

The Effect of Educational Guidelines on Pregnant Women`s Perception Regarding Calcium Supplementation

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Abstract

Background: Calcium supplementation during pregnancy is considered important for all mothers, as pregnancy increased demand for calcium to support the optimal growth and development of the fetus. **Aim:** the study aimed to evaluate the effect of educational guidelines on pregnant women`s perception regarding calcium supplementation. **Design:** A quasi-experimental design (one group pre - post-test) was used in the study. **Setting:** The study was conducted at antenatal care clinic at maternal and child health center at Helwan city, Egypt. **Sample:** A purposive sample of 100 pregnant women in second and third trimesters **Tools:** The study employed two assessment tools. Tool (I) A Structured Interviewing Questionnaire with three parts: Part (1) focusing on general characteristics, and Part (2) included obstetric history. **Part (3): knowledge assessment sheet (pre-post):** to assess women`s knowledge regarding calcium supplementation. Tool (II) Attitude Assessment Sheet (pre-post) designed to evaluate women's attitudes regarding calcium supplementation during pregnancy. **Results:** the pregnant women`s knowledge and attitude were improved after the implementation of educational guidelines regarding calcium supplementation during pregnancy ,highly statistically significant difference of knowledge and attitude between pregnant women regarding calcium supplementation , **Conclusion:** Based on these results, educational guidelines had a positive impact on both the knowledge and attitude of the pregnant women regarding calcium supplementation. This observation supports the research hypothesis. **Recommendation:** Continuous educational classes should be provided to pregnant women to increase their awareness regarding the importance of calcium intake during pregnancy, signs, symptoms of calcium deficiency, and how to prevent of problems resulting from calcium deficiency.

Key Words: *Calcium, Pregnancy, Educational Guidelines, Knowledge, Attitude.*

I. Introduction:

Pregnancy is a critical time for all women. during pregnancy increase risk of low calcium intake that increase risks to both fetus and mother. Fetal risks include restricted intrauterine growth, low birth weight, poor bone mineralization, and preterm birth, whereas maternal risks include hypertension and preeclampsia so intake of calcium supplementation in the prevention of preeclampsia (*Willemse et al.,2020*). Inadequate intakes of calcium are one of the most serious public health problems affecting mothers and their children in the world. WHO estimates that at least one woman dies every seven minutes from complications of hypertensive disorders of pregnancy this is may be because of low intakes of dietary calcium. Inadequate intakes of calcium during pregnancy cause hypertensive disorder which is a major health problem leading maternal and perinatal morbidity and mortality (*Tofu et al.,2023*).

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Low maternal calcium intake can lead to tetanus, muscle cramps, paresthesia, osteopenia, delayed growth, Low birth Weight, and poor bone mineralization in the fetus. Women with low calcium intake are at higher risk of developing hypertensive disorders during pregnancy, one of the leading causes of maternal mortality (*Nambiar et al.,2023*). The WHO recommends calcium supplementation with 1.5 to 2.0 g of elemental Ca daily from 20 weeks of gestation as part of antenatal care for the prevention of pre-eclampsia among all pregnant women because excessive Ca intake can have negative health consequences that could be particularly harmful during pregnancy, such as anorexia, weight loss, polyuria, heart arrhythmias, fatigue, and inhibit the absorption of other essential minerals (*Tesfaye et al.,2019*). The maternity nurses play an important role in maintain women's nutritional status during pregnancy because they have the first opportunity to contact with the pregnant women, nutritional, they consider as a health care provider talented with accountability to improve women's health, decrease morbidity and mortality associated with pregnancy. Pregnant women should be encouraged to consume enough amount of calcium from their dietary intake and supplementation. Educated women about importance of calcium intake and its effect of the health status of both women and their fetus. recommendation calcium supplementation according to world health organization (*Gaheen, et al.,2020*).

II. Significance of the study:

Inadequate calcium intake poses a significant public health challenge, particularly impacting mothers, and children worldwide. The increased occurrence of calcium deficiency during pregnancy is a pressing concern. Globally, an estimated 3.5 billion individuals face the risk of calcium deficiency due to insufficient dietary supply, with approximately 90% of those at risk located in Africa and Asia. The prevalence of low calcium intake is notably high, affecting at least 27% of high-income countries and a striking 88% of low- and middle-income countries. This highlights the widespread nature of the issue and emphasizes the need for targeted interventions to address calcium insufficiency in diverse populations. (*Gomes, tal.,2022*). In India found the prevalence of hypocalcemia in pregnant women was 66.4%. The prevalence of hypocalcemia in Algeria of pregnant women was 70.55% A in Pakistan the prevalence of hypocalcemia to be 60% in patients with preeclampsia (*Almaghamsi, et al.,2018*). In Egypt at Tanta city the study was conducted at antenatal outpatient clinic the significant of study represent the majority (90.2 %). found that more than three quarter (76.8%) of the studied pregnant women had poor knowledge while of the majority (90.2 %). studied pregnant women had poor practice related to calcium intake during pregnancy. **So**, the current study aimed to assess the effect of educational guidelines pregnant women's perception regarding calcium supplementation.

Aim of the study:

The study aimed to evaluate the effect of educational guidelines on pregnant women's perception regarding calcium supplementation during pregnancy.

Subject and Methods:

Research design:

A quasi-experimental design (one group pre – posttest) was used in the study.

Setting:

The research was carried out at the antenatal care clinic located within the primary Helwan center of the maternal and child health center in Helwan city, Egypt. This center offers comprehensive antenatal care services and is accessible to all pregnant women.

Subject:

Type of the sample:

A purposive sample of 100 pregnant women in second and third trimesters was selected, with ages ranging from 18 to 35 years. Pregnant women who had medical contraindications to calcium intake were intentionally excluded from the study.

Sample size:

100 pregnant women attended to antenatal care center were collected through period of three months.

III. Tools for data collection:

Two tools included that developed after reviewing the related literature with consideration to the aim of objectives and questions of the study.

Tool (I): A structured Interviewing questionnaire:

It was developed by the researcher in English and translated into simple Arabic language form. It consisted of three parts:

Part (1): Demographic data: this part composed of (4) questions aimed to collect data such as age, current residence, level of education, and occupation.

Part (2): Obstetric history: It included (age of menarche, regularity of menses, gravity, parity, number of abortions, gestational age in week, first day of last menstrual period and expected date of delivery, method of delivery, history of congenital anomalies).

