Application of Health Belief Model on Nursing Students' Perception regarding Benefits of Preconceptional Folic Acid Intake

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Abstract

Background: Preconception folic acid intake is necessary for optimal embryogenesis. Using health belief model is a great to improve the young women's belief towards recommended healthy behaviors of taking folic acid. ***Aim:*** The present study aimed to evaluate the effectiveness of the application of health belief model on nursing students' perception regarding benefits of preconceptional folic acid intake. ***Design:*** Quasi experimental design (pre-post test) was used to fulfill the aim of the study. ***Setting:*** The study was conducted at the Faculty of Nursing, Benha University. ***Sample:*** A purposive sample composed of (120) 4th year female nursing students. ***Tools:*** Two tools of data collection were self-administrated questionnaire and Health Belief Model scale. ***Results:*** The present study showed that there was a highly statistically significant difference in relation to all items of students' knowledge regarding preconceptional folic acid intake pre and post program ($P \leq 0.001$). Moreover, the mean total score of health belief model subscales post-preventive program are significantly higher than pre-preventive program, meanwhile, the mean score of perceived barriers post-preventive program is significantly lower than pre-preventive program ($P \leq 0.001$). ***Conclusion:*** Health belief model had positive effect on improving nursing students' perception regarding benefits of preconceptional folic acid intake. ***Recommendations:*** Application of health belief model for all university female students as a healthy preventive behavior towards folic acid deficiency.

Keywords: Health Belief Model, Nursing students' perception, Preconceptional, Folic Acid.

I: Introduction

Preconception period can be defined as the time from the intention to conceive to actual conception. But ignores the fact that many pregnancies (up to 50%) are unintended or mistimed, also does not take into consideration that high-risk factors

such as obesity or severe under nutrition will take months or even years to address. The preconception period has a significant impact on fertility, rates of congenital anomalies, preterm birth and infant and maternal mortality ***(The Lancet, 2018***).

Preconception care is the primary prevention of maternal and perinatal morbidity and mortality. Preconception care recognizes that many young women would plunge into parenthood without knowledge, skills or support that need to become mothers. The main goal of preconception care is to provide health promotion, screening, and interventions for women to reduce risk factors that might affect future pregnancies ***(Joyce et al., 2018)***.

Maternal perception about the importance of folic acid in preventing congenital malformation including neural tube defects plays an essential role in decreasing numbers of birth with disorders ***(Alquraini, 2019)***. The gaps between awareness, knowledge, and use of folic acid could be explained by difficulties in behavioral changes. Many factors contribute to behavioral changes associated with use of folic acid supplements included low use of folic acid supplements was reported to be associated with lack of pregnancy intention, high cost of folic acid tablets, forgetfulness, and lack of knowledge ***(Kim et al., 2018).***

Folic acid (vitamin B9) is the synthetic form of folate that is used in supplements and food fortification. Folic acid (FA) helps cut the risk of having a baby with certain birth defects of the brain and spinal cord especially before getting pregnant ***(Jalambadani et al., 2019).*** Nutritional folate consumption is not sufficient for optimal reduction of neural tube defects (NTDs) risk, therefore many countries encourage women to take folic acid before conception ***(Moser et al., 2019).***

The United States Public Health Service (UNPHS) had recommended taking 400 μg of folic acid on a daily basis for 3 months before conception until the 12

week of gestation for all women who planning to become pregnant. In addition, synthetic folic acid has a higher bioavailability than the natural form of folate ***(Ikeda-Sakai et al., 2019).*** No protection was observed in women who started folic acid after the seventh week of gestation due to the fact that NTDs occur during the 22^{th}-28^{th} days of the embryonic period, before most women even know about pregnancy. So, the initiation of folic acid supplements after the first month of pregnancy is too late to prevent NTDs ***(Lee et al., 2019)***.

