

## Original Article

# Self-reported Knowledge, Attitude and Consumption of Sugar-sweetened Beverages among Undergraduate Oral Health Students at a University in South Africa

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### ABSTRACT

**Aims and Objectives:** This study assessed the knowledge, attitude and consumption of sugar-sweetened beverages (SSBs) and its association with body mass index (BMI) among undergraduate oral health students.

**Materials and Methods:** A cross-sectional design was used and the study was conducted at a South African dental university. Undergraduate dental and oral hygiene students ( $n = 344$ ) registered in 2015 were invited to participate. A self-administered questionnaire was used to elicit the necessary information. Data analysis included frequencies and correlations using Chi-square tests. Statistical significance was set at  $P < 0.05$ .

**Results:** The response rate was 88% (301) and the mean age was 22.3 years (range: 17–42; standard deviation  $\pm 3.2$ ). The majority were female (72%) and 70% of respondents had an acceptable level of knowledge on the types of SSBs and possible health conditions if consumed excessively. Almost half (46%) had a positive attitude toward the consumption of SSBs. Clinical students had a significantly higher level of knowledge compared to nonclinical students ( $P = 0.03$ ). Participants consumed an average of six teaspoons ( $\pm 9.5$ ) of sugar from SSBs daily. Those with poor knowledge and attitude consumed significantly more SSBs ( $P < 0.01$ ) than those with higher levels of knowledge and attitude. Males were significantly more obese and overweight than females ( $P < 0.01$ ). There was no association between the amount of sugar consumed from SSBs and the BMI.

**Conclusions:** The knowledge and attitude toward SSBs was acceptable. Although sugar consumption from SSBs was relatively high, there was no significant correlation between the consumption of SSBs and the BMI.

**KEYWORDS:** Attitude and consumption of sugar-sweetened beverages (SSBs), self-reported knowledge on SSBs, BMI and consumption of SSBs

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## INTRODUCTION

Sugar-sweetened beverages (SSBs) are drinks with added sugar such as carbonated drinks, energy drinks, sport drinks and flavored juice drinks.<sup>[1]</sup> Studies have reported that the consumption of SSBs has increased in both developed and developing countries in the last three decades.<sup>[2,3]</sup> The increase is evident in many developing countries where access to SSBs has grown concomitantly with rising rates of urbanization.<sup>[2]</sup> Excessive consumption of these drinks has been associated with negative health consequences

such as nutrition-related chronic diseases like obesity, diabetes, hypertension, and coronary heart diseases.<sup>[4,5]</sup> South Africa (SA) has one of the highest prevalences of people classified as overweight or obese in Africa and the consumption of SSBs could be one of the responsible risk factors.<sup>[6]</sup>

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An increased intake of free sugars together with a poor diet has also been shown to be associated with the initiation and progression of noncommunicable diseases (NCDs).<sup>[7,8]</sup> NCDs are the leading causes of death and were responsible for 38 million (68%) of the world's 56 million deaths in 2012.<sup>[9]</sup> An additional concern is the association between the intake of free sugars and the prevalence of dental caries.<sup>[9]</sup>

SSBs are composed of energy-containing sweeteners such as sucrose, high-fructose corn syrup or fruit juice concentrates, all of which have essentially similar metabolic effects. SSBs are thought to lead to weight gain by virtue of high added sugar content, low satiety potential, and incomplete compensatory reduction in energy intake at subsequent meals after consumption of liquid calories leading to a positive energy balance.<sup>[3]</sup>

Some SSBs contain large amounts of fructose, which is known to increase serum uric acid levels which could lead to gout.<sup>[10]</sup> A study reported that the risk of incident gout was 85% higher in people who consumed two or more servings of SSBs daily compared with those who consumed <1 serving monthly.<sup>[11]</sup>

The World Health Organization (WHO) recommends that intake of free sugars not exceed 10% of the total energy,<sup>[9]</sup> while the American Heart Association (AHA) recommends a daily intake of 9 (37 g) and 6 (25 g) teaspoons of sugar for men and women, respectively.<sup>[11]</sup>

SA is planning to introduce taxes on SSBs and this study provides baseline data on consumption patterns. It is planned to carry out a follow-up study after the introduction of the tax to determine the effect it could have on the consumption patterns. These groups of students were chosen as they can be followed up relatively easy and tend to have easy access to SSBs. In addition, these are oral health students and they have received lectures on nutrition and diet and offer dietary counseling to their patients on a regular basis.

