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ORIGINAL STUDY

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Age of Menopause Among Women in Mosul City, Iraq

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Abstract

Background: Low women's awareness of their health during the menopausal period is creating a global hidden problem that affects women's quality of life and their related families and communities.

Objectives: The aim of this study was to find changes in the menopausal age after wartime conflict and assess women's knowledge of their health during this critical period. A mixed-method design was adopted. A mixed approach of a multistage cross-sectional study with a sample of 382 women aged ≥ 60 years attending primary health care centers in Mosul, Iraq, was included, supported by private in-depth qualitative interviews with 14 women. Proper statistical analysis was conducted. The findings show the mean menopause age among participants was 48.28 ± 5.33 years; early and late menopause were detected in 6.3% and 29.3%, respectively. The analysis of the age of menopause dependent variable by different independent variables using multiple linear regression shows a significant decrease in the age of menopause among those nulliparous or single women, smokers, subject to stress, and living in middle or low economic status, p-value is < 0.05. Higher parity, higher education, and rural or suburban residence significantly increase the age of menopause among women in a variable range. The majority of women (75.1%) possessed poor knowledge about how to manage their symptoms during menopause, which was simultaneously consolidated by their qualitative expressions. The study indicates that a higher percentage of women experiencing menopause at an unusual age could be a post-conflict effect. This, accompanied by gab of knowledge regarding how to alleviate menopausal symptoms, indicates serious health deterioration which calls for community-based educational programs directed at community strata involved, including health policymakers.

Keywords: Menopause, Women's health, Sexual problems, Hormonal changes, Menstruation, Quality of life

1. Introduction

Menopause is defined as the cessation of menstruation for one year or more with no obvious underlying factors. It is a natural biological mechanism that usually occurs in the late 40s or early 50s worldwide. Menopause timing is determined when the ovaries stop releasing eggs, leading to the loss of ovarian follicular function [1].

This process can occur early or late in a woman's life, depending on different factors. During this process, women are susceptible to many hormonal changes that may affect their health, quality of life, and influence health outcomes [2]. Several factors contribute to configuring this critical period, including social status, occupation, parity, obesity, and the presence of concomitant diseases [3–5]. The effect of these factors on the timing of menopause is not constant, as each factor can influence different processes in different ways due to the presence of concomitant variables [6, 7]. Stress that women are subjected to every day of their lives may be one of the factors that may exert excess influence on women's menopause [8]. In Nineveh governorate, and especially Mosul city, women apparently have been subjected to a lot of stress during recurrent war, ISIS invasion, and migration, which renders women with different types of grieving due to loss of their beloved husband, sons, fathers, or other family

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members or friends, loss of their possessions and properties, or due to force of migration or violation they subjected, although yet couldn't be measured by standardized perceived Stress Scale [9]. This crisis was followed by the COVID-19 pandemic era, which exacerbated their loss [10].

Hot flashes, arthritis, insomnia or sleep disturbance, mood changes, lack of sexual desire, dryness of the vagina, obesity, hypertension, or other chronic diseases are common symptoms that accompany this stage in life. Sexual health in particular is frequently underappreciated due to its possible impact on general well-being and marital life [11]. Premenopausal symptoms can last for a long period, and the absence of the necessary knowledge of ways to overcome menopausal symptoms may lead to years of discomfort without knowing the real causes [12]. Research suggests that age at natural menopause varies across populations [13]. No previous research assesses women's knowledge of how to improve their lives during this period. Recently updated data regarding menopausal age among Iraqi women, addressing confounding factors affecting this period, and knowledge of women on how to deal with it, are not available. We aim to address the common menopausal age of women in the current post-conflict era and to determine the level of knowledge of women about how to cope with symptoms accompanying this period in the city of Mosul, Iraq.

2. Materials and methods

This cross-sectional study is a quantitative part of the research took place in the center of Nineveh Governorate, Northern Iraq. A researcher explained the research purpose and protocol to all participants at the primary healthcare centers (PHCC) at the beginning of the study, from 5th January 2025–11th May 2025. The study utilized voluntary participation and received written consent for their approval before filling out the questionnaire through face-to-face interviews. The selection of the sample follows a multistage sampling technique to ensure appropriate representation of different community strata. Mosul was divided geographically into the west and east banks of the Tigris River. In the second sampling phase, Nineveh Street further divides each bank transversely. Consequently, northeast, southeast, northwest, and southwest represent the four main city subsets. These four zones were selected to reflect variations in socioeconomic status, as some PHCCs are located in high-income neighborhoods, while others serve low-income urban, suburban, and rural areas. The selection of each PHCC followed the probability proportional to size. The list of the PHCCs for each zone was arranged according to their catchment population. The larger units were included to ensure representation of the overall population.