Part (3): knowledge assessment sheet (pre-post): to assess women's knowledge regarding calcium supplementation adapted from (Gaheen, et al.,2020). *The questionnaire used in the study comprised a total of 21 items, with the first 21 items addressing various aspects related to calcium, as (Definition of calcium , sources of calcium, important of calcium, signs of hypocalcemia, signs of hypercalcemia, complication of calcium deficiency during pregnancy ,complication of hyper calcinemia ,What is the effect of calcium deficiency on the fetus and mother ,What is the impact of calcium deficiency on the mother in the future .*

The scoring system of total knowledge level of pregnant women was categories as the following:

- **Satisfactory level $\geq 60\%$ of the total score of knowledge**
- **Unsatisfactory level $< 60\%$ total score of knowledge.**

Tool (II): Attitude assessment sheet (pre-post): This tool was developed by the researcher after reviewing of related literature. (Goda,2018) ,(Gaheen, et al.,2020). It Include statement to assess women's attitude toward calcium supplementation and its effect on mother and fetus, questions started from (44 to 63).

The Likert scale used in the Attitude Assessment Sheet included 20 items, with respondents indicating their agreement or disagreement with statements on a 3-point scale (agree, not sure, disagree). Each response was assigned a specific grade: 2 grades for an "agree" response, 1 grade for a "not sure" response, and 0 grades for a "disagree" response. The total attitude score for each pregnant woman was obtained by adding up the grades assigned to all 20 items.

This scoring system allowed for a quantitative measure of pregnant women's attitudes toward calcium supplementation during pregnancy, providing a numerical representation of their overall perspective based on the Likert scale responses. The total attitude score would help in assessing the general trend and strength of attitudes within the study population, offering valuable insights into the participants' beliefs and perceptions related to calcium intake during pregnancy .The **total scoring system** of the pregnant women's attitude towards calcium supplementation during pregnancy was determined by summing up the grades assigned to each response and categories as the following:

- **Positive attitude $\geq 50\%$ of the total attitude score.**
- **Negative attitude $< 50\%$ of the total attitude score.**

Supportive material (educational guidelines):

The researcher developed a booklet in simple Arabic language that included pictures illustrating various information about calcium. The booklet aimed to educate pregnant women about the significance of calcium, through the following objectives:

General objective:

The general objective of the educational guidelines' session was to upgrade women's knowledge and attitude regarding calcium supplementation during pregnancy.

Specific objectives:

By the end of the session, the pregnant women should be known all information about:

- Definition of calcium,
- Determine the importance of calcium for mother and infants.
- List the sources of calcium.
- Determine the factors increase absorption, factors inhibit absorption of calcium.
- Recognize the requirements of calcium supplementation during pregnancy.
- Recognize the signs and symptoms, complication of hypocalcemia.
- Recognize the signs and symptoms, complication of hypercalcemia.
- Importance of calcium supplementations during pregnancy.
- Determine the suitable time, dose of calcium as doctor order.
- Determine the suitable dose as of calcium as doctor order.

Validity:

Revision of the tools for clarity, relevance, comprehensiveness, understanding, and applicability was done by a panel of expertise composed of three professors of obstetrics and gynecological nursing to measure the content validity of the tools and the necessary modification was done accordingly.

Reliability:

Reliability of the tools was assessed using Cronbach's alpha reliability coefficient. Cronbach's alpha reliability coefficient normally ranges between 0 and 1. Higher values of Cronbach's alpha (More than 0.7) denote acceptable reliability.

Items	Cronbach alpha	P -value
Tool I Part (1): Previous and current history for pregnant women	0.789	0.001*
Tool I Part (2): Knowledge assessment sheet	0.876	0.001*
Tool II: Attitude assessment sheet	0.896	0.001*

Ethical considerations:

The study protocol was submitted to the Scientific Research Ethics Committee at the Faculty of Nursing, Helwan University, for approval. Additionally, an official permission was obtained from the director of the study setting to conduct the research. Before participating in the study, pregnant women were provided with a detailed explanation of the study's objectives and gave their oral consent to participate. They were assured that all information collected would be treated confidentially and solely used for the study's purposes, with anonymity guaranteed. The participants were also informed that their involvement was entirely voluntary, and they had the right to withdraw from the study at any time.



II- Operational Design:

Preparatory phase:

A review of current and recent available literature about various aspects of the study using textbooks, articles, theses, and internet were searched and studied. This was necessary for the researcher to get more details about the study, and to be oriented with aspects of the present research and to develop the tools to be used.

Pilot study:

The pilot study was done on 10% of the studied women (10 pregnant women) to test the applicability, clarity, and the efficiency of the tools. Pregnant women in the pilot study were chosen randomly and then were included in the study. there were no major modifications found after the pilot study. the pilot showed very high levels of reliability.

Field work:

The study was carried out at antenatal care clinic in Helwan center of maternal and child health center at Helwan city, the data collection process took place between the beginning of March 2023 and completed by the end of May 2023, The researcher attended the antenatal clinic in Helwan center Saturday and Sunday of each week from 9:00 am to 1:30 p.m. Data was collected through four phases. The following phases were adopted to fulfill the aim of the current research: preparatory, assessment, implementation, and evaluation phases.

Preparatory phase: The educational guidelines were designed by the researcher based on reviewing of the related recent, national, and international literature and theoretical knowledge of various aspect of the study using books, articles, scientific journal, and internet with the aim of acquiring the depth of knowledge about the study. The content of the educational guidelines program was validated by a panel of expertise in obstetrics and gynecological nursing also, this helped the researcher to be more acquainted with the study, and with the process of tools' designing. Then tools were designed and tested for being valid and reliable.

Assessment Phase: This phase involved the pre-intervention data collection for baseline assessment. At beginning of the interview, the researcher introduced herself to women and explained the aim of the study and the freedom to participate in the study or not, withdrawal at any time., then the oral consent of the women was obtained. The researcher conducted individual interviews with each woman at an antenatal clinic to complete Tool (I) *A structured Interviewing questionnaire*, which comprising three sections. The first part comprised questions about the women's demographic data, the second part included inquiries regarding their obstetric history, and the third part consisted of questions assessing women's knowledge regarding calcium supplementation. The data collection process typically took 5-10 minutes per participant. Next, each woman was provided with Tool (II) to assess women's attitude regarding calcium supplementation during pregnancy. This tool required approximately 15-20 minutes to complete.

