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Knowledge, Attitude and Practices Regarding Calcium Intake among Pregnant Women in Tanta City

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Abstract
*Nutritional status of pregnant woman is the most important determinant of pregnancy outcomes, calcium deficiency can result into serious problems for mother and her growing fetus. The **aim** of this study is to assess knowledge, attitude and practices regarding calcium intake among pregnant women in Tanta city and provide pregnant women with healthy guidelines to prevent exposure to calcium deficiency during pregnancy. This study followed a **descriptive design**. The study was **carried out** at antenatal outpatient clinics in; Tanta University Hospital, Elmenshawy Hospital and El Mehalla El Kobra General Hospital. **The subjects** of the study consisted of 500 women who attended the previously mentioned antenatal outpatient clinics. **Four tools** were used to collect data for this study: **First tool**, structured interview sheet concerning Socio-demographic data, and **knowledge** of women regarding calcium intake. **Second tool**, covering of items related to women attitude regarding calcium intake during pregnancy. **Third tool**, assessment of women's practices regarding calcium intake during pregnancy. **Fourth tool**, brochure which was developed by the researchers and includes the necessary information needed for pregnant women related to calcium intake. The main **results** of this study revealed that more than three quarter (76.8%) of the studied women had poor knowledge while more than fifth (23.2%) had fair knowledge regarding calcium intake during pregnancy. The results also demonstrated that more than three fifth (60.4%) of the studied women had negative attitude and almost two fifth (39.6%) of them had positive attitude regarding calcium intake during pregnancy. Also, the majority (90.2 %) of the studied women had poor practice while; only 9.8% had good practice regarding calcium intake during pregnancy. A significant positive correlation was found between total knowledge level and total level of both practice and attitude of the studied women. This study **recommended** that an educational program about the importance of calcium intake during pregnancy for the benefits of the pregnant women and their fetus and measures to prevent calcium deficiency should be designed for all pregnant women.*
***Keywords:** Knowledge, Attitude, Practices, Calcium Intake.*

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I. Introduction

Pregnancy is a crucial period in women's lives where they tend to practice many changes in their bodies [(1)]. In pregnancy; a remarkable physiological and nutritional changes can occur, aimed to preserve maternal homeostasis and afford fetal growth and development [(2)]. Calcium requirements, absorption and urinary calcium excretion are higher during pregnancy than before conception or after delivery [(3,4)]. Calcium transportation is active processes from the pregnant women to her fetus which regulated by the placenta [(2)]. The skeleton of the newborn baby contains about 20 to 30 grams of calcium. The size of the fetal skeleton growth begins from mid pregnancy onward, with a maximal calcium buildup occurring during the third trimester. The total calcium buildup rate of the fetus increases from around 50 milligram per day at 20th gestational weeks to 330 milligrams at 35th weeks. For the third trimester of pregnancy, 200 milligram is considered the average buildup rate [(5)]. Maternal health and nutritional status are the significant indicators of the burden of any disease [(2,5)]. Hypocalcemia during pregnancy can pose numerous problems to the mother and fetus [(6)].

Since the total serum calcium normally decrease during pregnancy, thus a healthy and balanced maternal diet is crucial since the diet needs to take care of the women's nutritional needs as well as the needs of the growing fetus, enabling the mother to maintain her stores of nutrients and those required for fetal health as well as for the breastfeeding period [(4)]. Calcium balance is determined by the relationship between calcium intake, calcium absorption, and excretion [(6)]. Dietary calcium consumption varies with geographic regions. Calcium intake during pregnancy is higher than the recommended daily requirement of each country in Europe

and America. On the other hand, calcium intake is lower than the recommended daily requirement in; Japan, New Zealand, India, Egypt, and Qatar [7-10].

World Health Organization (WHO) verify the usefulness and safety of calcium supplementation in pregnant women as a public health approach, to achieve the Millennium Development Goals and the global targets set in the maternal, infant and child nutrition inclusive implementation plan. WHO recommends an intake from 1.5 to 2.0 gram elemental calcium per day divided into three doses preferred to be taken with meals staring from 20th weeks' gestation till the end of the pregnancy period [11].

Calcium is an important mineral in many physiological processes [9]. The most important function of calcium being bone composition, calcium levels affect many extracellular and intracellular processes [13]. These processes may include nerve impulse, nerve transmission, regulating of pulse rate, cell membrane stability, oocyte activation, bone structure, blood clotting, muscle contraction, cellular permeability and intracellular signaling. It is also an important cofactor for hormonal regulation in endocrine glands [14]. Calcium supplementation during pregnancy prevent hypertensive disorders and preeclampsia, especially in low calcium-consumed population, it has shown effectiveness in reducing the risk of preterm delivery in women with low calcium intakes. It reduces parathyroid release and intracellular calcium and so reduces smooth muscle contractility. By this means, it reduces uterine smooth muscle contractility and prevents preterm labor and delivery [1,3].

Human bodies didn't produce calcium, so must get it through other sources. Calcium can be found in a variety types of foods, including; dairy products, such as cheese, milk and yogurt, dark green leafy vegetables, such as broccoli, Chinese cabbage, and kale, soft bones fish, such as sardines and canned salmon, calcium-fortified foods and beverages, such as soy products, cereal and fruit juices, figs, and milk substitutes [14]. Vitamin D is important for calcium absorption, foods high in vitamin D may include; fatty fish such as salmon or mackerel, beef liver, egg yolks, milk, orange juice fortified with vitamin D, and fortified cereals [6]. Vitamin D deficiency in pregnancy leads to significant maternal and newborn complications. Maternal complication may include decreased body weight, gestational diabetes mellitus, preeclampsia, increase the tendency of infections, and increase the need for caesarean section delivery. The effect of vitamin D deficiency on new borne were include; low birth weight, wheezing chest, type I diabetes mellitus, dermal eczema, poor weight gain, impaired development and rickets [15].