The last stage involved systematic random selection at the PHCC level to recruit participants after confirming their eligibility and informed consent; every third attendant was recruited. A total of 382 women aged 60 years and above who reported a history of natural menopause and agreed to participate were included, despite the presence of recall bias being unavoidable. Exclusion criteria included women who had a history of medical or surgical induction of menopause. The total sample size was estimated according to the cross-sectional study equation [14].

The target population was estimated based on demographic data and the census. the total population of Mosul city (2000000), women aged >60 years represented by 3.1% of the general public [15], and the selected PHCCs' average attendance rate (17.5%) was included. This yields the following: (2,000,000 × 0.031 × 0.175 = 10,850) target population.

By applying the equation of cross-sectional study;

$$n = Z2 \times P \times \frac{1 - P}{d2} \ldots\ldots [14]$$

- Z = 1.96 (for 95% confidence level)
- P = 0.5 (maximum variability)
- d = 0.05 (margin of error)

and applying the finite population correction as the target population < 100000, the final population size needed is 374 participants. Expert professors review the content validity of the questionnaire items' relevance to the research aim. The questionnaire included questions on sociodemographic factors, experience with stressors in life, parity, smoking and menopausal symptoms which were evaluated by the Menopausal Rating Scale (MRS) [16]. In addition, participants' knowledge regarding strategies to alleviate menopausal symptoms were determined using a 10-item scale. These questions were: "Do you know what HRT is?" "What is the most common use for HRT?" "Would you advise HRT for managing the symptoms of menopause?" "Do you know that there are risks associated with HRT?" "Did you ask your doctor for HRT?" Do you exercise at least once a week?" "Do you realize that supplements are important in menopause?" "DP: You do exercises to keep your brain healthy, right? "Did you know yoga is helpful for menopause?" and "Are you aware of the risks associated with bone fractures after menopause?"

The responses were assessed according to a three-point Likert scale ('Yes', 'No', 'Maybe'). For scoring, "I know" was scored 1 and included as positive, while "I do not know /"Maybe" were regarded as negatives (scored 0). Therefore, each participant had a total knowledge score between 0 and 10.

The collected scores for knowledge were subdivided into three groups: low (1–4), moderate (5–7), and high (8–10). The Chi-square test was used for data analysis in order to evaluate the relationship between calculated knowledge level, along with the educational levels of the participants, which was considered an important factor. Further, multivariate linear regression was done to determine the impact of possible confounders on age at menopause. All analyses were performed by SPSS version 26.

2.1. Qualitative methods

A qualitative methodology was used to gain insights into women's experiences of menopausal symptoms. A question: How they describe the most bothersome symptoms during menopause was designed in semi-structured interviews to obtain narrative answers. The participants were selected purposively from a private clinic to ensure more privacy and freedom to speak. Fourteen women with diverse social strata were included in the study. Data were collected until the point of saturation (the phase at which no new or substantially new responses occurred. Informed consent was obtained from all participants before the interviews. For privacy reasons, all personal identification has been deleted. The interviews were recorded in writing, and efforts were made to reflect the words of the interviewees as faithfully as possible. An analysis of the written narratives was conducted. A 'category' was developed when 2 or more codes had something in common, and through repeated comparison of the categories, broader patterns were generated to describe shared experiences of participants. Data analysis continued until saturation was reached and a full understanding of the data was achieved.

3. Results

The results show that most of the 382 participants (44.7%) reached menopause between 46 and 50 years of age (Table 1). The mean age of menopause onset was 48.28 ± 5.33 (SD)years, with a median of 48.5 years and a mode value of 50 years. Early menopause at the age of 40 years and below was reported for 6.28% of the participants, and 29.32% of the participants indicated that their menopause started after 50 years.

Table 1. The distribution of study participants according to their age at menopause.

