

Onset of natural menopause and factors affecting its development: a study from primary health care centres in Al-Risafa in Baghdad

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ABSTRACT

INTRODUCTION: Menopause is a transition phase from the reproductive to the non-reproductive phase in a woman's life, by knowing factors affecting the age at natural menopause, the women can avoid them in order to prevent the serious health problems that associated with early and late age menopause.

OBJECTIVE: To determine the mean age at natural menopause in a sample of Iraqi women and to study the effect of socio-demographic and reproductive variables on the age at natural menopause.

METHODS: A cross sectional study was conducted in 12 primary health care centres from 6 health districts in Al-Risafa Health Directorate in Baghdad from January 2015 to June 2015. The sample was selected conveniently from women who are more than 40 years and visiting the primary health care centres. Data were collected by a questionnaire prepared for this purpose through direct interview with the enrolled women. The questionnaire has included four parts to collect sociodemographic, reproductive, past medical and habits histories.

RESULTS: This study showed 572 women aged above 40 years 1.4% refuse participation, 37.6% were premenopausal, 8.2% were with pathologic and iatrogenic menopause, and 52.8% were natural menopause, and 74.5% of them were at natural age at menopause while 6.3% of them were premature ovarian failure, 11.6% were early age menopause and 7.6% were late age menopause, with the mean age at natural menopause in this sample was 48.8 ± 6.7 years, and a median of 49.5 years. 75.6% of women's sisters were menopausal at age 45-55 years, 43.2% of diseased women had hypertension disease prior to menopause with maximum 25 years duration, 56.3% of women were married, 90.4% of women were with regular periods, and only 36.1% of women using combined oral contraceptive pills.

CONCLUSION: Majority of women get menopausal naturally at age between 45-55 years. Age at menopause was observed to be affected by sisters' age at menopause and history of hypertension prior to menopause.

Key words: menopause, natural menopause, age at menopause.

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INTRODUCTION

Natural menopause is a normal aging event of the woman's life that defined by menstrual cessation after 12 consecutive months of amenorrhoea due to depletion of ovarian follicles and not due to other medical intervention (e.g. hysterectomy, bilateral oophorectomy, or chemotherapy).^{1,2} The age range of natural menopause is about 45-55 years and an average of 51 years in most countries with some variations from one population to another.^{3,4} The life expectancy has increased worldwide over the past century and most men and women are

now living beyond the age of 80 years in most parts of the world, however the average age of menopause still remains around 50 years, so one third of the total life expectancy is beyond the menopausal age.^{4,5}

Menopause occur in woman below 45 years known as early age menopause associated with high risk of cardiovascular diseases and osteoporosis, and becoming a public health issue as a risk factor for fertility problems as the giving birth age getting closer to the menopausal age, while the late age menopause that occur in woman beyond 55 years associated with high

frequency of breast, ovarian, and endometrial cancer.^{6,7,8} Multiple socio-demographic and reproductive factors affecting age of menopause, such as marital status, economical state, body mass index (BMI) and habits, obstetrical and gynaecological factors, past medical and surgical factors, and drugs, thus understanding of these factors can provide clues for interpreting the mentioned diseases that associated to the early and late age menopause and could, in principle, suggest preventive measures.⁷ This study will determine the mean age of natural menopause in a sample of Iraqi women. And to investigate the effect of some socio-demographic and reproductive variables on the age at natural menopause.

METHODS

Design of the study and setting: A cross sectional study was conducted during the period between the 14th of January 2015 and the 13th of June 2015. Data were collected from 12 primary health care centres (PHC); 2 PHCs from 6 health districts in Al-Risafa Health Directorate in Baghdad. Al-Risafa Health Directorate has 9 health districts in total. The health districts involved in our study are Baghdad Al-Jadeda, Al-Sadr, Al-Ahaab, Al-Adhamia, Al-Risafa, and Al-Baladiat.

Ethical issues: This study has been approved by the scientific and ethical committees for research at Al-Risafa Health Directorate. Aims of the study were explained to all participants and a verbal consent was taken from each participant before being enrolled in the study. Woman who met the inclusion criteria and accepted to participate in the study was interviewed, items of the form were explained to the participants and filled in by the researcher. Privacy of the participants were respected during the collection and analysis of data.

