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Bioscience Research

Print ISSN: 1811-9506 Online ISSN: 2218-3973

Journal by Innovative Scientific Information & Services Network



RESEARCH ARTICLE

BIOSCIENCE RESEARCH, 2021 18(4): 2728-2735.

OPEN ACCESS

Impact of health educational program about vitamin D on knowledge and perception of students in Jouf University

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Background: Vitamin D deficiency is becoming a major silent problem worldwide and especially in Saudi Arabia. It is associated with several diseases, including bone diseases, Alzheimer's disease, cancers, heart disease, and other health problems. The presence of sufficient knowledge about this problem may lead to a decrease in its prevalence. This study aimed to assess and improve university students' knowledge and perception of vitamin D

This Quiz experimental research design was conducted on the main campus of female students at Jouf University from January 2020 to March 2020. A total of 50 students from the preparatory level were sharing in our study according to their agreement. Socio-demographic information and assessment of students' knowledge & perception toward vitamin D were collected through pretest questioner sheets, they divided into (5 groups) for taking health education sessions then posttest applied for showing participants' improvement.

Our study results indicated that students of Jouf university in preparatory level have low knowledge about vitamin D deficiency; risk people, causes, symptom, and complications (32%, 30%, 42%, and 20% respectively), safe dosage of the supplement, and complications of excess (98% and 88% respectively). While after participation in our health education program their knowledge and perception about vitamin D were improved with highly significant differences (P -value ≤ 0.05).

The present education program was successful and fulfilling the aim of the study. We recommended additional programs in a different setting in the community for more benefit and for decreasing the hazards of Vitamin D deficiency.

Keywords: Vitamin D, Knowledge, Perception, Sources, Complications, Deficiency.

INTRODUCTION

Vitamin D is a fat-soluble vitamin. Vitamin D is certainly present in few types of food, thus diet is measured a poor source of vitamin D that accounts for only 10% of the intake of vitamin D. Also vitamin D gotten by the exposure of unprotected skin to sunlight UVB radiation. It's present naturally in fish and egg, as well as vitamin D supplements. (Roth, et al. 2018) It is also made endogenously when ultraviolet rays

from sunlight raid the skin and activate vitamin D synthesis. Vitamin D deficiency was diagnosed when serum 25-hydroxyvitamin D concentration was ≤ 20 ng/mL (50 nmol/L). (Forrest and Stuhldreher, 2011)

Deficiency of vitamin D is becoming a global epidemic. (Roth et al.2018) It has been appraised that almost one billion people in the world suffer from vitamin D deficiency. The National Health and Nutrition Examination Survey 2005 to 2006

data were examined levels of vitamin D in adults (N = 4495). The total prevalence rate of vitamin D deficiency was 41.6%, with the highest rate seen in blacks (82.1%), and followed by Hispanics (69.2%). Vitamin D deficiency present more common among ignorant adult, obese, with a poor health status, hypertension, low high-density lipoprotein cholesterol level, or not taking milk daily (all $P < .001$). (Forrest and Stuhldreher, 2011)

Many studies indicated that vitamin D deficiency is associated with several diseases, as bone diseases, multiple sclerosis, Alzheimer's disease, alopecia, obesity, cancers, heart disease, diabetes Type 1 and 2, and other health problems. (Alotaibi et al. 2019 and Blebil et al. 2019) In addition to increased risk of tuberculosis, asthma, and chronic obstructive pulmonary disease, as well as viral and bacterial respiratory infections. (Hejazi et al. 2016 and Bener et al. 2014) Also, a recent study shown that patients hospitalized with COVID-19 who had sufficient levels of vitamin D had a decreased risk for adverse outcomes and death. (Maghbooli et al. 2020)

Many previous studies conducted in a different county in Saudi Arabia to estimate the prevalence of vitamin D deficiency show a rising up of vitamin D deficiency in Saudi Arabia. (Babli et al. 2015, Kaddam et al. 2017, Al-Faris, 2016 and Al-Daghri, 2018) Kaddam et al. 2017; report that there was a previous study done in 2014 in three regions in Saudi Arabia among students and employees, the results estimated that 49% of students and 44% of employees were vitamin D deficient. Also, a cross-sectional study conducted in Riyadh among 160 first-trimester pregnant women in 2010, showed that 50% of them had vitamin D deficiency. (Al-Faris, 2016) in another cross-sectional study conducted among King Faisal University Medical Students in 2009, the result was 96% of the total 198 students had vitamin D deficiency. (Babli et al. 2015)

