

PREVALENCE, KNOWLEDGE AND ASSOCIATION OF DIETARY SUPPLEMENT USAGE AMONG UNIVERSITY OF KWAZULU-NATAL STUDENTS

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ABSTRACT

The use of dietary supplements (DS) is rapidly increasing, with the industry valued at R7 billion annually in South Africa. University students, particularly vulnerable to DS use, often lack awareness of potential risks. This study aimed to determine the prevalence, knowledge and association of DS usage with physical activity among University of KwaZulu-Natal students. An online questionnaire gathered data on DS knowledge and usage related to physical activity. Descriptive statistics summarised the data, while inferential statistics determined significance, set at $p \leq 0.05$. Results showed 13.6% of students used DS, with no significant difference between health science (58.3%) and life science students (41.7%) ($p=0.8$). Physically active DS users (41.7%) outnumbered sedentary users (16.7%) ($p=0.03$). Primary motives for DS use included enhancing energy, improving performance and boosting immunity. Health science students exhibited significantly higher DS knowledge than their non-health science peers ($p=0.02$). The study concludes that educational interventions are necessary to increase awareness of DS hazards and promote safe usage among students, especially those involved in physical activities, regardless of their academic discipline. Future research should focus on using larger, randomly selected samples to improve the generalisability of the findings.

Keywords: Dietary supplements; Harmful substances; Physical activity.

INTRODUCTION

Approximately 58.5% of adults and 34.8% of children and adolescents use dietary supplements (DS) (Mishra *et al.*, 2023). This was an increase from the 2017–2018 report, where 57.6% of United States adults aged above 20 years reported using DS, with an estimate of 63.8% of women compared with 50.8% of men and at least one-third of children in developed countries having used DS (Binns *et al.*, 2018; Mishra *et al.*, 2021). In 2018, the DS market was worth an estimated \$101.38 billion US dollars with approximate growth to \$278 billion worldwide by 2024 (Islam *et al.*, 2021). In South Africa, the DS industry is estimated to be worth R7 billion per annum, with 46% of citizens using DS daily (Mwangi & Njuguna, 2019). By 2026, the South African DS industry is projected to grow at a compound annual growth rate of 13.5% (Maharaj, 2022).

DS are consumed orally as capsules, herbs, tablets, powders or pills to complement a regular diet. Such products contain vitamins, minerals, herbs, amino acids, etc., and can be easily obtained without prescription at retail outlets (Naidoo *et al.*, 2018). When used according to recommended doses, DS are said to promote overall well-being, boost athletic performance, enhance mental health and address nutritional deficiencies (Kołodziej *et al.*, 2019). However, improper consumption, such as overdosage or combining different supplements simultaneously, can have adverse health effects (Deldicque & Francaux, 2016).

Consumers of DS often hold high expectations, influenced by advertisements and nutritional information provided on the supplement labels. However, a study by Naidoo *et al.* (2018) reported instances of false claims and poor quality control within the DS industry. This suggests that not all active ingredients in DS products are accurately disclosed. Some DS may be contaminated with harmful substances (Maughan *et al.*, 2018). The situation is further complicated by the lack of specificity regarding listing prohibited substances on package labels, thus controlling this situation has become more complicated and challenging (Van der Bijl, 2014). This occurrence is not exclusive to South Africa but common in many other countries worldwide (Dwyer *et al.*, 2018). The use of DS without proper understanding of their active ingredients or a recommendation from a health professional can be detrimental to health (Naidoo *et al.*, 2018). In a study to determine nutrition knowledge and understanding of nutritional information, only 27% of respondents reported reading the information on the package before purchasing a supplement (Gabriels & Lambert, 2013). The prevalence of dietary DS usage is higher among the younger population, particularly university students, primarily influenced by media and peer pressure (Žeželj *et al.*, 2018). Research has shown that 60% of students use DS at least once weekly (Lieberman *et al.*, 2015; Liu *et al.*, 2018). Student-athletes are more inclined to use DS because of demanding schedules compared with non-athlete students (Randles, 2018). Islam and colleagues reported that 66.4% of student-athletes from different sports used DS (Islam *et al.*, 2021).

The available literature on DS has primarily focused on the athletic population, exploring their beliefs, knowledge, physical activity and the prevalence of DS use (Kołodziej *et al.*, 2019). At the collegiate level, most DS research focuses on student-athletes (Maughan *et al.*, 2018). However, it is important to note that DS are easily accessible to the general public, including non-athlete students. Only a limited number of studies have investigated the knowledge and consumption patterns of DS among non-student-athletes (O'Brien *et al.*, 2017; Jovičić-Bata *et al.*, 2019).