The aim of the study was to assess the level of knowledge and attitude toward SSBs, determine the amount of sugar consumed from SSBs and determine the association between sugar consumption from SSBs and the body mass index (BMI).

No similar study has been done in SA among oral health students.

## MATERIALS AND METHODS

A cross-sectional analytical study on undergraduate dental and oral hygiene (OH) students registered at a university in South Africa (SA) in 2015 was conducted. A total of 344 students were registered and all of them were invited

to participate. Since all registered students were invited to participate, the sample was representative and no sampling method was used. Students were divided into clinical (3<sup>rd</sup>, 4<sup>th</sup>, and 5<sup>th</sup> year dental and 2<sup>nd</sup> and 3<sup>rd</sup> year OH students) and nonclinical (1<sup>st</sup> and 2<sup>nd</sup> year dental and 1<sup>st</sup> year OH students) as described in other similar studies.

A pretested, self-administered questionnaire was used to collect information on the sociodemographic characteristics, knowledge and attitude of the students with regard to the health implications of frequent/excessive consumption of SSBs and their consumption patterns.<sup>[1]</sup> Students were asked to provide their current weight in kilograms and their height in meters to calculate their BMI. The BMI was calculated using the WHO guidelines and participants were classified as: "underweight" when the BMI was <18.50 kg/m<sup>2</sup>, "normal weight" if the BMI was between 18.51 and 24.99 kg/m<sup>2</sup>, "overweight" when the BMI was between 25.00 and 29.99 kg/m<sup>2</sup> and obese when BMI was >30 kg/m<sup>2</sup>.<sup>[12]</sup>

To determine the students' knowledge on SSBs, they were asked to identify the SSBs from a list of drinks. They were also asked about the health effects and health conditions associated with excessive intake of SSBs. Their knowledge was then rated as acceptable if they scored 50% or more and poor if they scored below 49%.

To determine the students' attitude toward SSBs, they were asked about how they felt regarding SSBs. This included questions on whether they would like being seen with SSBs, using SSBs while entertaining their friends and whether they considered SSBs as a good treat. The students were classified as having a positive attitude if they answered appropriately to these questions on their attitude. The scores were combined and a score of 50% or more was considered as having a positive attitude toward SSBs.

Habitual consumption pattern of SSBs was assessed using a validated Food Frequency Questionnaire (FFQ).<sup>[1]</sup> Participants were asked to report on how often they consumed SSBs listed in the FFQ. The consumption pattern of five categories of SSBs including fruit juice, soft carbonated drinks, soda drinks, energy drinks and tea or coffee with added sugar was measured. The amount of sugar ingested from these SSBs was converted into teaspoons. Each teaspoon contains approximately 4 g of sugar, hence 330 ml of a SSB, which contains 35 g of sugar, has the equivalence of 8.75 teaspoons. The number of teaspoons consumed was divided into four categories for ease of analysis; 0 teaspoons, 1 to 4, between 5 and 9 and >10 daily.

Data analysis was done with SPSS version 23 (IBM Corp. Released 2013. IBM SPSS Statistics for Windows, Version 22.0. Armonk, NY: IBM Corp). Quantitative variables were summarized as proportions, frequencies, mean with their standard deviations (SDs), range and percentages. The Chi-square and Pearson's correlation tests were used to determine the association and correlation between the variables and the level of significance was set at  $P < 0.05$ . Consent was obtained from each participant and all data were kept confidential and anonymity was ensured by not including any names. Ethical approval was obtained from the UP, Faculty of Health Sciences Ethics Committee (Approval number 345/2015).