Age Group (years)	Frequency	Percent (%)
≤20	1	0.26%
21–25	2	0.52%
26–30	1	0.26%
30–35	3	0.79%
36–40	17	4.45%
41–45	67	17.54%
46–50	179	46.86%
51–55	82	21.47%
56–60	30	7.85%
Total	382	100

Table 2. Sociodemographic characteristics of the study sample at the time of data collection (N = 342).

Characteristic	Category	Frequency (n)	Percent (%)
Age Group (years)	60–64	120	31.4
	65–69	98	25.6
	≥70	70	18.3
Marital Status	Married	280	73.3
	Widow	45	11.8
	Single	20	5.2
	Divorced	37	9.7
Residence	Urban	140	36.6
	Suburban	120	31.4
	Rural	122	32.0
Socioeconomic Status	Low	100	26.2
	Middle	180	47.1
	High	102	26.7
Education Level	University or higher	102	26.7
	Secondary	110	28.8
	Primary	90	23.6
	Illiterate	80	20.9
Employment Status	Employed/Retired	145	38.0
	Housewife	237	62.0
Smoking Status	Smoker	115	30.1
	Non-smoker	267	69.9
Parity (number of children)	0	15	3.9%
	1–2	80	20.9%
	3–5	160	41.9%
	>5	127	33.2%

Table 2 shows that the majority of the participants were married (73.3%), and 30.1% of the study sample were smokers, and (62%) of them were housewives. Only 27% had higher education.

The analysis of the age of menopause dependent variable by different independent variables using multiple linear regression shows a significant decrease in the age of menopause among those nulliparous or single women, smokers, subject to stress, and living in middle or low economic status, p-value is < 0.05. Higher parity, higher education, and rural or suburban residence significantly increase the age of menopause among women in a variable range (Table 3).

Table 4 shows that the commonest symptoms of menopause that the participants were complaining of

Table 3. Multiple linear regression analysis for predictors of age at menopause (n = 382).

Variable	B Coefficient	Std. Error	p-value	95% CI for B
Parity (ref: 1–2 children)				
0 children	–1.12	0.48	0.020	–2.07 to –0.17
3–5 children	+0.82	0.28	0.004	0.27 to 1.37
>5 children	+1.26	0.34	0.001	0.59 to 1.93
Education level (years)	+0.12	0.04	0.006	0.04 to 0.20
Smoking (yes)	–0.65	0.26	0.010	–1.16 to –0.14
History of stress (yes)	–0.58	0.21	0.007	–1.00 to –0.16
Economic status (ref: High)				
Middle	–0.38	0.19	0.045	–0.75 to –0.01
Low	–0.61	0.23	0.008	–1.06 to –0.16
Marital status (single vs others)	–0.54	0.23	0.022	–1.00 to –0.08
Residence (ref: Urban)				
Suburban	+0.30	0.21	0.150	–0.11 to 0.71
Rural	+0.79	0.22	0.001	0.35 to 1.23
Employment Status (ref: Housewife)				
Employed/Retired	+0.45	0.25	0.072	–0.04 to 0.94

Table 4. Frequency distribution of menopausal symptoms among study participants (N = 342).

Symptom	Number of participants (%)
Hot flashes	250 (73.1%)
Vaginal dryness	210 (61.4%)
Urinary incontinence	190 (55.6%)
Sexual problems (low libido, discomfort)	175 (51.2%)
Muscle weakness	160 (46.8%)
Bone pain	155 (45.3%)
Sleep disorders (insomnia, restless sleep)	140 (40.9%)
Mood changes (anxiety, irritability, depression)	110 (32.2%)
Amnesia (memory problems, forgetfulness)	95 (27.8%)
Heart discomfort (palpitations, chest pressure)	70 (20.5%)
No symptoms	11 (3.2%)

were hot flashes, vaginal dryness, and urinary incontinence, as they were presented in 73.1%, 61.4%, and 55.6%, respectively. Only a few participants (3.2%) did not experience any symptoms, as shown in Table 4.

The answers of the women to the questions related to health care and knowledge of methods for alleviating symptoms appear in Table 5, indicating that the percentages of participants who supplied positive answers to all 10 questions were low. All questions related to the benefits, uses, and risks of HRT were poorly answered. The answers to questions related to other methods (physical activities, yoga, brain exercises, and supplements) also indicated limited use or knowledge.

After the scores were collected for each individual, the distribution of the participants was presented in (Fig. 1), which demonstrated that high knowledge (8–10) was present in only 4.4%.

