AMERICAN RESEARCH JOURNALS
An Academic Publishing House

Research Article   **Open Access**

Knowledge and Attitude of Women and Nurses regarding Pre-Conception Care: A Comparative Study

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Abstract

Background: Despite the established importance of preconception care (PCC), it is still not a well-established service in many countries, and women's and nurses' related knowledge and attitudes need to be assessed.

Aim of the study: To compare the knowledge and attitude of married women and nurses regarding pre-conception care.

Subjects and methods: This comparative cross-sectional study was carried out on a stratified cluster sample of 106 nurses and 750 women from Maternal and Child Health (MCH) and Primary Health Care (PHC) centers at Minia city. The data collection tools were a self-administered questionnaire measuring nurse's awareness, knowledge, and attitudes related to PCC, and a similar interview questionnaire sheet for women. The tools were validated by experts' opinions and pilot-tested. Data collection lasted from June to November 2017.

Results: The majority of the nurses had a diploma (97.2%), 72.6% had training in antenatal care, and 60.4% provided PCC. Women's age ranged between 17 and 48 years, and 39.5% had an intermediate education. Nurses' awareness was higher than women (p<0.001). They had higher knowledge scores in most areas and in total knowledge (p<0.001), but women were higher in vaccination (p=0.001). The attitude towards planning for pregnancy was higher among nurses (p<0.001). In multivariate analysis nurses' higher qualification, longer experience years, and provision of PCC were positive predictors of their knowledge, while age and urban residence were negative predictors. Higher qualification and provision of PCC were positive predictors of nurses' attitude score, whereas urban residence was a negative predictor. Women's knowledge was positively predicted by their education, previous pre-term labor, planning pregnancy, having antenatal care, having PCC, and previous counseling, while labor complications and chronic diseases were negative predictors. Their attitude was positively predicted by urban residence, planning pregnancy, having antenatal care, previous counseling, and knowledge score, while education was a negative predictor.

Conclusion and recommendations: Nurses' knowledge and awareness of PCC is better compared to women, and both have hesitant attitudes. The study indicates the need for the urgent establishment of a formal PCC in PHC and MCH centers.

Keywords: Knowledge, Attitude, Nurses, Pre-Conception Care

INTRODUCTION

Preconception care (PCC) is a service provided to women planning the pregnancy to ensure having a healthy child [1]. In contrast, the antenatal care is provided during pregnancy, but both are integral parts of women reproductive health [2]. The PCC involves health promotive, preventive and curative interventions covering the physical, social, and psychological aspects of woman's life [3-5]. It may also involve genetic counseling and interventions [6, 5]. The PCC got increasing importance with the World Health Organization Global Action Plan for the Prevention and Control of Non-Communicable Diseases 2013-2020 [7].

There is mounting evidence that PCC could have an essential role in preventing both short and long-term adverse maternal and fetal outcomes of pregnancy [8]. Risk factors for poor outcomes of pregnancy include deficient nutrition with low folic acid intake, obesity, chronic diseases, and unhealthy habits [9-11]. It is anticipated that proper PCC can contribute to reductions in maternal mortality and morbidity worldwide and in particular in developing countries. Examples are the potentials of reducing the risk of neural tube defects through folic acid supplementation three months before conception, as well as the mitigation of the risks associated with smoking, alcohol and other drug consumptions, and occupational hazards [12-16].

Despite the established importance of PCC, it is still not a well-established service in many countries, especially the low-income ones. Moreover, research demonstrated that women's, as well as health care providers' knowledge and practice of PCC, is poor in developing countries [17-20]. This was also demonstrated in developed countries such as the Netherlands [21], although a good PCC program was established in China since 2010 [22]. Knowledge of PCC could be gained by education, training, or experience [23].

SIGNIFICANCE OF THE STUDY

Births resulting from unintended pregnancies are often associated with untoward health outcomes. Hence, the care provided to women should better be before a child is conceived, in order to prevent any birth defects and other adverse outcomes. There are no formal PCC in the local settings, and the related services might be provided during consultations for contraception and follow-up for chronic diseases. Thus, it is expected that the women, as well as the nurses in the study settings, have deficient knowledge and attitudes towards PCC. Moreover, there is a need to investigate the factors affecting such knowledge and attitude in order to set corrective actions.