Definition and selection of the cases: We have used a convenient sampling in selecting our sample. We enrolled any women above 40 years attending the PHC during the studied period. Five hundred seventy-two women have fulfilled the inclusion criteria. Eight women were excluded because they refused to participate in the study, so analysis was made on the data of 564 women. Those who have natural menopause were 302 women, 215 women were still menstruating at the time of the study, and 47 women were menopausal due to pathological

or iatrogenic cause. Menopause was defined in our study by menstrual cessation after 12 consecutive months of amenorrhoea due to ovarian follicles depletion and not due to other medical intervention.¹ we considered menopause as being natural if there are no pathological or iatrogenic causes to explain the menopause. Pathological or iatrogenic causes were searched for by good history taking and clinical examination whenever possible.

Inclusion and exclusion criteria: we included Women above 40 years of age fulfilling the definition of menopause. Any woman who is still menstruating after the age of 40, has a history of hysterectomy with or without oophorectomy, bilateral oophorectomy alone for any reasons, and history of chemo or radiotherapy were excluded from this study.

Formulation of the questionnaire form: The questionnaire form was prepared by the researchers themselves based on reviewing the similar studies and revised by consultant obstetricians and gynaecologists. The questionnaire form included 4 parts. The first concentrate on collecting some relevant socio-demographic features. The second part involved questions related to reproductive history. Past medical history and history of habits were taken in the third and fourth parts respectively.

Collection of data: The data were collected by the researcher through direct interview with each woman for about 15 minutes. The questionnaire form was filled in by researcher according the participants answers. It includes socio-demographic information, participants' obstetric and gynaecological history, History of hormonal use, family history of age at menopause, history of diseases preceded menopause, physical activity, and habit history of smoking and coffee consumption. The anthropometric measurements used in this research included weight, height and calculation of body mass index (BMI). Weight was measured by using the electronic scale, to the nearest Kg taken with their clothes but without shoes. Height was measured using a tape measures and headboard, to the nearest centimetre with the woman standing on a flat surface erect against a wall without shoes. The Body Mass Index (BMI) is calculated according to the formula: $BMI = \text{weight (kg)} / (\text{Height in meter})^2$. The WHO classification of BMI used to classify women into underweight $BMI < 18.5$, normal when BMI is 18.5-24.9, overweight when BMI is 25-29.9, and Obese when

BMI is ≥ 30 .⁹ Socio-demographic information includes crowding index to estimate economic level through family size and house room number which is calculated according to the following formula: crowding index = (number of family members - number of children under 10 years of age) / house room number. WHO classify crowding index into normal when it is ≤ 2 , and abnormal when it is > 2 .¹⁰ The habit history of smoking include total smoking exposure estimated according to WHO definition through the pack per year formula: pack/year = (number of cigarette / 20) $\times$ years of active smoking.¹¹

Statistical analysis: Statistical package for social sciences version 20 (SPSS 20) was used for data input and analysis. Continuous variables presented as means and discrete variables presented as numbers and percentages. In this study have two type of variables quantitative and qualitative, with subdivision of some variables into categories, with estimating number, percentage, mean and standard deviation of corresponding age at menopause for each variable category. ANOVA and t-test for two independent samples used to test the significance of the quantitative and qualitative variables on the menopausal age, and significance effect of any variable is considered if p value is less than 0.05. Kaplan Meier survival analysis was used to obtain the cumulative probability of non-occurrence of menopause (survival) with advance in age, and then the cumulative probability of menopause (event) with advance in age was extrapolated by subtracting the cumulative survival from one.

RESULTS

In our sample, the number of women who has natural menopause was 302 (52 %). (see Figure 1). The mean of age at menopause is 48.8 ± 6.7 year, with a range of 26-61 years. Majority of women 225 (74.5%) had a menopause at age between 45-55 years. (See Figure 2)

Table 1 shows relation of some personal socio-demographic variables on age of menopause. Table 2 shows effect of marriage related characteristics on age at menopause. While table 3 shows some obstetric and gynaecologic variables on age at menopause. All variables in the above tables were shown no statistical significance on age at menopause.

