Adhari A. Alselmi et al, 2025;9(6):1298–1304.
DOI: 10.24911/IJMDC.51-1745010056

ORIGINAL ARTICLE

Knowledge and attitude regarding added sugar consumption and its effects among students in Fakeeh College for Medical Sciences, Jeddah, Saudi Arabia

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ABSTRACT

Objective: This study aimed to assess knowledge, attitudes, practices, and barriers related to added sugar consumption among students at Fakeeh College for Medical Sciences, Jeddah, Saudi Arabia.

Methods: A cross-sectional survey was conducted among 320 healthcare students, primarily from MBBS (74.4%), nursing (10.9%), and pharmacy (6.3%) programs. A structured questionnaire assessed knowledge of added sugars, attitudes toward sugar intake, related dietary habits, and perceived barriers to reducing sugar consumption.

Results: Although 79.4%-100% of students claimed to understand added sugar, only 50%-81% correctly defined it. While 70%-100% recognized the health risks, awareness of the World Health Organization recommendations was limited (33.3%-50%). Although 75.9% reported efforts to reduce sugar intake, only 24.4% regularly read food labels. Major barriers included taste preference (31.6%) and lack of knowledge (17.5%). No statistically significant differences were found across academic programs (p-value > 0.05).

Conclusion: Despite high general awareness, a clear gap existed between knowledge and practice. Findings highlighted the need for targeted nutritional education that bridges this gap by enhancing practical skills and addressing cultural influences. Integrating active, culturally relevant nutritional education into health care curricula could empower future professionals to adopt healthier habits and effectively guide patients regarding added sugar consumption.

Keywords: Added sugar, health care students, knowledge, attitudes, Saudi Arabia.

Introduction

The rising consumption of added sugars, particularly among young adults, is a growing public health concern worldwide [1]. Approximately 75% of the Saudi population consumes added sugar through a variety of dietary sources. Young adulthood, when many attend college, is a critical period in an individual's life during which many habits develop, including those related to nutrition and food choices [2]. Advertisements steer young people to products that are rich in added sugar. Type 2 diabetes and obesity are strongly associated with added sugar consumption [3]. An understanding of the attitudes of health sciences students toward added sugar consumption is important, as they are the future health

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Received: 18 April 2025| **Accepted:** 26 May 2025

professionals who would educate patients about healthy dietary habits. Inadequate dietary habits constitute a major health concern, as they contribute to obesity and an increased risk of chronic non-communicable diseases [4].

If the body is unable to control the level of glucose in the blood, diabetes results and, over time, leads to serious damage to different body systems [5]. There are two types of sugar present in food: naturally occurring sugars and added sugars. Naturally occurring sugars are those found in fruit, vegetables, and milk products. They are beneficial for health and help prevent diabetes. However, added sugars (glucose, fructose, and sucrose - commonly known as refined sugar, corn syrup, or honey) present in meals and sugar-sweetened beverages such as soft drinks, fruit drinks, sweetened coffee and tea, and energy/sports drinks [6].

Saudi Arabia has the highest rate of soft drink and fast food consumption in the Middle Eastern region [7]. The high consumption of sugar is due to the hot weather, which requires cool drinks, a large youth market, and the adoption of food products that are consumed in the West [8]. Furthermore, there has been a corresponding rise in the rates of obesity and diabetes in the country. Saudi Arabia is among the top 10 countries in the prevalence of obesity and diabetes, with overall rates of 33.7% and 23.7%, respectively [9,10].

Diabetes has been linked to high fructose consumption through two pathways. Fructose increases hepatic triglyceride synthesis, which might impair insulin-mediated glucose uptake in peripheral tissues, which is an obesity-mediated mechanism [11]. The second pathway is linked to increased uric acid synthesis, which reduces insulin delivery to peripheral tissues [12]. In addition, high sucrose intake has also been reported to contribute to diabetes development [12].