There are two types of calcium deficiency; dietary calcium deficiency which is a condition in which there is an insufficient calcium intake, and hypocalcemia which is a low calcium level in the blood which can happened as a result of side effect of some medications, such as diuretics; medical treatments; or as a result of some diseases processes, such as renal failure or hypo-parathyroid [2,16]. Sign of calcium deficiency includes; muscle cramp, convulsions, general weakness, anorexia, and heart dysrhythmia, dry skin and brittle nails, numbness, high tendency to bone fractures, and muscle cramping, tetany which is characterized by muscle cramps, numbness and tingling in arms and legs which occur mostly at night, especially in the legs [5,17]. In addition; long-term calcium deficiency can lead to osteopenia which if untreated can lead to risk to osteoporosis consequently [16].

There are some factors that hinder calcium absorption during pregnancy such as high phytic acid in diet which is present in the bran coating of whole grains, phytic acid binds calcium and other minerals, making them insoluble and not absorbable in the intestines [5,9]. In addition; high sodium intake may prevent calcium absorption since it is increases urinary calcium excretion. Moreover; Caffeine intake can increase calcium excretion and reduce absorption. Also, vitamin D deficiency is affecting regulating of calcium absorption. Alcohol intake can affect calcium status by reducing its absorption while smoking interferes with the absorption of calcium in the intestines [9]. Celiac Disease is changes the lining of the intestine and impacts absorption of fat-soluble vitamins and minerals, such as vitamin D and calcium. Other factors, such as sedentary lifestyle and a diet that features a large amount of meat, may also affect body ability to absorb calcium [1,4].

Calcium deficiency during pregnancy is a condition in which the body has an inadequate calcium or hypocalcemia. It has numerous consequences of women health from the fetal phase to the elderly post-menopausal age. Low calcium intakes during pregnancy may stimulate Para Thyroid Hormone (PTH) secretion, increasing intracellular calcium and smooth muscle contractibility and release renin from the kidney, leading to vasoconstriction and retention of sodium and fluid. These physiological changes can lead to the development of pregnancy-induced hypertension and fetal growth disorders [6,7]. The following groups are among those who most likely need extra calcium intake; pregnant women, small children, lactating mothers, and menopausal women [4].

Pregnant women should be encouraged to consume enough amount of calcium through their dietary intake and supplementation [18]. The previous studies denoted that the pregnant women have low level of knowledge and negative attitude regarding the importance of calcium intake and its effect of the health status of both women and their fetus. So that, the maternity nurses should play an important role in maintain women's nutritional status during pregnancy because they have the first opportunity to contact with the pregnant women,

they consider as a health care provider talented with accountability to improve women's health, decrease morbidity and mortality associated with pregnancy [10].

Significant of the problems

Women in developing countries are at risk of malnutrition and nutritional deficiencies during pregnancy especially calcium resulting in negative pregnancy outcomes [19]. It has long been a major health problem during pregnancy in the Middle East and leading to complication for pregnant women and their growing fetus. As, the Egyptian pregnant women had poor knowledge and practice related to calcium intake during pregnancy [20]. Therefore, this study was conducted to assess the knowledge, attitude and practices of pregnant women toward calcium intake during pregnancy in Tanta city, Egypt.

II. Subjects and Methods

Aim of the study

The aims of this study were:

1- To assess knowledge, attitude and practices of pregnant women regarding calcium intake during pregnancy.

2- Provide pregnant women with healthy measures to prevent exposure to calcium deficiency during, and after pregnancy.

Research Questions:

1- What are the knowledge, attitude and practices of pregnant women regarding calcium intake during pregnancy?

3- Is there a relationship between knowledge, attitude and practices regarding calcium intake during pregnancy and the socio-demographic characteristics of the pregnant women?

Study design: A descriptive design was used in carrying out this study.

Setting: The study was conducted at ante natal outpatient clinic in; Tanta University Hospital,affiliated to Tanta University and Elmenshawy Hospital and El Mehalla El Kobra General Hospital which are affiliated to ministry of health. **Subjects:** The study include a convenience sample of women who are attending ante natal outpatient clinics of previous mentioned setting at the period from 1/9/2017 to 1/7/2018, two days/week, the total number of women interviewed by the researchers were 592 women, 50 of them represent the sample of the pilot study and 42 women refused to continue in the study or didn't meet the study criteria. So, the net remained number who actually involved in the study was 500 women according the following criteria.

- Either primi or multigravida.
- Pregnant with singleton fetus.
- Free from any medical disease
- Willing and agree to participate in the study.

Tools of data collection: -

To achieve the aim of this study the following three tools were used for data collection as follows:

Tool I: Pregnant Women knowledge' Structured Interviewing Questionnaire:

It was developed by the researchers after extensive reviewing of the recent related literature [1;2,14]. It comprised two parts:

Part (1): Socio-demographic characteristics of pregnant women:

This part was used to collect data such as: name, age, marital status, level of education, occupation, family income and place of residence.

Part 2: Pregnant Women knowledge Regarding Calcium Intake, such as: meaning of calcium and vitamin D, daily requirements needed of calcium and vitamin D, importance of calcium for pregnant women and for fetus, nutritional source for calcium , factors that help calcium absorption, types of foods that hinder calcium absorption of, signs and symptoms of calcium deficiency for pregnant woman, women at high risk group of calcium deficiency, the effect of calcium deficiency on pregnant women and baby after birth, the pregnancy trimester that pregnant women should increase calcium intake, treatment modalities of calcium deficiency and the source of the pregnant women information.

The scoring system for knowledge was as follows:

- Correct and complete answers will be scored as (2).
- Correct and incomplete answers will be scored as (1).
- Incorrect and didn't know will be scored as (0)

The total score of knowledge level was calculated as follows:
-Good knowledge level ≥ 75%
- Fair knowledge level 50% - < 75%
- Poor knowledge level < 50%

Tool II: Pregnant Women's Attitude Regarding Calcium Intake Questionnaire This tool was developed by the researchers after reviewing of related literature [2,5,9].
It consisted of (16) items on a 3-point Likert scale agree (3), neutral (2) and disagree (1). It includes attitude of pregnant women related to; eating food rich in calcium, factors which enhance calcium absorption, and avoidance of food that hinder calcium absorption.
The total scoring system of pregnant women's attitude was as follow:

- Positive attitude ≥ 50 % of the total attitude score.
- Negative attitude < 50 % of the total attitude score.