Table 4 shows the age of mother's and sis-

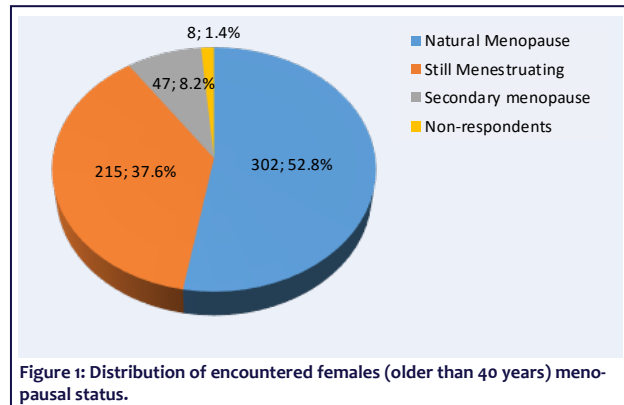


Figure 1: Distribution of encountered females (older than 40 years) menopausal status.

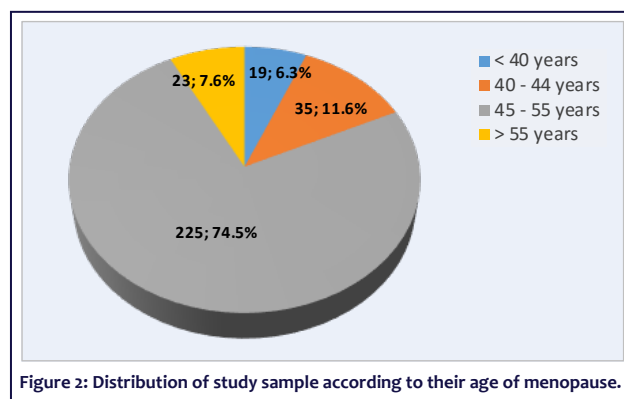


Figure 2: Distribution of study sample according to their age of menopause.

ters' age at menopause. Only 78 women have recalled the age at menopause for their sisters, other have not due to variety of reasons. Age of sister at menopause was statistically significant effect the age of the participants at menopause, p value 0.047. Age of mother at menopause did not show the same effect at age of participants at menopause p value 0.310.

Participants' history of hormonal use has shown no effect on age at menopause with p values > 0.05 , see Table 5. Presence of chronic medical illness; diabetes, cardiac disease, hypothyroidism, osteoarthritis, asthma, and rheumatoid arthritis have shown no relation to the age at menopause for participants apart from hypertension, p value 0.006. (Table 6)

Habits history like physical activity and coffee consumption show no effect on age at menopause (Table 7). The same was true for smoking and its related variables, see table 8.

Table 9 shows the Cumulative Proportion of developing menopause at each age. We can see that 7 women were menopausal at age of 35 years and 33 women get menopausal at age 45.

Table 1: Socio-demographic (personal) variables.

Variable	N	%	Mean±SD (MP)	P
Primary Health Centres				
Baghdad Aljadeda District	50	16.6	49.0±5.0	0.231
Sadr District	59	19.5	47.7±5.2	
Shaab District	49	16.2	48.2±6.1	
Adhamia District	48	15.9	48.6±4.8	
Resafa District	45	14.9	47.0±6.3	
Baladiat District	51	16.9	49.9±5.4	
Total	302	100		
Occupation				
Governmental employee	54	17.9	47.6±5.6	0.103
Non-governmental employee	4	1.3	43.8±9.4	
Housewife	214	70.9	48.5±5.6	
Retired	30	9.9	49.9±3.8	
Total	302	100		
Education				
Illiterate	123	40.7	48.9±5.6	0.354
Primary school	72	23.8	47.3±5.8	
Secondary school	50	16.6	48.9±5.4	
Diploma/Bachelor	54	17.9	48.4±5.0	
Higher than Bachelor	3	1.0	46.3±4.2	
Total	302	100		
Crowding Index				
≤ 2	218	72.2	48.5±5.4	0.670
> 2	84	27.8	48.2±5.9	
Total	302	100		
BMI				
Underweight	4	1.3	47.5±2.1	0.602
Normal weight	52	17.2	49.0±5.4	
Overweight	118	39.1	47.9±5.5	
Obese	128	42.4	48.6±5.6	
Total	302	100		

Table 2: Socio-demographic (marriage related) variables.

