

Knowledge of Vitamin D Deficiency and its Impact on Lifestyle Factors among the Students of Iqra University North Campus, Karachi

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Abstract

The purpose of the current study is to assess university students' knowledge, attitudes, and lifestyle choices about vitamin D because it is crucial to given the widespread implications for bone health and overall well-being. This study investigates the demographic information, lifestyle habits, and awareness levels concerning Vitamin D. In a cross-sectional study, 208 students from the Iqra University, North Karachi Campus had their vitamin D knowledge and its impact on lifestyle practices assessed using a questionnaire based on interviews, their nutritional status assessed using anthropometric measurements. Lifestyle practices like dairy consumption, soft drink consumption, coffee consumption, sun exposure, and exercise habits were dependent variable. The study also explored the participants' knowledge of the importance of sun exposure for Vitamin D synthesis, the role of Vitamin D in bone health, and muscle growth and they were independent variables. The significant associations observed between knowledge of vitamin D and lifestyle factors. The study's findings highlight the necessity of focused educational initiatives to bridge knowledge gaps and encourage students to lead healthy lifestyles. Legislators, educators, and public health experts who wish to improve student population health outcomes and knowledge of vitamin D are among the study's benefits.

Keywords: Vitamin D deficiency, Lifestyle practices, Bone health, Awareness.

Introduction:

In recent years, the medical world has increasingly recognized the significance of Vitamin D. It has now become clear that Vitamin D deficiency is a widespread global concern. While historically, this deficiency was linked to conditions like rickets and osteomalacia, recent research has highlighted the essential role of Vitamin D in promoting development, growth, and overall health throughout life. (Christie & Mason, 2011) For the body to establish and maintain function, vitamin D is necessary. It can be produced by the skin using sunlight or can be consumed through food supplements. Most bodily systems are impacted by vitamin D insufficiency, with bone health being one of the most severely affected (Alfayyadh, Alsouli, Alnasser, & Alfayyadh, 2020). Vitamin D deficiency has become a significant global public health issue that needs attention and action. (Nimri, 2018) It is estimated that Vitamin D deficiency affects approximately one billion people worldwide, impacting both males and females of all age groups. Insufficient exposure to sunlight and inadequate dietary intake are the two key environmental factors that contribute to low vitamin D levels. (Whiting & Calvo, 2011) Multiple factors such as season, latitude, time of day, age, skin pigmentation, sunscreen use, and glass exposure