Implementation phase: During this phase, the researcher uses a simple Arabic language to suit women's level of understanding, various educational methods and materials were used, including group discussion, demonstration and re-demonstration, audio visual and posters. and a designed booklet. The educational guidelines were implemented for a period of 3 months, it carried out through 4 sessions, each session took 30 minutes. Each session started by explaining the objectives of session, taking into consideration using simple and clear language. The subsequent session started with feedback about the previous session and the objectives of the new session. **First session** included an orientation about the program and its objectives for pregnant women the designed booklet was distributed to each woman, which contains instruction about calcium supplementation during pregnancy. **Second session** covered general knowledge about (what is calcium, importance,

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sources, factors effect on absorption, hypocalcemia, hypercalcemia, and it causes, symptoms, management of it. **Third session** included information about calcium supplementation during pregnancy and its benefits on mother and fetus and the correct dose of calcium supplementation as world health organization (WHO). **Fourth session** included information about problems resulting from ignoring of calcium supplementations during pregnancy and effects on fetus, mother at short-term and long -term. In the last of session every pregnant woman took one of guided booklet which aimed to provide accurate knowledge and attitude regarding calcium supplementation during pregnancy. The researcher developed group of WhatsApp, to facilitate the communication with the pregnant women, answer all their questions at any time and uploaded educating videos, photos, brochure.

Evaluation phase:

Evaluation was applied before and after the educational guidelines through pre and post-test by using the same tools in order to identify differences , similarities, and areas of improvement as well as defects and estimate the effect of the educational guidelines to improve women`s knowledge and attitude regarding calcium supplementation and observe the change in the women`s attitude regarding calcium supplementation during pregnancy . Post intervention: was done for each pregnant woman immediately after implementing the educational guidelines for assessing their acquisition of knowledge and attitude. It contained the same questions of tool I, II and as in the pre intervention.

Administrative Design:

An official letter from obtained from the dean of the faculty of nursing then conducted to directors of primary Helwan center of maternal and child health center at Helwan city to obtain an official approval to carry out the study after explanation of the aim of the study. the permission was obtained before the initiation of the data collection.

Statistical Item:

Numerical data were presented as mean and standard deviation (SD) values. Qualitative data were presented as frequencies (n) and percentages (%). Reliability of the questionnaire was assessed using Cronbach`s alpha reliability coefficient. Cronbach`s alpha reliability coefficient normally ranges between 0 and 1. Higher values of Cronbach`s alpha (More than 0.7) denote acceptable reliability. Spearman`s correlation coefficient was used to determine correlations between different variables. The significance level was set at $P \leq 0.05$. Statistical analysis was performed with IBM SPSS Statistics Version 26 for Windows.

IV. Results:

Table (1) shows that, the mean and standard deviation regarding age of the studied women were (25.24 ± 3.85746) . Concerning to the job; less than two thirds (62%) of the studied women were housewife and not working, and about one third (32%) of them were graduated from high school. More than three quarter of them (78%) were living in urban area with sufficient family income. Concerning to source of information; (40%) of the studied women receiving their information from the physician, while only 4% received their information from social media.

Figure (1): Pie graph representing source of information about the importance of calcium supplements during pregnancy.

Figure (2) : shows that, more than half (54%) of the studied pregnant women had a positive attitude within posttest, while only (10%) of them had a positive attitude within pre-test.

Table (2) shows that, there was a statistically significant difference between the knowledge of the studied women toward calcium supplementation during pre and post-test in which, regarding meaning of calcium , (10%)of the studied pregnant

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women at pre-test had incorrect answer but after application of the educational guidelines the result at post -test the majority (98%)had correct complete answer . regarding importance of intake of calcium supplementation during pregnancy (12%) had incorrect answer at pre-test while the majority of the studied pregnant women (100%) had corrected complete answer at posttest after application of the educational guidelines. Also, Regarding complication resulting from calcium deficiency during pregnancy the result at pre-test (40%) had incorrect answer ,while at posttest after application of the educational guidelines the result (96%)of the studied pregnant women had correct complete answer in which the answer of the studied pregnant women were correct in post-test more than pretest except the statement about "Susceptibility of pregnant women to calcium deficiency " (p- value= 0.155).

Figure (2) shows that, more than half (58%) of the studied women had a satisfactory level of knowledge within posttest after application of the educational guidelines, while only (10%) of them had a satisfactory level of knowledge within pre-test.

Table (3); The analysis indicates a statistically significant difference in the attitude of the women under study towards calcium supplementation between the pretest and post-test, except for the statement regarding "Getting calcium supplements during pregnancy" (p-Value= 0.186). During the pretest, approximately 52% of the women agreed with the statement "Necessity of taking calcium daily," whereas in the post-test, this agreement significantly increased to about 88%. Similarly, in relation to the statement about "Foods that prevent calcium absorption," only 30% of the women agreed during the pretest, but this agreement substantially rose to 92% in the post-test. Moreover, concerning the statement "Consuming caffeine, chocolate, and drinking alcohol prevent absorption of calcium in the body," only 10% of the women agreed during the pretest. However, the majority of them (96%) expressed agreement with the same statement in the post-test. This shift in attitudes suggests a positive impact of the intervention, particularly in enhancing awareness and understanding regarding calcium supplementation.

Figure (3) shows that, more than half (54%) of the studied pregnant women had a positive attitude within posttest, while only (10%) of them had a positive attitude within pre-test.

Table (4) shows that, there was a statistically significant association between women's knowledge and job, and educational level & source of information (p-value=0.000*), while there was no statistically significant association between women's knowledge and age, standard of living, living place & family income (p-value= 0.169, 0.385, 0.831,and 0.381 respectively).

Table (5) shows that, there was a statistically significant association between women's attitude and educational level & source of information (p-value=0.001* and 0.012* respectively), while there was no statistically significant association between women's attitude and age, job, standard of living, living place & family income (p-value= 0.221, 0.131, 0.326, 0.0872, and 0.077 respectively).

Table (6) shows that, there was no statistically significant association between women's knowledge and age of puberty, pattern of menstrual cycle, number of pregnancies, number of abortions, number of births, methods of previous delivery, previous premature births, previous birth defects, and presence of problems with the current pregnancy (p-value=0.059, 0.054, 0.472, 0.642, 0.512, 0.815, 0.591, 0.167, and 0.663 respectively).

Table (7) shows that, there was a statistically significant association between women's attitude and age of puberty, pattern of menstrual cycle, number of pregnancies, & number of births (p-value=0.023*, 0.029*, 0.011*, and 0.033* respectively). There was no statistically significant association between women's knowledge and number of abortions, methods of previous delivery, previous premature births, previous birth defects, and presence of problems with the current pregnancy (p-value=0.385, 0.081, 0.862, 0.862, and 0.893 respectively).