Variable	N	%	Mean±SD(MP)	P
Marital Status				
Single	12	4.0	46.8±5.6	0.070
Married	170	56.3	48.4±5.0	
Divorced	11	3.6	44.7±6.0	
Widow	109	36.1	49.0±6.1	
Total	302	100		
Age at first marriage				
< 20 y	143	49.3	48.1±5.9	0.212
20-24 y	70	24.1	48.0±5.4	
25-29 y	49	16.9	49.7±5.2	
> 30 y	28	9.7	49.4±3.8	
Total	290	100		
Husband's occupation				
Governmental employee	87	30.0	47.6±6.1	0.220
Non-governmental employee	63	21.7	48.3±5.6	
Unemployed	52	18.0	49.6±5.7	
Retired	88	30.3	48.7±4.6	
Total	290	100		
Husband's education				
Illiterate	68	23.4	49.3±4.9	0.286
Primary school	86	29.7	48.0±6.0	
Secondary school	49	16.9	47.7±6.0	
Diploma/Bachelor	73	25.2	48.4±5.4	
Higher than Bachelor	14	4.8	50.5±4.0	
Total	290	100		

DISCUSSION

The total study sample was 572 women aged above 40 years from Baghdad with 1.4 % of women refused to participate in the study, 37.6% were premenopausal women, 52.8 % were natural postmenopausal women, and 8.2 % were postmenopausal women due to pathological or iatrogenic causes. Zeena Adnan Kadhum from Iraq in 2005¹² has shown nearly a similar result in her sample of women between 45-55 years. She has 33.5% premenopausal women and 66.5% postmenopausal women. Greer et al from KSA in 2003¹³ has also shown that 44% were premenopausal women, 50.4% were natural postmeno-

pausal women and 5.6% were postmenopausal women due to pathologic or iatrogenic causes. Our results are in contrast with that of Dhia Al-Deen et al from Baghdad in 2009³ on a sample of women aged 46-57 years and Gold et al from USA in 2013¹⁴ on a sample of women aged 40-55 years. Both have reported that the majority of women in their sample were premenopausal and the minority were postmenopausal. This differences can be explained on the fact that they limit their target up to age of 55-57 years only.

Mean age at menopause in our sample was 48.8±6.7 years which is consistent with Salih et al from Iraq in 2012¹⁵ and Greer et al from KSA in 2003¹³ both have a mean age at menopause of 48.9 years. Mustafa GN et al from Erbil in Iraq in 2012¹⁶ founded the mean age at menopause as 47.4 years, and it was reported as 47.3±3.2 in the UAE.¹⁷ Studies from Iran¹⁸ and Japan¹⁹ have reported age at menopause of 52.5 and 51.5 years respectively. This variation may be explained by

Table 3: Variables of obstetric and gynaecologic history.

Variable	N	%	Mean±SD(MP)	P
Age at menarche				
10 th -11 th year	38	12.6	48.3±5.4	0.225
12 th -13 th year	178	58.9	48.5±5.8	
14 th -15 th year	65	21.5	47.5±4.9	
16 th -18 th year	21	7.0	50.3±4.3	
Total	302	100		
Gravida				
0	12	4.1	48.3±6.5	0.959
1-4	75	25.9	48.3±5.6	
> 4	203	70.0	48.5±5.4	
Total	290	100		
Parity				
0	17	6.0	48.4±5.8	0.486
1-4	97	33.4	47.9±5.8	
> 4	176	60.6	48.8±5.3	
Total	290	100		
Abortion				
0	143	49.3	48.8±5.8	0.532
≥ 1	147	50.7	48.3±5.1	
Total	290	100		
Age at first live birth				
< 20 year	132	48.4	48.1±5.9	0.143
20-24 year	66	24.2	48.0±5.4	
25-29 year	52	19.0	50.0±4.8	
> 30 year	23	8.4	48.8±4.8	
Total	273	100		
Age at last pregnancy				
< 20 year	4	1.4	46.5±4.4	0.718
20-35 year	132	47.5	48.3±5.8	
> 35 year	142	51.1	48.6±5.2	
Total	278	100		
Regularity of periods				
Regular	273	90.4	48.2±5.5	0.086
Irregular	29	9.6	50.1±5.7	
Total	302	100		

Table 4: Obstetric and gynaecologic variables include participant's family history of menopausal age.

Variable	N	%	Mean±SD, MP	P
Mother's age at menopause				
< 40 year	4	5.0	43.3±8.3	0.310
40-44 year	14	17.7	47.9±6.2	
45-55 year	54	68.4	48.5±5.1	
> 55 year	7	8.9	46.6±7.5	
Total	79	100		
Sisters' age at menopause				
< 40 year	2	2.6	41.5±4.9	0.047
40-44 year	14	18.0	46.9±5.4	
45-55 year	59	75.6	49.4±4.4	
> 55 year	3	3.8	49.0±5.3	
Total	78	100		

Table 5: Obstetric and gynaecologic variables include participants' history of hormonal use.