Tool III: Pregnant Women's Practices Regarding Calcium Intake Questionnaire. It consisted of (11) statements to assess pregnant women practices related to; increase calcium source foods, exposure to sunlight, comply with prescribed calcium and vitamin D medication, Taking of prescribed calcium and vitamin D medication in different times per day, seeking medical attention when having sign or symptom of calcium deficiency, performance of periodic ultrasonography and regularly checking of blood calcium level, avoidance of caffeine beverages and high sodium food during pregnancy with possible answers of yes (2) scores and no (1) score.
The total score of practices level was calculated as follows:

- A scoring of < 50% of the total score indicated poor practice.
- While a score of ≥ 50% of the total score indicated good practice.

Tool IV: Brochure was developed by the researchers using simple Arabic language and illustrates pictures which include the following:
Information needed for pregnant women related importance of calcium intake during pregnancy and detailed information regarding; meaning of calcium and vitamin D, daily requirements needed of calcium and vitamin D, importance of calcium for pregnant women and for fetus, nutritional source for calcium , factors that help calcium absorption, types of foods that hinder calcium absorption, signs and symptoms of calcium deficiency for pregnant woman, women at high risk group of calcium deficiency, the effect of calcium deficiency on pregnant women and baby after birth, the pregnancy trimester that pregnant women should increase calcium intake, treatment modalities of calcium deficiency and the source of the pregnant women information.

Methods: -

1. Approval

An official letter clarifying the purpose of the study was obtained from the faculty of Nursing and submitted to the responsible authorities of the selected setting for permission to carry out the study.

2. Developing the tools: Study tools were developed by the researchers based on the literature review. Tools were reviewed by a panel of five experts in the field of Obstetrics and Gynecological nursing to test its content validity. Reliability was tested before the main data analysis and was reported as 0.90 for knowledge and 0.82 for attitude. Opinion of experts of the study tools was analyzed by face validity 93% content validity 95%.

3. The pilot study: After development of the tools, a pilot study was carried out on 10 % of the pregnant woman (50 woman), from previously mentioned setting to test the clarity and applicability of the tools detecting any obstacles that might be encountered during data collection, as well as to determine the length of time needed to collect the data from each women. The necessary modifications were done according to the pilot study results. Those women were excluded from the study sample.

4. Ethical and legal consideration:

a. All women were informed about the purpose of the study.
b. An informed oral consent was taken from every participant in the study including the right to withdraw at any time.
c. The researchers were ensuring that the nature of the study do not cause any harm or pain for the entire women included in the study.
d. Confidentiality and privacy were taken into consideration regarding data collection.

5. Data collection:

1- The researchers attended the ante natal outpatient clinics at nine o'clock morning to meet the pregnant women.
2- Interview was done for all pregnant women who visited the ante natal outpatient clinics and choose the subjects that meet the inclusion criteria of the study.
3- For each pregnant woman; medical, obstetrical and gynecological history was obtained, assessment of vital signs to exclude those who are suffering from any medical health problem
4- Attendance of the researchers with the gynecologist to be aware of the pregnant woman's health conditions.
5- Confirm that the studied woman is pregnant in single fetus by checking the ultrasound finding or by performing an abdominal examination.
6- When the pregnant women are meeting the inclusion criteria; collecting data was performed by using the following tools:

Tool I, part 1 & 2 which is performed individually to each studied woman to collect data about the socio-demographic characteristics and knowledge regarding calcium intake during pregnancy.
Tool II, was used to collect data of pregnant women's attitude regarding calcium intake during pregnancy.
Tool III, was used to assess pregnant women's practices of calcium intake during pregnancy.
Tool V, was provided to the pregnant women after collecting of necessary study data, it composed of brochure which contains illustrated pictures and important information about calcium intake during pregnancy

Statistical analysis:

The collected data were organized, tabulated and statistically analyzed using SPSS software statistical computer package version 25. For quantitative data, the range, mean and standard deviation were calculated. For qualitative data, comparison was done using Chi-square test (χ^2). Correlation between variables was evaluated using Pearson and Spearman's correlation coefficient r. A significance was adopted at $P<0.05$ for interpretation of results of tests of significance (*). Also, a highly significance was adopted at $P<0.01$ for interpretation of results of tests of significance (**) [21].

III. Results

This study aimed to assess knowledge, attitude and practices regarding calcium intake among pregnant women and provide them with health measures to prevent calcium deficiency during and after pregnancy.

Figure (1, 2): Distribution of the studied women according to their sociodemographic characteristics

