Novelty Journals

ISSN 2394-7330

International Journal of Novel Research in Healthcare and Nursing
Vol. 7, Issue 2, pp: (533-551), Month: May - August 2020, Available at: www.noveltyjournals.com

Effect of Health Belief Model-Based Education on Mothers' Knowledge, Practice and Attitude Regarding Vitamin D Deficiency of their Children

Samia. A. Elnagar[1], Amal A. Abd El Salam[2], Basma. R. Abdel-Sadik[3]

[1]Assisatnt Professor of Pediatric Nursing, Faculty of Nursing, Monifia University, Egypt.

[2,3]Assisatnt Professor of Pediatric Nursing, Faculty of Nursing, Benha University, Egypt

Abstract: **Vitamin D and calcium deficiencies are common worldwide, causing nutritional rickets and osteomalacia, which have a major impact on health, growth, and development of infants, children, and adolescents. Widespread prevalence in all age groups including toddlers, school children, and adolescent in both rural and urban areas. the major reasons for the worldwide spread of vitamin D deficiency has been lack of awareness of mothers about vitamin D, health benefits, and prevention of deficient states across populations. Educational programs about importance of vitamin D for bone health help to prevent long-term health consequences. Aim of the study: The aim of the study was to explore effect of health belief model-based education on mothers' knowledge, practice and attitude regarding vitamin D deficiency of their children. Design: A quasi-experimental research design was used to conduct the study. Setting: This study was carried out in Pediatric Outpatient clinic, Benha University Hospital. Sample: A purposive sample (100) of mothers and their children. Tools of data collection: Tool (I): A structured interviewing questionnaire: It was consisted of four parts: Part (1): Personal characteristics of mothers'. Part (2): Personal characteristics and medical history of the children. Part (3): Mothers' knowledge related two main areas: vitamin D and its deficiency and nutritional rickets. Tool (II): Mothers attitude assessment scale to assess mothers attitude about importance of vitamin D and vitamin D supplementation. Tool (III): Mothers' reported practice: It was designed by the researchers to assess mothers' reported practice regarding care of children with vitamin D deficiency. Tool (IV): Health belief model questionnaire: The questionnaire consisted of 25 items used a 5-point Likert Scale to measure perceptions of behavior of mothers related children with vitamin D deficiency. Results of this study revealed that, there was a highly statistically significant difference observed between the studied mothers′ total knowledge, attitude and mothers′ reported practice regarding care of children with vitamin D deficiency at pre, post and after three months of health belief model education implementation P= (<0.001).This study concluded that: the implementation of the health belief model education for the mothers′ of children with vitamin D deficiency had exhibited improved knowledge, attitude and self-reported practice about caring of children with vitamin D deficiency after intervention compared to their pre intervention level. The study recommended that: Training program should be applied for nurses to improve their knowledge and practice about vitamin D deficiency , which will be reflected in improving mothers' knowledge and practice.**

Keywords: **Vitamin D deficiency, Health beliefs model.**

1. INTRODUCTION

The prevalence of vitamin D deficiency among children and adults varies significantly worldwide due to variation in sunlight exposure. Vitamin D commonly affects children under 5 to 10 years of age although there is a high prevalence of rickets among school children. Child populations have identified age, reduced intake of vitamin D-enriched foods, low sunshine exposure, skin covering, skin pigmentation, ethnicity, maternal vitamin D status, household crowding and air pollution. All these factors are considered risk factors for vitamin D deficiency and insufficiency among children **(Ahmed, et al. 2017).**

More than 254 million children suffer from vitamin deficiency worldwide in each year. Estimates of about one billion people worldwide are reportedly suffering from vitamin D deficiency and it is a widespread problem **(Alshahrani, 2014).** In children, the prevalence ranges from 14% to 49%, and 68% in Saudi Arabia and 52% in Pakistan 66% in India. Although sun exposure is considered a major source of vitamin D, the prevalence of its deficiency is paradoxically much higher in the countries with the sunny climate, such as Saudi Arabia, Egypt, Oman, United Arab Emirates and Jordan **(Kavitha et al. 2015).** Recently a study estimated that 4 billion cases of bone disease (rickets, osteomalacia and osteoporosis) and 3.3 billion disability-adjusted life years are lost globally due to vitamin D deficiency that results from reduced Ultraviolet exposure **(Tonnesen, et al. 2016)**.

Vitamin D is primarily synthesized by the skin through exposure to sunlight (UV-B radiation, wavelength 290–315 nm) while only a small fraction (5–10 %) comes from the diet. The primary role of vitamin D in the human body is to maintain extracellular calcium levels, but recently it has been implicated to have a non-skeletal role including protection from infectious, inflammatory and neoplastic disease outcomes **(Tonnesen, et al. 2016)**. Important role of vitamin D is to modulate the body's ability to adjust to changing calcium supply and demand **(Pettifor, 2014)**.

Despite many of the countries lying within the tropics and subtropics, overcrowding, atmospheric pollution, a lack of vitamin D-fortified foods, and social customs that limit skin exposure to sunlight are major factors in the development of vitamin D deficiency. Vitamin D deficiency in children is the most common cause of osteomalacia. The symptoms are typically diffuse bone pain, fatigue and proximal muscle pains. A waddling gait may be present due to muscle weakness and hip pain. A fracture may be the first presenting sign **(Pettifor, 2014)**.

The American Academy of Pediatrics recommended giving supplements of 200 IU/day of Vitamin D to all infants starting in the first 2 months after birth as a primary means of preventing rickets. In 2008, the policy was revised, and the dose increased to 400 IU/day starting in the first few days of life to continue through childhood to adolescence (**Zagaria and Pharm, 2009)**.

One of the major reasons for the worldwide spread of this nutritional disorder has been lack of awareness about the importance of vitamin D, its health benefits, and prevention of deficient states across populations. It has been suggested that awareness and educational campaigns about vitamin D at the community level targeting both general and high-risk populations could help prevent long-term health consequences (**Ahmed, 2015).** Therefore, health education programs should be targeted at women through various media including leaflets, television, and radio programs (**Chen, et al. 2016).** Encouraging a diet rich in vitamin D and calcium will help to maintain nutritional levels required for effective mineralization of the bones. Discussing dietary requirements and highlighting foods that are rich in calcium and vitamin D will help raise awareness of important food sources. Referral to a dietitian can also be helpful in assessing and planning nutritional support, especially where people have specific dietary requirements **(Abate, et al. 2016).**

A mother is the principal provider of the primary care that child needs, in child's earliest days, weeks and months. There is a strong linkage between maternal education and children's health. Nutritional awareness of mothers plays an important role in the health of children. The type of care provided depends on a large extent of mother's knowledge and understanding of some aspects of basic nutrition and health care **(Kaur, et al. 2015).** Health education aimed at raising mothers' awareness about vitamin D, its importance to health and wellbeing, the consequences of its deficiency and practices to prevent vitamin D deficiency (**Ferri, 2016).**

The World Health Organization defines health education as any combination of learning experiences designed to help individuals and communities to improve health by increasing knowledge or influencing attitudes **(Abate, et al. 2016).** The Health belief model (HBM) as a systematic method to explain and predict preventive health behavior. Health educations based on the health belief model are more effective in promoting a range of behavior changes. The HBM suggests that changes in behavior result from changes in the putative social-cognitive determinants of behavior; thus, interventions should target these changes (**Cao, et al., 2014)**.

Health belief model are beliefs including: Perceived susceptibility (refers to the person's perception of the chances or risk of the disease or certain condition), perceived severity (refers to one's perception of the seriousness of the consequences of the disease or certain condition), perceived benefit (refers to the person's belief in the efficacy of the recommended actions to decrease probability or seriousness of disease or certain condition), perceived barrier (refers to the person's

opinion of noticeable physical or psychological costs of the recommended actions), cues to action (proper actions to notify the person and prepare him/her for behavior change, and self-efficacy (one's confidence in his/her ability to do recommended actions While this model is a commonly used model and has been applied to explain different health-related behaviors and to design educational interventions among children**(Khoshgoftar, et al. 2019).**

Significance of study

Vitamin D deficiency is a global problem, and its prevalence is high even in developed and sunny countries. The prevalence of vitamin D insufficiency is increasing globally **(Aly & Abdel-Hady, 2015).** Rickets is still prevalent in Egypt; however, at a lower prevalence than that reported before. In **2016, Mahmoud, Ahmed, and Ali** reported a prevalence rate of rickets among 800 healthy infants attending the primary health centers that well distributed all-over the Cairo for vaccination. The study reported a prevalence of rickets was 1.125% in the whole studied infants, with 1.04% of those aged 9 months and 1.2% of those aged 18 months having active rickets. There are no effective community based preventive strategies till now to prevent rickets even in the most developed nations. Nutritional rickets still exists in a number of countries in the Middle East like Egypt. Egypt, a country where the sun is shining all the year, has still a high prevalence of vitamin D deficiency among young children The most of mothers have limitation of current knowledge related vitamin D deficiency, and benefit of vitamin D. In recent years there has been increasing awareness of the importance of vitamin D to prevent disease and disability. Therefore, the researchers found urgent to conduct this research to increases mothers' health education based on health belief model to prevent vitamin D deficiency. Meanwhile, improve children general health and outcomes.