Preconceptional folic acid protects against fetal structural anomalies, including neural tube defects, orofacial abnormalities and congenital heart defects, also protect against placental abruption and preterm birth which recommended for all women who attempting conception or sexually active without contraception ***(Khan and Robinson, 2018)***. Preconceptional folic acid administration can efficiently decrease the risk of women to produced fetus with neural tube defects with 85% decline in high prevalence and by 41% in the areas of low prevalence ***(Kamran et al., 2018)***.

Several factors have been associated with preconception folic acid supplementation, including maternal age, educational status, marital status, employment status, the number of prior pregnancies and income, whether the pregnancy was planned or unplanned, the level of knowledge and awareness of the importance of folic acid supplementation before and during pregnancy ***(Ezzeddin et al., 2019).***

Neural tube defects (NTDs) persist as a common and potentially devastating birth defect affecting the central nervous system and axial skeleton that occur as a result of a defect in the closure of a part of the neural tube during the early weeks of intrauterine development ***(Murphy and Westmark, 2020).*** Worldwide NTDs affect 0.5–2 in every 1000 pregnancies. The precise cause of NTDs is not fully realized,

but researchers expect that a combination of genetic, health and environmental factors are involved ***(Welderufael et al., 2019).***

Therefore, educational programs should focus on improving the knowledge of future medical staff. Special attention should be stressed on healthy, balanced nutrition and familiarizing women with food products rich in natural folic acid sources. Adequate education of young women would improve the prevention of neural tube defects in the future, by disseminating knowledge for women about the latest recommendations, taking folic acid at a dose of 0.4 mg at least 12 weeks before the planned pregnancy ***(Mroczek et al., 2018).***

Maternity nurses and midwives can emphasize on intervention and starts educational campaign that can put light on importance of consuming folic acid supplements and folate diet regularly to promote the healthy outcome of pregnancy and reduce the risk of neural tube defects ***(Puri et al., 2019)***. Nurses should be fully aware and provide folic acid supplementation advice. Women generally present at the obstetricians' clinics following conception, at a time too late for prevention of potentially avoidable NTDs. Post-natal clinics could also provide a venue for educating and informing women of the benefits of folic acid for future pregnancies ***(Gatt et al, 2019).***

Health Belief Model (HBM) is an explanatory theoretical model most relevant and applied when investigating motivation to act on asymptomatic and not developed illnesses. The HBM comprised of six concepts: perceived severity and susceptibility, benefits and barriers, self-efficacy, and cues to action. This model allows to chart a roadmap of the current gaps in a women's understanding of, motivation, or ability to engage in a health behavior ***(Urbanovich and Bevan., 2020).***

II: Significance of the study

The most frequent congenital anomalies were the high rate of neural tube defects due to no or low use of folic acid during preconception period ***(Taye et al., 2019).***Worldwide, approximately 300,000 babies are born with NTDs each year, and NTDs are responsible for approximately 29% of neonatal deaths associated with congenital anomalies ***(Sayan et al., 2018)***. In Egypt, the prevalence of congenital anomalies is increasing, and become 65.3/1000 live births ***(Abdou et al., 2019).***

Preconceptional folic acid significantly decrease the risk of NTDs. The incidence of NTDs in developing countries has been reported to be up to fourfolds higher than in developed ones. ***(Berihu et al., 2019)***. In Egypt, the incidence of spina pifida was 5/1000 due to lack of folate supplementation ***(Maged et al., 2016)***. Also, the incidence of neural tube defects was increased in offsprings of primigravida ***(Reda et al., 2019)***.

The rate of non-preventable NTDs can be brought down to 5-6/10,000 births when folic acid is taken correctly in the preconception period ***(Gatt et al., 2019)***. Over 2000 children would have been saved each year from death or a lifetime handicap if folic acid fortification had been implemented ***(Wald et al., 2020)***. The global prevalence of folate deficiencies worldwide is not known precisely, but is more marked in Africa ***(Bationo et al., 2020)***.