## RESULTS

Of the 344 registered students, 301 (88%) agreed to participate and of these 72% (217) were female. The age ranged from 17 to 42 years (mean 22.3 years;  $SD \pm 3.2$ ) and two-thirds (66%) were between 20 and 24 years old. There were 257 (85%) dental and 44 (15%) OH students and of these, 51% were classified as "clinical" and 49% as "nonclinical".

The association between the knowledge and attitudes of the respondents and their gender and clinical status is summarized in Table 1. More than two-thirds (70%) displayed an acceptable level of knowledge regarding the types of SSBs and its ill effects if consumed excessively. Almost half (46%) reported having a positive attitude toward the consumption and ill health effects of SSBs. There were no significant differences between the males and females ( $P = 0.11$ ) with respect to their levels of knowledge; however, more clinical students had an acceptable level of knowledge compared to nonclinical students ( $P = 0.03$ ).

As far as attitudes were concerned, significantly more males had a negative attitude toward SSBs and were more likely to be seen entertaining and socializing with SSBs compared to females ( $P = 0.02$ ).

There was no significant correlation between a positive attitude and high levels of knowledge regarding SSBs ( $P = 0.40$  and Pearson's correlation [ $r$ ] = 0.05). However, the vast majority of respondents who demonstrated a positive attitude had acceptable levels of knowledge as well.

The students consumed between 0 and 65 (mean 5.8;  $SD \pm 9.5$ ) teaspoons of sugar from SSBs daily. More than a third (35%) consumed 0 teaspoons, 32% consumed 1–4 teaspoons, 13% consumed between 5 and 9, and 20% consumed >10 teaspoons daily.

The students' self-reported height and weight were used to calculate their BMI. Unfortunately, some of the students did not provide their details and as a result, they were excluded from the BMI analysis. Of the remaining 255 students, 155 (61%) were normal weight, 57 (22%) were overweight, 27 (11%) were underweight, and 16 (6%) were obese.

The association between the number of teaspoons consumed from SSBs and BMI, knowledge, attitude, gender, course and clinical status is shown in Table 2. There was no association between the amount of sugar consumed and the students' BMI or gender. Those with poor knowledge and negative attitude consumed significantly more teaspoons of sugar from SSBs ( $P < 0.05$ ) compared to those with good knowledge and positive attitude.

OH ( $P < 0.05$ ) and nonclinical students ( $P = 0.02$ ) consumed significantly more teaspoons of sugar than dentistry and clinical students, respectively.

The association between BMI, gender, course and clinical status is shown in Table 3. Males were significantly more obese and overweight than females. There were significantly more OH students who were in the underweight and obese categories compared to dental students who were mostly within the normal weight category.

**Table 1: The association between knowledge ( $n=298$ ) and attitudes ( $n=288$ ) of students and their gender and clinical status**

	<i>n</i> (%)	Acceptable knowledge, <i>n</i> (%)	Poor knowledge, <i>n</i> (%)	<i>P</i>	Positive attitude, <i>n</i> (%)	Negative attitude, <i>n</i> (%)	<i>P</i>
Gender							
Male	84 (28)	53 (63)	31 (37)	0.11	29 (35)	53 (65)	0.02*
Female	214 (72)	155 (72)	59 (28)		103 (50)	103 (50)	
Clinical status							
Nonclinical	148 (50)	95 (64)	53 (36)	0.03*	74 (50)	74 (50)	0.15
Clinical	150 (50)	113 (75)	37 (25)		58 (41)	82 (59)	
Total		208 (70)	90 (30)		132 (46)	156 (54)	

\*Chi-square test was used

**Table 2: Association between the daily sugar consumption (teaspoons) from sugar-sweetened beverages and body mass index, knowledge, attitude, course and clinical status (n=301)**