Aim of the study

The study aim was to explore the effect of health belief model-based education on mothers' knowledge, practice and attitude regarding vitamin D deficiency of their children through the following:

1. Assess mothers' knowledge regarding vitamin D deficiency among children.
2. Assess mothers′ attitude toward children with vitamin D deficiency
3. Assess mothers′ practice toward children with vitamin D deficiency
4. Design and implement health belief model-based education for mothers' regarding care of children with vitamin D deficiency.
5. Evaluate the effect of the health belief model-based education implementation on mothers' knowledge and awareness toward caring of children with vitamin D deficiency.

Research hypothesis

- Mothers who exposed to health belief model-based education will exhibit improved knowledge after intervention compared to their pre intervention level.
- Mothers who exposed to health belief model-based education will exhibit improved practice after intervention compared to their pre intervention level.
- Mothers who exposed to health belief model-based education will exhibit positive attitude after intervention compared to their pre intervention level.

2. SUBJECT AND METHODS

Design:

A quasi experimental design was used in the current study. quasi-experimental research is research that resembles experimental research but is not true experimental research. Quasi-experimental research is similar to experimental research in that there is manipulation of an independent variable. It differs from experimental research because either there is no control group, no random selection, no random assignment or no active manipulation **(Shuttlerworth, 2008).**

International Journal of Novel Research in Healthcare and Nursing
Vol. 7, Issue 2, pp: (533-551), Month: May - August 2020, Available at: www.noveltyjournals.com

Setting:

This study was carried out in Pediatric Outpatient Clinic in Benha University Hospital. Pediatric Outpatient Clinic located on the ground floor in Hospital, consist of two beds. All children in examination make (growth measurement- vital signs and give prescribed medication) .

Sample:

A purposive (100) mothers and their children the samples were collected from previous setting. Age is from 5 to 12 year, free from any chronic diseases, and mothers accepted to be involved in the study.

Sampling size:-

Sample size was calculated using the following formula

Inclusion criteria:

- Children had vitamin D deficiency

- Vitamin D test for all children had sign and symptoms of vitamin D deficiency.

- The mothers of these children should be able to read and write.

- Children free from other medical health problems.

Exclusion criteria:

-Mothers not able to read and write

- Mothers previous taking education program about vitamin D.

- Children have kidney and thyroid disease.

Tools and technique of data collection:

There were four tools utilized to collect the required data. These tools as the following:

Tool (I): A structured interviewing questionnaire:

It was designed by the researchers after reviewing related references, **(Hockenberry et al. 2017).** It was written in Arabic language and consists of three parts:

Part (1): Personal characteristics of mothers' (such as age, educational level, occupation,).

Part (2): Personal characteristics and medical history of the children (such as age, gender, child complaint, time of complaint, serum vitamin D level).

Part (3): it included assessment of mothers' knowledge related two main areas:

1-vitamin D and its deficiency which included 7 open ended questions meaning, importance, sources of vitamin D, importance of sun exposure, the amount of vitamin D manufactured by the skin through sun exposure, the best times of sunlight exposure, the optimal period of time needed to gain enough vitamin D from sun exposure daily.

2-Nutritional rickets which included 9 open ended questions such as diseases caused by vitamin D deficiency, meaning, signs and symptoms, risk factors of nutritional rickets, complication of rickets, common age of rickets, disease associated with rickets, prevention of vitamin D deficiency and rickets, and treatment of vitamin D deficiency and rickets.

Scoring system:

The scoring system for mother's knowledge was calculated as follows (2) score for a correct and complete answer, (1) correct and incorrect answer while (zero) score for don't know. It involved open ended question consist of 16 question. For each area of knowledge, the score of the items was summed-up and the total divided by the number of the items, giving a mean score for the part. These scores were converted into a percent score.

The total knowledge score (32 points) was considered good if the score of the total knowledge ≥75 %, while considered average if it equals 50-<75%, and considered poor if it is < 50%.

Tool (II): Mothers attitude assessment scale:

Adapted from **(Al Marzooqi et al. 2016 - Kavitha et al. 2015 - Rezaei et al., 2014)**. To assess the attitude of mothers about importance of vitamin D and vitamin D supplementation The questionnaire was measured on a Likert Type Scale. It consist of (14) question, the total attitude score was 42. Mean score for the different levels of attitude was calculated as agree (2), uncertain (1), and disagree (0).

The total score for attitude was classified as the following:

A three-points attitude assessment scale score was calculated as (2) scores for agree, (1) scores for uncertain and (0) for disagree. The total score is summed and categorized as:

- Positive attitude ≥ 60%
- Negative <60%

Tool (III): Mothers' reported practice checklist: It was designed by the researchers in the light of relevant references **(Michie, et al. 2010)** to assess mothers' reported practice regarding care of children with vitamin D deficiency as nutrition, child activity, sun exposure, prevention from infection, prevention from fracture and vitamin D supplements. It consist of 5 checklist, each checklist divided into (5-14) statements.

Scoring system:

Scoring system of the studied mothers' practices was calculated as correct practice was scored 2 while correct and incomplete was scored 1 and incorrect or don know was scored 0. The total score for all practice was summed and classified as the following:

- Good reported practice ≥ 75%
- Average reported practice <50-75%
- Poor reported practice <50%

Tool (IV): Health belief model questionnaire: The questionnaire included key questions developed using constructs of the HBM. It included perceived susceptibility, perceived severity, perceived barriers, perceived benefits and cues to action.

- Perceived susceptibility included five items (the chances of vitamin D deficiency affecting my child, I worry a lot about vitamin D deficiency, vitamin D deficiency is a big problem, There is a good possibility that my child will die from vitamin D deficiency and Within the next year, I know that a baby could die vitamin D deficiency).
- Perceived severity included five items such as (I am afraid to even think about vitamin D deficiency, The thought of vitamin D deficiency scares me, the vitamin D deficiency hopeless condition, When I think about vitamin D deficiency my heart beats faster, I am afraid to Bone pain and fatigue from vitamin D deficiency).
- Perceived benefits included four items such as (exposure of sunshine will prevent vitamin D deficiency, It's best for children to exposure to sunshine and give vitamin D supplementation , Its best for child to eat food that contain source of vitamin D, I don't worry so much about vitamin D deficiency when a baby exposure to sunlight).
- Perceived barriers included six items such as (I can't reduce the chance of child complication from vitamin D deficiency, The best exposure to sunshine for child from 11-to 12 Am, the better for the child when exposure to sunshine with wear more clothes, my family/friends would make fun of me if I exposure the child to sunshine, Putting a baby on sunshine would require starting a new habit, which is difficult, and I prefer placing child with his clothes during exposure to sunshine).
- Cues to action included five items such as (I receive much of my child care information from health professionals such as doctors and nurses; I receive much of my child care information from family members, I know the food that contain vitamin D, I know changes that occurred from vitamin D deficiency and I know of a child that died of vitamin D deficiency).

Health belief model scoring system

- The questionnaire consisted of 25 items used a 5-point Likert scale (ranging from strongly agree to strongly disagree). Strongly agree took (one score), agree took (2 score), neutral took (3 score), disagree took 4 score. - Strongly disagree took 5 score). It consisted of five main parts, they are Perceived susceptibility included 5 questions (a min score of 5 and a max score of 25). Perceived severity included five questions (a min of 5 and a max score of 25). Perceived benefits included four questions (a min of 4 and a max score 20). Perceived barriers included six questions (a min score of 6 and a max score of 30). Cues to action included five questions (a min score of 5 and a max score of 25). With a total score (125) for all health belief models.