The World Health Organization (WHO) recommends reducing the intake of added sugar to less than 10% of daily caloric intake [13]. Research focused on consumer knowledge of sugars suggests that there is a generalized lack of knowledge about sugar intake guidelines as well as misconceptions about sugar sources [14].

Consumption of excessive sugar is related to many health concerns. Recent data by the WHO and the Global Burden of Disease revealed that Saudi Arabia is among the top countries in the region and the world in the prevalence of obesity and diabetes. According to the report, noncommunicable diseases burden the country, on an annual basis, with an estimated USD 19 billion in indirect costs and USD 13 billion in indirect costs from lost productivity [15].

Young people are particularly susceptible to consuming excess added sugar. Advertisements for sugar-rich drinks by athletic and music icons usually target teens and young adults [16]. It has been reported that 75% of Saudis consume added sugars in the form of soft drinks, energy drinks, sport drinks, and canned fruit drinks [2]. Moreover, 45.6% of Saudi college students in the Eastern region consume energy drinks daily [17], which leads to negative health effects associated with excessive sugar, calories, and caffeine, raising the chances for diabetes, risk of heart disease, and metabolic syndrome and promoting weight gain, especially in young adults [2].

In 2016, the relationship between the consumption of sugar-sweetened beverages and the risk of prediabetes and insulin resistance was investigated, revealing that consuming around one can of soda per day led to a 46% increased risk of developing prediabetes compared with low or non-consumers over 14 years [18]. Moreover, higher sugar-sweetened beverage intake was also associated with increased insulin resistance, which is a risk factor for type 2 diabetes [18]. It is, thus, important to identify attitudes toward added sugar and consumption trends in the youth to allow public health educators and awareness campaigns to address this issue. This can also help in increasing public awareness of health issues associated with added sugar and informing the population how added sugar consumption can be controlled.

Besides soft drinks and canned juices, cigarettes are also attractive to the youth, and they are one of the sugar-containing goods that most people are unaware of [19]. Sugars are found naturally in tobacco leaves; however, tobacco makers frequently add sugars. Toxic compounds in cigarette smoke are increased when sugar is added [20].

People are unaware that added sugar is hidden in food labels in a variety of ways. Therefore, this research was conducted to assess the awareness of undergraduate students at Fakeeh College for Medical Sciences (FCMS) about added sugar in dietary products. Since they are future health professionals who would be responsible for providing adequate knowledge and promoting healthy habits among their patients, it is necessary to assess their perceptions, awareness, and knowledge of added sugar in dietary products.

Subjects and Methods

This was an observational cross-sectional study. The study population comprised all students attending the medical, surgical, pharmacology, nursing, and medical laboratory sciences programs at FCMS in Jeddah throughout study period for 1 year which conducted from 1 January 2024 to 30 December 2024.

All undergraduate medical students, male and female, studying in the first to the sixth year of study, aged between 18 and 35 years were included in the study. However, internships and master's or PhD students, students from other universities, or those who were over 35 years old were excluded from the study.

The total number of students at FCMS (all programs) was approximately 1,353 (that is, 786 students in the medical and surgical program (MBBS), 118 students in the pharmacology program, 350 students in the nursing program, and 88 students in the medical laboratory

sciences (MLSs) program). By accepting an error of 5%, the calculated sample size at a 95% level of confidence was 300 using the Raosoft sample size calculator. To compensate for non-responses or incomplete responses, the sample size was increased to 320.

A validated questionnaire was adopted from a previous study for the present investigation [21]. The researchers collected the data at FCMS. The questionnaires were distributed among the students of different programs who gave consent to participate. A duration of 10 minutes was allowed to fill out the questionnaire, and a researcher was present to answer any queries. The questionnaire contained two parts: the first covered demographic characteristics (age, major, semester level, parents' education, marital status, number of children, and income), medical history, and anthropometrics (weight, height, and waist circumference), and dietary intake (via 24-hour dietary recall). The second explored participants' knowledge of what added sugar is, whether they believe they understand what added sugar is, whether they know the negative health consequences resulting from consuming excessive amounts of added sugar and whether they make an effort to reduce added sugar.