PURPOSE OF THE STUDY

The study aimed to assess the prevalence of DS use, knowledge and its association with physical activity status among students at the University of KwaZulu-Natal.

METHODS

Research design

A descriptive cross-sectional observational study was conducted using a quantitative approach. A self-administered questionnaire was employed to assess the knowledge and usage of DS among University of KwaZulu-Natal students. This design allowed for the collection of data at

a single point in time to describe the prevalence and association between DS usage and physical activity status among the participants.

Population and sampling

Students from the University of KwaZulu-Natal, specifically from the College of Health Sciences (CHS) and the College of Agriculture, Engineering and Science (CAES) participated in the study. The sample was selected using a purposive sampling technique, and students from the School of Health Sciences (SHS) and School of Life Sciences (SLS) were recruited. A sample size of 85 students was required to estimate the proportion of students using DS to within 15%, with a probability of 95%. The sample size was determined using a conservative estimate of 50% for the proportion of DS users, as this would maximise the sample size required for adequate power. No Bayesian prior estimates were used for the sample size calculation. Instead, this approach allowed for sufficient statistical power to detect meaningful differences between health sciences and non-health science students. Stata v15 was used in the sample size calculation.

Research tools and data collection

The questionnaire used in this study was derived from the research of two studies by Homan (2018) and Caldwell *et al.* (2018). The study questionnaire comprised five sections, all featuring closed-ended questions. Section one focused on gathering demographic information. Section two explored the reasons for using DS, if applicable. This section consisted of 27 questions, with responses rated on a Likert-type scale ranging from 1 to 5, where 1 represented “strongly disagree”, 2 for “disagree”, 3 for “neutral”, 4 for “agree” and 5 for “strongly agree”. Section three looked at exercise habits and included five multiple-choice questions related to fitness status, exercise frequency, duration, and reasons for engaging in physical activity. Section four assessed participants’ perceptions and featured eight questions using a Likert-type scale, similar to section two. Section five assessed participants’ knowledge of DS, with seven questions that required responses such as “true”, “false”, or “I don’t know”.

To ensure clarity and eliminate any ambiguities in the questionnaire, a pilot study was conducted. The pilot study included a sample of 30 Sport Science students from the University of KwaZulu-Natal, Westville campus. The primary investigator collected research data. Data were collected using an online questionnaire over 2 months, which was disseminated via the student portal announcement.

Statistical analysis

Descriptive statistics were used to summarise the data. Frequencies and percentages were used for categorical data. Knowledge items were measured on a Likert scale from 1 to 5. Where interquartile ranges were used to determine the most common reasons for using DS, scores >2.5 in the first quartile were considered to show the most prevalent items, and scores <2.5 in the first quartile were considered to show the least prevalent items. The frequency distribution of the responses was examined for normality and means or medians were reported. The student t-test or Wilcoxon rank-sum test were used to compare responses from the health sciences and non-health science students. Exercise habits were also measured on an ordinal scale and the Wilcoxon rank-sum test was used to compare users and non-users of DS. Categorical factors,

such as gender and year of study, potentially affecting the use of DS were identified using chi-square tests. Knowledge scoring assumed that “True” was always the correct answer, and questions that had a correct answer that was false were flipped, where “False” was reported as the correct answer. Assumptions for normality and homogeneity of variance were checked before applying these statistical methods. Stata v15 statistical software was used for the analysis, with the significance level at $p \leq 0.05$.

Ethical considerations

This study received ethical approval from the University of KwaZulu-Natal’s Humanities and Social Sciences Research Ethics Committee (HSSREC/00002443/2021). The gatekeeper’s permission was requested and granted by the University of KwaZulu-Natal registrar. All study participants who accessed the online questionnaire had to read the information sheet and consent before continuing the survey.

RESULTS

Demographics

In this study, a cohort of 88 individuals successfully completed the questionnaires. The gender distribution among the participants showed that 76.14% were female, while 23.86% were male. Regarding academic status, 57.45% of the participants were in third year, 24.35% were in second year and 18.2% were first years. Approximately 41% of students were aged 17 to 19 years, and 42.5% were between 20 and 21 years old. The remaining 16% were aged 22 to 27 years. Table 1 represents the study demographics.

Table 1. STUDY DEMOGRAPHICS (N=88)

	Frequency, n (%)
Gender	
Male	21 (23.86)
Female	67 (76.14)
Age, years	
17–19	31 (41.45)
20–21	38 (42.50)
22–27	19 (16)
Class standing	
1st year	17 (18.2)
2nd year	21 (24.35)
3rd year	50 (57.45)

The use of dietary supplements

When participants were asked about DS use in the previous month, only 13.6% of students reportedly used DS (Figure 1).