Variable	N	100%	Mean±SD	P
COC use				
Used	109	36.1	47.6±5.6	0.053
Not used	193	63.9	48.9±5.4	
Total	302	100		
Duration of using COCP				
≤ 1 year	28	25.7	46.1±6.9	0.480
2-4 years	40	36.7	47.5±5.6	
4-6 years	17	15.6	49.7±5.6	
6-8 years	5	4.6	48.2±1.9	
8-10 years	2	1.8	47.5±0.7	
> 10 years	17	15.6	48.0±3.7	
Total	109	100		
DMPA use				
Used	43	14.2	47.2±6.0	0.134
Not used	259	85.8	48.6±5.4	
Total	302	100		
Duration of using DMPA				
≤ 1 year	20	46.5	47.7±5.9	0.887
2 years	14	32.6	46.2±6.1	
3 years	4	9.3	47.8±7.9	
> 3 years	5	11.6	48.2±5.3	
Total	43	100		
Hormonal therapy use				
Used	37	12.3	47.9±4.7	0.553
Not used	265	87.7	48.5±5.6	
Total	302	100		
Duration of Hormonal therapy use (y)				
(Min-Max=1-4, Mean±SD=1.8±1.3)	37	100	47.9±4.7	0.932
Total	37	100		

Table (6): History of diseases preceded menopause.

Variable	N/111*	%**	Min-Max	Mean±SD	P
Hypertension	48	43.2	6-25	50.8±4.1	0.006
Diabetes	29	26.1	3-25	48.7±6.0	0.149
Cardiac disease	23	20.7	3-10	52.0±5.0	0.327
Hypothyroidism	32	28.8	1-24	48.4±4.0	0.094
Osteoarthritis	12	10.8	1-20	53.7±4.7	0.517
Asthma	3	2.7	17-30	50.0±2.0	0.333
Rheumatoid Arthritis	3	2.7	3-7	45.3±8.6	0.774

* Total number resemble number of diseased women, 39 of 111 women have more than one disease.
 ** The percent of the disease among diseased women.

racial and geographical factors.

The median of age of women with natural menopause was 49.5 years. Mustafa GN et al,¹⁶ Rizk DE et al,¹⁷ Reynolds RF et al from Lebanon,²⁰ Shakhathreh et al from Jordan,²¹ and Greer

Table 7: Effect of physical activity and coffee consumption on age at menopause.

Variable	N	%	Mean±SD	P
Time daily spent in exercise				
None	255	84.4	48.5±5.6	0.571
Up to 1 hour	20	6.6	46.8±6.0	
1-2 hour	16	5.3	48.6±3.8	
> 2 hour	11	3.7	49.3±5.0	
Total	302	100		
Coffee consumed(cups/day)				
0	264	87.4	48.2±5.5	0.163
1-4	37	12.3	49.8±5.2	
> 4	1	0.3	53.0± --	
Total	302	100		

et al from KSA¹³ have reported a median age at menopause ranging from 48-50 years. Alfredo Morabia, et al in 1998 described median age at menopause in eight countries (Australia, Chile, Columbia, Mexico, Philippines, China, Thailand and Kenya), to be varied from 49 to 52 years, and the three western countries exhibited median values of 50 years.²²

In our study, 6.3 % of women had menopause before age of 40 years i.e. premature ovarian failure, 11.6 % at age 40-44 years i.e. early age natural menopause, 74.5 % at age 45-55 years i.e. natural age of menopause, and 7.6 % at age > 55 years i.e. late age natural menopause. Mustafa GN et al¹⁶ founded nearly the same results; at age < 40 years were 4.4%, age < 45 years were 23.6%, age 45-55 years were 71.6%, and age > 55 years were 0.4%. In a study from Sweden and Denmark in 1997²³ menopause at age < 40 years were 1.2%, age 40-45 years were 6.5%, age 46-51 years were 47%, and age > 51 years were 45.3%. A study from Turkey in 2004²⁴ has shown that 35.9 % of women are menopausal before age of 46 years and 46.1 after that. Cedars et al²⁵ founded 1 % below age of 40 years, 10 % prior to age of 46 years and approximately 90 % of women experienced menopause during the early 50s of age. Variation in mean, median, and distribution of age at menopause among studies from around the world may be due to selection of sample or due to real difference in age at menopause in different countries due to genetic and environmental causes. Our sample is nearly homogenous with regards to racial and geographical factors as it is collected from an urban area in Baghdad in the centre of Iraq.