After the sample size was achieved, the data were saved on a personal computer with a password, which only the researchers could access. The data file was password protected under the authority of the principal investigator. Data analysis was carried out using IBM Statistical Package for Social Sciences software, version 23.0. The double data entry method was employed to decrease the chance of errors. Data were presented using descriptive statistics in the form of frequencies and percentages for qualitative variables and means and standard deviations for continuous variables. Statistical significance was determined using the chi-square test with a threshold of p-value < 0.05.

Results

A total of 320 students from various healthcare majors took part in the study. The majority were MBBS students (n = 238, 74.4%); six were studying medical laboratory sciences (1.9%). Among the participants, 44.7% were aged between 21 and 23 years. Most of the participants were single (93.1%). Regarding the monthly family income, 32.2% made between 8,000 and 14,999 SAR a month. Parental education revealed that 35.0% of students' fathers and 39.7% of their mothers were educated only up to secondary school (Table 1).

Students' knowledge of added sugar showed variation across programs, with no statistically significant differences (p > 0.05). Among the sample, 79.4% of the MBBS program knew what added sugar is, as opposed to 100% of the MLS students. Fifty percent of Pharm D and MLS students correctly identified added sugar as "sugar added during preparation or manufacturing."

Table 1. *Demographic characteristics of study participants (N = 320).*

Characteristic	Frequency (*n*)	Percentage (%)
Academic Program		
• MBBS	238	74.4
• Nursing	35	10.9
• Other	21	6.6
• Pharm D	20	6.3
• MLS	6	1.9
Age group (years)		
• 18-20	112	35.0
• 21-23	143	44.7
• 24-26	48	15.0
• 27 or older	17	5.3
Marital status		
• Single	298	93.1
• Married	21	6.6
• Divorced/Widowed	1	0.3
Monthly household income (SAR)		
• <3,000	42	13.1
• 3,000-7,999	89	27.8
• 8,000-14,999	103	32.2
• ≥15,000	86	26.9
Father's educational level		
• No formal education	8	2.5
• Primary school	24	7.5
• Secondary school	112	35.0
• Higher education	176	55.0
• Mother's educational level		
• No formal education	15	4.7
• Primary school	38	11.9
• Secondary school	127	39.7
• Higher education	140	43.7

The percentage for other programs was 81.0%. Awareness of negative health consequences ranged from 70.0% to 100% across programs. Knowledge of WHO recommendations ranged from 33.3% to 50.0% (Table 2).

Among the participants, 25.9% reported being very concerned about their daily sugar intake. Actively attempting to reduce added sugar consumption was reported by 75.9% of participants. Regarding label-checking behavior, 24.4% reported that they always checked food labels for added sugar content; 40.6% sometimes checked, 21.9% rarely checked, and 13.1% never checked. These differences were not statistically significant across academic programs (p-value > 0.05) (Table 3).

Table 2. *Knowledge about added sugar among different programs.*

Knowledge parameter	MBBS *N* (%)	Nursing *N* (%)	Pharm D *N* (%)	MLS *N* (%)	Other *N* (%)	*p* value*
Knows what added sugar is	189 (79.4)	28 (80.0)	16 (80.0)	6 (100)	18 (85.7)	0.739
Correctly identified added sugar**	136 (57.1)	19 (54.3)	10 (50.0)	3 (50.0)	17 (81.0)	0.345
Aware of negative health consequences	204 (85.7)	28 (80.0)	14 (70.0)	6 (100)	19 (90.5)	0.219
Aware of WHO recommendations	108 (45.4)	17 (48.6)	10 (50.0)	3 (50.0)	7 (33.3)	0.809

*Chi-square test.