Procedures:

Tools validity and reliability

The data collection tools and HBM education program were revised by a panel of three experts in the field of pediatric nursing to test face and content validity. Modifications of the study tools were done according to the panel judgment on clarity of sentences, appropriateness of content and sequence of items. Regarding reliability, internal consistency of all items of the tools was applied by the researchers by using Cronbach′s coefficient alpha. This turned to be (a=0.95) for knowledge assessment questionnaire. Reliability of Mothers attitude, the value was (.724). Reliability of mothers reported practice, the value was (0.859). Reliability of health belief model subscales ranged from 0.97 to 0.99 Cronbach's alpha value of the whole scale was found 0.91.

Ethical considerations:

All ethical issues were assured; oral consent has been obtained from each mothers' before conducting the interview and given them a brief orientation to the purpose of the study. They were also reassured that all information gathered would be kept confidentially and used only for the purpose of the study. Mothers had right to withdraw from the study at any time without giving any reasons.

Pilot study:

The pilot study was carried out on 10 mothers who represented 10% of the sample size. The pilot study was aimed to assess the tool clarity, applicability and time needed to fill each sheet, and the feasibility of the research process. Completing the sheets consumed about 30- 45 minutes. No modifications were done, so the pilot study sample was included in the total sample.

Preparatory phase:

An extensive review of the current and past available national and international references related to the research title was done, using a journal, textbooks and internet search was done. this takes time for one months.

Fieldwork:

The actual field work was carried out over a period from the beginning of February 2019 to the beginning of April 2019, covering a period of 3 months. The researchers were available two days/week (Monday, and Thursday) from 9 am-1 pm to collect data and distributed instruction program about vitamin D deficiency and improve health after finished filling the sheet. The total number of the studied mothers included in the study were (100) mothers and their children. Each interviewed mother takes about 30 to 45 minutes to fill the sheet depending upon their understanding and response.

Steps of Program Construction:

A. General objectives;

The aim of this program was to improve the mothers' knowledge, attitude and practice regarding to care of their children with vitamin D deficiency through application of belief model-based education program.

Novelty Journals

ISSN 2394-7330

International Journal of Novel Research in Healthcare and Nursing
Vol. 7, Issue 2, pp: (533-551), Month: May - August 2020, Available at: www.noveltyjournals.com

B. Specific objectives;

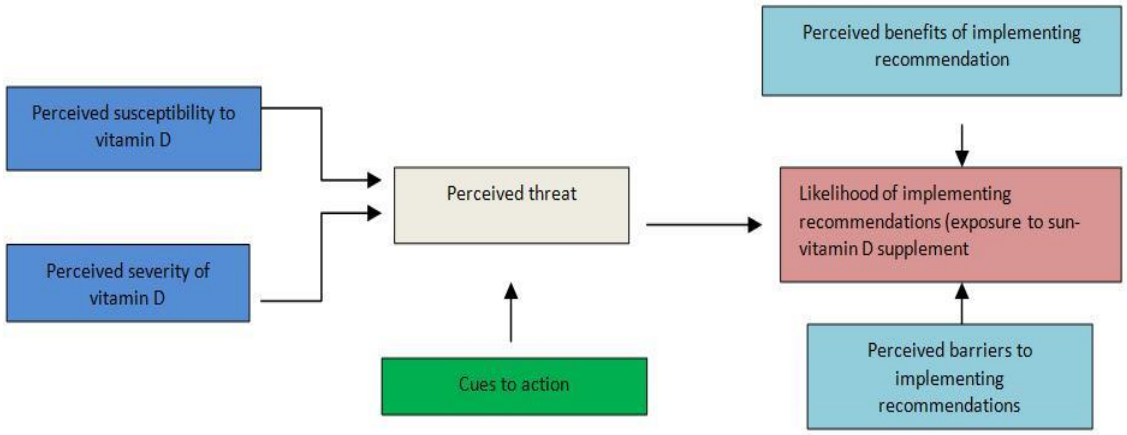
-By the end of this program, each mother should be able to:

(according to the given handout and questionnaire)

- Define of vitamin D.
- Identify importance of vitamin D
- Mention sources of vitamin D.
- Enumerate symptoms of vitamin D deficiency
- Clarify importance of sun exposure
- Identify the best times for sunlight exposure.
- Mention the period of time needed to gain enough vitamin D from sun exposure daily
- Define of rickets
- Enumerate signs and symptoms of rickets
- List risk factors of nutritional rickets
- Identify complications of rickets
- Illustrate methods of prevention methods from vitamin D deficiency and rickets
- Discuss treatment of vitamin D deficiency and rickets
- Illustrate nutritional requirement for children with vitamin D deficiency
- Enumerate prevention methods from infection
- Illustrate prevention methods from fracture
- Determine vitamin D supplements
- Perform body exercises for the child.

Health Education Related to Vitamin D deficiency

The Health education was designed by the researchers after extensive review of related references. The education program was guided by the health belief model



International Journal of Novel Research in Healthcare and Nursing
Vol. 7, Issue 2, pp: (533-551), Month: May - August 2020, Available at: www.noveltyjournals.com

Assessment Phase

This phase encompassed interviewing the participant to collect baseline data, at the beginning of the interview the researchers greeted the participation, introduced herself to each participant included in the study, explained all information about the study purpose, duration, and activities and taken oral consent. The average time for the completion of each participant interview was around (30-45minutes). Average number collected was 10 participant/day. The total sample was divided into 11 groups.

Planning Phase

Based on the results obtained from the assessment phase and relevant review of references, a booklet about vitamin D health education was designed by the researchers. This was prepared in simple Arabic language to suit mothers' level of understanding and distributed to all recruited mothers. As well as, different methods of teaching and instructional media were determined**.** The health education was implemented; it included 4 sessions for each session included two sessions of approximately two hour duration (9.00-1.00 pm) (based on comfort and willingness of the participants), were held one week apart. All of the education sessions were conducted by the researchers should be had adequate experience in the field of health education and full understanding of this mode of delivery.

At the beginning of the first session; Each mother was given a brief explanation related to vitamin D for children and importance of giving vitamin D supplementation.

The second session was held about the beliefs, assumptions and incorrect beliefs about vitamin D and issues that may be a barrier to vitamin D supplement practice and proper behaviors.

The third session, the mothers are encouraged to be sensitive about the vitamin D and problems if they do not act in future (perceived susceptibility) and depth perception of complications that may be occurred with unsafe practice (perceived severity).

The fourth and final session about the benefits of healthy exposure to sun (perceived benefits) during this period was discussed and safety practice (nutrition, child activity, sun exposure, prevent from infection, prevent from fracture, vitamin D Supplements). Mothers belief in the benefit of protective behavior suggested to mitigate symptoms or prevent child complication.

Each session started with a feedback about the previous session and the objectives of the new session, using simple Arabic language to suit mothers' level of understanding. At the end of each session, mothers' inquiries were discussed to correct any misunderstanding. Methods of teaching were used including modified lectures and group discussions. Instructional media included colored poster about vitamin D.

Evaluation Phase

The mothers' knowledge, attitude and reported practice and health belief model was evaluated after 1 month from implementation of health education used tool 1 (part 3, 4 and 5) and tool 11. The researcher evaluated and compared the effect of health education on mothers' knowledge, attitude and reported practice and health belief model pre and after 3 month.

Administrative design:

The aim of the study was explained to the administrative authorities, the written permission was obtained from the Dean of Faculty of Nursing, Benha University, to Benha University Hospital director requesting approval and cooperation for data collection, to facilitate the researchers work during data collection to meet the mothers at previously mentioned setting.

Statistical design:

All data collected were organized, tabulated and analyzed by using the Statistical Package for Social Science (SPSS version 20), which was used frequencies and percentages for qualitative descriptive data, and mean and standard deviation was used for quantitative data. Also in analytical statistics, inter-group comparison of categorical data was performed by using chi square test (-value). P value <0.05 was considered statistically significant (*) while >0.05 statistically insignificant and P value <0.001 was considered highly significant (**) in all analyses.

International Journal of Novel Research in Healthcare and Nursing
Vol. 7, Issue 2, pp: (533-551), Month: May - August 2020, Available at: www.noveltyjournals.com

3. RESULTS

Table (1): Shows that, more than half (54%) of studied children were aged more than 6 years old, with **mean±SD** age was 6.01±2.19 . In relation to children gender, more than half (52%) were males. Also, Also, more than third (40%**)** had complaint from vitamin D deficiency more than 5 years. Moreover, more than two thirds (68.0%) of children had vitamin D level less than 25nmol/liter, with mean level of vitamin D deficiency 18.27± 5.012.