Improving folic acid knowledge among healthcare providers, as well as among students is an essential step in promoting the use of preconception folic acid to prevent NTDs ***(Ishikawa et al., 2018)***. To the best of our knowledge there is limited studies in Obstetrics and Woman's Health Nursing department directed to evaluate the perception of folic acid benefits among Arabic young women. Therefore, it's important to apply health belief model to improve female nursing students' perception regarding preconceptional folic acid intake.

III: Aim of the study

The study was aimed to:-

Evaluate the effectiveness of the application of health belief model on nursing students' perception regarding benefits of preconceptional folic acid intake through:

1. Assessing nursing students' perception regarding preconceptional folic acid benefits according to nursing students' belief.
2. Designing and application of preventive program based on health belief model according to nursing students' needs.
3. Evaluating the effectiveness of preventive program on improving nursing students' perception towards the benefits of preconceptional folic acid intake.

Research hypothesis:

Application of health belief model would have positive effect on improving nursing students' perception regarding benefits of preconceptional folic acid intake.

IV: Subjects and Method

Study design: Quasi-Experimental design (pre-posttest) was used to fulfill the aim of the study.

Setting: - The study was conducted at the Faculty of Nursing, Benha University.

Sampling:-

A. **Sample type:** A purposive sample was used from the above mentioned study setting.
B. **Sample size:** A total of 120 female nursing students included in the current study which comprise the target population due to inclusion of greater number of engaged and married females compared to other classes. The total number

of students enrolled in fourth academic year 2018/2019 (375) students, (95) Males and (280) female. Only one hundred and twenty female were selected according to the following **inclusion criteria** and comprised the study sample:

- Female nursing students
- Engaged and married students
- Free from medical, psychological, obstetrical disease or congenital abnormality

- **Exclusion criteria:**

- Pregnant students

C. Sample technique: The researcher visited the study setting, introduced herself and explained the aim of the study briefly to female nursing students with the previous mentioned criteria and repeated 3 times/weekly through studying day until the predetermined size of sample was completed.

-Tools of Data collection:

Two main tools were used for data collection:-

Tool I- A self-administered questionnaire (Appendix I):

It was designed by the researcher after reviewing related literature ***(Alblowi and Alomayri., 2018; LaBrosse, 2011)*** and under guidance of supervisors. It was translated into a simple Arabic language in the form of close and open ended questions. It encompassed four parts**:**

Part 1: Personal and socio-demographic characteristics of the studied sample included such as (age, marital status, residence, working, monthly income and phone number). In additional, Anthropometric measurements: it involved measurement of weight (measured in kilograms) and height (measured in centimeters) which were converted into body mass index (measured by kg/m^2).

Part 2: Menstrual history included (age of menarche, duration, regularity……..etc).

Part 3: Past medical and family history included (past history of any health problems, relatives have children with neural tube defects).

Part 4: Assessment of female nursing students' knowledge regarding preconceptional folic acid intake. It consisted of 3 sections:

- **Section (1)** was concerned with knowledge related to preconception care.
- **Section (2)** was concerned with knowledge related to folic acid.
- **Section (3)** was concerned with knowledge related to neural tube defects.

Knowledge's scoring system:-

All knowledge variables were weighted according to items included in each question. Each item was given a score (3) when the answer was complete correct answer a score (2) when the answer was incomplete correct answer and a score (1) when the answer was I don't know. The total score of each section was calculated by summation of the scores of its items. The total score for the knowledge of each student was calculated by the addition of the total score of all sections. The total score of knowledge was ranged from 23 – 69.

