mean age at menopause as 45.3 years. The mean age at menopause was 44 years for Karachi cohort in the present study. A study done in Karachi [13] has reported similar menopausal age 44.5 years, while other studies (45.2 years [14], 47 years [15]) have reported higher menopausal ages as 45.2 years [14], 47 years [15]. These differences might be the result of different inclusion and exclusion criteria used for selection of study population.

The mean menopausal age reported in the western countries is 50.3 years [16,] which is higher as compared to the reported range of 45-47 years in developing countries [17]. The lower age at menopause could reflect additional social, economic, environmental, genetic factors, parity and previous use of oral contraceptives that were not explored in our study, and might affect the menopausal age in developing countries like India and Pakistan, which need to be explored [16].

Our results showed the maximum prevalence of chronic diseases in women who had menopause in

the age range of 51-55 years & 46-50 years for Mumbai and Karachi, respectively. More specifically among chronic diseases; Hypertension (18.6%), Type II diabetes mellitus (18%), and dyslipidemia (8%) were seen for Indian cohort and Hypertension (12.4%), Type II diabetes (11.7%) were seen for Karachi cohort. Insulin resistance, dyslipidemia, hypertension, and obesity collectively called metabolic syndrome are the known cardiovascular risk factors [18]. It has been reported that these risk factors cause 5 fold increase in the risk of CVD [19]. Physiological changes associated with menopause, especially declining estrogen levels have been reported to increase the clinical features comprising metabolic syndrome [20]. Estrogen deficiency also leads to alteration in lipid metabolism. All these factors may contribute to the increased prevalence of chronic diseases such as Hypertension, Type II diabetes mellitus, and dyslipidemia in menopausal women [21].

Our results showed that for the Mumbai cohort, widowed females (61%) and in Karachi cohort divorced females (66%) had the highest prevalence of chronic diseases. Studies have demonstrated that mortality is influenced by marital status. [22] Widowhood was shown to be associated with an elevated risk of death from all causes and cancer. [23] Similarly, a significant relationship is also reported for divorce; and CVD mortality was also significant in divorced women [24]. Marital dissolution such as divorce and widowhood are both associated with elevated mortality risks [25]. Thus menopausal physiological changes in

combination with marital status may contribute to a higher prevalence of chronic diseases.

Our study also showed that graduate females had a lesser prevalence of chronic diseases than females who only had high school education for both Mumbai and Karachi cohort. Similarly, females with higher income in both Mumbai and Karachi cohort had a lesser prevalence of chronic diseases. Lower education, Lower income is associated with increased risk for metabolic diseases [26]. Education and income components coupled with menopausal hormonal changes may impact the prevalence of chronic diseases. On the occupation front for Mumbai cohort, employed females and Karachi cohort, unemployed females showed a higher prevalence of chronic diseases. A sedentary lifestyle is associated with an increased risk of metabolic diseases [26]. The variation seen in results for Mumbai and Karachi cohort may be resultant of the type of work/ employment done by these females, which we did not capture.

It is interesting to note that Mumbai and Karachi were once a part of Bombay presidency, till partition and creation of two independent nations in 1947. There is so much that these 2 cities - Mumbai and Karachi still have it in common like culture, language, and food habits in spite of political differences. Our results did not show any major differences in these two port cities in terms of menopausal age, the prevalence of chronic diseases in general or specific chronic diseases such as Type II diabetes mellitus, or hypertension.

Potential Clinical Implications: Marital status, education, income may have an impact on the prevalence of chronic diseases in postmenopausal women. Chronic diseases not only increase the CVD risk for a post-menopausal woman but also put a lot of pressure on the healthcare system. We feel that governmental and non-governmental organizations, physicians, and regulators need to take steps to increase education among women, offer psychosocial support and increase awareness of the high prevalence of chronic diseases associated with the menopause and their management in postmenopausal women.

Study Limitations: The women were asked to provide some retrospective information such as age at menopause; hence, the recall bias is unavoidable, especially in some older women. We did not question for factors such as alcohol and smoking behavior which might influence the prevalence of chronic diseases.

Study Strengths:

- Population-based study.
- One of the few studies focussing on a population in a non-western country, India.