Table (2): Illustrates that, more than half (65.0 %) of studied mothers were aged from 25 years to less than 30 (mean±SD age was 27.48±2.17 years). In relation to mothers' education, more than half (53.0%) had technical education, less than three quarter (73.0 %) were housewives and 62.2% had enough family income per month.

Fig (1): Shows that, more than three quarter 76% of the studied children had loss of appetite, more than half (54%) of them had continuous fatigue and less than half (45%) of them had chronic and persistent pain.

Table (3): Clarifies that, the mean and standard deviation (SD) score of mother knowledge regarding vitamin D are depicted in Table 3. There was highly significant difference between mean mothers knowledge score regarding vitamin D of intervention in post and after three months of implementation of intervention when compared with pre intervention (P=<0.001). The paired t-test indicated that the mean mother knowledge score was highly significantly improved from 1.00 to 5.54 after three month of intervention. Specifically, 100% of mothers knew meaning of vitamin D, importance of vitamin D, source of vitamin D, best time of sun light and period of time to gain enough vitamin D after three month of intervention.

Table (4): Illustrates, the mean and standard deviation (SD) score of mother knowledge regarding rickets are depicted in Table 4. There was highly significant difference between mean mothers knowledge score regarding rickets of intervention in post and after three months of implementation of intervention when compared with pre intervention (P=<0.001). The paired t-test indicated that the mean mother knowledge score was highly significantly improved from 2.23 to 1.78 after three month of intervention. Specifically, 100% of mothers knew meaning of rickets, sign and symptoms, risk factor, complication, prevention and treatment of rickets after three month of intervention.

Table (5): Demonstrates, the mean and standard deviation (SD) of health belief model (HBM) constructs subscale are shown in Table 5. Except perceiving benefits, which was decreased, the mean score of all health belief model constructs were increased. The F test indicated that there was highly significant difference (0.001) between pre, post and after three month of intervention.

Table (6): Illustrates, the mean and standard deviation (SD) score of mothers reported practice regarding care of children with vitamin D deficiency are depicted in Table 6. There was highly significant difference(0.001) between mean mothers mother reported practice score regarding care of children with vitamin D deficiency in post and after three months of implementation of intervention when compared with pre intervention. The paired t-test indicated that the mean mothers reported practice score was highly significantly improved from 1.24 to 2.47 after three month of intervention.

Table (7): shows, a highly statistically significant difference observed between the studied mothers′ total knowledge, attitude and mothers′ reported practice regarding children vitamin D deficiency at pre, post and after three months of intervention P= (<0.001).

Fig (2): Shows that, the majority (93.0 & 87.0%) of studied mothers' had good knowledge about vitamin D deficiency and rickets in post and after three months of intervention while 56.0% of studied mothers' had poor knowledge pre intervention.

Fig (3): Shows that, the majority (85.0% & 79.0%) of studied mothers' had good reported practice regarding care of children with vitamin D deficiency in post and after three months of intervention while 62.0% studied mothers' had poor reported practice in the pre intervention.

Fig (4): Shows that, the majority (75.0% & 88.0%) of studied mothers' had positive attitude regarding children with vitamin D deficiency in post and after three months of intervention while (85.0%) of studied mothers' had negative attitude in the pre intervention.

Novelty Journals

ISSN 2394-7330

International Journal of Novel Research in Healthcare and Nursing
Vol. 7, Issue 2, pp: (533-551), Month: May - August 2020, Available at: www.noveltyjournals.com

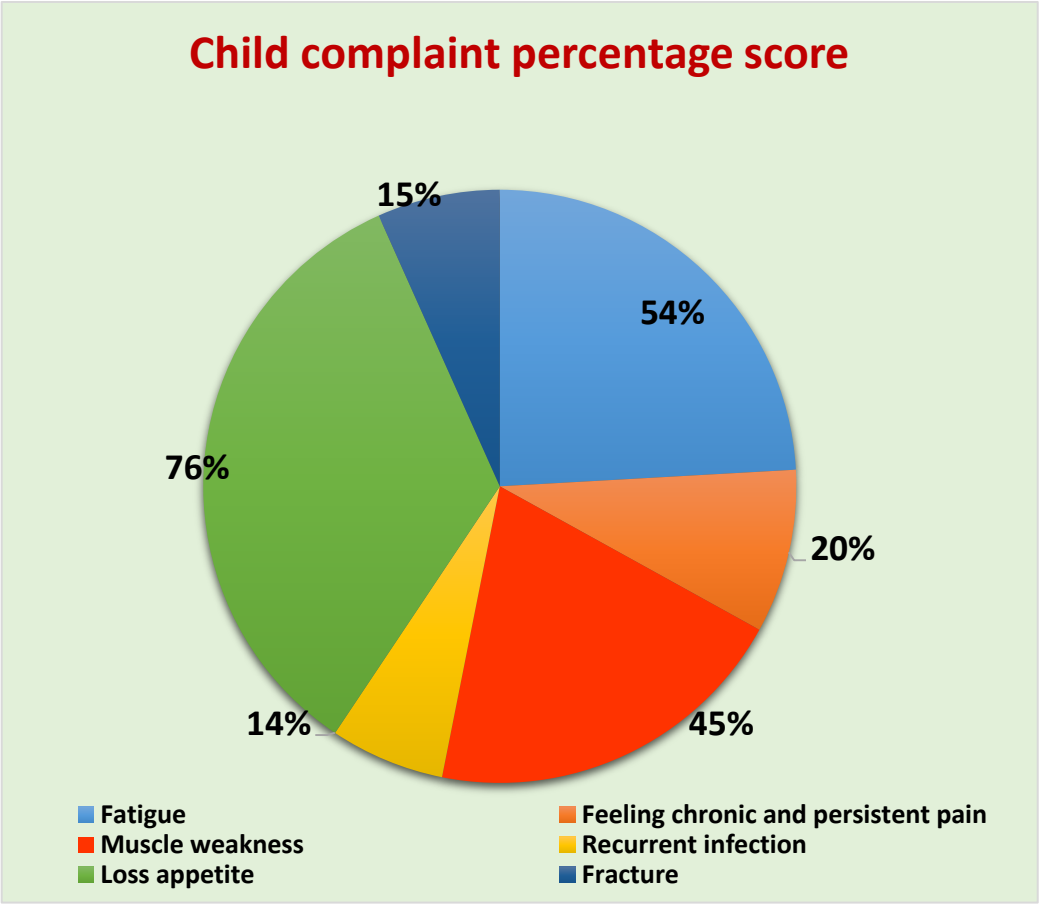


Figure (1): Distribution of studied children according to signs and symptoms of vitamin D deficiency.

Table (1): Distribution of children according to their personal characteristics (n=100).

Items	Studied children(n=100)	
	No.	%
Age /months		
<6	46	46%
≥6	54	54%
Mean ± SD	6.01±2.19	
Gender		
Male	52	52%
Female	48	48%
Time of child complaints		
- < one year	18	18%
- < 3 years	15	15%
- < 5 years	27	27%
- More than 5 years	40	40%
Serum vitamin D level		
<25nmol/liter	68	68.0%
< 30 nmol/liter	32	32.0%
30 to 60 nmol/liter	0	0.0%
≥70 nmol/liter	0	0.0%
Mean ± SD	18.27± 5.012	

Novelty Journals

ISSN 2394-7330

International Journal of Novel Research in Healthcare and Nursing
Vol. 7, Issue 2, pp: (533-551), Month: May - August 2020, Available at: www.noveltyjournals.com

Table (2): Distribution of mothers according to their personal characteristics (n=100).

Items	Number of mothers(n=100)	
	No.	%
Age (years)		
- < 20	6	7.5
- 20 - < 30	55	68.8
-≥35	19	23.7
Mean ± SD	**27.48 ± 2.17 years**	
Level of education		
- Unable to read and write	18	22.5
-Technical education	36	45.0
-High education	26	32.5
Occupation		
- Housewives	63	78.7
-Working	17	21.3
Monthly income		
Enough and save	20	20%
Just enough	62	62%
Not enough	18	18%

Table (3): Comparison of the studied mothers' knowledge score regarding to vitamin D deficiency at pre, post and after three months from intervention (n=100).