AIM OF THE STUDY

The study was conducted to compare the knowledge and attitude of married women and nurses regarding pre-conception care.

RESEARCH HYPOTHESIS

It was hypothesized that nurses' scores of knowledge and attitudes will be higher compared to women's scores.

SUBJECTS AND METHODS

Research Design and Setting

A comparative cross-sectional design was used in carrying out this study at the Maternal and Child Health (MCH) and Primary Health Care (PHC) centers at Minia city.

Subjects

The study included two groups of respondents, namely nurses working in the settings and married women attending the settings for vaccination of their infants through the first year of age. Minia city has a total of 19 MCH centers and 309 PHC centers. A stratified cluster sample of these centers was randomly selected. The two

strata were the MCH and PHC centers, and the centers represented clusters. Then, from each selected center, one or more nurse with at least six-month experience in the service was recruited. The total numbers of nurses were 33 from MCH centers and 73 from PHC centers. Similarly, from each selected center around ten adults married women with at least one previous pregnancy and delivery. Their numbers were 150 from MCH centers and 600 from PHC centers.

The sample size was calculated to demonstrate any difference of statistical significance between nurses and women's knowledge or attitude with a risk ratio 0.75, expecting a level of 60% or higher among nurses, at 95% level of confidence and 80% study power. Using the Open-Epi software package for the sample size of a difference between two proportions, and setting a sample ratio of nurses to women at 1-to-7, the required sample size after adjusting for a non-response rate of about 5%, the required samples were 106 nurses and 750 women.

Data collection tools

The researchers used two different tools for data collection, one for nurses and the other for women.

Nurses' tool

This consisted of a self-administered questionnaire in Arabic language to assess nurse's awareness, knowledge, and attitudes related to preconception care. It started with a section for personal characteristics as age, marital status, nursing qualification, experience years, residence, training in preconception care, etc. It also included questions about previous personal experience with preconception care and the provision of this service at work.

The second part assessed nurse's awareness of the elements of preconception care. It consisted of 10 elements such as talking with the doctor about pregnancy, medication advice, exercise, etc. The score of total awareness was computed by simple summation of the elements the respondent was aware of. The score was converted into a percent score, and means, standard deviations, and medians were calculated for quantitative statistical analysis.

The third part was intended to assess nurse's knowledge of preconception care. It involved 36 True/False questions covering different aspects of preconception care such as its benefits, services/ elements, risk factors, nutrition, vaccination, as well as chronic and infectious diseases during pregnancy. For scoring, each knowledge item with the correct answer was scored one and the incorrect zero. The scores of the items for each area were summed-up and the total divided by the number of items, giving a mean score for the area. These scores were converted into percent scores, and means, standard deviations, and medians were calculated for quantitative statistical analysis.

The fourth part was an attitude towards pre-conception care. It consisted of 17 positive and negative statements covering areas of pre-conception care as "*Preconception care has no impact on pregnancy outcomes,*" planning for pregnancy such as "*Planning for pregnancy is a priority for me,*" and pre-conception care services such as "*PHC centers are the best settings to provide preconception care.*" The response for each statement is on a 3-point Likert scale from "agree" to "disagree." These were scored from one to three. The scoring was reversed for negative statements so that a higher score indicates more positive attitude. The scores of the statements for each area were summed-up and the total divided by the number of statements, giving a mean score for the area. These scores were converted into percent scores, and means, standard deviations, and medians were calculated for quantitative statistical analysis.

Women's tool

This consisted of an interview questionnaire sheet in Arabic language to assess women's awareness, knowledge, and attitudes related to preconception care. It had a section for woman's personal characteristics as age, marital status, education, job, residence, as well as a full obstetric history and previous use of preconception care. The second part was exactly similar to the corresponding part of the nurses' questionnaire, with the same scoring system. The third part assessed women's knowledge of preconception care through 24 True/False questions covering the same areas as in the nurses' form, and the scoring was similar to it. The fourth part was an attitude scale consisting of 12 positive and negative statements covering the same areas of pre-conception care as in the nurses' tool, and it had the same scoring system.