Effect of some socioeconomic:

Table 8: Effect of smoking variables on age at menopause

Variable	N	%	Mean±SD	P
Smoking history				
Never	269	89.1	48.4±5.5	0.969
Ex-smoker	13	4.3	48.5±6.7	
Current smoker	20	6.6	48.1±5.3	
Total	302	100		
Smoking initiation				
Before menopause	28	84.8	48.3±5.9	0.856
After menopause	5	15.2	47.8±5.7	
Total	33	100		
Age at starting smoking, (Min-Max=10-54, Mean±SD=29.3±13.5)				
< 20 years	11	39.3	46.6±6.8	0.232
≥ 20 years	17	60.7	49.4±5.2	
Total	28	100		
Cigarettes/day (Min-Max=1-80, Mean±SD=17.1±16.9)				
≤ 10	14	50.0	49.5±5.5	0.301
> 10	14	50.0	47.1±6.3	
Total	28	100		
Years of active smoking(y) (Min-Max=1-55, Mean±SD=24.0±17.2)			48.3±5.9	0.769
Total	28	100		
Total Smoking Exposure (Packs/year) (Min-Max=0.1-176.0 Mean±SD=26.0±38.5)			48.3±5.9	0.955
Total	28	100		
Quitting smoking prior to menopause				
Yes	5	38.5	49.2±6.7	0.767
No	8	61.5	48.0±7.0	
Total	13	100		
Duration of quitting smoking before menopause(y) (Min-Max=4-23, Mean±SD=14.4±8.2)				
≤ 10 years	2	40.0	54.0±1.4	0.237
> 10 years	3	60.0	46.0±7.2	
Total	5	100		
Passive smoking				
Yes	195	64.6	48.5±5.4	0.671
No	107	35.4	48.2±5.7	
Total	302	100		

Different studies have mentioned that occupation and level of education of the women which were studied and her husband can be used as parameters for the measurement of socio-economic status. Our study has shown that participant's occupation has no effect on age at menopause, though the majority women of our sample were housewives, 70.9 %. This result is consistent to that of Delavar and Hajiahmadi from Iran in 2011.⁴ But it is in contrast to that of Remez from USA in 2001²⁶ in his cross sectional study where he stated that being unemployed is

Table 9: Survival table illustrating the cumulative probability of each menopause and still menstruating at each year of age.

Age years	Number of Cumulative Events	Number of Remaining Cases	Cumulative Proportion developing event at the age	
			Surviving Estimate	Menopause Estimate
35	7	295	0.977	0.023
36	10	292	0.967	0.033
38	16	286	0.947	0.053
39	19	283	0.937	0.063
40	32	270	0.894	0.106
41	36	266	0.881	0.119
42	42	260	0.861	0.139
43	48	254	0.841	0.159
44	54	248	0.821	0.179
45	87	215	0.712	0.288
46	99	203	0.672	0.328
47	118	184	0.609	0.391
48	144	158	0.523	0.477
49	161	141	0.467	0.533
50	196	106	0.351	0.649
51	211	91	0.301	0.699
52	232	70	0.232	0.768
53	249	53	0.175	0.825
54	264	38	0.126	0.874
55	279	23	0.076	0.924
56	291	11	0.036	0.964
57	294	8	0.026	0.974
58	295	7	0.023	0.977
59	298	4	0.013	0.987
60	300	2	0.007	0.993
61	302	0	0.000	1.000

associated with menopause at earlier age. Also our study has shown that level of participant's education has no effect on age at menopause, and the majority of women in our sample were illiterate, 40.7%. The same results were reported by Mustafa et al from Erbil¹⁶ and Alka Kriplani²⁷ from India. However, Paola et al from Mexico in 2006²⁸ and OyaÖzdemir et al from Turkey in 2004²⁴ have shown that women with less education would get menopause at earlier age that more educated one.

We have also used the crowding index as an additional measure of socio-economic status. Majority of our sample, 72.2%, were within normal crowding index, but they didn't show any statistical significance on age at menopause.