Items	Pre intervention	Post intervention	Paired t test	P	After three months	Paired t test	P
	Mean ±SD	Mean ±SD			Mean ±SD		
Meaning of vitamin D	1.120±.477	4.540±1.131	13.473	.000	4.070±1.273	12.798	.000
Importance of vitamin D	1.040±.281	4.560±1.076	13.183	.000	4.360±1.193	12.819	.000
Sources of vitamin D	1.00±.000	4.700±.870	13.392	.000	4.300±1.218	12.518	.000
Importance of sun exposure	1.470±1.234	6.180±.1.472	14.675	.000	5.540±1.877	13.714	.000
The amount of vitamin D manufactured by the skin through sun exposure	1.410±.865	5.170±1.172	15.085	.000	4.780±1.541	14.112	.000
The best times of sunlight exposure	1.200±.426	3.830±.636	15.038	.000	3.330±1.082	13.283	.000
The period of time needed to gain enough vitamin D from sun exposure daily	1.830±.829	3.750±.7703	20.244	.000	3.420±1.065	18.506	.000

Table (4): Comparison of the studied mothers' knowledge score regarding to nutritional rickets at pre, post and after three months from implementation of program (n=100).

Items	Pre intervention	Post intervention	Paired t test	P	Pre intervention	After three month	Paired t test	P
	Mean± SD	Mean± SD			Mean ± SD	Mean ± SD		
Diseases caused by vitamin D deficiency	2.23±.757	1.46±.880	19.86	0.00	2.23±.757	1.65±1.04	20.25	0.00
Meaning of rickets	2.21±.749	1.27 ±.852	18.25	0.00	2.21±.749	1.29±0.99	17.44	0.00
Signs and symptoms of rickets	2.27±.743	1.25±.846	18.14	0.00	2.27±.743	1.36±0.76	19.061	0.00
Risk factors of nutritional rickets	2.31±.694	1.80±.711	26.85	0.00	2.31±.694	1.31±0.81	18.90	0.00
Complications of rickets	2.31±.725	1.59±.770	22.90	0.00	2.31±.725	1.63±0.89	21.69	0.00
Common age of rickets	2.27±.713	1.59±.741	23.44	0.00	2.27±.713	1.55±0.95	22.95	0.00
Prevention of vitamin D deficiency and rickets	2.21±.778	1.59±.851	21.25	0.00	2.21±.778	1.78±0.85	22.78	0.00
Treatment of vitamin D deficiency and rickets	2.21±.749	1.27 ±.852	18.25	0.00	2.21±.749	1.29±0.99	17.44	0.00

Novelty Journals

ISSN 2394-7330

International Journal of Novel Research in Healthcare and Nursing
Vol. 7, Issue 2, pp: (533-551), Month: May - August 2020, Available at: www.noveltyjournals.com

Table (5): Comparison of mothers' health belief mean score at pre, post and after three month implementation of program(n=100).

Items	Pre intervention Mean ± SD	Post intervention Mean ±SD	After three month Mean ±SD	F	P value
Perceived Susceptibility	8.924 ± 3.097	21.419 ± 3.407	13.031 ± 0.315	22.442	<0.001
Perceived Severity	9.057 ± 3.958	22.428 ± 2.051	24.860 ± 0.304	26.376	<0.001
Perceived Barriers	11.866 ± 3.838	25.828 ± 3.259	23.982 ± 0.416	24.310	<0.001
Perceived Benefits	7.866 ± 2.465	17.415 ± 2.032	18.123 ± 0.623	24.594	<0.001
Cues to Action	8.3333. ± 3.124	22.104 ± 3.733	23.025 ± 0.351	24.577	<0.001

Table (6): Comparison of the studied mothers' reported practice regarding to care of children with vitamin D deficiency at pre, post and after three month of implementation (n=100).

Items	Pre intervention Mean ±SD	Post intervention Mean ±SD	Paired t test	P	Pre intervention Mean ±SD	After three month Mean ±SD	Paired t test	P
Nutrition	2.010±.362	2.660±.554	33.148	0 .00	2.010±.362	2.403±.578	32.872	0.00
Child activity	2.030±.171	2.840±.368	40.833	0 .00	2.030±.171	2.543±.498	40.255	0.00
Sun exposure	1.26±.899	1.74±.564	19.10	0 .00	1.26±.899	1.88±.435	20.42	0.00
Prevention infection	2.110±.314	2.670±.472	51.124	0 .00	2.110±.314	2.476±.500	40.107	0.00
Prevention fracture	1.290±.456	2.350±.808	13.751	0 .00	1.290±.456	1.960±.849	13.492	0.00
Vitamin D supplements	1.240±.429	1.720±.636	15.212	0 .00	1.240±.429	1.543±.618	10.881	0.00

Table (7): Total knowledge, attitude and reported practice scores of studied mothers' regarding with vitamin D deficiency through the intervention phases (No 100).

Items	Studied Mothers						X^2	P-value
	Pre-intervention		Post - intervention		After three months			
	No.	%	No.	%	No.	%		
Total knowledge score								
Good	5	5.0	93	**93.0**	87	87.0	160.894	0.00
Average	39	39.0	5	5.0	11	11.0		
Poor	56	56.0	2	2.0	2	2.0		
Mean±SD	11.47±3.201		40.170±7.712		35.870±10.046			
Total attitude score								
Positive	15	15.0	75	**75.0**	88	88.0	197.578	0.00
Negative	85	85.0	25	25.0	12	12.0		
Total reported practice score								
Good	7	7.0	85	85.0	79	79.0	182.600	0.00
Average	31	31.0	8	8.0	15	15.0		
Poor	62	62.0	7	7.0	6	6.0		
Mean±SD	30.280±8.51		67.090±15.11		63.05±14.821			

International Journal of Novel Research in Healthcare and Nursing
Vol. 7, Issue 2, pp: (533-551), Month: May - August 2020, Available at: www.noveltyjournals.com

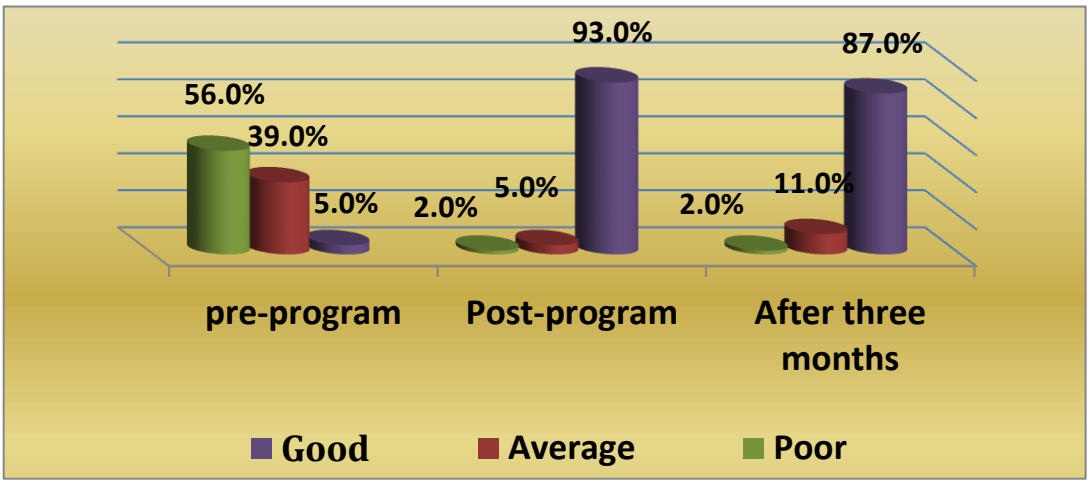


Fig. (2): Percentage distribution of the studied mothers' according to their total knowledge regarding vitamin D deficiency (pre, post and after three months n=100).

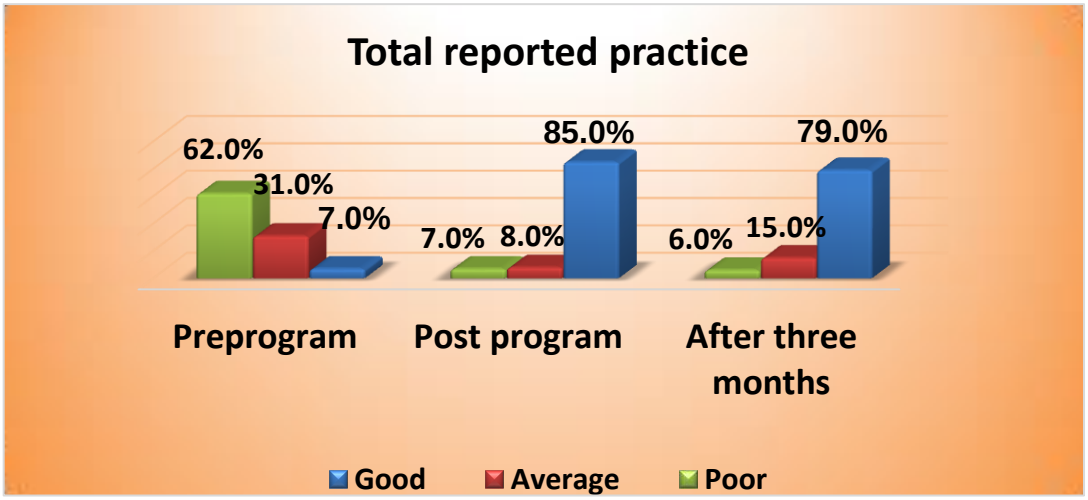


Fig. (3): Percentage distribution of the studied mothers' according to their reported practice regarding vitamin D deficiency (pre, post and after three months.

