Dental Students' Perceptions of Sugar Tax and Consumption of Sugar-Sweetened Beverages

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INTRODUCTION

Sugar remains a common risk factor that is associated with an increased risk of type 2 diabetes, obesity, heart disease, and dental caries.[1] One of the strategies for reducing sugar consumption is taxation, which aims to minimise the purchasing behaviour of sugar-containing items by increasing the prices. Sugar is additionally the primary etiological factor for dental caries and its disease progression.[3] Many factors influence the relationship between sugar and caries, such as the frequency of sugar consumption and the chemical structure of sugars. Teeth affected by dental caries may often result in irreparable damage and ultimate extraction, subsequently affecting the quality of life, which includes impairment of mastication, phonetics, and sleep disturbance due to unbearable pain.[4] An increase in the intake of sugary snacks coupled with a poor diet has also been shown to be associated with the progression of non-communicable diseases.[5] In addition, the high intake of these snacks and sugar-sweetened beverages has been linked with easy access, advertisements, habits, and addiction.[6]

The Sugar Sweetened Beverage (SSB) tax has been implemented in over 40 countries around the world with the aim of reducing purchasing and consumption of sugar sweetened beverages, incentivising product reformulation by industry, and generating revenue that would be directed to health-promoting programs.[7] SSB are drinks that contain added sugars such as sucrose, high fructose, corn syrup, or fruit-juice concentrates, such as soft drinks, juices, and energy drinks. This excludes beverages that contain intrinsic sugars, such as unsweetened milk and milk products.[8] The South African government implemented the SSB tax in 2018 following multiple stakeholder consultations. The tax, also termed the Health Promotion Levy was highly contested, and thus he initial proposed tax by the National Treasury was 10%, which was less than the 20% rate recommended by the World Health Organisation.[8] A review undertaken to assess the effect of SSB tax on sugar intake and dental caries provided evidence that about 20% of SSB tax, potentially reduced free sugar intake by approximately 4-4.4grams per day. In addition, it led to a reduction of dental caries over time.[9]

A cross-sectional study examining tax awareness and perceived cost of sugar-sweetened beverages in four countries namely Australia, the United States, the United Kingdom and Mexico between 2017 and 2019 assessed three following factors: Perceived cost of SSBs over time, awareness of SSB taxes in years where taxes were present and self-reported changes in beverage purchases in response to SSB taxes in years where taxes were present. This study found that the perceived cost of SSBs relative to non-SSBs was higher in Mexico in all three years. Tax awareness was higher in the U.K., and Mexicans were reported to be buying "less" taxed beverages. Furthermore, respondents with lower socioeconomic status were less likely to be aware of an SSB tax.[7]

Another research paper aimed at evaluating the impact of the sugar tax on sugar-sweetened beverage consumption among school children in Saudi Arabia reported that, after the implementation of the SSB tax, energy drink consumption declined and soft drink consumption increased slightly among school children aged 12-14. (). The proportion of soft drink consumption before tax was 92.5% and increased by 2% after tax to 94.6%. On the other hand, when it came to energy drink consumption before tax, the proportion was 46.1%, and after tax, it reduced to 38.4%, coming down to a reduction of 8%.[10]

In South Africa, a qualitative study was conducted in Soweto assessing the attitudes and perceptions that contribute to sugar-sweetened beverage (SSB) intake after the introduction of the sugar tax. Out of 85 participants recruited, only 57 were willing to participate, all of whom were adults over 18.[6] The participants were divided into focus discussion groups of 8 to 11, and interviews were conducted within these groups. When asked why people consumed sugar-sweetened beverages, many participants reported that the practice was out of habit that had been adopted from childhood, and others admitted that they were addicted. Many participants also mentioned the influence of advertisements on the persuasion of consuming sugar-sweetened beverages and how easily accessible these beverages were.[6]

Oral health professionals generally express support for sugar taxation policies, given their awareness of the detrimental effects of excessive sugar consumption on

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dental health and broader systemic outcomes.[11] It is further assumed that such professional endorsement may extend to their personal behaviours, with the expectation that they themselves would reduce their intake of sugarsweetened beverages.[12] However, not much evidence has been shown to link their support or understanding to their personal consumption. A study done in South Africa examining oral health students' knowledge, attitudes and consumption of SSB before the tax reported that although the students supported the implementation tax, they consumed on average 5.8 teaspoons of sugar per day from SSB's alone, not withstanding other types of sugar intake that would exceed the recommended daily intake of 7 or 8 teaspoons of sugar. [5, 13] The tax has since been adopted over 7 years ago in South Africa; However, limited evidence exists regarding the influence of such regulatory interventions on sugarsweetened beverage consumption among oral health professionals and students following their implementation. Therefore, this study aims to investigate perceptions of the SSB tax and patterns of SSB consumption among dental students at the University of the Witwatersrand after the tax was introduced