Validity and Reliability of Tools

The two tools were reviewed by a panel of three experts in women health and obstetric nursing to examine their face and content validity. Modification of the content and rephrasing of some statements were done according to their recommendations. The reliability of the attitude scales was examined through assessing their internal consistency, and they showed a good level of reliability as shown by their Cronbach alpha coefficients.

Pilot Study

A pilot study was conducted on approximately 10% of the samples of nurses and women to test the clarity and applicability of the data collection tools, and to determine the time required to fill them. The data collection forms were finalized based on the pilot results.

Ethical Considerations

The researchers obtained required ethical and administrative approvals to conduct the study. The aim and process of the study were explained to each potential participant nurse and woman, and their oral informed consent was obtained before any data collection. They were informed about their rights to refuse or withdraw from the study at any time. They were reassured about the confidentiality of any obtained information. Professional help was provided to women when needed.

Fieldwork

Permission to conduct the study was obtained from the directors of MCH and PHC centers. The researchers first met with the nurses individually and handed the data collection tool to those who gave their consent, along with instructions on how to fill it. It took each nurse approximately 45 minutes to be complete the form. Then, around twelve women were recruited from the center, and they were interviewed using the corresponding form after giving their consent. The woman's privacy was respected during the interview, which took 25-35 minutes. The data collection period lasted for six months from June to November 2017.

Statistical Analysis

Data entry and statistical analysis were done using SPSS 20.0 statistical software package. Data were presented using descriptive statistics in the form of frequencies and percentages for qualitative variables, and means and standard deviations and medians for quantitative variables. Cronbach alpha coefficient was calculated to assess the reliability of the scales through their internal consistency. Quantitative continuous data were compared using the non-parametric Mann-Whitney test. Qualitative categorical variables were compared using chi-square test. In order to identify the independent predictors of the knowledge and attitude scores, multiple linear regression analysis was used, and analysis of variance for the full regression models done. Statistical significance was considered at p-value <0.05.

RESULTS

The study sample of nurses included 106 female nurses whose age ranged between 21 and 59 years, mostly diploma degree nurses (97.2%), with median experience 20 years as illustrated in Table 1. The majorities of these nurses were married (89.6%), had a previous pregnancy (80.2%), and of this 90.6% had antenatal care. More than two-thirds of them (72.6%) had attended training in antenatal care, and 60.4% provided pre-conception care at their Primary Health Care (PHC) centers.

Table1. *Personal characteristics of nurses in the study sample (n=106)*

	Frequency	Percent
Age:		
<40	70	66.0
40+	36	34.0
Range	21.0-59.0	
Mean ± SD	38.1±8.6	
Median	37.0	
Marital status:		
Single	11	10.4
Married	95	89.6
Nursing qualification:		
Diploma	103	97.2
Bachelor	3	2.8
Experience years:		
<20	13	12.3
20+	93	87.7
Range	<1.0 - 40.0	
Mean ± SD	18.1±8.8	
Median	19.0	
Residence:		
Rural	73	68.9
Urban	33	31.1
Had training in:		
Pre-conception care	43	40.6
Antenatal care	77	72.6
Had previous pregnancy	85	80.2
Got pre-conception care	47	55.3
Got antenatal care	77	90.6
Provides pre-conception at center	64	60.4

Table 2 shows that the age of the married women in the study sample ranged between 17 and 48 years, with about two-fifth having an intermediate level education (39.5%). The majority of them were unemployed (85.1%), living in rural areas (80.3%), and having sufficient income (67.5%).

Table2. *Socio-demographic characteristics of women in the study sample (n=750)*

	Frequency	Percent
Age:		
<25	221	29.5
25-	243	32.4
30	158	21.1
35+	128	17.1
Range	17.0-48.0	
Mean ± SD	28.1±5.7	
Median	27.0	
Education:		
Illiterate	138	18.4
Read/write	121	16.1
Basic	73	9.7
Intermediate	296	39.5
University	122	16.3
Job status:		
Unemployed	638	85.1
Working	112	14.9
Residence:		
Rural	602	80.3
Urban	148	19.7
Income:		
Insufficient	244	32.5
Sufficient	506	67.5

As presented in Table 3, most women in the study sample were gravida 2-4 (63.6%), and para 2-4 (64.4%), and more than one-fourth of them had previous abortions (28.5%), while only 4.9% had previous pre-term labor. The majority of the women reported using contraception (78.7%) and having an antenatal care in current pregnancy (86.8%). Although around two-fifths of the women had previous pre-conception care (41.2%) and counseling (43.1%), a majority (70.1%) were interested in pre-conception care.