REFERENCES:

1. Suri V and Suri V: Menopause and oral health. J Midlife Health 2014; 5(3): 115-120.
2. Mahajan N, Aggarwal M and Bagga A: Health issues of menopausal women in North India. J Midlife Health 2012; 3(2): 84-87.
3. Grant M, Marbella A and Wang A: Menopausal Symptoms: Comparative Effectiveness of Therapies. Comparative Effectiveness Review Number 147. (Prepared by Blue Cross and Blue Shield Association Technology Evaluation Center Evidence-based Practice Center under Contract No. 290-2007-10058-I.) AHRQ Publication No. 15-EHC005-EF. Rockville, MD: Agency for Healthcare Research and Quality; 2015.
4. Sapre S and Thakur R: Lifestyle and dietary factors determine the age at natural menopause. J Midlife Health 2014; 5(1): 3-5.
5. Madhukumar S, Gaikwad V and Sudeepa D: A Community based study on perceptions about menopausal symptoms and quality of life of post-menopausal women in Bangalore rural. International Journal of Health Sciences and Research 2012; 2(3): 49-56.
6. Das B, Talukdara T and Ahmed A: Common health issues of menopausal women living in Char area around Fakhruddin Ali Ahmed Medical College and Hospital, Barpeta in North-East India. J Obstet Gynaecol Barpeta 2014, 1(1): 36-40.
7. Jha U: Clinical Practice of Menopausal Medicine: How & Why? In The Third National Revised Consensus Meeting Guidelines of Indian Menopause Society. Elsevier India Healthcare Communications 2008.
8. Rizvi S, Jalil F and Iqbal S: Prevalence of menopause, chronic illnesses and life style of middle-aged women in Karachi, Pakistan. Al Ameen J Med Sci 2012; 5(4): 347-354
9. Avachat S, Deshpande S and Zambare M: Study of orthopedic morbidities among postmenopausal women in a medical college hospital in a rural area of Western Maharashtra, India. Indian Journal of Clinical Practice 2013; 24(6): 574-577.

10. Singh M. Early age of natural menopause in India, a biological marker for early preventive health programs. Climacteric 2012; 15(6): 581-586.

11. Som N and Ray S: Menopause-specific quality of life of urban women in West Bengal, India. Menopause International 2012; 18: 99-105.

12. Deotale M, Ranganathan U and Mankeshwar R: Study of epidemiological features of health problems in perimenopausal and postmenopausal women in an urban community. International Journal of Medicine and Public Health 2015; 5(2): 147-151.

13. Adhi M, Hasan R and Shoaib S: Age and symptomatology of menopause in Karachi, Pakistan. Pak J Physiol 2007; 3(1): 41-44.

14. Rizvi S, Jalil F and Azam S: Prevalence of menopause, chronic illnesses and life style of middle-aged women in Karachi, Pakistan. Al Ameen J Med Sci 2012; 5(4): 347-54.

15. Baig L and Karim S: Age at menopause, and knowledge of and attitudes to menopause, of women in Karachi, Pakistan. J Br Menopause Soc 2006; 12(2): 71-4.

16. Rizk D, Bener A and Ezimokhai M: The age and symptomatology of natural menopause among United Arab Emirates women. Maturitas 1998; 29: 197-202.

17. Singh A, Kaur S and Walia I: A historical perspective on menopause and menopausal age. Bull Indian Inst Hist Med Hyderabad 2002; 32(2): 121-35.

18. Eshtiaghi R, Esteghamati A and Nakhjavani M: Menopause is an independent predictor of metabolic syndrome in Iranian women. Maturitas 2010; 65(3): 262-266.

19. Marroquin O, Kip K and Kelley D: Metabolic syndrome modifies the cardiovascular risk associated with angiographic coronary artery disease in women: a report from the Women's Ischemia Syndrome Evaluation Circulation 2004; 109(6): 714-21.

20. Gohlke B: Coronary artery disease--is menopause a risk factor? Basic Res Cardiol 2000; 95(1): I77-83.

21. Anand S, Islam S and Rosengren A: Risk factors for myocardial infarction in women and men: insights from the Interheart Study. Eur Heart J 2008; 29(7): 932-40.

22. Robles T and Kiecolt-Glaser J: The physiology of marriage: pathways to health. Physiol Behav 2003; 79(3): 409-16.

23. Jin L and Chrisatakis N: Investigating the mechanism of marital mortality reduction: the transition to widowhood and quality of health care. Demography 2009; 46(3): 605-25.

24. Waldron I, Weiss C and Hughes M: Marital status effects on health: are there differences between never-married women and divorced and separated women? Soc Sci Med 1997; 45(9): 1387-97.

25. Va P, Yang W and Nechuta S: Marital status and mortality among middle age and elderly men and women in urban Shanghai. PLoS One 2011; 6(11): e26600.

26. Kim S, Ko Y and Yi G: Role of social determinants and lifestyle on women's metabolic risk during the perimenopausal transition: results from a cohort study. Menopause 2015.