Majority of women in our sample were

obese (42.4%); however, BMI has no statistical significance on age at menopause. This result is consistent with that of Nagel et al from Ireland in 2005,²⁹ although the majority of women enrolled in his sample were of normal weight. Akahoshi et al from Nagasaki in 2002³⁰ has reported that the greater the BMI is, the more likely to have a menopause at a later age. It is obvious that higher BMI in our sample is due to the unhealthy diet, lack of physical activity, and negative attitude towards physical fitness that may characterize our community.

Nearly half of the women participated in the study were married, and about half of them were married at age of < 20 years. However, neither the marital status nor age at which a woman has got married has any effect on age at menopause. This figure is similar to that from a neighbor country like Iran⁴ but in contrast to that from USA³¹ which stated that formerly married women i.e. being widow, divorced, or separated were more likely to have early menopause.

Our study has shown that neither the occupation of the participant's husband nor his level of education affects the age at menopause. Thirty percent of the participants' husbands were retired and 30 % of them have a primary school level of education. This result is different from another study from Baghdad conducted in 2009³ in which the authors have found that occupation of a woman's husband and his level of education has a statistically significant effect on the age at menopause.

The effect of age of menarche on age at menopause is studied by many investigators. Whelan et al from USA in 1990³² has shown that menarche in majority of women occurs at age of 12-14 years and it does not affect age at menopause. While Farhmand et al from Iran in 2013³³ has shown that the late age at menarche causing late age at menopause. We found that 58.9 % of women participated in our study have started menstruation at age of 12-13 years and age of menarche is not a good predictor for age at menopause.

About two thirds of women participated in our study had > 4 pregnancies and > 4 deliveries and about half of them have experienced at least one abortion in their fertile life; however, none of these variables were associated with a statistically significant effect on age at menopause. Parazzini et al from Italy in 1992⁷

has shown another result as he stated that nulliparous women have reported an earlier age at menopause in comparison to the parous ones and the larger of the number of birth is, the later the age at menopause would be. With regard to number of spontaneous abortion, Parazzini has shown that it has statistically nonsignificant effect on age at menopause.

About half of women in our sample had the first live birth at age < 20 years, and nearly half had the last pregnancy at age of 20-35 years and neither age of women at the first live birth nor the age at the last pregnancy have a statistically significant effect on age at menopause. Some studies^{29,34} have reached to similar results; however, Whelan et al³² has shown that women who had a first birth at age of 30 years or older had a slightly earlier menopause than other women with majority of women had first birth at age < 30 year.

We did not find a statistically significant effect for regularity of the menstrual periods on the age at menopause although more than 90 % of women participated in the study were having regular periods. MeltemÇöl from Ankara²⁴ has reached to a similar result, but Whelan in USA³² has shown that woman who has a short period would have a menopause at an earlier age than woman who has a longer one.

Effect of genetics on age at menopause has gained good attention in the literature, we found a statistically significant relation between age at menopause of a woman and age at menopause of her sister. When a woman get menopause at early age, her sister will be more prone to have early menopause as well, and the vice versa. This relation was surprisingly not true for the participants' mothers age at menopause. MeltemÇöl²⁴ has stated that age at menopause for a woman goes parallel with the age at menopause for both her mother and sister. These results could be explained by the fact that genetic factor may has an effect to determine the age at menopause for a woman.

It may be intuitive to say that hormonal contraception can affect the menstruation and age at menopause. In our study about one third of women have used combined oral contraceptive pills (COCP) and only 12 % have used injectable hormonal contraception like Depot medroxy-progesterone acetate (DMPA) with a majority of them have used hormonal contraception for more than a year. Prior use of hormonal contra-

ception has not shown, in our study, to affect the age at menopause, the finding which was also shown by MeltemÇöl;²⁴ however, Gold et al from USA in 2001³¹ has stated that OCP was associated with earlier age at menopause but duration of use of OCP has shown no effect on age at menopause. It's worth mentioning that the minority of Gold's sample have used OCP and most of them for a period of less than a year.