Table 6 shows that a comparison of the three levels of knowledge: low (1–4), moderate (5–7), and high (8–10) after score collection to the level of participants' education using chi-square found an association

Table 5. Responses of the study participants regarding methods for alleviating menopausal symptoms.

Question	Positive responses (%)	Negative responses (%)
Do you know what Hormone Replacement Therapy (HRT) is?	93 (27.2%)	249 (72.8%)
What is HRT primarily used for?	76 (22.2%)	266 (77.7%)
Do you think HRT is effective in managing menopausal symptoms?	57 (16.6%)	285 (83.3%)
Are you aware that HRT has potential risks?	45 (13.1%)	297 (86.8%)
Did you ask your doctor about HRT?	80 (23.4%)	262 (76.6%)
Do you perform physical activity regularly?	90 (26.3%)	252 (73.7%)
Do you know that supplements are important during menopause?	130 (38.0%)	212 (62.0%)
Do you perform brain exercises to maintain brain health?	75 (21.9%)	267 (78.1%)
Do you know that yoga is useful during menopause?	19 (5.5%)	323 (94.4.0%)
Do you know the risk of bone fractures after menopause?	77 (22.5%)	265 (77.5%)

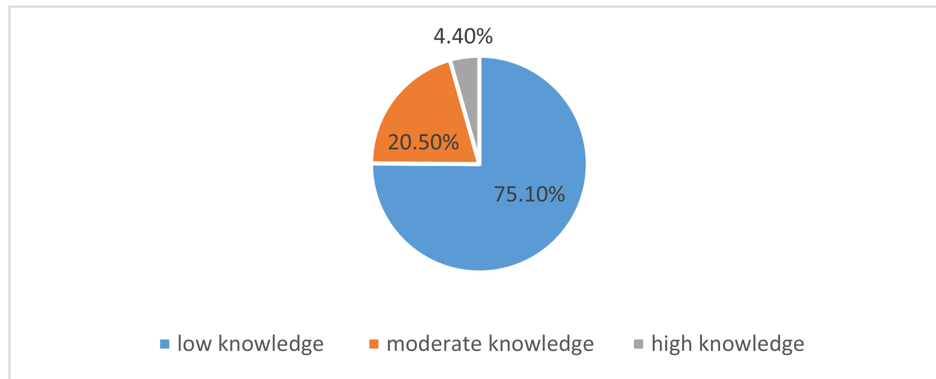

Fig. 1. Level of knowledge of how to alleviate menopausal symptoms among participants.

Table 6. Knowledge level by education level using.

Education Level	Low (1–4)	Moderate (5–7)	High (8–10)	Total
Illiterate	72 (90.0%)	8 (10.0%)	0 (0.0%)	80
Primary	69 (76.7%)	18 (20.0%)	3 (3.3%)	90
Secondary	84 (76.4%)	23 (20.9%)	3 (2.7%)	110
University or Higher	62 (60.8%)	29 (28.4%)	11 (10.8%)	102
Total	287(75.1%)	78 (20.5%)	17 (4.4%)	382

Chi-square test: $\chi^2 \approx 18.7$, df = 6, p ≈ 0.004.

between them, where overall p ≈ 0.004, as higher education attainment among participants seems to have high knowledge scores. Besides, the analysis of knowledge score 1–10 among 4 education levels using Kruskal–Wallis Statistic shows a significant difference (Kruskal–Wallis H = 17.82, df = 3, p = 0.001), indicating the knowledge level increases with the increase in education.

Significant association of knowledge levels to the education level using chi-square after

3.1. Qualitative results

Participants' narratives were analyzed into Emerging Themes.

3.2. Menopausal symptoms

"Hot flushes feel like fire burning inside my body (Participant 1, rural, 61 years)

"My bones ache all night long," I cannot sleep, and don't know why." (Participant 4, housewife, 61 years), (Participant 7, housewife, 56 years).

"I was extremely irritable during the years of menopause, and they lasted for five years. I had irregular cycles with heavy bleeding, and I was anemic, and nothing helped, even with supplements, until my period finally ceased. Although I was grateful for the cessation of the cycle, I still suffered continuous bone pain, incontinence, and I still have a low sex drive and painful intercourse." (Participant 9, educated, 63 years).

