

The prevalence of food insecurity in South African dental schools: A cross-sectional study

SADJ September 2023, Vol. 78 No.8 p394-400

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ABSTRACT

Background

Food security is an important factor which can promote academic outcomes and general health and wellbeing of dental students. The aim of this study was to determine the extent of food insecurity among dental students across all dental schools in South Africa.

Methodology

An online cross-sectional survey was adapted and modified from the United States Department of Agriculture Community Food Security Assessment toolkit and disseminated to the four dental schools/faculties in South Africa. Food insecurity was determined using a pre-specified questionnaire on food insecurity. The sample size was determined based on a previous study. Categorical variables were displayed as frequencies and percentages and associations were determined using a Chi-squared test and a Fishers' Exact test. A simple and multiple logistic regression was run to determine the strength and direction of associations with food insecurity with other variables of interest using backward elimination and a likelihood ratio test.

Results

The study consisted of 210 participants. The median age was 21 [IQR:21-22] years. Most of the students were from UWC (53.5%, n=113). There were more females than males in the study. Almost 90% (89.1%, n=187) of dental students felt food insecure in some form or other.

Discussion

Food insecurity is prevalent among oral healthcare students and requires intervention from stakeholders such as the universities, government and various role players to aid in the eradication thereof.

Conclusion

Food insecurity among dental students in South Africa is at an all-time high. This paper provides evidence that can inform stakeholders of the necessity to improve student access to food at dental schools in South Africa.

Keywords

Food insecurity, dental students, higher education, South Africa, undergraduate dental

BACKGROUND

Food insecurity plays a major role in affecting populations across the globe in both lower middle-income and high-income countries.^{1,2} Food security, as defined by the United Nations Committee on World Food Security, means that all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their food preferences and dietary needs for an active and healthy life.³ In 2020, between 720 and 811 million people faced hunger.⁴ According to Sustainable Development Goal (SDG) 2 [Zero Hunger], it is envisioned by the United Nations to alleviate hunger, achieve food security, improve nutrition and promote sustainable agriculture completely by 2030.⁵ According to the United Nations: World Food Programme, from 2017-2019 between 15% and 24.9% of South Africans were subjected to chronic hunger, which is indicative that the SDG goals will not be achieved by 2030. The prevalence of severe food insecurity in the total South African population was 18% from 2014-2016, which was much higher than other upper to middle-income countries such as Serbia, Russia and Romania – 1.2%, 0.7% and 1.1% – but lower than Namibia and Botswana.⁶

The prevalence of food insecurity among university students ranges from 21% to 82%, globally.⁷ Studies conducted with regard to food insecurity in the context of university students in South Africa are few. Numerous studies have been conducted regarding school children in South Africa and the effect of food insecurity on cognitive function. Due to the bias that higher education only caters for the elite and financially stable, food insecurity at higher institutes is often a disregarded subject matter, but this has changed with the #feesmustfall movement since 2015.⁸ As a result of not being in full-time employment, having to rely on alternate sources of income to fund themselves while studying, living for the first time on their own⁹, preparing food for themselves for the first time, and studying in an unfamiliar environment⁹ have all led to the challenges of food insecurity among students that should not be overlooked.⁴ These challenges have posed an impact of an imbalanced diet which can have dire medical, physical and educational consequences for students.¹⁰⁻¹⁴

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Food insecurity does not affect all students equally. In South Africa, students who are persons of colour, first-generation students and students from foster care systems are more likely to experience food insecurity. Food insecurity has been studied among different populations at universities across South Africa^{15,16}. This will be the first time food insecurity will have been reported in oral healthcare students across South Africa. This study aimed (1) To determine the prevalence of food insecurity among oral healthcare students across South Africa; and (2) To develop a multivariate model to identify possible association between food insecurity and potential risk indicators in undergraduate dental students across South Africa. The information obtained from this study will highlight the need for university stakeholders to provide food pantries and nutrition education programmes.

METHODS

A cross-sectional descriptive quantitative online survey was utilised (self-administered online survey – SurveyMonkey®) across the four dental schools in South Africa – University of the Western Cape (UWC), University of Pretoria (UP), University of the Witwatersrand (Wits) and Sefako Makgatho Health Sciences University (SMU). Participants were enrolled undergraduate dental, oral hygiene and dental therapy students at the four dental schools in South Africa. The inclusion criteria consisted of all undergraduate dental, oral hygiene and dental therapy students in South Africa. The online survey was adapted and modified to suit the needs of the research in a local and specific circumstance from the United States Department of Agriculture Community.