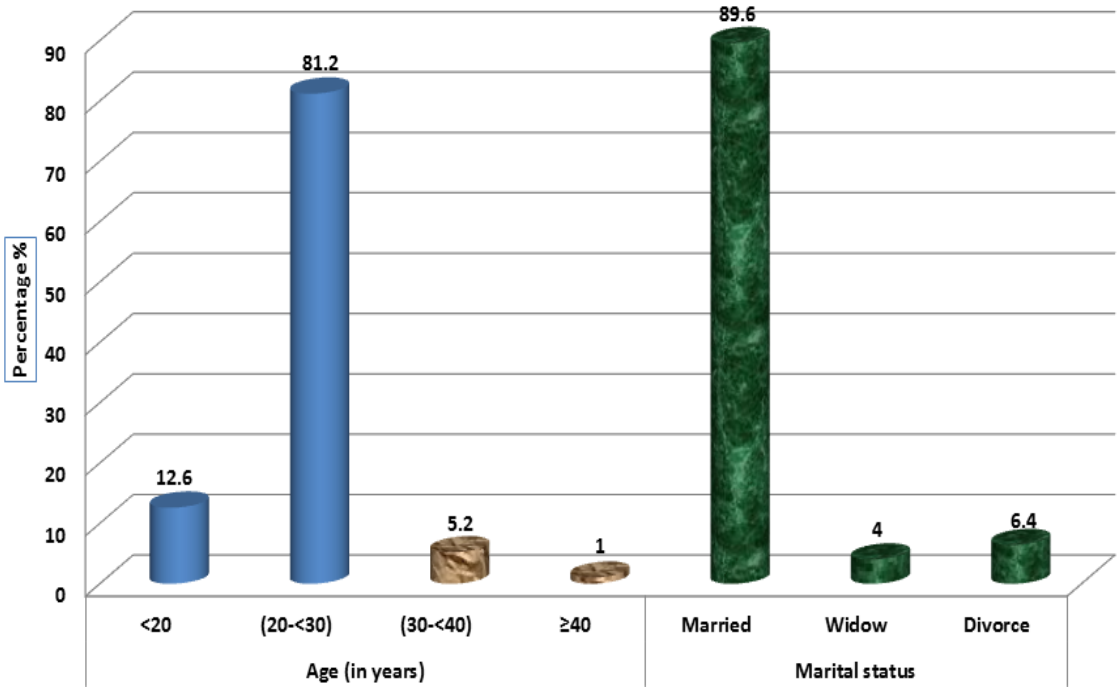

Fig: (1)

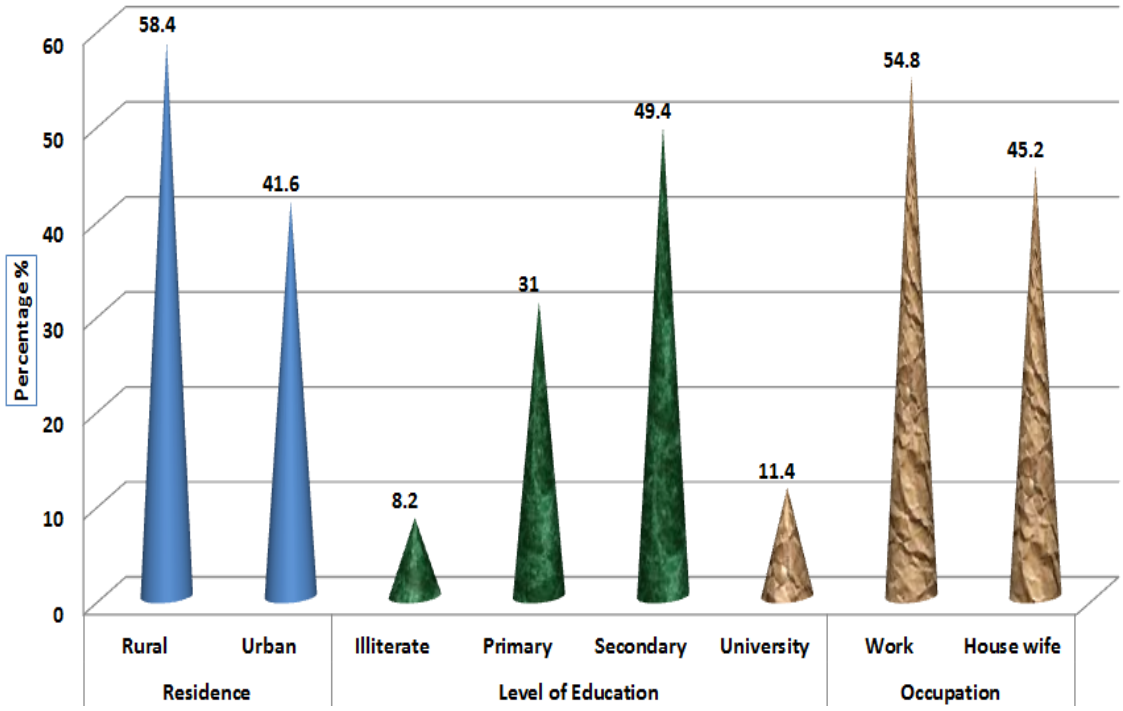

Fig: 2

Fig: (1,2); Distribution of the studied women according to socio – demographic characteristics. It shows that the majority of women 89.6% and 81.2% were married and their age ranged from 20- <30 years respectively with the mean age of 22.74±4.318. Almost half (49.4%) of them had secondary educational level. On the other hand, more than half (58.4% and 54.8%) of them were living in rural area and was employee respectively.

Table (1): The source of women's knowledge regarding calcium intake during pregnancy

Source of women knowledge	The studied women (n=500)	
	N	%
▪ Doctors	285	57.0
▪ Nurses	390	78.0
▪ Friends & Relatives	282	56.4
▪ Curriculum content	119	23.8
▪ Books & magazines	178	35.6
▪ The media	149	29.8
▪ The neighbors	197	39.4

More than one answer was chosen

Table (1): show the source of women's knowledge regarding calcium intake during pregnancy. It was observed more than three quarter (78.0%) of studied women got information from nurses, followed by more than half of them (57.0% and 56.4%) obtained their knowledge from doctors and their friends & relatives respectively.

Table (2): Distribution of the studied women according their knowledge regarding calcium intake during pregnancy

Items	The studied women (n=500)	
	N	%
Meaning of calcium		
▪ Incorrect	410	82.0
▪ Correct	90	18.0
Daily requirement of calcium		
▪ Incorrect	430	86.0
▪ Correct	70	14.0
Meaning of vitamin D		
▪ Incorrect	392	78.4
▪ Correct	108	21.6
Daily requirement of vitamin D		
▪ Incorrect	402	80.4
▪ Correct	98	19.6

Table (2): Continues:

Items	The studied women (n=500)	
	N	%
Importance of calcium intake for pregnant women.		
▪ Incorrect	208	41.6
▪ Incomplete correct	202	40.4
▪ Complete correct	90	18.0
Importance of calcium intake for fetus.		
▪ Incorrect	316	63.2
▪ Incomplete correct	97	19.4
▪ Complete correct	87	17.4
Nutritional source for calcium		
▪ Incorrect	271	54.2
▪ Incomplete correct	129	25.8
▪ Complete correct	100	20.0
Factors that help to absorb calcium		
▪ Incorrect	225	45.0
▪ Incomplete correct	165	33.0
▪ Complete correct	110	22.0
What are the foods that hinder the absorption of calcium in the body?		
▪ Incorrect	232	46.4
▪ Incomplete correct	143	28.6
▪ Complete correct	125	25.0
Symptoms of a calcium deficiency in a pregnant woman		
▪ Incorrect	272	54.4
▪ Incomplete correct	120	24.0
▪ Complete correct	108	21.6
High risk woman for calcium deficiency		
▪ Incorrect	238	47.6
▪ Incomplete correct	144	28.8
▪ Complete correct	118	23.6
Effect of calcium deficiency on baby after the birth		
▪ Incorrect	267	53.4
▪ Correct	233	46.6
What are the most trimester needed for increase calcium intake?		
▪ Incorrect	241	48.2
▪ Incomplete correct	108	21.6
▪ Complete correct	151	30.2
Methods of treatment of calcium deficiency		
▪ Incorrect	228	45.6
▪ Incomplete correct	115	23.0
▪ Complete correct	157	31.4
Effect of calcium deficiency on women on long term		
▪ Incorrect	302	60.4
▪ Incomplete correct	143	28.6
▪ Complete correct	55	11.0

Table 2, Represents the distribution of the studied women regarding their knowledge about calcium intake during pregnancy. It was reveals that the majority of studied women (82.0%, 86.0%) had incorrect answer about meaning of calcium and daily calcium requirement respectively; in addition, majority of them (87.4%, 80.4%) had incorrect answer about meaning of vitamin D and daily vitamin D requirement respectively. While, more than half of them (63.2%, 60.4%, 54.2%, 54.4%, 53.4%) had incorrect answer regarding; importance of calcium intake for fetus, effect of calcium deficiency on women on long term, nutritional source for calcium, symptoms of a calcium deficiency in a pregnant woman, and effect of calcium deficiency on baby after the birth respectively. The study also illustrates that less than fifth 18% and 17.4% of the studied women have complete and correct answers related to importance of calcium intake for pregnant women and importance of calcium intake for fetus respectively, in addition about fourth 22% and 25% of the studied women have complete and correct answers related to factors that help to absorb calcium and types of foods that hinder of calcium absorption in the body respectively while about tenth of them 11% have complete and correct answers related to effect of calcium deficiency on women on long term.

Table (3): Distribution of the studied women according to their total level of knowledge regarding calcium intake during pregnancy

Total Knowledge Level	The studied women (n=500)	
	N	%
▪ **Poor** ▪ **Fair**	384 116	76.8 23.2
Range Mean ± SD	(3-17) 10.23±2.743	

< 50% Poor 50-<75% Fair

Table 3, presents the total score level of women's knowledge regarding calcium intake during pregnancy. It was found that more than three quarter (76.8%) of the studied women had poor knowledge while less than fourth of them (23.2%) had fair knowledge and none of them had good knowledge regarding calcium intake during pregnancy.

Table (4): Distribution of the studied women according to their attitude toward calcium intake during pregnancy.

Items	The studied women (n=500)					
	Positive		Neutral		Negative	
	N	%	N	%	N	%
1.Better to drink cup of milk daily	145	29.0	199	39.8	156	31.2
2.Eat foods rich in calcium	61	12.2	239	47.8	200	40.0
3.Is necessary exposure to direct sun light in the early morning and evening	51	10.2	223	44.6	226	45.2
4.It is better not to eat many types of calcium-rich foods in one meal,	55	11.0	301	60.2	144	28.8
5.I think it is necessary to take calcium supplement as prescribed without stop it from myself	67	13.4	255	51.0	178	35.6
6.It is necessary to take vit D to help in calcium absorb	79	15.8	279	55.8	142	28.4
7.It is unlikely that the pregnant woman will develop a calcium deficiency	65	13.0	146	29.2	289	57.8
8.Pregnant woman should seek medical help when feeling muscle stiffness especially at night	78	15.6	292	58.4	130	26.0
9.It is necessary to Ultrasound in 28th gestational week to ensure that there are no abnormalities in the fetus	146	29.2	215	43.0	139	27.8
10. It is essential that pregnant woman conducts laboratory testing to assess calcium level	162	32.4	274	54.8	64	12.8
11.It is important to use calcium and iron at different times and both medications are not taken simultaneously	50	10.0	403	80.6	47	9.4
12. Pregnant women must maintain healthy dietary habits during pregnancy and lactation.	168	33.6	276	55.2	56	11.2
13.It is necessary to take calcium before pregnancy to avoid a deficiency during the first three months of pregnancy	115	23.0	277	55.4	108	21.6
14.Avoid eating sodium in large quantities because it reduces the absorption of calcium	159	31.8	209	41.8	132	26.4
15. Mothers should know that drinks containing soda and caffeine impede the body's absorption of calcium, so be careful not to overuse it.	173	34.6	204	40.8	123	24.6
16.Should not take calcium or vitamin D without prescribed	211	42.2	225	45.0	64	12.8

Table (4) presents the distribution of the studied women according to their attitude toward calcium intake during pregnancy. It was obvious that majority (80.6%) of women had neutral attitude toward important of calcium use and iron at different times. Near to two third (60.2%) of them had neutral response toward not eating many types of calcium-rich foods in one meal. While more than half (58.4%, 55.8%, 55.4%, 55.2%, 54.8%, 51.0% respectively) of them had neutral attitude toward; Pregnant woman should seek medical help when feeling muscle stiffness especially at night, importance to take vitamin D to help calcium absorption , take calcium before pregnancy to avoid its deficiency during the first three months of pregnancy, maintaining of

healthy dietary habits during pregnancy and lactation. conducts laboratory testing more than onetime to detect calcium level, and take calcium supplement as prescribed without stop it from herself.