METHODOLOGY

A quantitative study, using a cross-sectional study design was employed. All 147 undergraduate Wits dental students, across years 1-5, in 2023 were invited to participate on a voluntary basis. The study questionnaire was adopted from a validated questionnaire by Wrottesley et al, 2020.[14] The questionnaires and participant information sheet were printed and handed out to the relevant class representatives, who were asked to distribute them to the students at the end of their clinical session for the day. The self-administered questionnaire took 15 minutes to complete. It had close-ended questions that consisted of four sections with five questions each. Section A addressed the demographic variables such as age, year of study and the average money spent on food and sugar-sweetened beverages. Section B consisted of questions about awareness of sugar taxation and its meaning and rationale. Section C focused on the attitudes towards the sugar tax policy. Section D assessed the daily SSB consumption habits of the students. Ethical principles were adhered to, to ensure that students were not coerced into answering the questionnaires and that anonymity was maintained. Permission was additionally obtained from the Head of School and the University registrar. The ethical clearance number is – M221155.

The data was collected and transferred onto a Microsoft Excel spreadsheet which was imported on to STATA version 14 for data analysis. The data was analysed using descriptive analysis. Chi-squared analysis was then used to assess the association between demographic variables and SSB consumption. All analysis was set to a 95% confidence interval.

Results

Sixty-three out of 147 dental students participated in the study, giving a 42% response rate. Table 1 shows the demographics of the participants, in terms of age, 87.3% of them were between 18-25 years. They were largely in their 1st year of study (31.7%), and most (42.8%) had access to 1000-2000 Rands pocket money a month. The second-year students were not available during the data collection phase.

Table 1: Student demographic profile (N=63)

Variables	Frequency	Proportion (%)
Age		
• 18-25	55	87.30
• 26-32	8	13.70
Year of study		
1	20	31,75
2	0	00.00
3	21	33,33
4	16	25,40
5	6	9,52
Access to money for food		
R0-R1000	21	33,33
R1001-R2000	27	42.86
>R2000	15	23,81

In terms of perceptions, Table 2 shows that 82.5% of the students were aware of the implementation of sugar tax, however 66.6% did not know when it was introduced. They believed (42.8%) that a sugar tax would reduce the consumption of SSBs, and 76.1% of them felt that the money generated should be used to subsidise healthy foods.

Table 2: Students' perceptions of SSB tax

Variable s	Frequency	Proportion (%)
Aware of sugar tax	52	82,54
Year of implementation		
• 2018	12	19,50
• 2019	9	14,29
• Do not know	42	66,67
Sugar tax will reduce obesity	19	30,15
Sugar tax will reduce SSB consumption	27	42,86
Money generated to be used for:		
• Obesity interventions	5	7.94
• Research	9	11.29
• Revenue for government	1	1.59
• Subsidising healthy food	48	76.19

Most (95.2%) of the students continue to consume SSB, see Table 3. The majority of them spend close to R150 rands per month on SSB's. Particularly when they are at restaurants or parties (88,8%; 87,3%). The majority (82,5%) report that the reason they drink SSB's is largely for the enjoyment of the taste.

Table 3: SSB Consumption

Variables	Frequency	Proportion
Drinks SSB	60	95,24%
Money spent on SSB		
• R0-R150	41	65,08%
• R151-R300	16	25,40%
• >R300	6	9,52%
Drinks SSB at these setting		
Home	21	33,33%
Varsity	36	57,14%
Parties	55	87,30%
Restaurant	56	88,89%
Sports/gym	28	44,44%
park/beach	40	63,49%
Reason for drinking SSB		
Drink option	32	50,79%
Enjoy the taste	52	82,54%
To quench thirst	27	42,86%
Family likes to drink it	28	44,44%
Completes a meal	26	41,27%
Mix with alcohol	24	38,19%
Boosts energy level	28	44,44%

No association was found between demographic variables and SSB consumption. However, there was an association between the year of study and money spent on SSB's and SSB consumption. The fourth-year students proportionally spent more than R300 on SSB's (p=0.048), Table 4. In addition, only 18.7% of fourth-year students reported not consuming SSBs, compared with the other classes (p=0.026). See Table 5.