can influence the skin's ability to produce vitamin D3. After synthesis, vitamin D3 undergoes conversions in the liver and kidney to become biologically active. Insufficient sun exposure poses a risk of vitamin D deficiency, while prolonged excessive sun exposure increases the risk of non-melanoma skin cancer. Most individuals need to obtain 90% of their required vitamin D through casual sunlight exposure. (Holick, 2004) Additionally, various factors can affect the dietary intake of vitamin D, and the lack of fortification of staple foods in many countries contributes to low vitamin D intakes. (Whiting & Calvo, 2011) There are a limited number of foods that contain Vitamin D. Vitamin D3 is present in oily fish such as sardines, mackerel, and salmon, providing 360 IU per 3.5-ounce serving. While egg yolks contain some vitamin D, their high cholesterol levels mean they are not a significant source (typically no more than 50 IU per yolk). Cod liver oil has been valued for over three centuries for its important role in promoting strong bones and is an excellent source of vitamin D3. Vitamin D fortification is found in only a small number of foods, such as milk (providing 100 IU per 8-ounce serving), orange juice (also providing 100 IU per 8-ounce serving), various juice products, as well as certain breads and cereals. While supplements improve vitamin D levels, availability may be limited in some countries. In addition, lack of education and low socioeconomic status can pose barriers to accessing these dietary sources. (Whiting & Calvo, 2011). Vitamin D is known as the sunshine hormone and it is well-recognized for its key role in calcium balance and bone health. (Arora.H, Dixit, & Sirivastava, 2016) Treatment for vitamin D deficiency involves taking its supplements. Definite groups of people are at higher risk of vitamin D deficiency and are therefore advised to take vitamin D supplements on daily basis. These groups include women who are pregnant and on breastfeeding, infants and young children aged 6 months to 5 years, individuals aged 65 and over, and people who have limited exposure to the sun. (Galesanu & Mocanu, 2015) Hormonally active form 1, 25-dihydroxyvitamin D (1, 25-[OH] D) which is derived from 25- [OH] D required for the normal process of bone calcification and bone remodeling. After entering the bloodstream and being processed by vitamin D 25-hydroxylase (25- OHase) in the liver, vitamin D that comes from the large organ of our body (skin) or food enters the circulation. Once 25(OH) D3 is back in the bloodstream, kidney 1-hydroxylase (1-OHase) enzyme transforms it into 1, 25(OH) 2D3. (Holick, 2004) Insufficient levels of vitamin D can lead to increased risks such as osteomalacia, fractures, and secondary hyperparathyroidism. Additionally, it can also cause inadequate bone calcification. There is evidence linking a lower socioeconomic status to an increased risk of disorders connected to nutrition. The main socioeconomic factor that influences eating healthy is educational level; a lower level of education is linked to poor diet quality and low food consumption. (Tonessen, Hovind, Jensen, & Schwarz, 2016) Evidence of various cross-sectional studies has linked Vitamin D deficiency to various Non-communicable diseases in which Type 1 and Type 2 diabetes, cancers, heart disease, and many other diseases are included. (Arora.H, Dixit, & Sirivastava, 2016) Additionally, information about lifestyle and sociodemographic factors that are relevant to vitamin D concentration in blood may support initiatives to promote health among young adult subgroups. (Christie & Mason, 2011). Osteoporosis commonly known as the "silent disease", is marked by a decrease in quality of bone mass, resulting in fragile bones and an elevated risk of fractures (Puttapitakpong, et al., 2014) (Hosseini, Tork, & El-sabeely, 2014) Systemic osteoporosis, periarticular osteopenia, bone erosion, and a higher risk of fractures and deformities are all connected with the widespread effect of inflammation on bone, which may lead to a lower quality of bone. (Vosse & DeVlam, 2009) Along with vitamin D deficiency osteoporosis is one of the main public health issue, which marks millions of people around the world and its numbers increases by age. Osteoporosis defined by World Health Organization (WHO) based on bone mineral density, the value falls more than 2.5 standard deviations below the average peak in young adults (Alyahya, Lee, Al mazidi, Morgan, & Lanhamnew, 2014). In Asia especially Pakistan,

osteoporosis is a major health issue due to severe nutritional deficiencies and a lack of sufficient diagnostic methods. Only a few studies in Pakistan have focused on bone diseases. These studies found that while women are aware of osteoporosis, this awareness does not always lead to preventive actions against the disease. (Bilal, et al., 2017). There are severable controllable risk factors in osteoporosis such as low physical activity, sedentary lifestyle, smoking, use of alcoholic beverages, poor diet, etc. While on the other hand uncontrollable risk factors are gender, family history, ethnicity, age, post menopause and body mass index. (Hossein, Tork, & El- sabeely, 2014). Furthermore, calcium has been shown to decrease individual's risk of vertebral compression fractures (Han, Kim, & Kim, 2021). Sufficient knowledge of calcium among medical personnel is essential for raising public awareness. (Geddaway, et al., 2020). Regular exercise such as jogging, walking, stair climbing at the effort of 70-90% and adequate calcium intake (1,500 mg/day) can increase lumbar spine bone density by 5% in nine months, delaying bone degeneration throughout life. (Hossein, Tork, & El-sabeely, 2014) One strategy to protect young adults' bone health later in life is to raise awareness about vitamin D deficiency among them. A clearer understanding of the vitamin D deficiency could also benefit elderly family members who are more vulnerable (Khan, et al., 2019). At the age of 25 and 35 years our peak bone mass (PBM), is reached at the maximum level and is primarily influenced by vitamin d status, calcium consumption and physical activity as well. (Tonessen, Hovind, Jensen, & Schwarz, 2016) The greatest way to assess deficiency is to analyze blood levels of 25-hydroxyvitamin D (Kennel, Drake, & Hurley, 2010). Individuals who have restricted oral intake, poor intestinal absorption, or insufficient sun exposure are often at risk for developing vitamin D deficiency or insufficiency. The Food and Nutrition Board (FNB) determined the safe upper limit for consumption, which is 2000 IU, or 50 micrograms per day (Heaney, 2000). Below blood 25OHD concentrations of 250 nmol/L, which would only be created at continuous oraldoses above 10,000 IU (250g)/day, actual toxicity is not observed (Heaney, the vitamin d requirement in health and disease, 2005). Because lifestyle habits develop in early life, there is need to raise awareness about vitamin D deficiency among young adults when they reach peak bone mass. To address behavioral risk factors, early knowledge related to vitamin D deficiency in young adults is essential in order to lower healthcare expenses, we aim to minimize the risk of vitamin D deficiency, and thereby reducing the likelihood of developing different bone related diseases or disorders.