Continuous data such as “age” was displayed as median and interquartile range, since age was not normally distributed. All categorical data was displayed as frequencies and percentages. Bivariate comparisons were made using Chi-squared or its nonparametric equivalent (Fishers Exact test – used if the cell counts were less than five). Food insecurity was dichotomised where responses with “once a week”, “few times a week” and “daily” to the question “How often do you skip a meal?” were considered as food insecure. Gender referred to biological sex. The residences

of the students were based on whether the students stayed while they were studying, “At home”, “Private residential boarding” or at “University residence”.

Perceptions, behaviour, nutritional values, impact of food insecurity and experiences of hunger

Students were asked to describe whether they thought that their meals were nutritious or not and they were also asked to report whether they brought a packed lunch to school (“No”, “Yes/Sometimes”). Perceived nutritional value of purchased food was also assessed by asking the question whether the participant considered the food that they purchased to be “nutritious” or “unhealthy”. Categories such as “more often” referred more than once, ever. Participants were also required to answer whether they worried about not having enough food to eat (“Daily/More often”, “Never”), and whether they felt hungry when going to sleep because they did not have enough food to eat (“Yes”, “No”).

Accessibility and affordability

Questions around financial accessibility to food were asked, including whether the participant had money to buy food if they did not carry a packed lunch to school (“No”, “Yes/Sometimes”). Affordability of food was determined by assessing whether the food purchased by students on campus was affordable (“Affordable”, “Expensive”) and how often they purchased fast food because it was cheaper (“Daily/More often”, “Never”). And whether the food purchased on campus, and its availability, was also assessed (“Yes”, “No”).

Food scarcity and coping strategies for food scarcity

“How often have you had no food to eat because of lack of resources” (“Daily/More often”, “Never”), and behaviour of watering down food to stretch it further was also assessed (“Yes”, “No”).

Strategies used to acquire food

Strategies such as selling assets, sacrificing health or education, buying instruments, buying scrubs, WiFi and textbooks were assessed (“Yes”/“No”). Financial coping strategies such as borrowing money from friends were also assessed (“Yes”, “No”).

Table 1: Baseline demographics

		n (%)	Food Insecure 187 (89.1) n (%)	Food Insecure 23 (10.9) n (%)	p-value
Name of institution	SMU	45 (21.4)	43 (95.6)	2 (4.4)	0.199
	UP	21 (10)	17 (80.9)	4 (19.1)	
	UWC	113 (53.8)	98 (86.7)	15 (13.3)	
	WITS	31 (14.8)	29 (93.6)	2 (6.5)	
Discipline of study	Dental Therapy	7 (3.3)	6 (85.7)	1 (14.3)	0.718
	Dentistry	168 (80)	149 (88.7)	19 (11.3)	
	Oral Hygiene	35 (16.7)	32 (91.4)	3 (8.6)	
Gender	Male	57 (27.1)	49 (86.0)	8 (14.0)	0.456
	Female	152 (72.9)	138 (90.2)	15 (9.8)	
Residence	Home with family	66 (31.4)	59 (89.4)	7 (10.6)	0,152
	Private boarding	41 (19.5)	33 (80.5)	8 (19.5)	
	University residence	103 (49)	95 (92.2)	8 (7.8)	

Table 2: Perceptions, behaviour, nutritional values, impact of food insecurity and experiences of hunger

		n (%)	Food Insecure 187 (89.1) n (%)	Food Insecure 23 (10.9) n (%)	p-value
Do you consider your meals to be nutritious or unhealthy?	Nutritious	153 (72.9)	131 (85.6)	22 (14.4)	0.006*
	Unhealthy	57 (27.1)	56 (98.3)	1 (1.7)	
Do you bring a packed lunch to campus?	No	65 (31.0)	63 (96.9)	2 (3.1)	<0.015*
	Yes/Sometimes	145 (69.1)	124 (85.5)	21 (14.5)	
Do you consider the food you purchase to be nutritious?	Nutritious	153 (72.9)	131 (85.6)	22 (14.4)	0.005*
	Unhealthy	57 (27.1)	56 (98.3)	1 (1.7)	
How often did you worry that you are not eating enough food?	Daily/More Often	111 (52.9)	108 (97.3)	3 (2.7)	<0.001*
	Never	99 (47.1)	79 (79.8)	20 (20.2)	
Did you ever go to sleep hungry because you don't have enough food?	Yes	47 (22.4)	46 (97.9)	1 (2.1)	0.032*
	No	163 (77.6)	141 (86.5)	22 (13.5)	

A simple unadjusted and multiple adjusted logistic regression model was run to determine associations between food insecurity and different risk factors. Variables included in the final multiple regression model were determined based on a likelihood ratio test using backward elimination. All statistical analysis was performed in StataCorp 2021. Stata Statistical Software (Release 17). College Station, TX: StataCorp LLC. All tests noted as statistically significant at $p < 0.05$.