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Table (8): shows that, there was a statistically significant positive correlation between total women’s knowledge and total attitude & number of delivery (p-value=0.000*, and 0.015*). There was no statistically significant correlation between total women’ knowledge and age of puberty, number of pregnancies& number of abortions (p-value=0.345, 0.106, and 0.760 respectively).

Table (9): shows that, there was a statistically significant negative correlation between total women’s attitude and number of pregnancies, number of abortions & number of births (p-value=0.000*, 0.043*and 0.000* respectively). There was no statistically significant correlation between total women’s attitude and age of puberty (p-value=0.256).

Table (1): Distribution of demographic data for the studied women (n=100).

Items	Studied Women (n = 100)	
	N	%
Age: <ul style="list-style-type: none"> • 18 <25 • 25 <30 • 30 – 35 <p style="text-align: center;">Mean ± SD</p>	38 54 8	38 54 8
	25.24 ± 3.85746	
Job: <ul style="list-style-type: none"> • Working • Housewife 	38 62	38 62
Educational level: <ul style="list-style-type: none"> • Don't read or write. • Read and write. • Primary • Secondary • University 	4 18 20 32 26	4 18 20 32 26
Residence: <ul style="list-style-type: none"> • Rural • Urban 	22 78	22 78
Family income: <ul style="list-style-type: none"> • Sufficient • Insufficient 	78 22	78 22

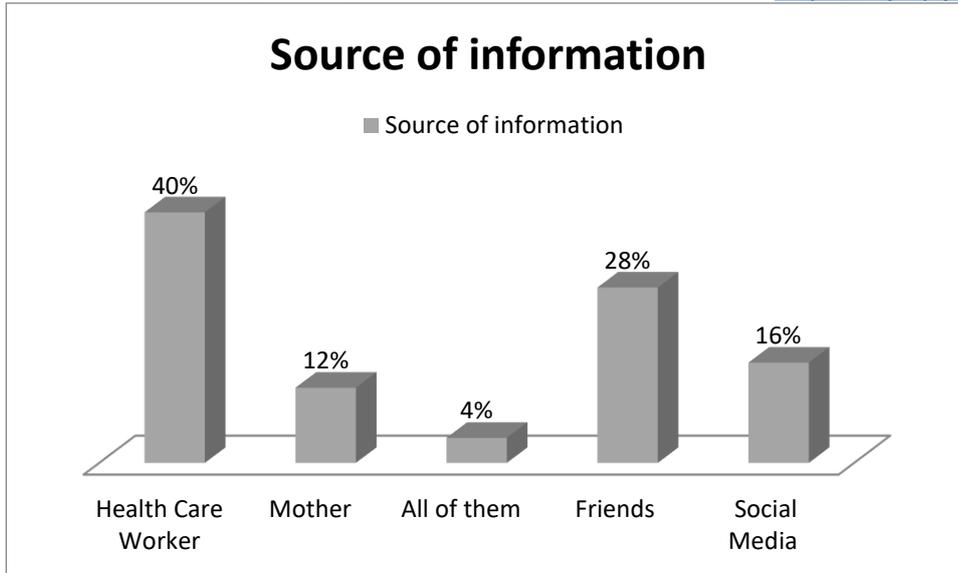


Figure (1): representing Source of information about the importance of calcium supplements during pregnancy.

Table (2): Distribution of pregnant women’s knowledge regarding calcium supplementation. (n=100).

Items	Studied Women (n=100)				x ²	P-Value
	Pre-Test		Post-Test			
	No	%	No	%		
The meaning of calcium is: <ul style="list-style-type: none"> • Incorrect answer • Correct complete answer 	12	12	2	2	7.68	0.006*
The foods rich in calcium are: <ul style="list-style-type: none"> • Incorrect answer • Correct incomplete answer. • Correct complete answer 	2	2	10	10	12.41	0.00*
Factors that help increase calcium absorption: <ul style="list-style-type: none"> • Incorrect answer • Correct incomplete answer. • Correct complete answer 	30	30	12	12	12.355	0.003*
Factors that prevent absorption of calcium:	0	0	2	2	21.8	0.000*
	70	70	86	86		

<ul style="list-style-type: none"> • Incorrect answer • Correct incomplete answer. • Correct complete answer 	74	74	42	42		
	0	0	2	2		
	26	26	56	56		
Importance of calcium for the pregnant women:	64					
<ul style="list-style-type: none"> • Incorrect answer • Correct incomplete answer. • Correct complete answer 	0	64	22	22	36.797	0.000*
	36	0	2	2		
		36	76	76		
Importance of calcium supplementation for fetus :	40					
<ul style="list-style-type: none"> • Incorrect answer • Correct complete answer 	60	40	14	14	17.149	0.000*
		60	86	86		
Need for calcium increase during pregnancy:	34					
<ul style="list-style-type: none"> • Incorrect answer • Correct complete answer 	66	34	4	4	29.24	0.000*
		66	96	96		
The best time to take calcium supplements:	62					
<ul style="list-style-type: none"> • Incorrect answer • Correct incomplete answer. • Correct complete answer 	2	62	8	8	68.157	0.000*
	36	2	0	0		
		36	92	92		
Symptoms of calcium deficiency:	34					
<ul style="list-style-type: none"> • Incorrect answer • Correct incomplete answer. • Correct complete answer 	2	34	2	2	37.58	0.000*
	64	2	0	0		
		64	98	98		
The complications of calcium deficiency:	40					
<ul style="list-style-type: none"> • Incorrect answer • Correct complete answer 	60	40	4	4	37.76	0.000*
		60	96	96		
The effect of calcium deficiency on the mother:						
<ul style="list-style-type: none"> • Incorrect answer 						