The score of total knowledge was classified as the following:

- **Good:** (≥ 75% correct answers) (51 ≤ 69)
- **Average:** (50 - < 75% correct answers) (34 < 51)
- **Poor:** (< 50% correct answers) (23 < 34)

Tool II: Health Belief Model Scale (Appendix II)

The health belief model scale ***(Adapted from Kloeblen and Batish, 1999)*** which was found to be predictive of intention to permanently follow a high folate diet in low-income pregnant women and was modified for use with students. Modifications was done by the researcher under the guidance of the supervisors of

the study and was translated into Arabic language to evaluate health beliefs of female nursing students towards preconceptional folic acid intake. It composed of 36 items including six subscales forming health beliefs. The subscales are related to susceptibility, severity of folic acid deficiency, benefits to, barriers, self-efficacy to folic acid intake and cues to action:

- Perceived susceptibility of folic acid deficiency, it consisted of (4) items.
- Perceived severity of folic acid deficiency, it consisted of (5) items.
- Perceived benefits of folic acid intake, it consisted of (10) items.
- Perceived barriers of folic acid intake, it consisted of (9) items.
- Self-efficacy of folic acid intake, it consisted of (2) items.
- Cues to action for folic acid intake, it consisted of (6) items.

Scoring system:

The health belief model scale uses a three-point Likert scale to rate the items (agrees, uncertain, disagree). The researcher corrected the responses and for each statement "3" points were given for positive responses (agree) while "2" were given for uncertain and "1" points was given for negative responses (disagree), respectively. Scores had a possible range from 36 to 108 for the total health belief model score with a low score indicating low perception and high score indicating high perception. For the five subscales, higher scores indicating extremely healthy beliefs. But for the subscale concerning barriers, higher scores indicate more negative health beliefs.

The level of health beliefs was classified according to ***Kamal et al., (2017):***

- **Low perception** when the total score was less than 50%.
- **Moderate perception** when the total score was 50% to less than 75%.
- **High perception** when total score was more than 75%.

Tool validity:

The content validity of questionnaires was reviewed by five jury experts related to specialty composed of 3 assistant professor from faculty of nursing, Benha University, one professor of obstetrics and gynecological nursing at faculty of nursing, Zagazig University and one professor obstetrics and gynecology at faculty of medicine, Benha University to ascertain clarity, relevance, comprehensiveness, and applicability of tools.

Tool reliability:

Reliability was done by Cronbach's alpha, the internal consistency of knowledge was 0.913 and health belief was 0.891.

Ethical consideration:

An official permission from the selected study setting was obtained for the fulfillment of the study, approval of each student to participate in the study was taken orally before history taken, the aim of the study was explained to each student, the study was not cause any physical, social or psychological risk on the participant and each participant was free to withdraw at any time of data collection without obligation.

Pilot study:

A pilot study was conducted on 10% (12 female nursing students) of the total sample before starting data collection to test the simplicity, clarity, feasibility and applicability of the study tools using the a self-administered questionnaire and health belief model scale. As well as the estimation of the time needed to fill the questionnaire. No modifications were done. Students who shared in the pilot study were included in the main study sample.

Field work:

The process of data collection was carried out beginning from February to the end of May 2019, covering a long period of four months. The researcher visited the pre mentioned setting from 9 am to 3 pm, three days per week (Sunday, Tuesday and Thursday) to collect data from female nursing students until sample size was completed. The researcher implemented the program through 4 phases as the following:

- **Assessment phase:**

At the beginning of interview the researcher greeted the students, introduced herself to each student and took oral consent to participate in the study. The average time required for completion of the questionnaire was around (15-20 minutes). In this phase of the program, assessed perception of the studied students through collection and analysis of baseline data from the filled tools. In this phase the researcher did the pre- test.

- **Planning phase:**

Based on the results obtained from pretest assessment of students' knowledge regarding preconceptional benefits of folic acid intake and review of relevant literature, the researcher identified the important needs for target group. The researcher designed the educational booklet in an Arabic language supported by figures. The sessions' number and its content were determined. The researcher used different teaching methods such as lecture, group discussion with the assistance of the instructional media as pictures and data show.

- **Implementation phase:**

In this phase the researcher implemented the prevention program to the studied students at the pre mentioned setting. Students were divided into 6 groups, and each group consists of 20 students. The duration of the educational program lasted 2 weeks for each group, the program was divided into 6 sessions, each session lasted 45- 60

minutes included periods of discussion according to students' achievement, progress and feedback.