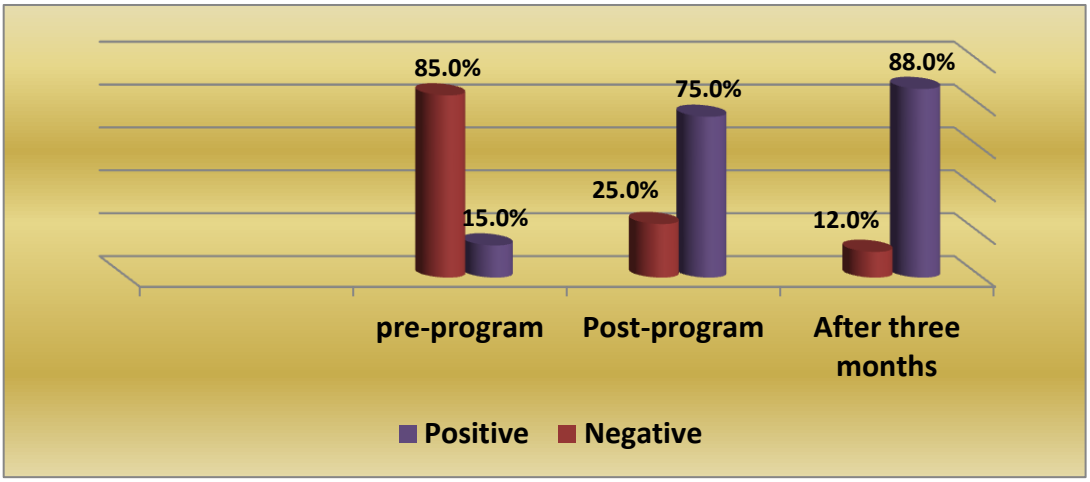


Fig. (4): Percentage distribution of the studied mothers' according to their attitude regarding children with vitamin D deficiency (pre, post and after three months.

International Journal of Novel Research in Healthcare and Nursing
Vol. 7, Issue 2, pp: (533-551), Month: May - August 2020, Available at: www.noveltyjournals.com

4. DISCUSSION

Vitamin D status and calcium are important nutrients for skeletal growth and bone health. Children are particularly vulnerable to vitamin D deficiency. Children with vitamin D deficiency may be prevented and treated with adequate intake of vitamin D **(Khadilkar, et al. 2017).** The health belief model is a model that illustrates the relationship between beliefs and health, and it is based on the hypothesis that preventive health behavior consists of mothers beliefs(**Khoramabadi, et al.2016).**

Regarding to mothers' characteristic, more than half of studied mothers were aged from 25 years to less than 30 (mean ± SD age was 27.48±2.17 years). In relation to mothers' education, more than half had technical education, less than three quarter were housewives and more than two third had enough family income per month. This finding agreed with **Abdinia, (2014),** which study entitled‟ Maternal knowledge and performance about use of iron and multivitamin supplements in children in Northwest of Iran,” who found that the mean age of mothers was (28.54+0.487) years.

Also, this finding was contradicted with **Holick. & Chen. (2019),** which study ‟ Vitamin D deficiency: a worldwide problem with health consequences,” who reported that, risk factors of rickets in children attending outpatient clinics of Abu El Rish hospital for pediatric, Egypt, (N=60), they found that less than half of mothers were illiterate. As well as, this finding agreement with **Çataklı et al. (2014),** which study ‟ Knowledge and practices of mothers regarding vitamin D supplementation admitted to an Hospital,” who found that, less than one third of mothers were primary school graduate and more than half of mothers lived in rural areas. This finding was in agreement with **Kalyani and Sharma, (2016)**, study entitled‟ Awareness of vitamin D deficiency among females attending the OPD,” who reported that three quarters of mothers were housewives.

As regard children characteristic, more than half of studied children were aged ranged between 6-12 years. In relation to children gender, more than half were males. This study agreed with **Sharmaine, et al., (2014),** which study ‟ Knowledge, awareness, attitudes and sources of vitamin D deficiency and sufficiency in Saudi children,” with reported that 34% of two- to 12-year-old children had insufficient vitamin D levels. This study agreed with **Chen, et al., (2016), who** study ‟ Vitamin D deficiency and sub-clinical osteomalacia in Axial spondyloarthropathy,” with found that 6% of four- to six-year-old children had vitamin D insufficiency. Among toddlers, 25(OH)D concentrations declined between 16 months and six years of age and were related to stopping vitamin D supplementation. Also, this study was accordance with **Brunner, (2017),** who study ‟ Rickets: causes, symptoms and treatment,” reported that children age ranged between 6-18 years with a mean of 13.5. Nonspecific symptoms, such as bone pain and fatigue were the most presenting symptoms, while skeletal deformities and fractures were the presenting symptoms in only 5 and 3childs.

Moreover, this study accordance with **Godel, (2017),** who study ‟ Vitamin D supplementation: Recommendations for Canadian mothers and infants,” who showed that, 59% of children were females and 41% were males, (with a mean age of 10.5±4.3).

As regard clinical manifestation of vitamin D deficiency**,** more than three quarter of the studied children had loss of appetite, more than half of them had continuous fatigue and less than half of them had pain. This result supported by the result by **Theodoratou et al., (2014)** which study entitled‟ Vitamin D and multiple health outcomes: umbrella review of systematic reviews and meta-analyses of observational studies and randomized trials,” who illustrated that, the most important symptom of vitamin D are bone aches (24%) tooth decay (18%) bone fracture (16%) followed by delayed walking (14%) the least were bow legs (11%) and obesity (6%). This study is similar to the study **Wheeler, et al.(2015)**, who study ‟ Epidemic of Vitamin D Deficiency and Its Management,” findings that, more than three quarters of the studied children had loss of appetite, and more than half complained of continuous fatigue and less than half of them had chronic and persistent pain.

According to, serum vitamin D, the study showed that, less than three quarter of children had vitamin D level less than 25nmol/liter, with mean level of vitamin D deficiency 18.27± 5.012.this study accordance with Liu, et al.(2018),who study‟ High Prevalence of Insufficient Vitamin D Intake and Serum 25-Hydroxyvitamin D in Chinese School-Age Children: A Cross-Sectional Study,” findings that, the average serum 25-(OH)D concentration of the participant children was 15.0 ± 7.9 ng/mL. A total of 3.2%, 54.7%, and 76.9% of the children’s serum 25-(OH)D concentrations were below 5 ng/mL, 15 ng/mL, and 20 ng/mL, respectively. Only 23.1% of children reached a sufficient level of serum vitamin D.

As regards, mother's knowledge regarding vitamin D deficiency, the mean and standard deviation (SD) score of mother knowledge regarding vitamin D are depicted in Table 3. There was highly significant difference between mean mothers knowledge score regarding vitamin D of intervention in post and after three months of implementation of intervention when compared with preprogram (P=<0.001). The paired t-test indicated that the mean mother knowledge score was highly significantly improved from 1.00 to 5.54 after three month of intervention. Specifically, 100% of mothers knew meaning of vitamin D, importance of vitamin D, source of vitamin D, best time of sun light and period of time to gain enough vitamin D after three month of intervention. This finding was congruent with **Al-Agha et al. (2016),** "studied the awareness of vitamin D and its deficiency in Jeddah population," Saudi Arabia, (N=1752), they found that more than two thirds of studied sample didn't know that 90% of vitamin D comes from the sun. This finding supported by **Al marzooqi et al. (2016),** who study " Knowledge, attitude and practice of vitamin D supplementation status among six months old infants in Abu Dhabi Island," who found that majority of studied sample didn't know cause of vitamin D deficiency.