Table3. *Obstetric and medical history of women in the study sample (n=750)*

	Frequency	Percent
Gravidity:		
1	133	17.7
2-4	477	63.6
5	140	18.7
Parity:		
1	173	23.1
2-4	483	64.4
5	94	12.5
Abortions:		
0	536	71.5
1+	214	28.5
Preterm labor:		
0	713	95.1
1+	37	4.9
Had cesarean delivery	410	54.7
Had previous labor complications	431	57.5
Use contraception	590	78.7
Plan pregnancy	387	51.6
Current pregnancy:		
Had antenatal care	651	86.8
Had pregnancy complications	349	46.5
Took medications	580	77.3
Pre-conception care:		
Had pre-conception care	309	41.2
Had pre-conception counseling	323	43.1
Interested in pre-conception care	526	70.1
Have chronic diseases	179	23.9
Had previous surgery	207	27.6

Table 4 points to generally low awareness of women about the elements of pre-conception care. This was prominent regarding the elements related to work hazards, chronic diseases, exercise, and vaccination, which were known by only less than one-third of them. Meanwhile, nurses' awareness was generally high, except for the elements of exercise and vaccination. The table demonstrates that the nurses' awareness was higher compared with women in all elements, with statistically significant differences (p<0.001). The only exceptions were related to the elements of talking to the doctor about pregnancy and having advice on medications, which were high in both groups.

Table4. *Comparison of awareness of pre-conception care elements among nurses and women*

Pre-conception elements	Group				X^2 test	p-value
	Women (n=750)		Nurses (n=106)			
	No.	%	No.	%		
Talking with doctor about pregnancy	597	79.6	90	84.9	1.65	0.20
Medication advices	558	74.4	84	79.2	1.16	0.28
Nutritional regimen	480	64.0	84	79.2	9.60	0.002*
Vitamins/Folic acid	419	55.9	84	79.2	20.95	< 0.001*
Genital infections testing	351	46.8	75	70.8	21.32	< 0.001*
Family history	289	38.5	76	71.7	41.77	< 0.001*
Work hazards	237	31.6	67	63.2	40.51	< 0.001*
Chronic diseases	206	27.5	73	68.9	72.46	< 0.001*
Exercise	203	27.1	62	58.5	42.91	< 0.001*
Vaccination	151	20.1	51	48.1	40.33	< 0.001*

(*) Statistically significant at p<0.05

Table 5 indicates higher scores of knowledge of pre-conception care among nurses compared to women in the areas of chronic diseases (0.008), infectious diseases (p<0.001), and service/elements (p<0.001). Conversely, women knowledge scores were higher in vaccination (p=0.001). However, the total knowledge score was higher among nurses (p<0.001). Similarly, they had a higher total awareness score (p<0.001). As regards the attitude, only the attitude towards planning for pregnancy had a significantly higher score among nurses compared with women (p<0.001). Although the total attitude score tended to be higher among nurses, the difference did not reach statistical significance (p=0.08).

Table5. *Comparison of scores of knowledge, awareness, and attitude towards pre-conception among nurses and women*