- **Evaluation phase:**

After implementing the program, the researcher applied the post- test immediately to evaluate the knowledge acquired. Evaluation was done by using the post – test questionnaire which was the same formats of pre- test in order to compare the change in the studied students' perception immediately after the implementation of the preventive program based on health belief model.

Administrative Design:

An official approval from Dean Faculty of Nursing, Benha University, containing the title, objective, tools and the study technique, was obtained to conduct the study. Then, the researcher interviewed each student and obtained an informed oral consent before starting the data collection.

Statistical Design:

Data was verified prior to computerized entry. The Statistical Package for Social Sciences (SPSS version 20) was used followed by data analysis and tabulation. Descriptive statistics were applied (e.g., mean, standard deviation, frequency and percentages). Also, tests of significance (Chi - square test and Fisher Exact Test) were applied to test the study hypothesis. Pearson correlation coefficients were used.

V: Results

Table (1) shows that (50.8%) of the studied students were in age group 22 < 23 years old with the mean age 22.18 ± 0.78 years. Regarding marital status, less than two thirds (63.3%) of the studied students were engaged, more than half (60%) were resident at rural setting and (73.3%) of the studied students were not working.

In addition to monthly income, less than half of them (48.3%) had enough only income.

Table (2) reveals that, slightly more than two thirds (68.3%) of the studied students hadn't any previous health problems, less than two thirds (60.5%) of them had anemia. Also majority (98.3%) of studied students hadn't relatives have children with neural tube defects.

Table (3): clarifies that there was highly statistically significant difference regarding mean total scores of preconception care, folic acid and neural tube defects pre-preventive program compared to the scores post-preventive program ($P \leq 0.001$).

Figure (1) illustrates that more than one tenth of students (12.5%) had good knowledge regarding preconceptional folic acid intake pre-preventive program. While, most of them (90.8%) had good knowledge post-preventive program.

Table (4): reveals that the mean total score of health belief model and its subscales, perceived susceptibility, perceived severity, perceived benefits, self-efficacy and cues to action post-preventive program are significantly higher than pre-preventive program ($P \leq 0.001$). Meanwhile, mean score of perceived barriers post-preventive program is significantly lower than pre-preventive program ($P \leq 0.001$).

Figure (2): demonstrates that more than one tenth (11.7%) of studied students had high perception of total health beliefs regarding preconceptional folic acid intake pre-preventive program. While, most of them (89.2%) had high perception post-preventive program.

Table (5) shows that there was statistically significant positive correlation between total knowledge and health belief scores pre and post preventive program ($P \leq 0.001$).

Table (1): Distribution of the studied students according to socio-demographic characteristics

Socio-demographic characteristics	No.	%
Age (years)		
21< 22	22	18.4
22 < 23	61	50.8
23 < 24	37	30.8
Mean ± SD	22.18 ± 0.78	
Marital status		
Engaged	76	63.3
Married	44	36.7
Residence		
Urban	48	40.0
Rural	72	60.0
Working		
Yes	32	26.7
No	88	73.3
Monthly income		
Enough and spared	30	25.0
Enough only	58	48.3
Not enough	32	26.7

Table (2): Distribution of the studied students according to past medical and family history

Past medical and family history	No.	%
Any previous health problems		
Yes	38	31.7
No	82	68.3
If yes, health problems are (n=38)		
Anemia	23	60.5
Severe headache	15	39.5
Relatives have children with NTDs		
Yes	2	1.7
No	118	98.3

Table (3): Mean score of the studied students' knowledge regarding preconceptional folic acid intake pre and post preventive program (n= 120)

Phase / Knowledge about	Maximum score	Pre-program n= 120 Mean ± SD	Post-program n= 120 Mean ± SD	Paired t test	P-value
Preconception care	24	15.58 ± 2.45	23.18 ± 1.48	30.706	0.000**
Folic acid	36	19.63 ± 4.47	33.16 ± 4.65	20.241	0.000**
Neural tube defects	9	5.12 ± 1.11	7.92 ± 1.27	17.570	0.000**
Total	69	40.23 ± 5.85	64.32 ± 5.91	29.055	0.000**