Table (5): Distribution of the studied women according to their total level of attitude toward calcium intake during pregnancy

Total attitude level	The studied women (n=500)	
	N	%
▪ **Negative**	302	60.4
▪ **Positive**	198	39.6
Range Mean ± SD	(10-24) 16.52±3.045	

< 50% Negative ≥ 50% Positive

Table 5 illustrates the total score level of women's attitude regarding calcium intake during pregnancy. It was observed that more than half (60.4%) of the studied women had negative attitude and almost two fifth (39.6) of them had positive attitude regarding calcium intake during pregnancy.

Table (6): Distribution of the studied women according to their practice toward calcium intake during pregnancy

Items	The studied women (n=500)			
	No		Yes	
	N	%	N	%
1.Drink a cup of milk daily	304	60.8	196	39.2
2.Eat calcium-rich foods	332	66.4	168	33.6
3.Exposure to direct sunlight early morning daily	389	77.8	111	22.2
4.Take calcium medications that my doctor prescribes daily	298	59.6	202	40.4
5.Take Vitamin D daily	368	73.6	132	26.4
6.When I feel muscle spasm in my legs, especially at night, I will go to the doctor	369	73.8	131	26.2
7.Go to the doctor to do ultrasound to Check health of my fetus regularly	333	66.6	167	33.4
8.Perform laboratory test for calcium more than once during pregnancy	415	83.0	85	17.0
9.Take iron medication at the morning and calcium at evening daily	333	66.6	167	33.4
10.Reduce soda drinks, tea and coffee during pregnancy	356	71.2	144	28.8
11.Avoid high salt in diet	337	67.4	163	32.6

Table 6, Represents the distribution of the studied women according to their practice toward calcium intake during pregnancy. It was found that the majority (83.0%) of the studied women doesn't perform laboratory test for calcium during pregnancy and more than three quarter (77.8%) of them don't exposed to direct sunlight early morning daily. On the other hand; this table also reveals that more than third (40.4%, 39.2, 33.6, 33.4, 33.4%) of them take the medications of calcium as doctor prescribes every day, drinking a cup of milk daily, eat calcium-rich foods, going to the doctor to do ultrasound to check health of their fetus regularly, and take iron drug at the morning and calcium at evening every day respectively.

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Table (7): Distribution of the studied women according to their total level of practice regarding calcium intake during pregnancy

Total practice level	The studied women (n=500)	
	N	%
▪ **Poor** ▪ **Good**	451 49	90.2 9.8
Range Mean ± SD	(0-7) 3.33±1.560	

< 50% Poor ≥ 50% Good

Table 7, Demonstrated the total score level of women's practices regarding calcium intake during pregnancy. This table illustrated that majority (90.2 %) of the studied women had poor practice while small percent (9.8%) had good practice regarding calcium intake during pregnancy.

Figure 3. Distribution of the studied women according to their total knowledge, attitude and practice level regarding calcium intake during pregnancy

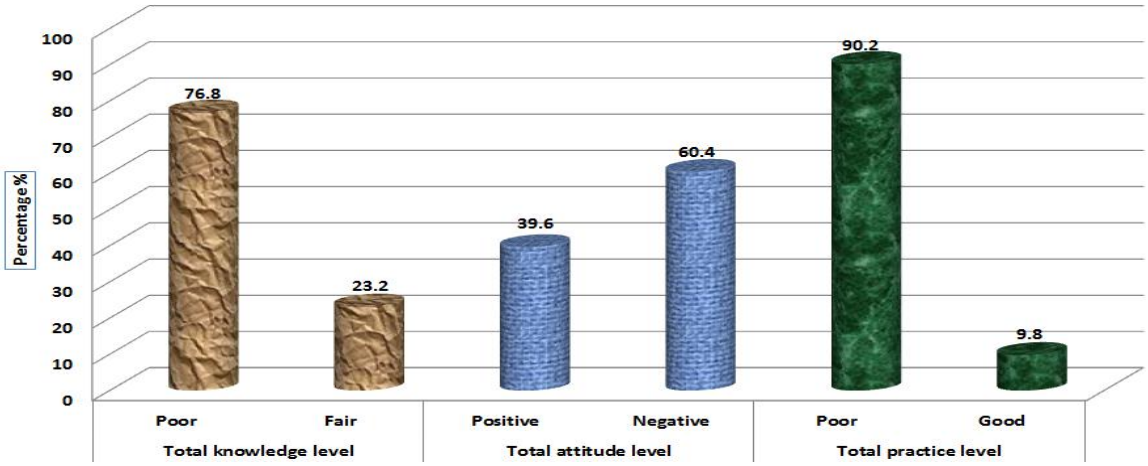

Figure 3 Presents the total score level of women's knowledge, attitude and practices regarding calcium intake during pregnancy. It was found that more than three quarter (90.2%, 76.8%) of studied women had poor practice and knowledge respectively, while only 23.2% and 9.8% of them had fair knowledge and good practice respectively regarding calcium intake during pregnancy. It also observed more than half of the studied women (60.4%) had negative attitude and 39.6% of them had a positive attitude toward calcium intake during pregnancy.

Table (8): Percent comparison and correlation between total knowledge level of the studied women and their socio characteristics

Characteristics	The studied women (n=500) Total knowledge level				χ^2 P
	Poor		Fair		
	N	%	N	%	
Age (in years)					
▪ <20	52	10.4	11	2.2	
▪ (20-<30)	305	61.0	101	20.2	4.207
▪ (30-<40)	22	4.4	4	0.8	0.240
▪ ≥40	5	1.0	0	0.0	
r , P	-0.065 , 0.148				
Marital Status					
▪ Married	351	70.2	97	19.4	26.218
▪ Widow	6	1.2	14	2.8	0.000*
▪ Divorce	27	5.4	5	1.0	
Level of Education					
▪ Illiterate	36	7.2	5	1.0	
▪ Primary	133	26.6	22	4.4	16.791
▪ Secondary	177	35.4	70	14.0	0.001
▪ University	38	7.6	19	3.8	
r , P	0.194 , 0.000**				
Occupation					
▪ Work	200	40.0	74	14.8	FE
▪ House wife	184	36.8	42	8.4	0.033*
Place of Residence					
▪ Rural	216	43.2	76	15.2	FE
▪ Urban	168	33.6	40	8.0	0.086

* Significant at level P<0.05.