Scores of:	Scores (max=100)				Mann Whitney Test	p-value
	Women (n=750)		Nurses (n=106)			
	Mean ± SD	Median	Mean ± SD	Median		
Knowledge:						
Benefits	70.5 ± 34.5	100.00	81.6 ± 18.6	88.90	1.13	0.29
Chronic diseases	81.1 ± 24.7	100.00	86.5 ± 25.5	100.00	7.10	0.008*
Infectious diseases	62.1 ± 30.4	66.70	75.0 ± 36.7	100.00	20.94	< 0.001*
Nutrition	47.6 ± 23.3	50.00	43.7 ± 23.2	33.30	1.73	0.19
Services/elements	53.0 ± 31.3	66.70	65.7 ± 23.2	80.00	19.21	< 0.001*
Risk factors	69.0 ± 22.9	72.70	70.4 ± 14.1	72.70	1.19	0.27
Vaccination	44.3 ± 23.3	33.30	35.2 ± 31.5	33.30	11.48	0.001*
Total knowledge	61.6 ± 13.0	62.50	75.8 ± 9.3	77.80	105.11	< 0.001*
Awareness of elements	47.0 ± 22.0	40.0	70.4 ± 30.1	80.00	231.30	< 0.001*
Attitude:						
Pre-conception care	73.2±24.3	66.70	69.3±27.1	66.70	1.45	0.23
Planning for pregnancy	57.6±19.3	58.30	67.2±17.2	66.70	23.62	< 0.001*
Pre-conception care services	53.4±22.1	50.00	55.2±24.2	50.00	0.02	0.88
Total attitude	60.4±13.6	62.50	63.0±15.8	64.70	3.07	0.08

(*) Statistically significant at p<0.05

In multivariate analysis (Table 6), nurses' higher qualification, longer experience years, and provision of pre-conception care were identified as statistically significant independent positive predictors of their knowledge score, while their age and urban residence were negative predictors. The model explains 26% of the variation in the knowledge score. The table also illustrates that nurses' higher qualification and provision of pre-conception care were statistically significant independent positive predictors of their attitude score, whereas their urban residence was a negative predictor. The model also explains 26% of the variation in the attitude score.

Table6. *Best fitting multiple linear regression model for nurses' knowledge and attitude scores*

	Unstandardized Coefficients		Standardized Coefficients	t-test	p-value	95% Confidence Interval for B	
	B	Std. Error				Lower	Upper
Knowledge score							
Constant	89.29	6.62		13.484	<0.001	76.11	102.47
Age	- 0.75	0.30	- 0.69	2.473	0.016	-1.35	- 0.15
Qualification	13.82	5.57	0.24	2.482	0.015	2.74	24.91
Experience	0.78	0.30	0.70	2.544	0.013	0.17	1.38
Urban residence	- 4.11	1.90	- 0.21	2.166	0.033	-7.89	- 0.33
Provides PC service	8.11	1.78	0.44	4.545	<0.001	4.56	11.66
r-square = 0.26			*Model ANOVA: F = 6.91, p = 0.001*				
Variables entered and excluded: marital status, training courses, previous pre-conception care and related opinion							
Attitude score							
Constant	51.35	9.18		5.597	< 0.001	33.09	69.61
Qualification	30.85	10.06	0.30	3.067	0.003	10.84	50.87
Urban residence	- 9.34	3.35	-0.27	2.790	0.007	-16.00	- 2.68
Had previous PC care	9.39	3.05	0.29	3.075	0.003	3.31	15.47
r-square = 0.26			*Model ANOVA: F = 8.24, p < 0.001*				
Variables entered and excluded: age, marital status, experience, training courses, provides PC service							

Concerning women's knowledge score, multivariate analysis in Table 7 demonstrates that their education level, previous pre-term labor, planning pregnancy, having antenatal care, having pre-conception care, and previous counseling were its statistically significant independent positive predictors. On the other hand, the history of labor complications and chronic diseases were negative predictors. The model explains 25% of the variation in the knowledge score. As regards women's attitude score, the table indicates that their urban residence, planning pregnancy, having antenatal care, having previous counseling, in addition to the knowledge score were its statistically significant independent positive predictors. Conversely, their education level was a negative predictor. The model explains 32% of the variation in the attitude score.