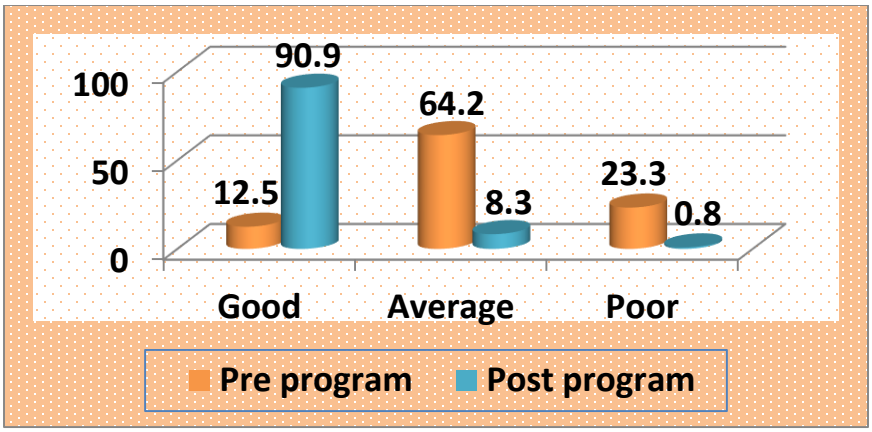

Figure (1) Distribution of the studied students' total knowledge regarding preconceptional folic acid intake pre and post preventive program (n= 120)

Table (4): Mean score of health belief model subscales regarding preconceptional folic acid among studied students pre and post preventive program (n= 120)

Scale \ Phase	Maximum score	Pre-program n= 120	Post-program n= 120	Paired t test	P-value
		Mean ± SD	Mean ± SD		
Perceived susceptibility	12	6.47 ± 1.86	10. 88 ± 1.12	20.526	0.000**
Perceived severity	15	8.54±0.58	14.08 ± 1.05	55.613	0.000**
Perceived benefits	30	17.11 ± 1.99	27.83 ± 1.98	41.627	0.000**
Perceived barriers	27	20.60±2.88	14.74± 2.15	16.848	0.000**
Self-efficacy	6	2.32 ± 0.63	5.43 ± 0.92	29.220	0.000**
Cues to action	18	9.96±2.10	16.49 ± 1.58	27.850	0.000**
Total	108	69.82 ± 10.87	92.12 ± 5.46	19.667	0.000**

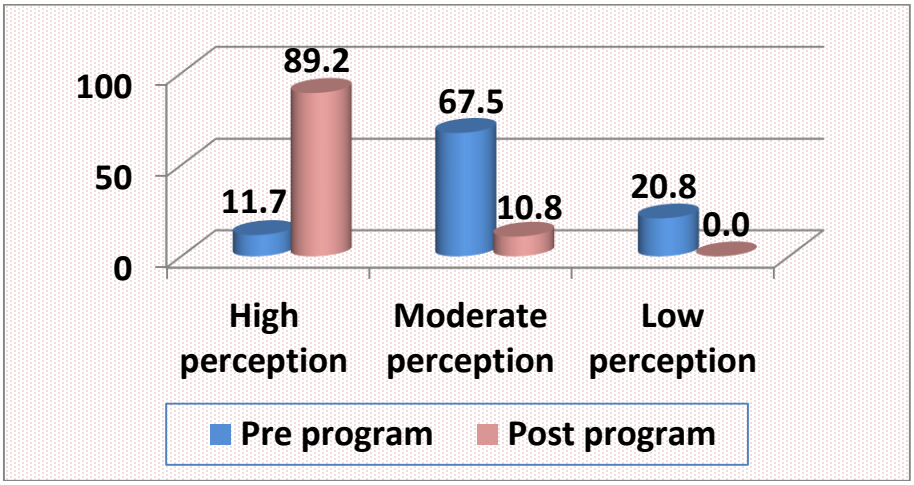

Figure (2) Distribution of the studied students' perception of the total health beliefs regarding preconceptional folic acid intake pre and post preventive program(n=120)