**Correctly identified as "sugar added during preparation or manufacturing."

Table 3. *Attitudes and practices regarding sugar consumption (N = 320).*

Parameter	Frequency (*n*)	Percentage (%)	*p* value*
Level of concern			0.165
Very concerned	83	25.9	
Somewhat concerned	167	52.2	
Not concerned at all	70	21.9	
Actively attempt to reduce intake.			0.476
Yes	243	75.9	
No	77	24.1	
Label checking frequency			0.334
Always	78	24.4	
Sometimes	130	40.6	
Rarely	70	21.9	
Never	42	13.1	

Statistically significant level *p* value <0.05.

Table 4. *Main barriers to reducing added sugar intake.*

Barrier	Frequency (*n*)	Percentage (%)	*p* value*
Taste preference	101	31.6	0.052
Lack of knowledge	56	17.5	
Social/cultural factors	27	8.4	
Availability/ affordability of healthier options	29	9.1	
Multiple barriers**	107	33.4	

*Chi-square test.

**Includes combinations of two or more barriers.

Taste preference emerged as the primary single barrier (31.6%), followed by lack of knowledge (17.5%), availability/affordability of healthier options (9.1%), and social/cultural factors (8.4%) (Table 4).

Artificial sweeteners were used by 46.6% of participants. Awareness of national sugar policies was reported by 44.7%. Weight changes due to sugar consumption were noticed by 69.1% of participants. Among the samples, 47.5% reported receiving professional advice to reduce sugar intake. No statistically significant associations were found between these factors and academic programs (p-value > 0.05) (Table 5).

Table 5. *Sugar consumption patterns and health awareness.*

Parameter	Yes (%)	No (%)	*p*-value*
Uses artificial sweeteners	149 (46.6)	171 (53.4)	0.635
Aware of national sugar policies	143 (44.7)	177 (55.3)	0.081
Noticed weight changes due to sugar consumption	221 (69.1)	99 (30.9)	0.097
Received professional advice to reduce intake	152 (47.5)	168 (52.5)	0.075

Note. All percentages were rounded to one decimal place. *p* values were derived from chi-square tests of independence between variables and academic programs. Statistical significance was set at $p < 0.05$. Missing values, if any, were excluded from percentage calculations.

*Chi-square test.

Discussion

This study found that all (100%) MLS students, 80.0% of nursing and Pharm D students, and 79.4% of MBBS students knew what added sugar is. Nevertheless, with the ability to identify the correct definition of added sugar, there was a large gap, as only 57.1% of MBBS students, and 50.0% of Pharm D and MLS students were able to define added sugar as "sugar added during preparation or manufacture". The results of this study are in line with another similar study [22]. In a manner comparable to global trends, knowledge of sugar and added sugars according to WHO guidelines continues to be low [23]. While 85.7% of MBBS students knew about the negative health impacts of added sugar, this knowledge was not necessarily translated into behavior. This reflects broader challenges reported in the literature, summarized by the fact that knowing and understanding the health risks of added sugar does not necessarily lead to compliance with recommendations [24].

While 75.9% of participants were trying to lower their intake of added sugar, only 24.4% read food labels for sugar content, and 21.9% said that they seldom or never checked. Such behavior described an alternate

reality between knowledge and action, which has been described in similar studies [22,24]. One study, for example, mentioned that healthcare students are aware of the dangers of added sugar but do not follow nutritional recommendations in practice [22]. This behavioral gap can be attributed to limited hands-on knowledge and habituated practices [24]. In all, 25.9% of participants were very concerned about their sugar intake, and 52.2% were somewhat concerned. Their concern, however, did not lead to drastic behavioral changes, thereby highlighting the need for interventions directed at attitudes and practical skills, such as food label interpretation and portion control [25].