** Highly significant at level P<0.01.

Table (8) demonstrated comparison and correlation between total knowledge level of the studied women and their sociodemographic characteristics. It was obvious that there is a significant difference between women knowledge and their socio-demographic characteristics except their age and residence, also there was a correlation between total score of knowledge and marital status where (P=.000). This table also showed that there were a statistically significant differences between total score of knowledge and women occupation and their level of education where p=0.033, 0.001 respectively.

Table (9): Percent comparison and correlation between total attitude level of the studied women and their socio characteristics.

Characteristics	The studied women (n=500) Total attitude level				χ^2 P
	Negative		Positive		
	N	%	N	%	
Age (in years)					
▪ <20	20	4.0	43	8.6	
▪ (20-<30)	165	33.0	241	48.2	10.282
▪ (30-<40)	8	1.6	18	3.6	0.016*
▪ ≥40	5	1.0	0	0.0	
r , P	-0.024 , 0.585				
Marital Status					
▪ Married	179	35.8	269	53.8	0.260
▪ Widow	7	1.4	13	2.6	0.878
▪ Divorce	12	2.4	20	4.0	
Level of Education					
▪ Illiterate	15	3.0	26	5.2	
▪ Primary	67	13.4	88	17.6	0.955
▪ Secondary	97	19.4	150	30.0	0.002
▪ University	19	3.8	38	7.6	
r , P	-0.025, 0.580				
Occupation					
▪ Work	133	26.6	141	28.2	FE
▪ House wife	65	13.0	161	32.2	0.000*
Place of Residence					
▪ Rural	120	24.0	172	34.4	FE
▪ Urban	78	15.6	130	26.0	0.458

* Significant at level P<0.05.

Table (9), shows the relationship between total attitude of studied women regarding calcium intake during pregnancy and their socio-demographic characteristics. It was obvious that there are no significant differences between women's attitude and their marital status, level of education and place of residence. On the other hand, a statistically significant differences were detected between women's attitude and their age and occupation where P= 0.016*, 0.002*, 0.000* respectively.

Table (10): Percent comparison and correlation between total practice level of the studied women and their socio-demographic characteristics.

Characteristics	The studied women (n=500) Total practice level				χ^2 P
	Poor		Good		
	N	%	N	%	
Age (in years)					
▪ <20	58	11.6	5	1.0	
▪ (20-<30)	364	72.8	42	8.4	1.058
▪ (30-<40)	24	4.8	2	0.4	0.787
▪ ≥40	5	1.0	0	0.0	
r , P	-0.099 , 0.027*				
Marital Status					
▪ Married	402	80.4	46	9.2	1.088
▪ Widow	19	3.8	1	0.2	0.580
▪ Divorce	30	6.0	2	0.4	
Level of Education					
▪ Illiterate	33	6.6	8	1.6	
▪ Primary	143	28.6	12	2.4	5.218
▪ Secondary	224	44.8	23	4.6	0.156
▪ University	51	10.2	6	1.2	
r , P	-0.032 , 0.473				
Occupation					
▪ Work	239	47.8	35	7.0	FE
▪ House wife	212	42.4	14	2.8	0.015*
Place of Residence					
▪ Rural	261	52.2	31	6.2	FE
▪ Urban	190	38.0	18	3.6	0.543

* Significant at level P<0.05.

Table (10), Revealed the relationship between total practice of studied women regarding calcium intake during pregnancy and their socio-demographic characteristics. It was illustrated that there were no statistically significant differences between total women's practice and their socio-demographic characteristics expect of the occupation where FE= 0.015.

Table (11): Correlation between the total knowledge, attitude and practices level of the studied women.

	The studied women (n=500) Total practice level				χ^2 **P**
	Poor		**Good**		
	N	**%**	**N**	**%**	
Total knowledge level					
▪ Poor	352	70.4	32	6.4	FE
▪ Fair	99	19.8	17	3.4	0.045*
r , P	0.016 , 0.721				
Total attitude level					
▪ Negative	181	36.2	17	3.4	FE
▪ Positive	270	54.0	32	6.4	0.539
r , P	0.081 , 0.070				
Total attitude level Vs **Total knowledge level** r , P	0.119 , 0.007**				

* Significant at level P<0.05.
** Highly significant at level P<0.01.

Table 11, Correlation between the total knowledge, attitude and practices level of the studied women. It was found that there was a significant relation exists between total knowledge and total practice level where FE= 0.045*, in addition there was a significant relation exists between total knowledge and total attitude level where P= 0.007*.

IV. Discussion

Calcium has a vital role in maintenance of maternal health and development of fetus. This is supported with evidence that maternal calcium intake can affect fetal bone development with long term effect of skeletal growth and reduces maternal risk of developing hypertensive disorders. Hence it is necessary to educate pregnant women how to meet their calcium requirements for their own and for their infant's needs [(22)]. Thus, this study has shed some lights on knowledge, attitude and practices regarding calcium intake among pregnant women and explain to the pregnant women the health measures needed to prevent exposure to calcium deficiency during and after pregnancy.

The findings of the present study declared that the mean age of the studied women was 22.74±4.318, this finding disagreed with **Arega A et al., (2015)** who reported that the mean age of the study subjects was 28.44 (± 4.199) years in the study that assess (the knowledge, attitudes and practices among pregnant women regarding maternal nutrition) from the researcher point of view this disagreement attributed to that the previous study was based on systematic review so the data collected from different places and population but this study depend on the inclusion criteria[(23)].

Regarding women's level of education, the result of the current study demonstrated that almost half of them had secondary school educational level, this finding goes in line with **Ahmed E et al., (2015)** who reported that the highest percentage of the studied women were housewives and had secondary educational level. This agreement due to that both studies were done follow the same sample criteria [(24)].