	Number of teaspoons of sugar, n (%)					P
	0	1-4	5-9	≥10	Total	
BMI (n=255)						0.37
Underweight	5 (19)	13 (48)	3 (11)	6 (22)	27 (100)	
Normal	63 (41)	46 (29)	22 (14)	24 (15)	155 (100)	
Overweight	22 (39)	19 (33)	6 (10)	10 (17)	57 (100)	
Obese	4 (25)	4 (25)	3 (19)	5 (31)	16 (100)	
Knowledge (n=298)						<0.01*
Good	73 (35)	79 (38)	22 (11)	34 (16)	208 (100)	
Poor	32 (35)	16 (18)	17 (19)	25 (27)	90 (100)	
Attitude (n=288)						<0.01*
Positive	48 (36)	54 (41)	14 (10)	16 (12)	132 (100)	
Negative	54 (35)	41 (26)	22 (14)	39 (25)	156 (100)	
Gender (n=301)						0.06
Male	29 (34)	19 (23)	15 (18)	21 (25)	84 (100)	
Female	77 (35)	78 (36)	24 (11)	38 (18)	217 (100)	
Course (n=301)						<0.01*
OH	6 (14)	20 (45)	4 (9)	14 (32)	44 (100)	
Dentistry	100 (39)	77 (30)	35 (14)	45 (17)	257 (100)	
Clinical status (n=301)						0.02*
Nonclinical	41 (27)	53 (36)	19 (13)	36 (24)	149 (100)	
Clinical	65 (43)	44 (29)	20 (13)	23 (15)	152 (100)	

\*Chi-square test was used, BMI=Body mass index, OH=Oral hygiene

**Table 3: Association between body mass index, gender, clinical status and course of participants (n=255)**

	n (%)	Underweight, n (%)	Normal, n (%)	Overweight, n (%)	Obese, n (%)	P
Male	75 (29)	2 (3)	36 (48)	29 (39)	8 (10)	< 0.01
Female	180 (71)	25 (14)	119 (66)	28 (16)	8 (4)	
Nonclinical	124 (49)	15 (12)	75 (60)	27 (22)	7 (6)	0.47
Clinical	131 (51)	12 (9)	80 (61)	30 (23)	9 (7)	
OH	34 (13)	7 (20)	15 (44)	7 (21)	5 (15)	0.01*
Dentistry	221 (87)	20 (9)	140 (63)	50 (23)	11 (5)	
Total		27 (11)	155 (61)	57 (22)	16 (6)	

\*Chi-square test. OH=Oral hygiene

## DISCUSSION

The relatively high response rate of 88% could have been due to the questionnaires being handed out during lecture periods which are compulsory to attend.

A large proportion of the participants had adequate knowledge of the health hazards of excessive consumption of SSBs. This was similar to another study conducted on Nigerian dental students.<sup>[1]</sup> The high level of knowledge concerning SSBs and its sugar content could stem from the fact that the role of sugar in the etiology of dental caries is part of the curriculum. Clinical students had significantly more knowledge than nonclinical students and this could be due to the increased exposure to the role of sugar in the etiology of dental caries in the more senior years. It could also be due to the fact that students in the clinical years provide dietary advice to their patients and this interaction may

improve both their knowledge and attitudes toward the consumption of sugar.