Results:

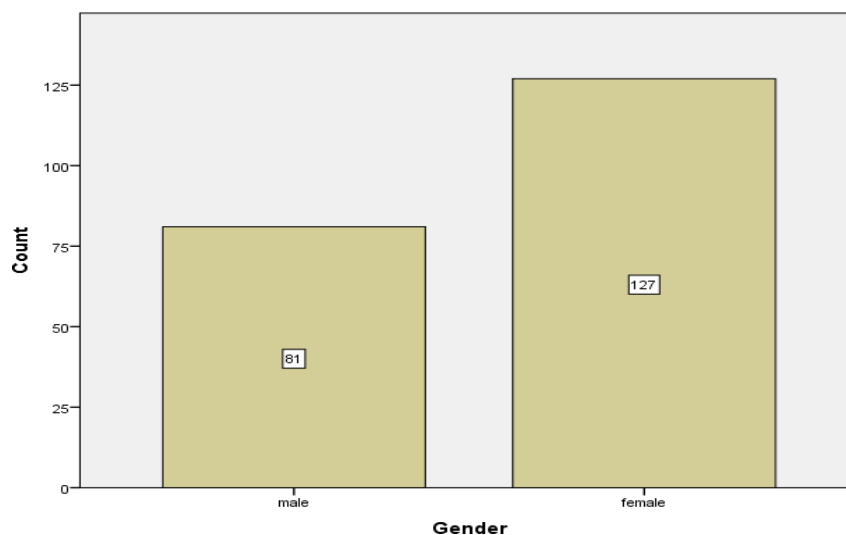


Figure 1: Sociodemographic Information of Participants

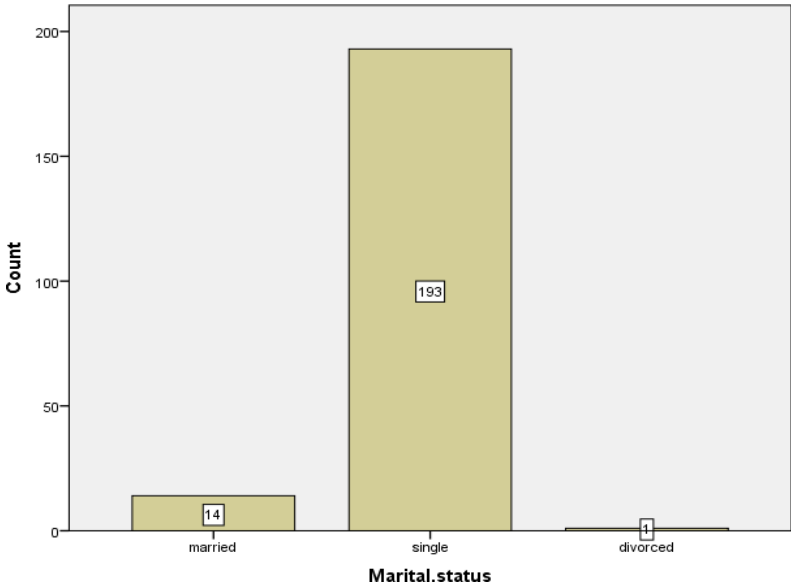


Figure 2: Sociodemographic Information of Participants

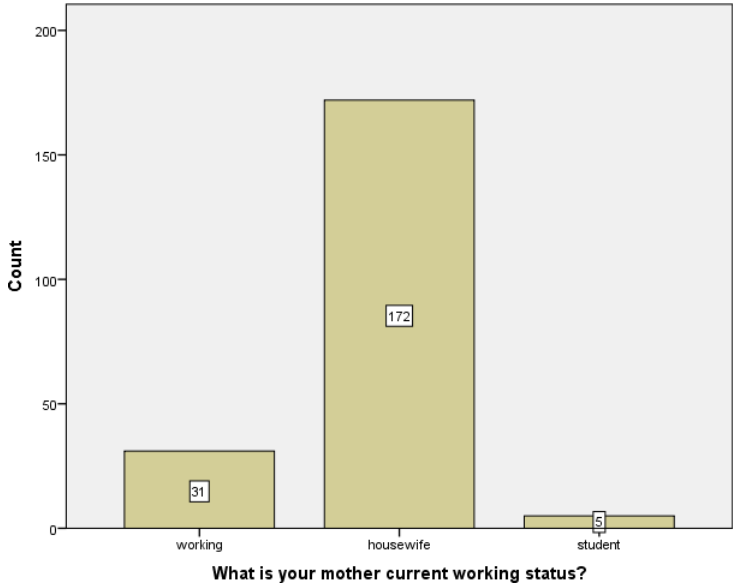


Figure 3: Sociodemographic Information of Participants

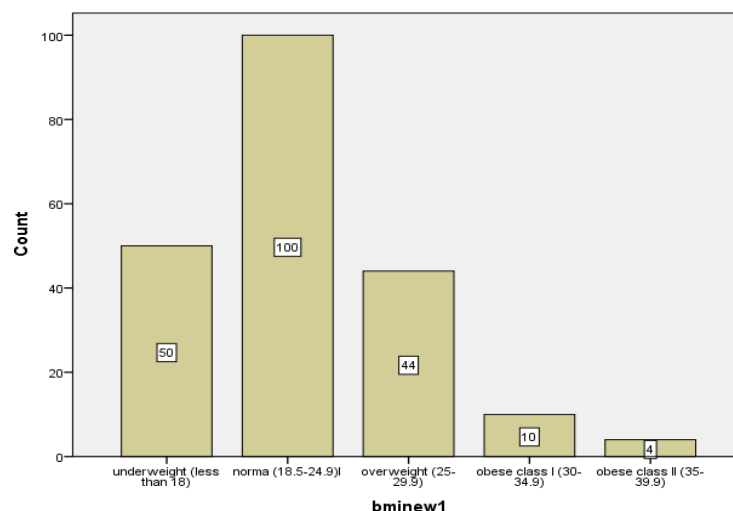


Figure 4: Sociodemographic Information of Participant

				Vitamin D is used to treat bone disease and rickets.		Total
				yes	no	
male	How often do you consume dairy products?	never		6	2	8
		1-2/day		43	11	54
		≥ 2/day		12	3	15
		daily		3	1	4
		Total		64	17	81
female	How often do you consume dairy products?	never		6	1	7
		1-2/day		88	8	96
		≥ 2/day		11	0	11
		sometimes		5	0	5
		daily		5	0	5
		1 time/day		1	0	1
		1-2 times/week		1	0	1
		twice a week		1	0	1
		Total		118	9	127

Table 1: How often do you consume dairy products? Vitamin D is used to treat bone disease and rickets.

				Sun exposure encourages vitamin D production in the skin		Total
				yes	no	
male	How much time you typically spend in direct sunlight each day?	< 15 minutes/day		17	1	18
		15 - <30 minutes/day		29	5	34
		≥ 30 minutes/day		24	5	29
		Total		70	11	81
female	How much time you typically spend in direct sunlight each day?	< 15 minutes/day		60	3	63
		15 - <30 minutes/day		38	2	40
		≥ 30 minutes/day		24	0	24
		Total		122	5	127

Table 2: How much time you typically spend in direct sunlight each day? Sun exposure encourages vitamin D production in the skin.

Gender			Vitamin D is important in the maintenance of calcium and phosphates.		Total
			yes	no	
male	How often do you consume dairy products?	never	6	2	8
		1-2/day	53	1	54
		≥ 2/day	14	1	15
		daily	4	0	4
		Total	77	4	81
female	How often do you consume dairy products?	never	7	0	7
		1-2/day	94	2	96
		≥ 2/day	11	0	11
		sometimes	5	0	5
		daily	5	0	5
		1 time/day	1	0	1
		1-2 times/week	1	0	1
		twice a week	1	0	1
		Total	125	2	127

Table 3: How often do you consume dairy products? Vitamin D is important in the maintenance of calcium and phosphates.