Additionally, one study done in KSA from 2011 to 2016, revealed the prevalence of vitamin D deficiency was (81.0%) among different populations categories (adults, children and adolescents, newborns, and pregnant/lactating women). (Al-Daghri, 2018) Regarding the study of Hussain et al. 2014; total of 10,709 patients were analyzed; (68.5 %) Saudis people compared to (31.5 %) non-Saudis. Vitamin D deficiency found in 83.6 % from them. All of age, gender, and nationality have significant differences in the severity of vitamin D deficiency. Severe vitamin D

deficiency affected females compared to males (35.6 vs. 23.7 %, $p < 0.000$), as well as adolescents compared to other age groups (49.2 vs. 30.9 %, $p < 0.000$). Concerning to the effect of nationality in the prevalence of vitamin D deficiency, Saudis were found with more prevalence than non-Saudis (37.2 vs. 20.3 %, $p < 0.000$). So, there is an urgent requisite to increase the Saudi population's awareness about vitamin D and its deficiency complications.

Habib et al. 2014; justifies the increasing rate of vitamin D deficiency in Saudi women to the insufficient intake of vitamin D in diet and poor exposure to sunlight, and skin pigmentation.

An international study conducted in developing countries provide recommendation about the necessity for improving of people awareness about vitamin D deficiency and its impact on adult health. (Roth, et al. 2018) An additional recent study by Tariq et al. 2020; assessed Pakistan university students' knowledge, attitudes and practice towards Vitamin D. They found limitation in the university students' knowledge about vitamin D and recommended that they need an elevation of their awareness about the importance for exposure to sunlight and adequate dietary intake of vitamin D.

Still, there is no studies examine the young adults Saudis knowledge, and perception about vitamin D. Identifying level of knowledge, and their perception about vitamin D is vital for designing an appropriate interventions for Saudi Arabia people.

Aim of the study

General objective:

Improve the knowledge and perception of students about vitamin D.

Specific objectives:

Assess of knowledge and perception of students about vitamin D.

Application of a health education session about vitamin D.

Evaluate the impact of health education on patients' knowledge and perception about vitamin D.

MATERIALS AND METHODS

Research design:

A quiz experimental design was utilized in the present study.

Setting:

The study was done on the main campus of female students in Jouf University.

Sample:

A convenient sample of 50 students from the preparatory level was sharing in our study according to their agreement, which divided into (5 groups) into health education sessions.

Ethical Consideration:

Purpose of study was explained to each student group. They have the right to participate in the study or to refuse.

Tools of study:

The researcher was developed an interview questionnaire which containing three parts:

Part 1:

Socio-demographic data which include; (name, age, marital status, level of education).

Part 2:

An interview sheet developed to assess the students' data about vitamin D. It includes data about (benefit, sources, Cause of deficiency, the symptom of deficiency,.....)

Part 3:

Another interview sheet developed to assess the student's perception of vitamin D.

General objectives of the health education session:

- 1- Assess the students' knowledge and perception about vitamin D.
- 2- Improve the students' knowledge and perception about vitamin D.

Specific objectives of the health education unit:**After completion of our health education session, the students will apply to:**

- Enumerate the benefit of vitamin D in the human body.
- Know sources of vitamin D.
- Identify manifestation of vitamin D deficiency.
- Explain causes of vitamin D deficiency.
- Describe safe daily supplements of vitamin D for different age categories.
- Know risky people of vitamin D deficiencies.
- Explain the complication of vitamin D deficiencies.
- Explain the complication of vitamin D excess.

Data collection:

Data collection was starting from October 2019 to November 2019. Through two interviews of each student group.

Methods of data collection:**Pilot Study:**

A pilot study was done before starting data collection to evaluate the clarity of the study tool and to estimate the time needed to fill the sheet. It was carried out on a sample of 10 students, who were excluded from the total sample. The necessary modification was done according to the result of the pilot study.

The technique of data collection:

Data was collected by interviewing students, explaining the purpose of the study, and taking their permission for sharing in the study. Then questioners' sheet was filled by fifty students (pre-test). Then they divided into five groups. After that, the researchers explain the health education session about vitamin D to each group separately. At the end of the session students filled the same questionnaire sheet (posttest).

Data analysis:

Data analysis was done by using (SPSS) version 16 and clearing of data was done then data analysis was started by descriptive statistics. After that cross-tabulation and application of P-value by using paired sample t-test for testing the significance, if P-value was less than or equal 0.05.

The scoring system:

The correct answer for each question was given one grade and zero for an incorrect answer.

RESULTS

As regards the socio-demographic characteristics of the studied sample, all of the participants (100%) were less than twenty years. Concerning their marital status (80%) of them were single and only (20%) were married.

Table (1) show that only 16% from students know all benefits of vitamin D in the pretest while after our health education session their knowledge improved by 72%. About complication of vitamin D deficiency about half of them (52%) know its effect in elders before the session while after it 86% of them know that. Before health education, the researcher noted that the majority (86%) know that sunlight is one source of vitamin D and only 4% know the correct time for exposure to sunlight

while after session 92% know it. After health education, half of the students (50%) know that eating a diet rich with vitamin D can protect from

deficiency while before our session only 16% know that.