We tried to study the effect of 7 chronic diseases, separately or in combination, that started during the fertility life on age at menopause. We found that the longer the duration of hypertension a woman has before the menopause, the later the age at menopause would be and the vice versa. Presence of diabetes mellitus, cardiac diseases, hypothyroidism, osteoarthritis, asthma, and rheumatoid arthritis have shown no such effect. Salih et al from Erbil¹⁵ has reached to a similar result. Mcknight, et al from USA in 2011³⁵ has shown that women who have CVD would have early menopausal age than those who have not, while Gold, et al¹⁴ has demonstrated that diabetes mellitus had an effect on age at menopause.

In consistent with cultural behaviour of Iraqi women, our study has shown that 84.4 % of participant have no physical activity. Also we found that physical activity has no effect on determining age at menopause. A study from the western countries²⁹ has come up with similar result in 2005, but the author has also reported that the majority of women in his sample had no physical activity. Another study from the USA¹⁴ has stated that the greater the physical activity is the earlier the age at menopause would be.

This study shown no effect of coffee consumption on age at menopause with the majority of women 87.4% had no coffee consumption. Literature has shown a contradictory result when it comes to measure the effect of consumption of coffee on age at menopause. Kinney² from the USA has reported that consumption of coffee does not affect age at menopause, while Gold³⁶ from also the USA has shown that coffee is significantly associated with earlier natural menopause. We could not study the effect of alcohol on age at menopause in our sample because all the participants have no history of alcohol consumption and this is in consistent with the Islamic attitude of an eastern country like Iraq in which alcohol consumption by women is not only religiously forbidden but also socially unacceptable.

In our study, we discovered that history of smoking, its severity, age at start, duration and total exposure (see table 8) have shown statistically nonsignificant effect on age at menopause with a majority of women were never smoked, starting smoking at age ≥ 20 years with maximum smoking duration of 55 year and maximum total smoking exposure of 176 pack/year. Mustafa GN¹⁶ agrees that smoking does not affect the age at menopause. Parazzini et al⁷ has shown that number of cigarettes a woman smokes a day would not affect the age at menopause. But many studies have come to a different result; Kinney,² for example, has shown that being a current smoker means earlier age at menopause. Rebecca Hardy³⁷ has also reached to a conclusion that smoker women present with earlier age at menopause with a majority of her sample were ex smoker; in addition, Gold³⁶ found that the effect of smoking on age at menopause is even related to the severity of smoking; the more the number of cigarette a woman smokes the earlier the age at menopause would be. Mikkelsen⁸ has even calculated that the total smoking exposure at highest doses was related to early menopause, with the majority starting smoking at age < 20 years. In this study, about one third of smoking women quitted before menopause, and 60 % of them have done it for more than 10 years; nevertheless, quitting of smoking and its duration had no effect on age at menopause. This result was inconsistent with Mikkelsen⁸ who shows that quitting of smoking for more than 10 years before menopause associated with decrease risk of early menopause, with the majority of women quitting smoking < 10 years before age of menopause. Also we could not find that being a passive smoker has any effect on age at menopause, the note that also shown by Mikkelsen,⁸ however, other study¹⁴ has shown the reverse. The variation in percentages of women who smoke in Iraq than in other western countries can be explained on a cultural base where Iraqi community refuses the idea of smoking by women so low rate of smoking among Iraqi women can be either a real low rate or reluctance of Iraqi women to disclose her real smoking habit.

Survival function of age at menopause is to arrange in accumulative way the number of women who became menopause in each age. The table is organized from minimum age at menopause to the maximum table 9. We found that the majority of women became menopause at 45-55 years, only 7 women menopaused at

age less than 35 years while only 2 continue menstruation after age of 60 years.

CONCLUSIONS

It has been shown in our study that the majority of women get menopaused naturally at age of 45-55 years. Age of a woman's sister at menopause and her having hypertension are the only factors that have a statistically significant effect for her age at menopause. Age of a women's mother at menopause, use of hormonal contraception, and physical activity have not shown a statistically significant effect on age at menopause.

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Abbreviation list: Analysis of variance (ANOVA), Body Mass Index (BMI), Cerebrovascular disease (CVD), Combined oral contraceptive pill (COC), Depot medroxyprogesterone acetate (DMPA), Kingdom of Saudi Arabia (KSA), Number (N), Minimum minus maximum (Min-Max), Oral contraceptive pill (OCP), Primary Health Care Centres (PHC), Standard Deviation (SD), Statistical Package for Social Sciences version 20 (SPSS 20), United Arab Emirate (UAE), United State of America (USA), World Health Organization (WHO)

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