Gender			Use of sunscreen creams may be a cause of vitamin D deficiency.		Total
			yes	no	
male	Do you apply sun protection agents when exposed to the sun?	yes	8	9	17
		no	29	19	48
		sometimes	9	7	16
		Total	46	35	81
female	Do you apply sun protection agents when exposed to the sun?	yes	20	43	63
		no	12	20	32
		sometimes	11	21	32
		Total	43	84	127

Table 4: How often do you consume dairy products? Vitamin D is important in the maintenance of bone and teeth.

Gender			Vitamin D is important in the maintenance of bone and teeth		Total
			yes	no	
male	How often do you consume dairy products?	never	7	1	8
		1-2/day	52	2	54
		≥ 2/day	14	1	15
		daily	2	2	4
		Total	75	6	81
female	How often do you consume dairy products?	never	7	0	7
		1-2/day	94	2	96
		≥ 2/day	11	0	11
		sometimes	5	0	5
		daily	5	0	5
		1 time/day	1	0	1
		1-2 times/week	1	0	1
		twice a week	1	0	1
		Total	125	2	127

Table 5: Do you apply sun protection agents when exposed to the sun? Use of sunscreen creams may be a cause of vitamin D deficiency.

This study included a total of 208 participants. The Sociodemographic characteristics of the study participants are shown in Figures 1, 2, 3, and 4. The majority of the participants ($n = 100$) were normal BMI. A small group of participants ($n = 4$) were obese and 50 participants were underweight. There is a substantial correlation between the understanding of vitamin D in the treatment of bone illnesses and rickets and the gender of the person who frequently consumes dairy products. Out of 81 male respondents, 54 of them were male and reported consuming dairy products 1-2 times/day. In addition, 4 individuals claimed daily usage of dairy products, and 15 males acknowledged taking them twice a day or more. 8 men, who made up the minority, said they never eat dairy products. In addition, the responses from female respondents indicated a wider range of consumption rates. 96 out of the 127 female respondents said they ate dairy products 1-2 times/day. 11 females in a smaller sample reported eating dairy products twice a day or more. 5 of the female participants admitted to sometimes/occasionally drinking dairy products, while the remaining 5 said they often consume them. Just 7 women said they had never eaten dairy. Furthermore, there was only 1 response for each category: once a day, one to two times a week, and twice a week for dairy product use. (Table 1). In other question, the percentages of respondents who usually spend their days in direct sunshine compared to those who are aware that sun exposure promotes the skin's production of vitamin D. Out of 81 respondents, 34 men, or the biggest group, reported spending 15 to less than 30 minutes per day in sunlight. Following this are 18 males who spend less than 15 minutes a day in the sunlight and 29 males who spend 30 minutes or more a day in the sun. On the other hand, 63 out of the 127 female respondents fall into the category of those who spend less than 15 minutes a day in direct sunshine. A smaller group of 24 females acknowledged spending 30 or more minutes per day in direct sunshine, whereas another major group of 40 females reported spending 15 to less than 30 minutes per day in sunlight. So in summary - there appears to be an insignificant association between respondents who typically spend in direct sunlight each day vs people who are aware that exposure to sunlight promotes the skin's production of vitamin D. (Table 2). The percentages of respondents who frequently eat dairy products compared to those who are aware of vitamin D's role in maintaining levels of calcium and phosphates reveals significant differences who identified as male and female. Out of 81 respondents, 54 of them were male and reported consuming dairy products 1-2 times/day. In addition, 4 individuals claimed daily usage of dairy products, and 15 males acknowledged taking them twice a day or more. 8 men, who made up the minority, said they never eat dairy products. In addition, the responses from female respondents indicated a wider range of consumption rates. 96 out of the 127 female respondents said they ate dairy products 1-2 times/day. 11 females in a smaller sample reported eating dairy products twice a day or more. 5 of the female participants admitted to sometimes/occasionally drinking dairy products, while the remaining 5 said they often consume them. Just 7 women said they had never eaten dairy. Furthermore, there was only 1 response for each category: once a day, one to two times a week, and twice a week for dairy product use. In conclusion, it seems that there is a significant association between male students who frequently consume dairy products and those who are aware of the need of vitamin D for the preservation of calcium and phosphates, but there is significant correlation between female students. (Table 3). The percentages of respondents who frequently eat dairy products in comparison to those who are aware of the significance of vitamin D for maintaining healthy bones and teeth reveals significant differences between respondents who identified as male and female. Out of 81 respondents, 54 of them were male and reported consuming dairy products 1-2 times/day. In addition, 4 individuals claimed daily usage of dairy products, and 15 males acknowledged taking them twice a day or more. 8 men, who made up the minority, said they never eat dairy products. In addition, the responses from female respondents indicated a wider range of consumption rates. 96 out of the 127 female respondents said they ate dairy products 1-2 times/day. 11 females in a smaller sample reported eating dairy products twice a day or more. 5 of the female participants admitted to sometimes/occasionally drinking dairy products, while the remaining 5 said they often consume them. Just 7 women said they had