"I always suffer from forgetting things, like amnesia, with sleep disorder, whatever I try, I still forget simple things, and this brings me much trouble" (Participant 2, urban, housewife, 63 years)

3.3. Physical discomfort during intercourse and loss of sexual desire

"For my husband, he still wants to have sex, but for me, I think it has become like a duty and not a pleasure" (Participant 3, rural, 61 years)

"I've never been able to orgasm, and I had no idea how to improve this situation?" (Participant 8, housewife, 59 years)

"It's very painful due to the dryness . . . I avoid intimacy because it burns." (Participant 6, housewife, 63 years)

"Sometimes I'm ashamed to discuss it with my husband, so sometimes I pretend to have pleasure because he said that 'I am Cold." (Participant 5, employed, 69 years)

"I have this severe itchy vagina, which is accompanied by urinary incontinence that troubles me a lot. I went to a bunch of doctors, and they all said there is no infection, but nobody told me why. I don't know why, still to this day it still happens." (Participant 7, urban, 64 years)

3.4. Adaptation and coping

"Over time, because of a lot of stress and tiredness, chronic disease, both my husband and I adapted to these changes" (Participant 10, educated, 61 years)

"I began praying more and being with family rather than worrying about physical things." (Participant 11, urban, 72 years)

"Everything was normal for me. My period was just done, and I felt so relieved." (Participant 14, rural, 66 years)

3.5. Need for support and information

"No doctor ever said to me take it month by month, week by week. I felt like something was wrong with me, I was angry all the time with no reason" (Participant 13, rural, 66 years)

"If there was counseling, women wouldn't feel as much shame talking about these changes." (Participant 12, employed, 62 years)

4. Discussion

The current study showed that the mean age of menopause was 48.28 ± 5.33 (SD). years, which is within the reported range found in other studies, but with a relatively wider standard deviation, indicating variable changes of menopausal age among the current population [17, 18]. Interestingly, a substantial proportion of the participants (29%) underwent menopause after 50 years of age (21.1% and 8.5% in the age groups of 51–55 and 56–60 years, respectively). On the other hand, early menopause at the age of 40 and below was reported in 6.2% of the participants. Although uncommon, early-onset menopause may trigger severe exhaustion in women, affecting their fertility status, marital status, or quality of daily life [19]. Menopause has recently been referred to as "the age of hope" in certain Arab regions [20]. This sensitive subject affects a wide range of women at different stages of their lives and may lead to the development of multiple mild or severe health symptoms. Irrespective of the intensity, symptoms may affect women's quality of life during perimenopause, menopause, and post-menopause and can last for many years [21]. Factors influencing the onset of menopause were analyzed using multiple linear regression analysis. These factors show a significant decrease in the age of menopause among those nulliparous or single women, being smokers, subjected to stress, and living in middle or low economic status, p-value is < 0.05. Higher parity, higher education, and rural or suburban residence significantly increase the age of menopause. The effect of these factors has been examined in other studies [22]. Chronic stress has been demonstrated to physiologically alter the hypothalamic-pituitary-ovarian axis, which speeds up follicular depletion and causes ovarian function to stop earlier [23–25] Similarly, the transient ovarian suppression that occurs during pregnancy and lactation is not present in nulliparous women lead her ovaries to age more quickly [26]. Early menopause has also been linked to low socioeconomic status, which is frequently accompanied by lower educational attainment, less access to healthcare, and nutritional deficiencies, which could affect the quality of ovarian function [27, 28]. Smoking is one factor that is associated with menstrual changes [29]. On the other hand, higher education is associated with delayed menopause, which could be related to better socioeconomic status, better nutrition [30]. In the current study, the analysis shows delayed menopause among rural and suburban women compared to urban women. This effect has been studied and has led to many controversial results depending on the local factors [30, 31]. Rural influence that reports higher parity than urban population may exert similar high parity and longer lactation after their pregnancies, which leads to preservation of ovarian stores and delays their menopause. However, the influence of genetic predisposition, in combination with environmental factors and autoimmune diseases, body mass index requires further studies.

Several symptoms were encountered among most participants, who reported hot flashes, vaginal dryness, urinary incontinence, sexual problems, muscle weakness, bone pain, and sleep disorders. Mood changes and amnesia were less common, while heart discomfort was rarely reported. Some studies have reported variable symptoms across a wide range of frequencies, depending on the area and time of data collection [18, 32].