Also, this finding was similarly to **Saghafi, et al. (2013)** who " Bone densitometry in patients with osteomalacia: is it valuable.," Also, reported in study that mothers had insufficient knowledge about vitamin D. However, mothers' knowledge related to vitamin D supplement intake requirement the present study revealed insufficient knowledge regarding vitamin D supplement before the program implementation. Meanwhile, the study carried **Manson and Bassuk, (2015)** which study entitled" Vitamin D research and clinical practice," out by reported that mothers had poor knowledge regarding source of vitamin D. additionally supplementing of vitamin D in children increase bone density, and prevent bone fractures.

On the other hand, the result of the current study contradicted with **Babelghaith et al. (2017),** who " Knowledge and practice of vitamin D deficiency among people lives in Riyadh," they found that less than half of participants knew complication caused by vitamin D deficiency(rickets and osteomalacia). So the first research hypothesis is supported.

On the other hand, this finding disagreed with **Alshamsan and Bin-Abbas, (2016),** which study entitled" they studied knowledge, awareness, attitudes and sources of vitamin D deficiency and sufficiency in Saudi children, (N= 100), they reported that less than three quarters of studied sample knew benefits of vitamin D.

As regards, mothers' health beliefs, the mean and standard deviation (SD) of health belief model (HBM) constructs subscale are shown in Table 5. Except perceiving benefits, which was decreased, the mean score of all health belief model constructs were increased. The F test indicated that there was highly significant difference (0.001) between pre, post and after three month of intervention. the current study agreed with **Arsenault et al., (2013)**, who " Very low adequacy of micronutrient intakes by young children and women in rural Bangladesh is primarily explained by low food intake and limited diversity," who reported that, This result was consistent with study conducted by **Elsobkey and Amer, (2019),** who " Mothers' health education based on health belief model to prevent vitamin D deficiency in children with cerebral palsy," who illustrated that, there was a statistically significant difference between pre and after 1 month from health education (p=<0.001). it showed an increased mean score of health belief model of the mothers. Also, this result was accordance with study conducted by **Zhao, et al. 2015** the item of health belief model in a study entitled" Systematic review of association between vitamin D levels and susceptibility and disease activity of ankylosing spondylitis," who reported that, The mean score of perceived severity and perceived benefits showed a significant difference after implementation of health education.

Regarding to mothers reported practice, the mean and standard deviation (SD) score of mothers reported practice regarding care of children with vitamin D deficiency are depicted in Table 6. There was highly significant difference(0.001) between mean mothers mother reported practice score regarding care of children with vitamin D deficiency in post and after three months of implementation of intervention when compared with pre program. The paired t-test indicated that the mean mothers reported practice score was highly significantly improved from 1.24 to 2.47 after three month of intervention. This result was consistent with **Abate, et al. (2016),** who study" Assessment of practice and factors affecting sunlight exposure of infants among mother attending governmental health facilities in Debre," the study reported that the majority of mothers exposed infants outdoor. These findings are supporting the second research hypothesis.

International Journal of Novel Research in Healthcare and Nursing
Vol. 7, Issue 2, pp: (533-551), Month: May - August 2020, Available at: www.noveltyjournals.com

According to mothers' attitude, this table showed that, the majority of studied mothers' had positive attitude regarding children with vitamin D deficiency in post and after three months while more than three quarter of studied mothers' had negative attitude in the pre- intervention, there was a highly statistical significant difference. These results were in the same line with **Çiçek et al. (2015),** who " Determination of the level of knowledge and attitudes of mothers regarding vitamin D use in Konya," they found that the majority of mothers had negative attitude about vitamin D pre health education implementation. This finding is supporting the third research hypothesis.

This finding disagreed with **Kavitha et al. (2015),** which study entitled" Knowledge, attitude and practice regarding vitamin D deficiency among antenatal mothers in Tamilnadu," they found that the majority of the study participants had poor practices for prevention of vitamin D deficiency.

Collectively, mother knowledge, attitude and reported practice, there was a highly statistically significant difference observed between the studied mothers' total knowledge, attitude and mothers' reported practice regarding children with vitamin D deficiency at pre, post and after three months of intervention P= (<0.001). This study agreement with **Alwadei, et al. (2018),** who study" Public awareness of vitamin " D " deficiency among children in Najran City ," who reported improved awareness of the mothers, better knowledge, attitude, and practice in the proper way of exposing their children to sunlight.

Moreover, this study accordance with **Kavitha, et al. (2015),** who reported that, the majority of the study participants had limited knowledge, poor practices, and negative attitude toward vitamin D and vitamin D supplement. From the researcher' point of view mothers' awareness about vitamin D sources, and supplement about are very important to improve vitamin D deficiency for their children

5. CONCLUSION

According to the results, the implementation of the health belief education for the mothers′ of children with vitamin D deficiency had exhibited improved in their knowledge, attitude and self-reported practice about caring of children with vitamin D deficiency after intervention compared to their pre intervention level. There was a highly statistically significant difference observed between the studied mothers′ total knowledge, attitude and mothers′ reported practice regarding children vitamin D deficiency at pre, post and after three months of intervention P= (<0.001).

6. RECOMMENDATIONS

- Mothers' knowledge and practice should be evaluated continuously through nurses to ensure the effectiveness of the provided care for their child.
- Training program should be applied for nurses to improve their knowledge and practice about vitamin D deficiency , which will be reflected in improving mothers' knowledge and practice.
- Future studies are needed to be conducted on the vitamin D deficiency rickets among children to prevent further complications.
- Further studies to bridge the gap in knowledge required to facilitate food fortification with vitamin D, and to compare the cost-effectiveness of fortification versus supplementation programs.
- The educational program regarding vitamin D deficiency can prevent further complication according to guideline.
- Guidelines for young children and their parents about vitamin D deficiency.

REFERENCES

[1] **Abate, A., Murugan, R. and Gualu, T. (2016):** Assessment of practice and factors affecting sunlight exposure of infants among mother attending governmental health facilities in Debre Markos Town, East Gojjam, Ethiopia, American Journal of Nursing,5(1),pp.32-34.

[2] **Ahmed, S. (2015):** Study of vitamin D level on critically ill children, Master Thesis in Pediatrics, Faculty of Medicine, Benha University, p.25.

[3] **Al-Agha, A., Alorabi, S., Saeed, S. and Shalabi, N. (2016):** Vitamin D and its deficiency in Jeddah Population. Saudi Arabia. Journal of community and public health Nursing .vol 2(2), pp.1-2.

[4] **Al Marzooq, D., Al Ameri, D., Al Hayayi, E., Al Shehi, H., Al Ameri, K., Al Dhufair, K. and Al Fahim, M. (2016):** Knowledge, attitude and practice of vitamin D supplementation status among six months old infants in Abu Dhabi Island. International Journal of Medical and Pharmaceutical Sciences.vol6(5).pp.3-4.

[5] **Aly, H. and Abdel-Hady, H. (2015):** Vitamin D and neonate. Journal of Clinical Neonatology.vol4(1).pp.2-4.

[6] **Ahmed, A., Ahmed, T. and Long, K.(2017):** Prevalence and risk factors of vitamin D insufficiency and deficiency among 6–24-month-old underweight and normal-weight children living in an urban slum of Bangladesh. Public Health Nutrition. Vol10(2).p6.

[7] **Alshamsan, F., Bassam, S. and Bin-Abbas, M.D.(2014):** Knowledge, awareness, attitudes and sources of vitamin D deficiency and sufficiency in Saudi children. Saudi Medical Journal. Vol 33(4), p. 9.

[8] **Abdinia, B.(2014):** Maternal knowledge and performance about use of iron and multivitamin supplements in children in Northwest of Iran. International Journal of Pediatrics.2(2).pp.12-22.

[9] **Arsenault, J. E., Yakes, E.A., Islam, M. M., Hossain, M.B., Ahmed, T., Hotz, C., Lewis, B. and Rahman, A.S. (2013):** Very low adequacy of micronutrient intakes by young children and women in rural Bangladesh is primarily explained by low food intake and limited diversity. Journal of Nutrition. Vol 143: 197–203.

[10] **Alshamsan, F. and Bin-Abbas, B. (2016):** Knowledge, awareness and attitudes and sources of vitamin D deficiency and sufficiency in Saudi children. Saudi Medical Journal. 37(5), p.579-582.