<ul style="list-style-type: none"> Correct complete answer 	50	50	10	10	38.09	0.000*
	50	50	90	90		
Effect of calcium deficiency on the fetus: <ul style="list-style-type: none"> Incorrect answer Correct complete answer 	54	54	4	4	60.709	0.000*
	46	46	96	96		
Methods of calcium deficiency treatment: <ul style="list-style-type: none"> Incorrect answer Correct incomplete answer. Correct complete answer 	60	60	20	20	34.23	0.000*
	0	0	2	2		
	40	40	78	78		
Symptoms of calcium excess in the body: <ul style="list-style-type: none"> Incorrect answer Correct incomplete answer. Correct complete answer 	24	24	6	6	16.75	0.001*
	74	74	92	92		
	2	2	0	0		
Complications of high calcium doses: <ul style="list-style-type: none"> Incorrect answer Correct complete answer 	62	62	20	20	36.46	0.000*
	38	38	80	80		
Definition of vitamin D: <ul style="list-style-type: none"> Incorrect answer Correct complete answer 	18	18	4	4	10.01	0.002*
	82	82	96	96		
The right time of intake calcium supplementation: <ul style="list-style-type: none"> Incorrect answer Correct incomplete answer. Correct complete answer 	8	8	0	0	10.526	0.005*
	90	90	100	100		
	2	2	0	0		
Calcium and iron supplements at the same time: <ul style="list-style-type: none"> Incorrect answer Correct complete answer 	18	18	2	2	14.22	0.000*
	82	82	98	98		

*: Significant at $P \leq 0.05$

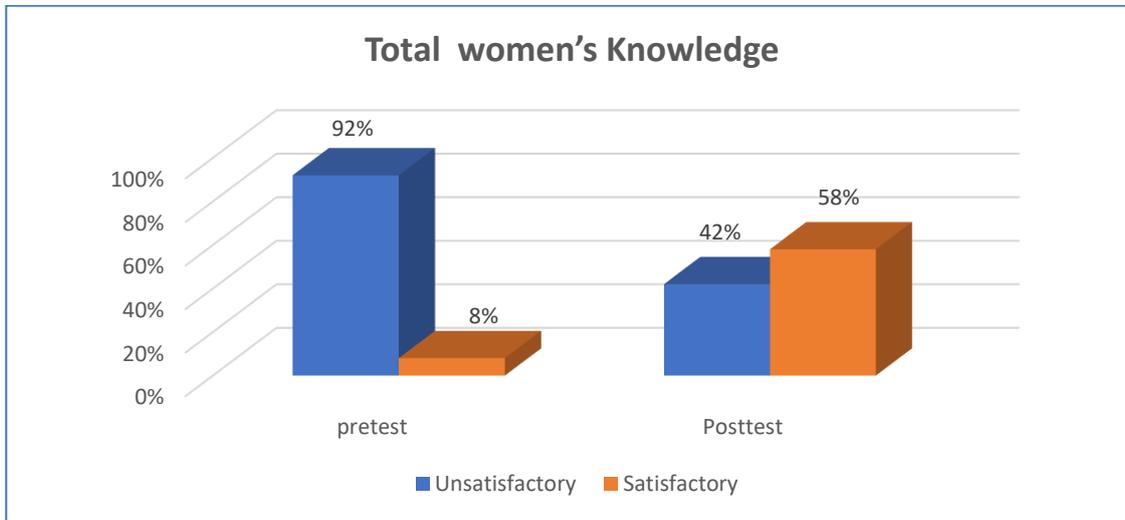


Figure (2): Bar graph representing total pregnant women's knowledge.

Table (3): Distribution of pregnant women's attitude toward calcium supplementation (n=100).

Items	Studied women (n = 100)				x2	P-Value
	Pre-Test		Post-Test			
	No	%	No	%		
Necessity of taking calcium daily: <ul style="list-style-type: none"> Not Agree Not Sure Agree 	10	10	0	0	32.77	0.000*
Importance of starting calcium supplements in the 20th week of pregnancy: <ul style="list-style-type: none"> Not Agree Not Sure Agree 	50	50	0	0	102.81	0.000*
complications of calcium deficiency during pregnancy: <ul style="list-style-type: none"> Not Agree Not Sure Agree 	14	14	0	0	71.82	0.000*

	54	54	10	10		
	32	32	90	90		
Importance of intake calcium supplementation before pregnancy to prevent calcium deficiency: <ul style="list-style-type: none"> • Not Agree • Not Sure • Agree 	70	70	20	20	51.58	0.000*
	18	18	38	38		
	12	12	42	42		
Necessity of laboratory tests to measure calcium level during pregnancy: <ul style="list-style-type: none"> • Not Agree • Not Sure • Agree 	36	36	16	16	22.548	0.000*
	46	46	36	36		
	18	18	48	48		
Intake calcium and iron supplements at different times and not at the same time: <ul style="list-style-type: none"> • Not Agree • Not Sure • Agree 	22	22	2	2	43.86	0.000*
	22	22	2	2		
	56	56	96	96		
Taking calcium/ Vit D without doctor's prescription: <ul style="list-style-type: none"> • Not Agree • Not Sure • Agree 	8	8	0	0	12.99	0.002*
	22	22	12	12		
	70	70	88	88		
Importance of sunlight exposure in morning & evening: <ul style="list-style-type: none"> • Not Agree • Not Sure • Agree 	6	6	0	0	18.05	0.000*
	22	22	6	6		
	72	72	94	94		
Necessity of taking calcium supplements as prescribed by the doctor without stopping: <ul style="list-style-type: none"> • Not Agree • Not Sure • Agree 	8	8	0	0	10.299	0.006*
	20	20	14	14		

	72	72	86	86		
Foods that help absorption of calcium: <ul style="list-style-type: none"> • Not Agree • Not Sure • Agree 	6	6	0	0	47.21	0.000*
	40	40	4	4		
	54	54	96	96		
Foods that prevent calcium absorption: <ul style="list-style-type: none"> • Not Agree • Not Sure • Agree 	38	38	0	0	83.9	0.000*
	32	32	8	8		
	30	30	92	92		
Getting of calcium supplements during pregnancy: <ul style="list-style-type: none"> • Not Agree • Not Sure • Agree 	16	16	8	8	3.366	0.186
	24	24	30	30		
	60	60	62	62		
Impact of calcium deficiency on health of the fetus: <ul style="list-style-type: none"> • Not Agree • Not Sure • Agree 	12	12	0	0	40.96	0.000*
	22	22	0	0		
	66	66	100	100		
Eating of foods rich in calcium: <ul style="list-style-type: none"> • Not Agree • Not Sure • Agree 	8	8	4	4	15.72	0.000*
	54	54	30	30		
	38	38	66	66		
Taking vitamin D to help calcium absorption: <ul style="list-style-type: none"> • Not Agree • Not Sure • Agree 	10	10	0	0	37.70	0.000*
	26	26	2	2		
	64	64	98	98		
Consuming caffeine, chocolate & drinking alcohol prevent absorption of calcium in the body: <ul style="list-style-type: none"> • Not Agree • Not Sure • Agree 	60	60	0	0	149.6	0.000*
	30	30	4	4		
	10	10	96	96		