Table 1: Assessment of students' knowledge about vitamin D

Items	Pre-test	Post-test	P- value
	NO.(%)	NO (%)	
1- Benefits of vitamin D:			
• Don't know	8(16)	0(0.0)	
• Know about benefit	42(84)	50(100)	
a- Benefits for healthy bone and prevent rickets	28(56)	3(6)	0.000*
b- Benefits for healthy bone and other benefits	8(16)	36(72)	0.04*
c- Other benefits	6(12)	11(22)	0.110
2- Complication of vitamin D deficiency:			
• Don't know	10(20)	2(4)	
• Know about complication	40(80)	48(96)	
a- Rickets in children	9(18)	42(84)	0.000*
b- Muscle/bone weakness in adults	11(22)	32(64)	0.000*
c- Osteoporosis in elders	26(52)	43(86)	0.000*
3- Sources of vitamin D:			
• Don't know	1(2)	3(6)	
• Know about sources	49(98)	47(94)	
a- Food sources.	37(74)	49(98)	0.000*
b- Sun exposure	43(86)	46(92)	0.371
c- Vitamin D supplements	0(0.0)	2(4)	0.159
4- Safe action taken to avoid vitamin D deficiency:			
a- Don't know			0.000*
b- Exposure to sun light for 10 to 15 minutes	48(96)	4(8)	0.000*
c- from 10 am to 3 pm	2(4)	46(92)	
5- Causes of vitamin D deficiency:			
• Don't know	15(30)	1(2)	
• Know about causes	35(70)	49(98)	
a- Decrease of exposure to sun lights	26(52)	38(79)	0.877
b- Don't eat diets containing it	8(16)	25(50)	0.001*
c- Others	16(32)	43(86)	0.000*
6- Symptoms of deficiency:			
• Don't know	21(42)	2(4)	
• Know about symptoms	29(58)	48(96)	
a- Musculoskeletal symptoms (bones & joint pain, muscle cramp)	18(36)	34(68)	0.001*
b- Weakness, fatigue, restlessness	4(8)	4(8)	0.548
c- Others	12(24)	38(76)	0.000*
7- Daily dosage from vitamin D supplement:			
a- Don't know	49(98)	13(26)	0.000*
b- Know about dosage	1(2)	37(74)	0.000*
8- Risky people for vitamin D deficiency:			
• Don't know	16(32)	1(2)	
• Know	34(68)	49(98)	
a- Elders	32(64)	46(92)	0.000*
b- Feeding women	4(8)	46(92)	0.000*
c- People don't exposure to sun light	2(4)	20(40)	0.000*
d- Patient with gastritis	0(0.0)	25(50)	0.000*
9- Complication of vitamin D excess:			
• Don't know	44(88)	1(2)	
• Know about complication	6(12)	49(98)	
a- Gastrointestinal complications	6(12)	48(96)	0.000*
b- Hypercalcemia	0(0.0)	19(38)	0.000*

Significant difference = P-value ($\leq 0.05^*$)

Less than half (42%) don't know symptoms of vitamin D deficiency before our health education session while only 4% don't know after it. Only 2% know the safe dosage of vitamin D supplement in before the program and their knowledge improved to 74% after program. In the pre-test, eight percent (8%) from student know that breastfeeding infant at high risk for vitamin D deficiency while in posttest the majority (92%) knows that. Finally, the majority (88%) don't know the complication of vitamin D excess before our education session while after it only 2% don't know it.

As regard pre-test and post-test results, it reflects that our health education session had a successful impact on students' knowledge around vitamin D.

Table (2) demonstrate that only about one-third (30%) of students perceived that they may be had vitamin D deficiency before our health education session while after the session the majority of them (96%) perceived that. Also, 88% decided that they heard/learn about vitamin D in the pretest while after our session their opinion change to 94% said (no), this reflects our health education benefit to them.

As regard pre-test and post-test results, it reflects that our health education session had a successful impact on students' perceptions about vitamin D.

Dissection

The current study is the first one that applied to improve knowledge and perception of Jouf university students at the preparatory level about vitamin D. An educational program prepared and conducted based on the researcher's previous assessment.

A previous study done in Saudi Arabia found low in the participant awareness concerning vitamin D, including where it comes from and what it does for health.⁽¹⁵⁾ This result agrees with the current study result in the majority of items in the pretest.