Taste was the most significant barrier to reducing sugar intake (31.6%), followed by lack of knowledge (17.5%) and the availability or cost of healthier options (9.1%). Also, 33.4% of respondents stated that they faced multiple barriers. These findings corroborate those made by other studies emphasizing environmental and social parameters that exert a major influence on dietary behaviors [24]. In addition, as a part of cultural norms in Saudi Arabia, sugar-sweetened beverages are staples at social gatherings; this complicates reduction efforts [26]. Similar scenarios are seen globally, where taste preferences and prices are major hurdles to healthy eating [27].

The majority of the participants (46.6%) consumed artificial sweeteners; 69.1% felt a change in weight due to the consumption of sugar. Only 44.7% knew about the country's sugar policies, and 47.5% received a professional recommendation to reduce their sugar intake. These findings consolidate the results of previous bodies of work that highlighted the gap between awareness and practice related to healthier habits [21]. Participants' weight change in response to sugar consumption showed some of the general health risks of excessive sugar consumption, such as obesity and metabolic syndrome [24].

Numerous conceptual gaps and challenges in the actual application of nutritional principles among healthcare students are still highlighted in international literature. For example, knowledge gaps in sugar-related language have been observed, notably among non-nutrition students [22]. Similarly, behavioral concerns highlighted in this study agree with studies where young adults overestimated how protected they are from health risks due to their youth and lifestyle [24].

The findings of this study illustrated the urgent need to implement a full educational intervention in the curricula for health care that would address all observed gaps. For example, interactive workshops, animations, and practical demonstrations designed to enhance knowledge and, thus, behavioral outcomes should be incorporated into these educational programs [28]. Besides instructions on sugar consumption, culture should also be incorporated into the proposed interventions, particularly in Saudi Arabia, where sugary beverages are ingrained in social traditions [28].

The future public health policy should be geared toward taste, economic viability, and availability of healthier substitutes. For example, in other areas, policy interventions through the addition of taxes for sugar-sweetened beverages and advertising restrictions have proven useful and, therefore, should be tested locally [29]. Also, healthcare students must be trained to identify barriers and further advocate for dietary changes.

The self-reported information gathered for this study might have been biased, particularly about sugar consumption habits. Subsequent investigations should use an objective method, such as dietary recall or biomarkers, to validate these findings [30]. Additionally, broader samples from a variety of healthcare institutions would further enhance generalizability.

Conclusion

This study identified a wide gap between knowledge and practice regarding added sugar among students at FCMS. Even though most of the students had some knowledge of added sugar and its detrimental effects on health, less than half were able to define it appropriately, and awareness of WHO guidelines was low. The disconnect between knowledge and practice was evident - 75.9% of participants reported attempting to reduce their sugar intake, yet only 24.4% consistently checked food labels. Taste preference (31.6%) and lack of knowledge (17.5%) emerged as primary barriers to reducing sugar consumption. The findings stress the necessity for health education curricula reforms blending evidence-based, culturally appropriate nutritional education. The reforms should eliminate knowledge gaps while teaching skills for reading food labels, making healthier food choices, and overcoming taste preferences and cultural norms in favor of high sugar consumption.

Future interventions must be interactive, such as hands-on workshops and how-to instruction on negotiating social settings where sweet foods are the standard. Policy interventions aimed at shaping the taste, price, and availability of healthier choices should also be considered. Through these challenges, students at healthcare schools can prepare better to become professionals who understand and practice healthy eating habits, which are essential for personal health as well as effective patient counseling.

List of Abbreviations

FCMS	Fakeeh College for Medical Sciences
MBBS	Medical Bachelor, Bachelor of Surgery
MLS	Medical Laboratory Sciences
WHO	World Health Organization

Conflicts of interest

The authors declare that there is no conflict of interest regarding the publication of this article.

Funding

None.

Consent to participate
Informed consent was obtained from all the participants.

Ethical approval
Ethical approval was granted by the Research and Ethics Committee at Fakeeh College for Medical Sciences, Jeddah, Saudi Arabia via application number: 314/2022 and Approval No.: 314/IRB/2022, date: 19 June 2022.

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