Ignoring intake of calcium during pregnancy delays teething and walking of the infant: <ul style="list-style-type: none"> • Not Agree • Not Sure • Agree 	46	46	2	2	85.24	0.000*
	40	40	24	24		
	14	14	74	74		
Sources of calcium: <ul style="list-style-type: none"> • Not Agree • Not Sure • Agree 	4	4	0	0	53.16	0.000*
	38	38	0	0		
	58	58	100	100		
Ignoring intake of calcium supplementation during pregnancy resulting in preeclampsia: <ul style="list-style-type: none"> • Not Agree • Not Sure • Agree 	46	46	2	2	135.1	0.000*
	42	42	4	4		
	12	12	94	94		
Visiting the doctor when symptoms of calcium deficiency present as losing some teeth and joint pain: <ul style="list-style-type: none"> • Not Agree • Not Sure • Agree 	32	32	16	16	7.10	0.029*
	50	50	60	60		
	18	18	24	24		

*: Significant at $P \leq 0.05$

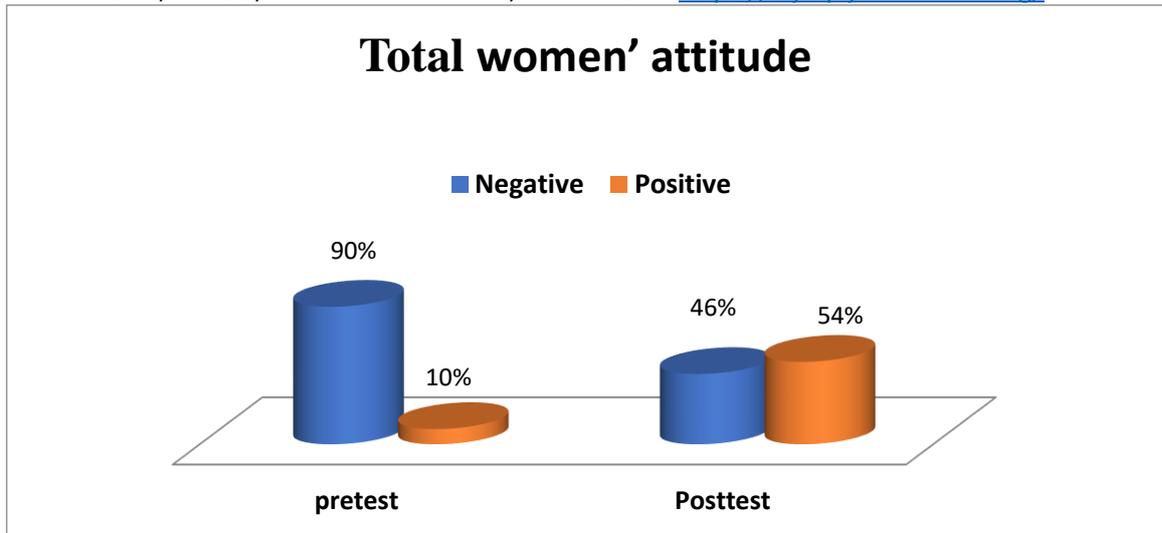


Figure (3): Bar graph representing total pregnant women' attitude:

Table (4): Association between total pregnant women's knowledge and demographic data.

Items	Women's Knowledge				x2	P-value
	Un satisfactory		Satisfactory			
	No	%	No	%		
Age: <ul style="list-style-type: none"> 18 <25 25 <30 30 – 35 	36	39.1	2	25	3.554	0.169
	50	54.3	4	50		
	6	6	2	25		
Job: <ul style="list-style-type: none"> Working Housewife 	30	32.6	8	100	14.18	0.000*
	62	67.4	0	0		
Educational level: <ul style="list-style-type: none"> Don't read or write. Read and write. Primary education Secondary education University education 	4	4.3	0	0	24.74	0.000*
	18	19.6	0	0		
	20	21.7	0	0		
	32	34.8	0	0		
	18	19.6	8	100		

Living place: <ul style="list-style-type: none"> Rural Urban 	20	21.7	2	25	0.046	0.831
	72	78.3	6	75		
Family income: <ul style="list-style-type: none"> Sufficient Insufficient 	72	78.3	6	75	0.046	0.831
	20	21.7	2	25		
Source of information about calcium supplements: <ul style="list-style-type: none"> Health worker (Physician, nurse) Mother Friends social media All of the above 	40	43.5	0	0	20.41	0.000*
	12	13	0	0		
	26	28.3	2	25		
	12	13	4	50		
	2	2.2	2	25		

*: Significant at $P \leq 0.05$

Table (5): Association between total pregnant women’s attitude and demographic data.

Items	Women’s Attitude				x ²	P-value
	Negative		Positive			
	No	%	No	%		
Age: <ul style="list-style-type: none"> 18 <25 25 <30 30 – 35 	36	40	2	20	3.021	0.221
	48	53.3	6	60		
	6	6.7	2	20		
Job: <ul style="list-style-type: none"> Working Housewife 	32	35.6	6	60	2.283	0.131
	58	64.4	4	40		
Educational level: <ul style="list-style-type: none"> Don't read or write. Read and write. Basic education High school education University education 	4				17.628	0.001*
	18	4.4	0	0		

	20	20	0	0		
	30	22.2	0	0		
	18	33.3	2	20		
		20	8	80		
Living place:						
• Rural	20	22.2	2	20	0.026	0.872
• Urban	70	77.8	8	80		
Family income:						
• Sufficient	68	75.6	10	100	3.134	0.077
• Insufficient	22	24.4	0	0		
Source of information about calcium supplements.						
• Health worker (Physician, nurse)	34	37.8	6	60		
• Mother	12	13.3	0	0		
• Friends	28	31.1	0	0	12.778	0.012*
• social media	14	15.6	2	20		
• All of the above	2	2.2	2	20		

*: Significant at $P \leq 0.05$

Table (6): Association between total pregnant women's knowledge and previous & current history.