Table 4: Relationship between Year of Study and money spent on SSB

Year of Study	0-150 (Rands)	151-300 (Rands)	>300 (Rands)
1	70.0%	20.0%	10.0%
3	66.6%	23.8%	9.52%
4	50.0%	37.5%	12.5%
5	83.3%	16.6%	0.0%

Table 5: Relationship between Year of Study and SSB consumption

Year of Study	No	Yes
1	0.0%	100%
3	0.0%	100%
4	18.7%	81.3%
5	0.0%	100%
		p=0.026**

DISCUSSION

Our findings indicated that among the n=63 students participating in the study, 82.5% of them were aware of the implementation of sugar tax, although more than 50% (66.6%) did not know when it was introduced. They had positive perceptions on the benefits of the tax and believed that it could reduce SSB consumption and that the money generated should be utilised for subsidising healthy foods. Despite these perceptions, most (95.2%) reported consuming SSBs. Although most students spent no more than R150 on SSB, our results showed that 4th-year students spent significantly more (>R300) on SSBs (p=0.048). In addition, there was an association between the year of study and SSB consumption which revealed that although the fourth year students spent more on SSB's, they were the only group that had 18.7% of participants not consuming SSB's. No association was found between demographic variables and SSB consumption variables.

Our study revealed that as much as the majority of the students were aware of the sugar tax and understood the benefits of such a regulation in reducing obesity, consumption and money being directed to health-promoting initiatives (76.1%), their awareness and positive perceptions were not adequate to influence SSB consumption. This finding aligns with the results of Mosenogi et al. (2024), who examined the influence of multiple regulatory interventions on SSB consumption among South African adults and concluded that taxation alone was insufficient to alter consumer behavior meaningfully.[15] Similarly, Fadupin et al. (2014) reported that despite 86.7% of Nigerian undergraduate students demonstrating good knowledge of SSBs, only a small proportion refrained from consuming fruit juices (17.3%) or carbonated soft drinks (18.3%). Many participants continued to consume SSBs despite awareness of their health implications, largely because these beverages were perceived as socially desirable.[16]

Our results interestingly revealed that although the fourth-year students spent more money on SSB's, they were the only group where 18.7% reported not to consume SSB. Concerning access to money and SSB consumption, a systematic review of 21 studies examining association between socio-economic status and SSB consumption, found that those who had a high socio-economic status or more access to money were 48% less likely to consume SSB's.[16] In our findings, this was reflected in the fourth-year students, who presumably had access to more money. This same group was the only one with participants not consuming SSBs. (18,7%;p=0.026). Miller et al (2020) further explore other drivers of sugar consumption among young adults. Their qualitative study found that participants drank SSBs to address their low energy levels, as shown by 44.4% of our participants. Miller et al.'s participants also considered frequent consumption acceptable when taken in moderation, even though they could not clearly define "moderation". Finally, many young adults relied on packaging and labeling, which are often unreliable.[15]

Regarding determinants of SSB consumption behaviour, the literature suggests that taxation alone is not sufficient to bring about behaviour change. Product formulation and promotion regulations are found as key in influencing positive change.[15] Furthermore, evidence also suggests that 'signalling effects' of an SSB tax may play an important role in changing consumer behaviour. Signaling effects are ways in which the implementation of a tax by government may signal to consumers that consumption of taxed goods should be reduced.[19] This can be implicit or explicit. The implicit signal is tied to the assumption that the price should reduce consumption. The explicit ones are found to be more effective as government directly communicates the potential harms of the taxed product by consistent awareness campaigns.[18] A cross-sectional sample of South African adults found that soda sales dropped as the knowledge of the health harms of SSBs and intention to

reduce consumption increased.[20] This suggests that media coverage and pro-tax campaigns in these instances had effects beyond price.

LIMITATIONS

This study had some limitations. The relatively small sample size restricted the depth of the statistical analyses that could be performed, including the inability to conduct regression modelling. Nevertheless, the findings offer valuable preliminary insights into dental students' perceptions of the sugar-sweetened beverage (SSB) tax and their consumption habits after its implementation. Future research could expand the scope of the study by including a broader range of oral health students, such as oral hygiene and dental therapy students. In addition, although the questionnaire provided a practical, low-burden method for estimating habitual dietary intake, participants' reports of their SSB consumption may have been affected by recall bias. However, we had data on perceptions, which provided useful baseline data that can be valuable for building on future research.

CONCLUSION

This study demonstrated that although dental students were generally aware of the sugar-sweetened beverage (SSB) tax and held favorable perceptions of its intended benefits, this awareness alone did not translate into reduced SSB consumption. Given that positive perceptions alone were insufficient to influence consumption behaviour, the existing literature suggests that taxation should be complemented by additional regulatory strategies, such as product formulation and promotion regulations, to bring about a more positive behavioural change.

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CPD questionnaire on page 290

The Continuing Professional Development (CPD) section provides for twenty general questions and five ethics questions. The section provides members with a valuable source of CPD points whilst also achieving the objective of CPD, to assure continuing education. The importance of continuing professional development should not be underestimated, it is a career-long obligation for practicing professionals.