[11] **Alwadei, A., Al-Johani, N., Mohammed, S. and Hassanein, M. (2018):** Public awareness of vitamin " D " deficiency among children in Najran City and the role of primary health care centers in raising their awareness. Available at: http:// Amani_Alwadei@yahoo.com

[12] **Babelghaith, S., Wajid, S., Al-Zaaqi, M., Al-Malki, A., Al-Amri, F., Alfadly, S. and Alarifi, M. (2017):** Knowledge and practice of vitamin D deficiency among people lives in Riyadh. Saudi Arabia-Across sectional study. Biomedical Research. vol 28(7), pp. 3114-3115**.**

[13] **Brunner, S. (2017):** Rickets: causes, symptoms and treatment. Available at http://www.medicalnews today. com/ articles/ 176941. php. Accessed on11/9/2019.at6:17pm.

[14] **Catakli, T., Tasar, S., Ogulluk, M. and Dallar, B.(2014):**Knowledge and practices of mothers regarding vitamin D supplementation admitted to an Hospital. Ege Journal of Medicine.vol53(3). p.135

[15] **Cicek, Z., Kalkan, I. and Bilgen, B.(2015):**Determination of the level of knowledge and attitudes of mothers regarding vitamin D use in Konya, Global Journal on Advances in Pure and applied sciences.vol7(2).pp.9-18

[16] **Chen, Y., Fu, L., Hao, J., Yu, Z., Zhu, P., Wang, H. and Xu, D.(2015):** Maternal vitamin D deficiency during pregnancy elevates the risk of small for gestation age and low birth weight infants in Chinese population. The Journal of Clinical Endocrinology and metabolism. vol 100(5).p.1.

[17] **Chen, J., Chen, X., Liu, D., Sigdel, K.R. and Ruan, G. (2016):** Vitamin D deficiency and sub-Clinical osteomalacia in Axial spondyloarthropathy. Rheumatology (Sunnyvale). Vol 6(3). P 5. Available at: http:// doi:10.4172/2161-1149.1000205.

[18] **Cao, Z., Chen, Y . and Wang, S.(2014):** Health belief model based evaluation of school health education programme for injury prevention among high school students in the community context. BMC Public Health. vol 14(26). Available at:http://www.biomedcentral.com/1471-2458/14/26

[19] **Elsobkey, F. and Amer, S. (2019):** Mothers' health education based on health belief model to prevent vitamin D deficiency in children with cerebral palsy. American Journal of Nursing Research. Vol. 7. No. 5.Available at:DOI:10.12691/ajnr.

[20] **Frieri, M. and Valluri, A. (2011):** Vitamin D deficiency as a risk factor for allergic disorders and immune mechanisms. Allergy and Asthma Proceedings, 32(6), 438-444.doi: 10.2500/aap.2011.32.3485

[21] **Godel, J. (2016):** Vitamin D supplementation: Recommendations for Canadian mothers and infants. Paediatr Child Health .12(7):pp5-9.Available at:http://doi: 10.15537/smj.2016.5.14951

[22] **Hockenberry, M., Wilson, D. and Rodgers, C.(2017):**Essential of pediatric nursing. P. 501. Elsevier. com.Available at: https://www.elsevier.com

[23] **Holick, M. and Chen, T. (2019):** Vitamin D deficiency: a worldwide problem with health consequences. Am J Clin Nutr . pp.1–4. Available at: https://academic.oup.com/ajcn

[24] **Kaur, K., Grover, K. and Kaur, N. (2015):** Assessment of nutrition knowledge of rural mothers and its effectiveness in improving nutritional status of their children, Indian Research Journal of Extension Education. Vol 15(4).p90

[25] **Kavitha, D., Anjalakshi, C., Venkataraman, P., Rukmani, J. and Murali, R.(2015):** Knowledge, attitude and practice regarding vitamin D deficiency among antenatal mothers in Tamilnadu: A phenomenological study.Asia Pacific Journal of Research. Vol 3(4).pp.9-11.

[26] **Kalyani, V. and Sharma, S. (2015):** Awareness of vitamin D deficiency among females attending the OPD, ALLMS, Rishikesh, IOSR Journal of Nursing and Health Science.vol5(4). p.77.

[27] **Khadilkar, A.V., Sanwalka, N.J., Chiplonkar, S.A., Khadilkar, V.V. and Mughal, M.Z.(2011):** Normative data and percentile curves for dual energy X-ray absorptiometry in healthy Indian girls and boys aged 5–17 years. Bone. vol 48(7).pp 810–819.

[28] **Khadilkar, A., Kadam, N., Chiplonkar, S., Fischer, P.R. and Khadilkar, V.(2012):** School-based calcium vitamin D with micronutrient supplementation enhances bone mass in underprivileged. Indian Remenarchal Girls. vol 51: 1–7.

[29] **Kavitha, D., Anjalakshi, C., Venkataraman, P. and Rukmani, J.R.(2015):** Knowledge, attitude and practice regarding vitamin D deficiency among antenatal mothers in tamilnadu. Department of Medical Research, India. Asia Pacific Journal of Research Vol 1. p 109. Available at: http:// www.apjor.com .

[30] **Khoshgoftar, M., Mazaheri, M. and Tarahi, M.(2019):** The effect of educational intervention based on health belief model to decrease and prevent mobile phone addiction among female high school students in Iran. Int J Pediatr . Vol.7(10). Available at:http:// ijp.mums.ac.ir.

[31] **Khoramabadi, M. ,Dolatian, S., Hajian, M. and Zamanian, R.(2016):** Effects of education based on health belief model on dietary behaviors of Iranian pregnant Women. Glob J Health Sci. vol8(2).Available at:https:// doi: 10.5539/gjhs.v8n2p230

[32] **Liu, Y Li, X., Zhao, A., Guo, M., Xue, X.(2018):** High prevalence of insufficient vitamin D intake and serum 25-Hydroxyvitamin D in Chinese School-Age Children: A Cross-Sectional Study. Nutrients. vol 10(7).Available at:http:// doi: 10.3390 /nu1 0070822

[33] **Mahmoud, A. O., Ahmed, A. Y., & Aly, H. M. (2016):** The prevalence of active nutritional rickets in Egyptian infants in Cairo. Egyptian Pediatric Association Gazette, 64(3(, 105-110.

[34] **Manson, J.E. and Bassuk, S.S. (2015):** Vitamin D research and clinical practice: at a crossroads. JAMA 31(3).pp 1311-1312**.**

[35] **Michie,C., Frsphfls, F. and Bangalore, S.(2010):**Managing vitamin D deficiency in children. London Journal Prim Care(Abingdon).vol3(1).31-36.

[36] **Pettifor, J.M. (2014):** Calcium and Vitamin D Metabolism in Children in Developing Countries, Ann Nutr Metab.vol 64(2).pp 15–22. Available at:http //www.karger.com/anm

[37] **Saghafi, M., Azarian, A., Hashemzadeh, K., Sahebari, M. and Rezaieyazdi, Z. (2013):** Bone densitometry in patients with osteomalacia: is it valuable. Clinical cases in mineral and bone metabolism. The Official Journal of the Italian. vol 10(3). pp180-182.

[38] **Shuttleworth, M.(2008):** Quasi-experimental design.p.1. Available on: https: // explorable. com/quas-experimental-design .

[39] **Theodoratou, E., Tzoulaki, I., Zgaga, L. and Ioannidis, J.P.(2014):** Vitamin D and multiple health outcomes: umbrella review of systematic reviews and meta-analyses of observational studies and randomized trials. British Medicine Journal. p348.

[40] **Tønnesen, R., Peter, H., Thorbjorn, J., & Peter, S. (2017):** Determinants of vitamin D status in young adults: influence of lifestyle, sociodemographic and anthropometric factors. BMC Public Health vol 20(10). pp. 1718-1728

[41] **Wheeler, B.J., Dickson, N.P., Houghton, L.A., Ward, L.M. And Taylor, B.J.(2015):** Incidence and characteristics of vitamin D deficiency rickets in New Zealand children: a New Zealand Pediatric Surveillance Unit study Benjamin. Australian and New Zealand Journal of Public Health . vol. 39 no. 4. Available at :https://doi: 10.1111/1753-6405.12390

[42] **Zhao, S., Duffield, S.J., Moots, R.J. and Goodson, N.J. (2014):** Systematic review of association between vitamin D levels and susceptibility and disease activity of ankylosing spondylitis. Rheumatology Journal. vol 53(4). pp1595-1603.

[43] **Zagaria, M. and Pharm, D. (2009):** Osteomalacia: Vitamin D Deficiency and Bone Pain.vol 34(3).pp22-24.