Items	Women's Knowledge				x ²	P-value
	Un satisfactory		Satisfactory			
	No	%	No	%		
Previous history of pregnancy:						
Age of puberty:						
• 10-13	63	68.5	8	100	3.552	0.059
• 14-17	29	31.5	0	0		
Pattern of menstrual cycle:						
• Regular	62	67.4	8	100	3.727	0.054
• Irregular						

	30	32.6	0	0		
Number of pregnancies:	44	47.8	6	75		
• 1-2	36	39.1	2	25	2.517	0.472
• 3-4	8	8.7	0	0		
• 5-6	4	4.3	0	0		
• 7-8						
Number of abortions:	54	58.7	6	75		
• No	36	39.1	2	25	0.887	0.642
• 1-2	2	2.2	0	0		
• 3-4						
Number of deliveries:	22	23.9	2	25		
• No	50	54.3	6	75	2.303	0.512
• 1-2	16	17.4	0	0		
• 3-4	4	4.3	0	0		
• 5-6						
Methods of Previous delivery:	24	26.1	2	25		
• No previous delivery	34	37	2	25	0.943	0.815
• Normal	32	34.8	4	50		
• Caesarean section	2	2.2	0	0		
• Instrumental delivery						
Previous premature birth:	76	82.6	6	75		
• No	16	17.4	2	25	0.289	0.591
• Yes						
Previous birth defects:	74	80.4	8	100		
• No	18	19.6	0	0	1.909	0.167
• Yes						
Current history of pregnancy:						
Presence of problems during previous pregnancy:						
• No						

<ul style="list-style-type: none"> • Yes 	50	54.3	4	50	0.056	0.813
	42	45.7	4	50		
Problems during the current pregnancy: <ul style="list-style-type: none"> • No • Yes 	54	58.7	4	50	0.228	0.633
	38	41.3	4	50		
Health visits and follow up on pregnancy: <ul style="list-style-type: none"> • No • Yes 	2	2.2	0	0	0.177	0.674
	90	97.8	8	100		

*: Significant at $P \leq 0.05$

Table (7): Association between total pregnant women’s attitude and obstetric and maternal history of the studied pregnant women .

Items	Women’ Attitude				x ²	P-value
	Negative		Positive			
	No	%	No	%		
Age of puberty: <ul style="list-style-type: none"> • 10-13 • 14-17 	67	74.4	4	40	5.186	0.023*
	23	25.6	6	60		
Pattern of menstrual cycle: <ul style="list-style-type: none"> • Regular • Irregular 	60	66.7	10	100	4.76	0.029*
	30	33.3	0	0		
Number of pregnancies: <ul style="list-style-type: none"> • 1-2 • 3-4 • 5-6 • 7-8 	40	44.4	10	100	11.11	0.011*
	38	42.2	0	0		
	8	8.9	0	0		
	4	4.4	0	0		

Number of abortions: <ul style="list-style-type: none"> • No • 1-2 • 3-4 	52	57.8	8	80	1.910	0.385
Number of deliveries: <ul style="list-style-type: none"> • No • 1-2 • 3-4 • 5-6 	18	20	6	60	8.730	0.033*
Methods of Previous delivery: <ul style="list-style-type: none"> • No previous delivery • Normal • Caesarean section • Both 	20	22.2	6	60	6.743	0.081
Previous premature birth: <ul style="list-style-type: none"> • No • Yes 	74	82.2	8	80	0.30	0.862
Previous birth defects: <ul style="list-style-type: none"> • No • Yes 	74	82.2	8	80	0.30	0.862
Presence of problems during previous pregnancy: <ul style="list-style-type: none"> • No • Yes 	46	51.1	8	80	3.024	0.082
Problems during the current pregnancy: <ul style="list-style-type: none"> • No • Yes 	44	48.9	2	20		
Health visits and follow up on pregnancy: <ul style="list-style-type: none"> • No 	52	57.8	6	60	0.018	0.893
<ul style="list-style-type: none"> • Yes 	38	42.2	4	40		

• Yes	2				0.227	0.634
	88	2.2	0	0		
		97.8	10	100		

*: Significant at $P \leq 0.05$

Table (8): Correlation between pregnant women’s knowledge and attitude, age of puberty, number of pregnancies, number of abortions, and number of births.

Items	Mean±SD	Total knowledge	
		Correlation Coefficient	P-value
Total Attitude	23.18 ± 8.46	0.627	0.000*
Age of Puberty	13.22 ± 1.040	-0.095	0.345
Number of Pregnancies	2.80 ± 1.49	-0.162	0.106
Number of Abortions	0.60 ± 0.876	-0.031	0.760
Number of deliveries	1.40 ± 1.30	-0.243	0.015*

*: Significant at $P \leq 0.05$

Table (9): Correlation between pregnant women’s attitude and age of puberty, number of pregnancies, number of abortions, and number of births.

Items	Mean±SD	Total Attitude	
		Correlation Coefficient	P-value
Age of Puberty	13.22 ± 1.040	-0.115	0.256
Number of Pregnancies	2.80 ± 1.49	-0.393	0.000*
Number of Abortions	0.60 ± 0.876	-0.203	0.043*
Number of deliveries	1.40 ± 1.30	-0.381	0.000*

*: Significant at $P \leq 0.0$

Discussion:



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Pregnancy is a crucial period for women, characterized by an increased risk of low calcium intake that poses risks to both the fetus and the mother. The fetal risks associated with inadequate calcium intake during pregnancy include restricted intrauterine growth, low birth weight, poor bone mineralization, and preterm birth. Maternal risks include hypertension and preeclampsia, emphasizing the importance of calcium supplementation in preventing preeclampsia (**Willemse et al., 2020**). Insufficient calcium intake represents one of the most serious public health challenges affecting mothers and their children globally. Recognizing the critical role of calcium in pregnancy and addressing the challenges associated with low intake is essential for promoting the health and well-being of both mothers and their infants. Interventions, including education on proper nutrition and calcium supplementation, are crucial in mitigating the risks associated with inadequate calcium during pregnancy (**Korhonen et al., 2022**).

So, this study was conducted to evaluate the effect of educational guidelines on pregnant women's perception regarding calcium supplementation during pregnancy.

In the current study, the demographic characteristics of the studied pregnant women revealed that the sample ranged in age from 18 to 35 years old, with a mean age of 25.24 ± 0 years. This finding is in the same line with the results reported by (**Alowais et al., 2019**) in their study titled "Knowledge, attitude, and practices regarding dietary supplements in Saudi Arabia," where the mean age of the participants was 25.01 ± 0 years. From researcher's point of view who suggests a consistency in the age distribution of the sampled populations. This may indicate a comparable demographic profile among the women participating in both studies, providing context, and facilitating a better understanding of the results in relation to age-specific factors. The alignment in mean age contributes to the generalizability of findings across different research studies within a similar demographic context.