Our study results found that the students had satisfactory knowledge about sources of vitamin D, 74% of the known correct food sources of vitamin D, and 86% of them know that exposure to the sun provides vitamin D. These results comparable to the results of O'Connor, et al. 2018⁽¹⁶⁾ study in the UK, where the participants had good knowledge about sources of vitamin D. Additionally, the study of Arora, et al. 2015; which is the first Indian study that assesses the college students' knowledge, awareness, and attitude about Vitamin D. The study results found that (53.3%) from students specified sunlight as the main source of Vitamin D, 44.9% of students assumed that the sun and diet both are the main sources of Vitamin D, while only 0.6% of them did not aware of the source of Vitamin D.

Table 2: Assessment of students' perception about vitamin D.

Items	Pre-test	Post-test	P- value
	NO.(%)	NO.(%)	
1- Skin protection from sun light cause			0.000*
2- decrease body vitamin D:			
a- Disagree/strongly disagree	16(32)	1(2)	
b- Unsure	21(42)	2(4)	
c- Agree or strongly agree	13(26)	47(94)	
3- I may have a vitamin D deficiency:			0.000*
a- Disagree and strongly disagree	8(16)	1(2)	
b- Unsure	27(54)	1(2)	
c- Agree or strongly agree	15(30)	48(96)	
4- Do you heard/learnt about vitamin D?			0.000*
• Yes	3(6)	44(88)	
• No	47(94)	6(12)	

Significant difference = P-value ($\leq 0.05^*$)

However, our results are in contrast to those reported in the studies across Bangladesh, the Middle East, Iran, and Lebanon which found a limitation in their participant knowledge about sources of vitamin D. (Toher et al. 2014 and Boland, 2013) Tariq et al. 2020; study which conducted in Pakistani university found students had lack of knowledge about sources of vitamin D. This revealing the increased awareness of Saudi university students about sources of vitamin D.

Only 14% of Jouf university students didn't know that sun rays considered a source of vitamin D production. This disagrees with the study of Boland (2013); which found 91% of Canadian university students didn't know the benefit of the sunlight as a source of vitamin D.

In our study 16% of Jouf university students didn't know the benefit of vitamin D and 56% know that vitamin D has benefits effect on bone, this is similar to the study of Tariq et al. 2020; which found 17.8% from Pakistani university students didn't know this and 33% from students were attentive of the bone health benefits of vitamin D. This reflects positive feedback that Saudi students had better knowledge about benefit of vitamin D than Pakistani students.

Only, nine percent of Pakistani female students in Tariq et al. 2020; study, stated that they didn't know the benefits of vitamin D, while 16% of Saudi students in the current study didn't know this benefit.

In a study of Boland (2013); forty percent of participants recognized dairy milk as a source of vitamin D and only 15% of them known cod liver oil and eggs, while 74% of those in our study known sources from fatty fish, cod liver oil, eggs, orange, milk and milk products. This reflects a better knowledge of Jouf students regarding the source of vitamin D comparing the 2013 study.

The majority of Jouf university students (96%) didn't know the time needed for sun exposure daily to prevent vitamin D deficiency. This disagrees with the study of Boland (2013); which found only 27% of Canadian university students reported that they did not know the average time of sun exposure per week.

National Institute of Health (2012); targeted the inhibition of osteoporosis through increased vitamin D intake, particularly in middle-aged women. This agrees with the current students' report 52% known that vitamin D deficiency may be causing osteoporosis in elders.

Blebil et al. 2019; assessed the general public awareness, knowledge, attitude, and the Practice of vitamin D in Malaysia. The researches asked

participants "Have you ever heard/learned about vitamin D?" the majority of them (90%) answered "Yes" this disagree with current students which found only 6% heard/learned about vitamin D. Also 2019 study results disagreed with current study results in participants opinion about researcher statement "If I regularly protect my skin from the sun, I am in danger of not getting enough vitamin D", "46.8% strongly agree/agree, 35.8% unsure and 17.5% disagree/strongly disagree" while current results were "26% strongly agree/agree, 42% unsure and 32% disagree/strongly disagree".

CONCLUSION

In conclusion, students in the preparatory level of Jouf University have low knowledge about vitamin D and haven't perceived the dangers of Vitamin D deficiency in their health. The present health education session was improved their knowledge and perception about vitamin D. So, its successes and fulfilling the aim of the study.

Recommendation

This study recommended the following:

- 1- Stress on the media (TV) role for community awareness for a periodic blood test to measure levels of vitamin D.
- 2- Application of more programs about vitamin D for different categories in the Saudi community.

CONFLICT OF INTEREST

The authors declared that present study was performed in absence of any conflict of interest.

ACKNOWLEDGEMENT

The researcher would like to thank all students sharing in this study..

AUTHOR CONTRIBUTIONS

Add contribution of each author (with abbreviated name) here. For example WEP designed and performed the experiments and also wrote the manuscript. EW, OA, and IDJ performed animal treatments, flow cytometry experiments, tissue collection, and data analysis. AS and MR designed experiments and reviewed the manuscript. All authors read and approved the final version.

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