RESULTS

This study consisted of 210 participants. The median age of the participants was 21 [Interquartile range (21;22)]. Of the 210 participants, 89.1% (n=187) classified themselves as being food insecure. The majority, 53.8% (n=113), of the participants were students from UWC. Students from UWC were more likely to report being food insecure, 15% (n=15). Dentistry students made up 80% (n=168) of the participants and were more likely to report food insecurity (Table 1).

Perceptions, behaviour, nutritional values, impact of food insecurity and experiences of hunger

The majority, 69.1% (n=145), of the participants considered their meals to be unhealthy. In addition, 85.5% (n=124) of these participants felt food insecure. However, the majority of the participants considered the food that they purchased to be nutritious (72.9%, n=153). There was a statistically significant association between food insecurity and bringing a packed lunch to campus ($p < 0.015^*$) (Table 2).

Accessibility and affordability of food

Just over 31% (n=65) of the sample did not bring a packed lunch to school and, of those, 96.9% (n=56) were food insecure. Just over 52% (n=111) were worried that they did not have enough food to eat, and 22.4% (n=47) went to bed feeling hungry (Table 3). The majority of the students reported that they always had money to buy food (68.1%,

Table 3: Accessibility and affordability of food

			Food Insecure 187(89.1) n (%)	Food Secure 23 (10.9) n (%)	p-value
If you don't carry a packed lunch, do you always have money to buy food?	No	67 (31.48)	64 (95.5)	3 (4.5)	0.056*
	Yes/Sometimes	143 (68.1)	123 (86.0)	20 (14.0)	
If you have to buy food on campus, is it readily available?	No	43 (20.5)	40 (93.0)	3 (7.0)	0.425
	Yes	167 (79.5)	147 (88.0)	20 (12.0)	
How affordable is the food you purchase on campus?	Affordable	91 (43.3)	38 (41.8)	53 (58.2)	0.084
	Expensive	119 (56.7)	36 (30.3)	83 (69.8)	
How often do you purchase fast food because it is cheaper?	Daily/More Often	130 (61.9)	34 (26.2)	96 (73.9)	0.001*
	Never	80 (38.1)	40 (50 .)	40 (50 .)	

Table 4: Food scarcity

		n (%)	Food Insecure 187(89.1) n (%)	Food Secure 23 (10.9) n (%)	p-value
How often have you had no food to eat because of a lack of resources?	Daily/More Often	89 (42.4)	86 (96.6)	3 (3.4)	0.003*
	Never	121 (57.6)	101 (83.5)	20 (16.5)	
Have you ever watered down/stretched your meals to make them last longer?	Yes	94 (44.7)	89 (94.7)	5 (5.3)	0.019*
	No	116 (55.2)	98 (84.5)	18 (15.5)	

n=67), of which 12% (n=64) of these students were food secure.

Food scarcity

Sixty-seven (31.9%) of the participants reported to skip a meal daily. Almost 43% (n=89) reported to not eat food due to lack of resources. There was a statistically significant association between food insecurity and lack of resources to buy food (p=0.003). There was also a significant association between students stretching or watering down their food to make it last longer and food insecurity (p=0.019) (Table 4).

Strategies to acquire food

Economic strategies such as selling assets, sacrificing

health, not buying instruments, not buying scrubs, not buying Wi-Fi or textbooks to buy food were reported. There was a statistically significant association between choosing between buying textbooks or paying for notes and food insecurity (p=0.003) (Table 5).

Participants who worried that they were not eating enough food were 7.639 (2.08 to 28.02) times more likely to report food insecurity compared to participants who did not worry that they were not eating enough food. Overall, the different disciplines in dentistry, different types of dental students or different institutions did not differ in food insecurity perception.