Table7. *Best fitting multiple linear regression model for women's knowledge and attitude scores*

	Unstandardized Coefficients		Standardized Coefficients	t-test	p-value	95% Confidence Interval for B	
	B	Std. Error				Lower	Upper
Knowledge score							
Constant	41.54	2.23		18.638	< 0.001	37.17	45.92
Education	0.95	0.32	0.10	2.968	0.003	0.32	1.58
Previous preterm	3.52	1.53	0.07	2.299	0.022	0.51	6.52
Labor complications	- 2.98	0.86	- 0.11	3.442	0.001	- 4.67	-1.28
Plan pregnancy	3.80	0.94	0.15	4.040	< 0.001	1.95	5.65
Has antenatal care	3.17	1.34	0.08	2.367	0.018	0.54	5.79
Previous pre-conception care	2.48	0.96	0.09	2.592	0.010	0.60	4.36
Previous counseling	3.27	0.94	0.12	3.467	0.001	1.42	5.12
Chronic diseases	- 2.14	1.03	- 0.07	-2.076	0.038	- 4.16	- 0.12
r-square=0.25 Model ANOVA: F=26.56, p=0.001 *Variables entered and excluded: age, residence, job, income, gravidity, abortions, pregnancy complications,*							
Attitude score							
Constant	28.08	2.42		11.607	<0.001	23.33	32.83
Education	-0.84	0.31	-0.09	2.684	0.007	-1.46	-0.23
Urban residence	2.29	1.03	0.07	2.223	0.027	0.27	4.32
Plan pregnancy	6.59	0.90	0.24	7.305	<0.001	4.82	8.37
Previous counseling	2.80	0.88	0.10	3.171	0.002	1.07	4.53
Knowledge score	0.34	0.04	0.33	9.652	<0.001	0.27	0.41
r-square=0.32 Model ANOVA: F=62.74, p=0.001 *Variables entered and excluded: age, job, income, gravidity, abortions, pregnancy complications, previous pre-conception care, antenatal care, preterm delivery, labor complications, chronic diseases*							

DISCUSSION

The results of the present study indicate that the knowledge of pre-conception care and the awareness of its elements is discrepant between nurses and married women, with these latter having lower scores of both. Meanwhile, the attitudes seem to be ambivalent with no overall significant difference between women and nurses.

According to the present study findings, the majority of the nurses and women considered talking to the doctor about pregnancy and having advice on medications as the main elements of pre-conception care. This reflects a common misconception about this service since the pre-conception care is not just the physician's role, but it encompasses other areas and other specialties, particularly nursing and midwifery.

Conversely, the awareness of vaccination as an essential element of pre-conception care was found to be low among both the nurses and the women in the current study. It came at the bottom rank of awareness among the two groups. The finding is worrisome since it overlooks the role of vaccination before pregnancy, and limits

its role only to the vaccines provided to women during their pregnancy. A similarly low level of awareness of vaccination before conception was revealed by *Ordinioha & Brisibe* in Nigeria [24]. Thus, even in developed countries such as the United States, the vaccination coverage rate of Tetanus, diphtheria and acellular pertussis is low among pregnant women [25].

Similarly, the awareness of the nurses and women in the present study about exercise as an important element of pre-conception care was low. This was particularly evident among women. This reflects a generally deficient societal look at physical activity as a part of a healthy lifestyle that affects health in general, and pregnancy and its outcomes in particular. In line with this, *Ribeiro and Milanez*, in Brazil, found that only approximately one-fifth of the studied women engaged in an adequate exercise, defined as at least three times per week. The lack of adequate exercising was attributed to lack of time and feeling of tiredness [26].

The present study has also revealed that women's awareness about work hazards and chronic diseases as elements of pre-conception care was low and significantly lower compared with the nurses. The low awareness of the work hazards night is attributed to that the great majority of these women are housewives and unemployed. Meanwhile, their low awareness of the importance of chronic diseases that may affect pregnancy, and their importance as a pre-conception care element could be attributed to the low prevalence of chronic diseases in this group of women given their mostly young age. The findings are in congruence with those of *Zhou et al* in China, and *Teng & Ahmed* in Canada were a majority of the respondent women had low awareness of preconception care [27-28].

Concerning the knowledge of pre-conception care, the current study findings revealed generally acceptable scores for both women, median scores exceeding 62%, and nurses, median scores exceeding 77%. For both, the scores of knowledge were high regarding the benefits of pre-conception care. Nonetheless, a striking finding was that women' knowledge of vaccination in pre-conception care was significantly higher compared with nurses' knowledge. This is an alarming result that necessitates urgent interventions to improve nurses' related knowledge. In agreement with this, *(Bayrami et al)* reported that midwives' knowledge of preconception care was moderate [29]. Moreover, a study in Brazil demonstrated that the knowledge of the healthcare providers about pre-conception care, particularly regarding nutrition and folic acid supplementation was low [30].