never eaten dairy. Furthermore, there was only 1 response for each category: once a day, one to two times a week, and twice a week for dairy product use. To summarize, there seems to be a significant association between male students who frequently consume dairy products and those who are aware of the need of vitamin D for maintaining healthy bones and teeth, but a significant correlation between female students and this knowledge (Table 4). The frequencies of using sun protection products when exposed to sunlight to their awareness of vitamin D and the possibility that using sunscreen products might result in a vitamin D shortage showed that participants, both male and female, responded in rather different ways. Out of those who responded, 17 men said "yes," 48 said "no," and 16 said "sometimes." which shows the co-response of men is significant. By comparison, the responses from female respondents showed an opposite the pattern: 63 said "Yes," 32 said "No," and 32 said "Sometimes." which shows the co-response of men is insignificant because with 63 females answering "Yes" compared to just 17 men, this suggests that a greater percentage of female respondents than male respondents are affirmative. In contrast, 32 men said "No" to the question as compare to female which were 48. With 16 males and 32 females, the number of "Sometimes" replies was nearly equal in both groups. These findings point to a substantial gender gap in the replies, with females exhibiting a greater tendency for positive answers. In conclusion, it seems that there is no significant association found in female as compare to male students who use sun protection when outside and their understanding of vitamin D, namely the possibility that using sunscreen lotions might result in a vitamin D shortage. (Table 5).

Discussion:

The findings from our study reveal important insights into the relationship between lifestyle factors, such as dairy consumption, sun exposure, and the use of sun protection, and the participants' knowledge of Vitamin D. The data shows a clear gender disparity in awareness and lifestyle habits. For instance, the majority of male respondents consumed dairy products regularly, with a significant proportion reporting daily or frequent intake, which correlates with their knowledge of Vitamin D's role in maintaining calcium and phosphate levels. In contrast, the female respondents showed a wider variation in their dairy consumption habits, but despite this, a significant portion were aware of Vitamin D's importance in bone health. Regarding sun exposure, male respondents tended to spend more time in direct sunlight than females, with 34 men spending 15-30 minutes daily in the sun. Despite this, a larger number of women were aware of Vitamin D production through sunlight, even though they spent less time outdoors. This suggests that lifestyle choices, such as sun exposure, may not always align with knowledge, particularly among female respondents. The findings show no significant association between daily sun exposure and knowledge of Vitamin D's role in skin production. When examining the use of sunscreen, a substantial difference in awareness was observed between genders. More females were aware of the potential for sunscreen to block Vitamin D synthesis than males, despite both groups reporting similar frequencies of sunscreen use. This highlights a knowledge gap in male respondents, particularly in understanding the balance between sun protection and Vitamin D deficiency. In conclusion, our research observed a significant association between lifestyle factors and knowledge of Vitamin D, particularly in terms of dairy consumption and sun protection awareness. This suggests that interventions aimed at improving Vitamin D knowledge should consider gender-specific approaches, focusing on aligning lifestyle habits with health education.

Conclusion:

Since the study's findings demonstrated that there is significant association between knowledge of vitamin D insufficiency and preventive lifestyle practices among Iqra University students, the second research hypothesis—the alternative hypothesis—was accepted. We have initiated this study in Pakistan because our motivation is that bone disease tend to effect lot of Pakistani men and women later in their life and it's a big problem in the whole population. So, we want to study the university students because they still have the chance to improve their vitamin D status so they can prevent from future consequences.

We want to determine if students are aware of vitamin D deficiency or have lifestyle practices that prevent it.

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Conflicts of Interest: The authors declare no conflicts of interest.

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