Table (5): Correlation between studied students' total knowledge and health belief scores pre and post preventive program (n=120)

Variable		Total knowledge score			
		Pre-program		Post-program	
		r	P value	r	P value
Total health belief score	Pre-program	0.724	0.000**		
	Post-program			**0.861**	**0.000****

****A highly statistical significant difference (P ≤ 0.001)**

VI: Discussion

Preconception is a critical period for the prevention of adverse pregnancy outcomes. Folic acid intake during preconception period is necessary for optimal embryogenesis ***(Bayrami et al, 2020).*** The impact of NTDs is considered a global health-care issue affecting huge number of newborns which account for the second leading cause of infant mortality and result in high rates of morbidity each year. Fortunately, the risks of NTDs can be reduced by 70% when using folic acid supplements (0.4 mg/day) before conception and throughout the 1st trimester of pregnancy ***(Turgut et al., 2019).***

The high prevalence of folate deficiency underlines the need for implementation of preconception folic acid supplementation as part of maternal health services ***(Bhide and Kar., 2019)***. According to the HBM framework, women's decisions to initiate and adhere to a new behavior are influenced by the perceptions of the health threat (folate deficiency) and of the proposed behavior (folic acid intake) ***(Nechitilo et al., 2016).***

The present study aimed to evaluate the effectiveness of the application of health belief model on nursing students' perception regarding benefits of preconceptional folic acid intake.

According to socio-demographic characteristics of the studied students, The result of the current study showed that half of the studied sample were in the age group of 22 < 23 years with a mean age of 22.18 ± 0.78 years. This result is nearly similar to a study carried out in Australia by ***Fayet-Moore, (2014)*** who studied "Micronutrient status in female university students: iron, zinc, copper, selenium, vitamin B12 and folate" and found that the participants' mean age was 22.6 ± 2.9 years.

The result of the present study revealed that more than half of them were resident at rural setting. This result also agreed with a study performed by ***Sailaja et al., (2019)*** who studied "Effect of Structured Teaching Programme on Folic Acid Supplements in Prevention of Congenital Anomalies among Undergraduate Students in A Selected College, Tirupathi" and demonstrated that the majority of undergraduate female student (58%) residing in the rural area.

As regards past medical and family history, the current study showed that, slightly more than two thirds of the studied students hadn't any previous health problems and less than two thirds of them had anemia. This result reflected lack of multivitamins intake and poor balanced healthy diet. Also, the association of having previous health problem and preconception folic acid awareness may be explained by the fact that women who had any previous health problem may seek information about preconception health and pregnancy.

The results of the current study revealed that the majority of studied students hadn't relatives have children with neural tube defects. The present study comes in the same line with ***Alquraini, (2019)*** who studied "Perceptions of Folic Acid Knowledge and Intake among Women in the Childbearing Age in Al-Ahssa'a-Saudi Arabia 2018" and illustrated that (99.5%) reported no family history of child with neural tube defects. Also, this finding was contradicted with ***Alnaami et al., (2018),*** and demonstrated that nearly one quarter of female college students had relative with

congenital anomaly. This may be due to family history consider risk factor for neural tube defects.

The results of the present study revealed that there was highly statistically significant improvement in the post total students' knowledge scores regarding preconceptional folic acid intake. In post-preventive program, there was more than three quarters had good knowledge. This result may be due to the positive effect of the preventive program and the learning sessions. Also, the topic of the study is considered vital and sensitive to their life and work. So, students were very interested and satisfied during the learning sessions.