Meanwhile, our results concerning women's knowledge are midway among similar studies in the literature. They are higher compared with studies from Iran [31], Nigeria [19], Sudan [20], and Nepal [32]. However, they are lower compared with studies from Egypt [33], Jordan [34], and Saudi Arabia [35]. The discrepancies are certainly attributed to differences in the study settings and the characteristics of the studied samples.

As regards the factors influencing nurses' knowledge of pre-conception care, the present study results showed that a higher nursing qualification, more experience years, and the provision of pre-conception care at the center were associated with better knowledge score. These factors are expected to enhance nurses' knowledge, especially the factor of the provision of pre-conception care at the center, which may force the nurse to acquire needed knowledge to be able to provide this service. The negative association between age and knowledge score is quite known given the decreasing ability and eagerness to learn with advancing age. Thus, unmet educational needs regarding pre-marital and pre-conception care have been elucidated in a study on Iranian midwives [36]. Meanwhile, our finding of the positive influence of nurses' experience years on their knowledge of preconception care is in agreement with the results of *Tokunbo et al* study in Nigeria [37].

For women, the factors positively affecting their knowledge scores were their educational level, having previous pre-term labor, planning pregnancy, having antenatal care, having pre-conception care, and previous counseling. The effects of these factors are quite plausible given the influence of education on knowledge, as well as the positive effect of the actual utilization of pre-conception care. As for the positive association between previous pre-term delivery and knowledge, it could be explained by the worries of the woman having such incident, which

may push her to acquire more knowledge about pre-conception care. In congruence with this, **Dunlop et al** demonstrated a significant positive association between women's educational attainment and their knowledge of pre-conception care knowledge [38]. On the same line, previous studies showed that women's knowledge of preconception care was significantly influenced by their educational status, obstetric history, income, and family planning [39-41].

The present study has also assessed the attitude towards pre-conception care. The only significant difference between nurses and women was regarding the attitude towards planning for pregnancy, which was higher among nurses. In line with this, a study in the United Kingdom found that a great majority of the nurses under study had a positive attitude towards preconception care, and were convinced with its beneficial effects on maternal and neonatal outcomes [37].

Nonetheless, the median attitude scores of both groups in the present study were around 60%, reflecting more uncertainty or ambivalence. This could be related to the related levels of knowledge and awareness of the elements of pre-conception care. A more positive attitude towards pre-conception care and related healthy lifestyles was revealed among women in a study in the United States [42], which might be attributed to their higher socioeconomic level compared to our sample. Similarly, although women in underprivileged areas in the United Kingdom had a deficient knowledge of preconception care, their related attitudes tended to be positive [43].

The factors positively affecting nurses' attitude scores were their higher qualification and their provision of pre-conception care. These are similar to the factors affecting their knowledge and the same explanations might apply. Meanwhile, the nurses' urban residence turned to be a negative predictor of their attitude score. This might be due to that the nurse not living in the same community might be less able to share the same prevalent attitudes and conceptions.

As for women's attitude score, the factors having a positive influence turned to be their urban residence, planning pregnancy, having antenatal care, and having previous counseling. These factors reflect a high level of health awareness and behavior, which would certainly positively shape women's attitude. Moreover, a higher knowledge score was associated with more positive attitude score, thus indicating the importance of improving women's knowledge of pre-conception care. In this respect, **van der Zee et al** in the Netherlands reported that was reluctant to have preconception care despite their related positive attitude, and this was attributed to their lack of knowledge about the true concept of preconception care [44].

Conclusion and Recommendations

The conclusion is that nurses' knowledge of pre-conception care and their awareness of its elements is better compared to married women, although not very high in both. They have generally hesitant attitudes with no significant overall difference. The study indicates the need for the urgent establishment of a formal preconception care in PHC and MCH centers, along with training programs for nurses in the provision of its services. The program needs to be promulgated in the community served by these centers, as well as in media.

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