Regarding the analysis of job, level of education, residence, and family income revealed that less than two-thirds of the studied pregnant women were housewives, while about one-third had graduated from high school. Furthermore, more than three-quarters of the participants were living in urban areas with sufficient family income. These findings are consistent with the results conducted by (**Cormick et al., 2019**). Who studied "Global inequities in dietary calcium intake during pregnancy" that found the highest percentage of the studied women were housewives. From the researcher's point of view, that suggests a common trend in the demographic characteristics of pregnant women in both studies, emphasizing the prevalence of housewives among the participants. This consistency may contribute to a more comprehensive understanding of the demographic profile of pregnant women in these specific settings and help inform targeted interventions and educational programs.

Concerning the source of women's knowledge regarding calcium intake, the present study revealed less than half of the studied women receiving knowledge from the health worker (physician, nurses), while only less than one quarter received knowledge from social media. This result agrees with the study that conducted by (**Kraemer et al., 2023**). Who studied "Knowledge, Attitudes and Practices of Pregnant Women and Healthcare Providers in Bangladesh regarding Multivitamin Supplements during Pregnancy." That found the source of women's knowledge regarding calcium intake, study revealed that more than three quarters of the studied women gained their knowledge from doctors. From the

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researcher point of view, that Saied increase pregnant women's knowledge about calcium intake depend on increase awareness and using all methods to improve knowledge regarding calcium supplementation especially social media.

In the current study, the findings indicate a noteworthy improvement in the total knowledge about calcium supplementation during pregnancy. More than half of the pregnant women under study achieved a satisfactory level of knowledge in the post-test, a significant increase compared to the pre-test where only ten of them demonstrated satisfactory knowledge. This outcome stands in contrast to a study by (Gaheen et al.,2020) titled "Knowledge, Attitude, and Practices Regarding Calcium Intake among Pregnant Women in Tanta City," who reported that most of the studied women had poor knowledge related to calcium intake. From the researcher's point of view that perspective, this disparity in results suggests that the increase in knowledge among pregnant women could be attributed to more comprehensive educational programs and regular follow-up interventions implemented in the current study. The emphasis on education and consistent follow-up appears to have played a crucial role in enhancing the understanding and awareness of pregnant women regarding calcium supplementation during pregnancy.

Regarding the total attitude of the pregnant women during calcium supplementation in this study there was statistically significant difference between the total attitude of the studied pregnant women toward calcium supplementation during pre and post-test in which the majority of the studied women had negative attitude within pre-test, while more than half had positive attitude within post-test after application of the educational guidelines regarding calcium supplementation during pregnancy. This result agree with (Meertens et al.,2018). who studied "Should women be advised to use calcium supplements during pregnancy". That reported observed that three fifth of the studied women had negative attitude toward calcium intake. From the researcher's point of view that reported the total attitude depend on the total knowledge of the studied pregnant women. When women had satisfactory level of knowledge that reflect on attitude (positive attitude), but women had unsatisfactory level of knowledge that reflect negative attitude.

The analysis of the association between total women's knowledge and demographic data in this study reveals several significant findings. There is a statistically significant association between women's knowledge and their job, educational level, and source of knowledge. Conversely, no statistically significant association was observed between women's knowledge and their age, living place, and family income. These results align with the findings of (Goda et al.,2018), who conducted the study entitled "knowledge, practice, and attitude of pregnant women regarding the effect of calcium during pregnancy". That reported a statistically significant association between women's knowledge and their job, educational level, and source of knowledge. From the researcher's point of view, that believed there were factors such as employment, higher education, a higher income level, and urban residency may positively influence knowledge acquisition. This suggests that women who work, have higher educational attainment, and reside in urban areas may be more likely to have enhanced knowledge levels, highlighting the importance of these demographic factors to increase women's awareness and understanding, particularly in the context of pregnancy and calcium intake.

Regarding the association between total women's attitude and demographic data. The result that show, there was a statistically significant association between women's attitude and educational level & source of knowledge, while there was no statistically significant association between women's attitude and age, job, living place & family income. This result

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disagree with (*Sh Goda et al.,2019*). who studied " Assess the knowledge, practice and attitude of pregnant women for effect, of calcium during pregnancy" in Banha city. that found difference significant between total attitude and demographic data.

From the researcher point of view there was relation between demographic data and women`s attitude such as level of education effect on women attitude.

Regarding the association between total women`s knowledge and previous & current history for the studied women. That shows, there was no statistically significant association between women`s knowledge and age of puberty, pattern of menstrual cycle, number of pregnancies, number of abortions, number of births, methods of previous delivery, previous premature births, previous birth defects, and presence of problems with the current pregnancy. the result in the same line with (*Dewi et al.,2020*). who studied Knowledge, Attitude, and Behavior Level of Women of Reproductive Age toward Calcium Intake.

Regarding the association between total women`s attitude and previous and current history for the studied women. The result shows that, there was a statistically significant association between women`s attitude and age of puberty, pattern of menstrual cycle, number of pregnancies, &number of births. There was no statistically significant association between women`s knowledge and number of abortions, methods of previous delivery, previous premature births, previous birth defects, and presence of problems with the current pregnancy. this agree with (*Gaheen et al.,2020*) who studied "Knowledge, Attitude and Practices Regarding Calcium Intake among Pregnant Women in Tanta City." That found statistically significant association between women`s attitude and age of puberty, pattern of menstrual cycle, number of pregnancies, &number of abortions.

V. Conclusion:

Based on the findings of the present study, it can be inferred that the introduction of educational guidelines led to a substantial and statistically significant enhancement in both knowledge and attitude towards calcium supplementation among the studied pregnant women. As a result, the educational guidelines effectively fulfilled their goal of positively impacting the participants' understanding and outlook regarding calcium supplementation. These outcomes lend strong support to the research hypothesis, indicating that the implemented educational intervention successfully contributed to the improvement of knowledge and attitude in relation to calcium supplementation during pregnancy.

Recommendations:

Based on the results of the present study, the following recommendations are suggested:

1. Continuous educational classes is recommended to provide ongoing educational classes for pregnant women, focusing on increasing awareness regarding the importance of calcium intake during pregnancy.
2. Routine screening for all pregnant women throughout the three trimesters of pregnancy to facilitate early diagnosis and proper treatment of hypocalcemia.
3. Empowering pregnant women with knowledge and a positive attitude towards antenatal care during pregnancy.

Further studies:

Replication of the study on a larger probability sample, with different affiliations in different regions in Egypt to enhance the generalizability of the results.

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