Table 5: Strategies to acquire food

		n (%)	Food Insecure n (%)	Food secure n (%)	p-value
Did you ever have to sell assets or items to buy food?	Yes	16 (7.6)	15 (93.8)	1 (6.2)	1
	No	194 (92.4)	172 (88.7)	22 (11.3)	
Did you ever have to sacrifice health or education costs to buy food?	No	160 (76.2)	138 (86.3)	22 (13.7)	0.019*
	Yes	50 (23.8)	49 (98.0)	1 (2.0)	
Did you ever have to choose between buying instruments and buying food?	No	162 (77.1)	139 (85.8)	23 (14.2)	0.003*
	Yes	48 (22.9)	48 (100.0)	0 (0.0)	
Did you ever have to choose between buying clothes/scrubs and buying food?	No	134 (63.8)	114 (85.1)	20 (14.9)	0.014*
	Yes	76 (36.2)	73 (96.1)	3 (3.9)	
Did you ever have to choose between buying Wi-Fi and buying food?	No	179 (85.2)	157 (87.7)	22 (12.3)	0.234
	Yes	31 (14.7)	30 (96.8)	1 (3.2)	
Did you ever have to choose between buying textbooks or paying for notes and buying scrubs?	No	149 (71.0)	127 (85.2)	22 (14.7)	0.003*
	Yes	61 (29.1)	60 (98.4)	1 (1.6)	
Have you ever had to borrow money for food from friends?	Yes	82 (39.1)	16 (19.5)	4 (4.9)	<0.025*
	Never	128 (61.0)	109 (85.2)	19 (14.8)	

Table 6: Adjusted and unadjusted logistic regression

Food insecure		95% Confidence Interval	p-value	95% Confidence Interval	p-value
Name of institution	SMU				
	UP	0.198 (.033 to 1.181)	0.076		
	UWC	0.304 (0.067 to 1.387)	0.124		
	WITS	0.674 (0.09 to 5.062)	0.702		
Discipline of study	Dental Therapy				
	Dentistry	1.307 (0.149 to 11.449)	0.809		
	Oral Hygiene	1.778 (0.157 to 20.1)	0.642		
Gender	Female				
	Male	0.666 (.266 to 1.667)	0.385		
Residence	Home with family				
	Private boarding	0.489 (0.163 to 1.471)	0.203		
	University residence	1.409 (0.486 to 4.088)	0.528		
Do you consider your meals to be nutritious or unhealthy?	Nutritious				
	Unhealthy	9.405 (1.237 to 71.486)	0.03*		
Do you bring a packed lunch to campus?	No				
	Yes/Sometimes	0.187 (0.043 to 0.825)	0.027*		
Do you consider the food you purchase to be nutritious?	Nutritious				
	Unhealthy	2.44 (1.014 to 5.869)	0.046*		
How often did you worry that you are not eating enough food?	Daily/More Often				
	Never	0.11 (0.032 to 0.382)	0.001*	7.639 (2.08 to 28.02)	0.002*
Did you ever go to sleep hungry because you don't have enough food?	Daily/More Often				
	Never	0.139 (0.018 to 1.062)	0.057*		
If you don't carry a packed lunch, do you always have money to buy food?	No				
	Yes/Sometimes	0.288 (0.083 to 1.007)	0.051		
If you have to buy food on campus, is it readily available?	No				
	Yes	0.551 (0.156 to 1.949)	0.355		
How affordable is the food you purchase on campus?	Affordable				
	Expensive	2.222 (.916 to 5.393)	0.078		
How often do you purchase fast food because it is cheaper?	Daily/More Often				
	Never	0.284 (0.114 to 0.705)	0.007*		
How often have you had no food to eat because of a lack of resources?	Daily/More Often				
	Never	0.176 (0.051 to 0.613)	0.006*		

Food insecure	SMU	95% Confidence Interval	p-value	95% Confidence Interval	p-value
Have you ever watered down/ stretched your meals to make them last longer?	Daily/More Often				
	Never	0.306 (0.109 to 0.858)	0.024*		
Did you ever have to sell assets or items to buy food?	Daily/More Often				
	Never	0.521 (0.066 to 4.14)	0.538*		
Did you ever have to sacrifice health or education costs to buy food?	No				
	Yes	7.812 (1.026 to 59.499)	0.047*		
Did you ever choose between buying clothes/scrubs and buying food?	No				
	Yes	4.269 (1.225 to 14.879)	0.023*		
Did you ever have to choose between buying Wi-Fi and buying food?	No				
	Yes	4.204 (0.546 to 32.385)	0.168		
Did you ever have to choose between buying textbooks or paying for notes and buying scrubs?	No				
	Yes	10.394 (1.369 to 78.933)	0.024*		
Have you ever had to borrow money for food from friends?	No				
	Yes	0.294 (0.096 to 0.899)	0.032*	1.686 (.51 to 5.57)	0.392