Concerning the source of women's knowledge regarding calcium intake, the present study revealed that more than three quarters of the studied women gained their knowledge from nurses followed by doctors, this result disagree with the result of **Sinikovic D et al., (2009)** in the study about**;** assessment of women's awareness of the importance of long –chain omega-3 polyunsaturated fatty acid consumption during pregnancy; knowledge of risks, benefits and information and found that the most common source of women's knowledge were books and magazines followed by their families [(25)].

The results of the present study represented that majority of studied women had incorrect answer about daily requirement of calcium and vitamin D and more than half of them had incorrect answer about importance of calcium intake for fetus, effect of calcium deficiency on women on long term, nutritional source for calcium, symptoms of calcium deficiency on the pregnant woman, and the effect of calcium deficiency on baby after birth. This finding goes in line with **Goda T et al., (2018)** who reported that nearly half of the study subject reported incorrect level of knowledge regarding importance of calcium intake for fetus and its effect on women on the long term [(26)].

On the other hand, this finding disagreed with **Ahmed E et al., (2015**) **& Carroli G (2010)** who reported that more than half and majority of the studied women had correct knowledge regarding daily requirement of calcium and its effect on fetal and maternal conditions. From the researcher point of view this disagreement between the current and previous study might be attributed to the lack of knowledge sources such as; educational programs, booklets, posters and health education related to importance of calcium for the pregnant women [(24, 27)].

The current study also illustrated that more than two fifth of studied women reported incorrect answers related to the proper trimester that pregnant women should increase calcium intake, high risk woman for calcium deficiency, type of foods that hinder the absorption of calcium in the body, methods of treatment of calcium deficiency, factors help calcium absorption, and importance of calcium intake for pregnant women. The current study findings agreed with the finding of **Omas M & Weisman S (2013)** who stated that the vast majority of the studied women had incorrect answers regarding food rich calcium and factors that help its absorption. This agreement attributed to lack of knowledge about calcium metabolism between pregnant women [(28)].

Regarding the total knowledge level of the studied women about calcium intake during pregnancy; the findings of the current study revealed that most of the studied women had poor knowledge related to calcium intake. In this regard; the findings of the current study was supported by **Tenaw et al., (2018)** in a study about; Nutritional knowledge, attitude and practices among pregnant women who attend antenatal care at public hospitals of Addis Ababa, Ethiopia and illustrated that most of the studied women had poor level of knowledge regarding calcium intake [(29)]. On the other hand, **Federal Democratic Republic of Ethiopia (2013)** reported that there were adequate percent of women who had knowledge about the calcium intake during pregnancy. This contradiction might be related to differences in the residence and the level of education of the studied women in both studies [(30)].

Concerning to the total score level of women's attitude regarding calcium intake during pregnancy. It was observed that three fifth of the studied women had negative attitude toward calcium intake. This finding agreed with **Goda T et al., (2018)** who pointed that nearly half of the studied women had negative attitude toward calcium intake during pregnancy [(26)].

Considering, the total score level of women's practice regarding calcium intake during pregnancy, the results of the present study explained that; majority of the studied women had poor practice level while, and small percent had good practice regarding calcium intake during pregnancy. The findings of the present study matching with **Arega A (2015)** who illustrated that only third of the studied sample had good practice regarding women's nutrition during their pregnancy [(23)]. Also, **Goda T et al., (2018)** revealed that nearly one third of the studied women had a satisfactory practice regarding calcium intake [(26)]. From the researcher point of view, this agreement might be related to lack of knowledge regarding the importance of calcium supplementations. Furthermore, these findings may be due to insufficient nutritional counseling that should be provided to the pregnant women regarding health practices toward calcium supplementation during pregnancy and its effect on the health status of mother and her growing fetus.

Regarding the result of the present study related to percent comparison and correlation between total knowledge level of the studied women and their socio-demographic characteristics. It was obvious that there was a positive correlation between women's total knowledge score and their level of education, marital status, and occupation, this results goes in line with **Arega A 2015 & Daba G (2015)** who reported that there was a significant relation between the knowledge total score level regarding calcium supplementation and women's occupation and level of education[(23, 31)].

As regard, the relationship between total attitude of studied women regarding calcium intake during pregnancy and their socio-demographic characteristics. Statistically significant differences were detected between women's attitude and their age; level of education, residence and occupation. This result disagreed with

Goda T et al., (2018) who demonstrated that there was no relation between total attitude of the studied women and their socio-demographic characteristics [(26)].

Concerning the relationship between total practice of studied women regarding calcium intake and their socio-demographic characteristics; it was illustrated that there are no significant differences between total women's practice and their socio-demographic characteristics expect in the occupation. This finding matching with **Agueh V (2015)** in his study to assess; Dietary Calcium Intake and Associated Factors among Pregnant Women in Southern Benin since pointed out that occupation status was associated with adequate calcium intake [(32)].

Regarding the present comparison and correlation between the total knowledge, attitude and practice level of the studied women. It was found that a significant relation exists between total knowledge level and total level of both practice and attitude. The finding of the current study supported by **Goda T et al., (2018)** who concluded that there was a positive correlation between the total knowledge, practice, and attitude score among the studied women [(26)].

V. Conclusion

The majority of studied women had poor knowledge, attitude and practices about calcium intake during pregnancy. It was obvious that there were no statistically significant differences between total women's practice and their socio-demographic characteristics expect of the occupation. Also, there was a significant relation exists between total knowledge and total practice. In addition, there was a significant relation between total knowledge and total attitude level where.

VI. Recommendation

- An educational program about the importance of calcium intake during pregnancy for the benefits of the pregnant women and their fetus and measures to prevent calcium deficiency should be designed for all pregnant women.
- Mass media should make public awareness regarding importance of calcium intake during pregnancy
- Advising women in reproductive age regarding positive attitude and good practice of calcium intake to prevent calcium deficiency during or after pregnancy.

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