This result comes in the same line with ***Stevens et al., (2018)*** who studied "Folate supplementation to prevent birth abnormalities: evaluating a community-based participatory action plan for refugees and migrant workers on the Thailand-Myanmar border" to assess women's knowledge pre and post intervention, and found that there was significant improvement in the knowledge (73%) about importance of taking folic acid before conception post intervention ($P < 0.001$ compared to baseline).

Concerning total studied students' knowledge scores regarding preconceptional folic acid intake pre-preventive program, the results of the present study revealed that more than one tenth of the studied students had good knowledge. This result may be due to the nursing curriculum need to be updated with the knowledge about benefits of preconceptional folic acid intake and the association with neural tube defects. Also, most students are interested in the curriculums to pass the academic tests and not to obtain knowledge.

This result is nearly similar to ***Koirala and Pokharel, (2018)*** who studied "Assessing the Level of Knowledge in the Preconceptional Use of Folic Acid Supplement among Primigravida Women" and showed that there was (10.8%) of total respondents had good knowledge about preconceptional folic acid benefits.

This result in agreement with ***Goshu et al., (2018)*** who studied "Women's awareness and associated factors on preconception folic acid supplementation in Adet, northwestern Ethiopia, 2016: implication of reproductive health" and revealed that only (15.9%) of participants had good knowledge on preconception folic acid supplementation.

Concerning health belief model subscales regarding preconceptional folic acid among studied students, the current study results revealed that the mean total score of health belief model and its subscales, perceived susceptibility, perceived severity, perceived benefits, self-efficacy and cues to action post-preventive program are significantly higher than pre-preventive program. Meanwhile, mean score of perceived barriers post-preventive program is significantly lower than pre-preventive program. These results could be reflecting that the most of students were believed that neural tube defects could significantly affect their lives and the high score seems to imply that studied students understand the benefits of folic acid intake.

This result goes in the same line with study conducted in Iran by ***Araban et al., (2017)*** who studied "Nutrition modification aimed at enhancing dietary iron and folic acid intake: an application of health belief model in practice" and demonstrated that there were significantly increased in mean score post intervention compared to baseline to all health belief model constructs, while the perceived barriers were significantly decreased.

The results of the present study revealed that more than one tenth of nursing students had high perception of total health beliefs regarding preconceptional folic acid intake pre-preventive program. While, more than three quarters of them had high perception post-preventive program. This may be due to the preventive program based on health belief model had great role in improving perception of the studied students towards importance of preconceptional folic acid intake.

As regards correlation between total health belief and total knowledge of the studied students. The present study revealed that there was statistically significant positive correlation between total knowledge and health belief scores pre and post preventive program. This may be due to good knowledge reflected with high perception and better health beliefs.

VII: Conclusion

Based on the results of the present study, it concluded that; Application of health belief model have positive effect on improving nursing students' perception regarding preconceptional folic acid intake. Also, there was a highly statistically significant difference in relation to all items of students' knowledge regarding preconceptional folic acid intake pre and post preventive program. Moreover, the mean total score of health belief model and its subscales, perceived susceptibility, perceived severity, perceived benefits, self-efficacy and cues to action post-preventive program are significantly higher than pre-preventive program, while mean score of perceived barriers post-preventive program is significantly lower than pre-preventive program. Meanwhile, there was statistically significant positive correlation between total knowledge and health belief scores pre and post preventive program. Therefore, the study hypothesis was supported and the aim was acheived.

VIII: Recommendations

- Application of health belief model for all university female students as a healthy preventive behavior towards folic acid deficiency.
- Promoting awareness about the optimal time and importance of preconception folic acid intake through disseminating booklet and posters among female students.
- Health promotion campaigns should highlight the benefits and safety of folic acid supplements for all university female students.

Further studies need to be performed:

- Evaluate the effect of preconception counseling on women's health beliefs regarding folic acid intake.
- Future research should aim to conduct a similar study on a large sample for generalizing the findings.
- Further prospective research is needed concerning application of health belief model regarding nurses' knowledge towards importance of periconceptional intake of folic acid.

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