Age-associated pelvic floor muscle atrophy and loss of collagen in the connective tissue, as a result of decreasing estrogen production in women, probably contribute to successively higher rates of urge and stress incontinence and the prevalence of genitourinary syndrome of menopause (GSM) [33, 34]. These changes lead to worsening sexual function with advancing menopause status, including frequently reported symptoms such as low sexual desire, poor lubrication, and dyspareunia. Low-dose vaginal oestrogen can help alleviate genitourinary problems and sexual discomfort [35].

Some of the symptoms related to estrogen depletion can be managed or decreased using HRT, which contains estrogen [36]. The effectiveness of estrogen

or its derivatives in relieving mood-related symptoms with or without hot flashes has been evaluated in several studies [37–39]. The effectiveness of estrogen in managing other symptoms and parameters among postmenopausal women has been investigated in a prospective cohort study by Shaban and Dizaye, who found significant alleviation of symptoms related to hot flashes, night sweat, and vaginal dryness and improved clinical parameters related to the lipid profile, blood pressure, and body mass index [36]. The presence of estrogen in the body has a significant effect on bone health and formation [40]. Low physical activity and a sedentary lifestyle with limited workplace facilities encouraging exercise lead to enhanced bone degradation and a low adrenaline push, which affects metabolism and induces the development of multiple diseases associated with obesity or other chronic diseases [41].

The qualitative results consolidate the quantitative data, as most participants' expressions indicate the suffering, especially in sexual problems and hot flush. Complaints of ignorance on how to deal with this situation have been recorded. Low knowledge was encountered from their answers, similar to the score obtained in this study.

Research indicates that human beings must be active and engaged in terms of cognitive function and productivity to ensure healthy living and enhance their quality of life [42]. Walking, yoga, healthy eating, and brain exercises are all methods documented to protect against diseases of aging [43].

Unsatisfactory answers to HRT-related questions were supplied by most participants. Similarly, the rate of positive answers regarding knowledge of alternative methods for alleviating symptoms of menopause was extremely low, with 75% of the participants exhibiting low knowledge. Although 26.7 % of the participants had completed higher education or above, they exhibited higher knowledge regarding symptoms' alleviation in only 4.4% of all participants. This level of knowledge indicates the absence of relevant programs in the community and the presence of gaps in education among the female population, despite their educational attainment. Despite the knowledge revolution globally and the availability of internet access. Furthermore, the data on the educational level among participants show that about half of the participants (23.6%, 20.9%) were illiterate or had received primary education, respectively, which is a particularly limiting factor in increasing female knowledge about their health, added to the lack of educational programs. Data up to 2025 show that some families pull their daughters out of primary or low intermediate schools; the dropout rate is estimated at 20% of the respective age group compared to 6.8% among the male age group population, according to the recent census in Iraq (November 2024). This indicates that illiteracy among the young generation is still not eradicated, contributing to increasing negative experiences among women who do not know how to overcome the perceived symptoms during these transitional periods that can last for 1–many years. This, in turn, will affect their quality of life. During the years from the age of menopause onward, women could experience substantial deterioration in their quality of life with little intervention.

4.1. Strengths and limitations

This study addresses the age of menopause and assesses women's knowledge of their health in the menopausal period. A mixed-method, multistage design with narrative expression allowed for a more comprehensive and realistic understanding of menopausal.

Unavoidable recall bias cannot be excluded from data collection as the age of participants was 60 years and older and this may affect the recall of the exact time of their menopause. The financial and human resources constraint limit the data collection from different national or international areas for a more in-depth description of regional data.

5. Conclusion

The mean age of menopause among the study cohort was 48.28 ± 5.33 (SD). years. Most participants didn't know how to alleviate post-menopausal symptoms that accompany this period and affect them, indicating a major gap in their knowledge. Higher education seemed to have a significant effect on their knowledge. More attention should be directed toward implementing community programs that increase women's health Knowledge regardless of their education level.

Conflict of interest

The author declares no conflict of interest.

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Author contribution

The corresponding author has started the research idea, sought ethical approval, collected and analyzed the data, and drafted the manuscript. The final version and changes according to the journal requirement were also done by the corresponding author, who final version for submission.

Ethical approval

This study was approved by the "Medical Research Ethics Committee" at the College of Medicine, University of Mosul (Approval number: UOM/COM/MREC/24-25/DEC8). All procedures adhered to the ethical standards of both institutional and national research committees, together with the 1964 Helsinki Declaration and its post-amendment updates.

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