DISCUSSION

Some 89.1% of oral healthcare students in South Africa reported food insecurity, which is a statistic not to be taken lightly. This result was higher than previous studies from other universities in the country that reported 65% of students were deemed food insecure.¹ In contrast to the Free State study, where males felt more food insecure than females, the majority (75%, n=102) were females in this study.¹⁵

Almost 31.9% of students skipped a meal daily. While a vast array of factors could contribute to students skipping a meal, this still indicates that skipping a meal can be directly linked to being food insecure. In an ever-changing world, some students are still required to manage their hunger by using techniques such as watering down their food. More than 16% of students worried about not having enough food to eat at least once a week, the majority of whom were food insecure. Some 44.76% of the students felt that they had no food to eat because of a lack of resources; more than 94% were food insecure.

Some 22.4% of students have had at least one night a week where they have gone to bed on an empty stomach. While, again, reasons for this may vary, it is still unacceptable that students are meant to focus and concentrate on studying, not sleeping on an empty stomach. Marshall et al. (2021) have also shown that food-insecure students are more likely to report having experienced food- or hunger-related stress, sleep, study or academic performance than their food-secure counterparts.¹⁸

While it must be noted that economic factors alone are not responsible for food insecurity, with most of the students

finding the food available on campus to be nutritious, it must also be observed that 61.9% of students still purchased food on campus because it is cheaper. Students at Wits and in the Free State shared the same concerns about food availability on campus and the lower nutritional content thereof, as noted in the 2013 study.¹⁵

Some coping strategies noted were borrowing money from friends (39.1%) and selling assets (7.6%). These methods of coping are unstable and only valid for the short term. Long-term solutions need to be suggested for these students.

Hunger can impede students from functioning optimally. In an ideal world, all people should be well taken care of, healthy and food secure; however, that is not the case, especially among dental students in South Africa. Due to the great variety of factors that need to be considered when dealing with food insecurity, it is not a unilateral issue that can be resolved individually. We need intervention from the local government and parliament to aid in the eradication of food insecurity.

Food insecurity is a complex issue and requires multiple collaborative strategies to reduce the growing risk of individuals becoming food insecure. Implementing policies and interventions to ensure that nutritious food is affordable and readily available conveniently is imperative.¹⁹ Some recommendations would be to formulate a universal model to determine food insecurity, a restructuring procedure to reallocate funds for needy students by providing food instead of cash and food vouchers from specific retailers, and universities to provide more cost-effective, nutritious and healthy food options on their campuses.

At a governmental level, the possibility of having food banks and alternative methods of food procurement must be discussed, as hunger is the leading cause of theft and crime in South Africa and has negative impacts on all aspects of life. Food insecurity practices should focus on increasing food access and affordability, building community food solutions, regional development, supporting food social enterprise, and planning for local food systems.²⁰ It is also important for further research to be conducted to ascertain the actual effects of food insecurity on the education and performance of students.

CONCLUSION

Food insecurity is rife in South African dental institutions. Food insecurity may impact on the success of dental students' academic performance and the students' health in general. There is a need to address food insecurity at university level.

Abbreviations

SDG – sustainable development goals
UWC – University of the Western Cape
UP – University of Pretoria
Wits – University of the Witwatersrand
SMU – Sefako Makgatho Health Sciences University

Limitations

This was a cross-sectional study and causal relationships cannot be speculated. The data from this study was self-reported and open to reporting bias and attempts to reduce this bias were ensured via the anonymity of the survey. There could have been selection bias, as students who dropped out or de-registered from studies were not included in this study.

DECLARATIONS

Ethics approval and consent to participate

Ethical approval was received from UWC Humanities and Social Science Research Ethics Committee: Reference Number: HS17/8/28. All research was performed in accordance with the Declaration of Helsinki and informed consent was obtained from all the participants. There were no minors involved in this study.

Consent for publication

Not applicable.

Availability of data and materials

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Conflict of interest

The authors declare they have no conflict of interest.

Funding

The study was self-funded by the authors.

Authors' contributions

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Dhansay: Substantial contributions to the conception, design of the study, data acquisition, interpretation of the data, drafting the manuscript, critically revising the manuscript and final approval of the version to be published. Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. All authors read and approved the final manuscript.

Acknowledgements

The various schools and faculties of dentistry that participated in this study.

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