There was a significantly greater number of females who displayed a positive attitude towards SSBs compared to males. This meant that females disliked SSBs more than males and did not see it as a means of entertainment with their friends. This could be as a result of them eating healthier, having a higher nutritional knowledge, higher engagement in food-related activities and showing a higher preference toward food items that are commonly included in their diet.<sup>[13]</sup> Studies also reported that females describe food as more important and tended to be more careful about what and how much they consumed.<sup>[13]</sup> Studies have shown that gender differences in food preferences appear to begin during childhood.<sup>[14]</sup> There has been no specific reasons behind gendered preferences and practices are not easily



understood due to social and cultural differences among groups and individuals. It is however argued that it might be due to earlier involvement of females in food activities as compared to males and therefore females tend to be more aware and careful of what and how they eat and drink.<sup>[13,15]</sup>

The current study reported no correlation between the knowledge and attitude of respondents toward SSBs. This was not surprising as other studies indicated that knowledge does not translate into changes in behavior or attitude, but that changes in behavior are influenced by conditions in which people live.<sup>[16]</sup> Many health promotional activities fail because health professionals assume that by providing health education, knowledge will increase and this would change behavior and attitudes.<sup>[16]</sup> One author argues that dental health education can result in improvement of dental health behavior, but it is less effective in changing dental attitudes.<sup>[16]</sup>

On average, students consumed 5.8 teaspoons of sugar from SSBs alone and about 33% of them drank between 5 and 65 teaspoons of sugar daily. This amount of sugar from one source alone is relatively high as the AHA recommends a maximum of between 6 and 9 teaspoons per day.<sup>[11]</sup>

Males were significantly more obese and overweight than females while the majority of females fell into the normal weight category. This was not surprising as it has been reported that females tend to watch the attributes of food such as calories and the amount of sugar and tend to eat healthier meals.<sup>[13,15]</sup>

The majority of students were of normal weight and there was no correlation between the BMI and the amount of sugar ingested from SSBs. A number of studies have shown a significant association between frequent intake of SSBs and being overweight.<sup>[1,2,5]</sup> It is possible that there was no correlation between sugar intake from SSBs and BMI in the current study due to some of the limitations. These included self-reported height and weight which might have been underestimated and students were also not asked of other sporting activities that they are engaged in to compensate for the positive balance of energy. It is possible that they were engaged in sporting activities which could have caused a reduction in their BMI.

#### LIMITATIONS

The cross-sectional studies on the intake of SSBs and weight gain are prone to confounding, because the consumption and weight are measured at a single point in time. For example, persons may abstain from consuming SSBs as part of a weight loss strategy, which could result in a negative association or underestimation of the link

between the BMI and consumption. It is possible that this might have been the case in this study. In addition, students may have underestimated or underreported on their actual weight due to societal norms and the negative connotations associated with being overweight.

It is also possible that students underreported their consumption patterns of SSBs due to their knowledge regarding its harmful ill health effects. Response acquiescence is common among questionnaires that tend to determine habits that are considered taboo or have negative connotations.

#### CONCLUSIONS

These oral health students had adequate knowledge levels related to SSBs, with clinical students displaying even more knowledge than nonclinical students. More females than males reported having a positive attitude towards SSBs and they claimed not to use SSBs for enjoyment or entertainment. The average consumption of sugar from SSBs was within the recommendations, but 20% of respondents consumed excessive amounts daily. There was a significant association between having good knowledge, a positive attitude and being a clinical student with a reduced consumption of sugar intake. The majority of students were of normal weight and there was no correlation between the consumption of sugar from SSBs and the BMI.

#### RECOMMENDATIONS

Government policy interventions could have the most visible effect on controlling SSBs' consumption and obesity among adolescent and young adults.

To support the proposed introduction of tax on SSBs, this could have far-reaching health implications and has shown to be effective in reducing the consumption of these beverages with a subsequent positive effect on general and oral health diseases.

The knowledge of students should be improved by providing more lectures on the harms of sugars. The students should be educated on the consequences of excessive sugar consumption during all years of study and not to limit it to the later years.

Access to SSBs should be reduced by increasing the taxes and by initiating policies in the dental school to ban the sales of these drinks. This could be extended to the entire university including the medical and dental hospitals and all the other similar health facilities.

Physical activities should be encouraged during the day by allowing a sports day which could improve the health of the students and allow them to interact between each other in a social and positive environment.

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Nil.

## CONFLICTS OF INTEREST

There are no conflicts of interest.

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