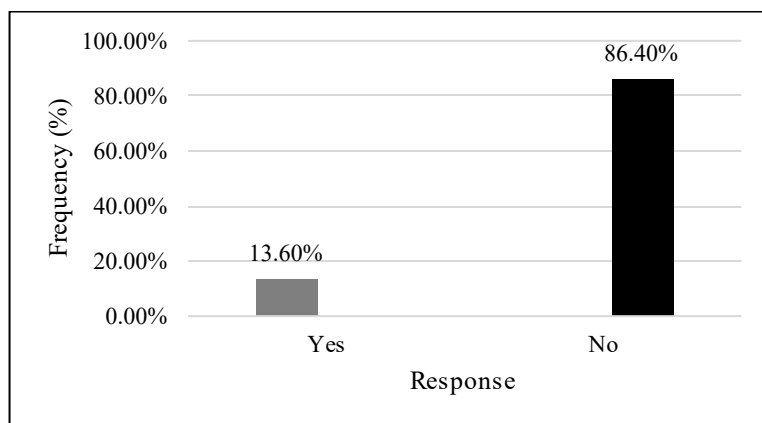


Figure 1. PREVALENCE OF DIETARY SUPPLEMENT USAGE (%) REPORTED BY PARTICIPANTS.

Table 2. USE OF DIETARY SUPPLEMENTS ACCORDING TO GENDER, AGE AND CLASS STANDING

Dietary supplement use	No, <i>n</i> (%) (<i>N</i> =76)	Yes, <i>n</i> (%) (<i>N</i> =12)	<i>p</i> value
Current course			
Health sciences	37 (48.7)	7 (58.3)	0.8
Non-health sciences	39 (51.3)	5 (41.7)	
Gender			
Male	21 (27.6)	0 (0.0)	0.06
Female	55 (72.4)	12 (100.0)	
Age, years			
17–19	25 (32.9)	6 (50.0)	0.30
20	15 (19.7)	4 (33.3)	
21	18 (23.7)	1 (8.3)	
22–27	18 (23.7)	1 (8.3)	
Class standing			
1st year	15 (19.7)	2 (16.7)	0.9
2nd year	18 (23.7)	3 (25.0)	
3rd year	43 (56.6)	7 (58.3)	

Dietary supplement knowledge

Table 2 presents DS usage based on gender, age and class standing. Results showed no significant difference in DS use between students from the SHS (58.3%) and the SLS (41.7%) ($p=0.8$). All female students in the study reported using DS, representing a 100% usage rate. However, no significant difference in DS use between female and male students was reported ($p=0.06$). Additionally, there were no significant differences in DS usage across age groups ($p=0.30$) or among students of varying class standings ($p=0.9$).

The DS knowledge of students from the SHS was significantly better than that of SLS (4.11 ± 1.63 and 3.36 ± 1.38 , $p=0.02$). Furthermore, responses from the SHS students showed better DS knowledge than those from SLS. Significantly more students from SHS correctly responded to the statement “the more protein you take, the more muscle you will build” compared with SLS students (75% SHS vs. 54.5% SLS; $p=0.045$). On the item “dietary supplements are regulated the same way as over-the-counter medications”, SHS students were more likely to answer correctly, compared with SLS students (45.5% SHS vs. 22.7% SLS; $p=0.03$).

Association between dietary supplement use and physical activity status

Participants who frequently (3–4 days/week) participated in physical activity had significantly higher DS intake compared with those who rarely exercise (41.7% vs. 16.7%; $p=0.03$). Conversely, 36.8% of participants reported not using DS rarely/never exercised, and another 36.8% of participants reported a low exercise frequency of 1–2 days per week (Table 3).

Table 3. RELATIONSHIP BETWEEN DIETARY SUPPLEMENT USE AND EXERCISE HABITS

Exercise frequency	Use of dietary supplements, <i>n</i> (%)		<i>p</i> value
	No (<i>N</i> =76)	Yes (<i>N</i> =12)	
Rarely/never	28 (36.8)*	2 (16.7)*	
1–2 days/week	28 (36.8)*	3 (25.0)	
3–4 days/week	16 (21.1)	5 (41.7)*	0.03*
>5 days/week	4 (5.3)	2 (16.7)	

*Significant difference ($p\leq0.05$).

Reasons for dietary supplement use

The most common reasons for engaging in physical activity among DS users were health (41.7%) and stress relief (41.7%). DS non-users' most common reasons for participating in physical activity were health (32.9%). However, no significant differences were found between DS users and non-users for any of the items concerned with reasons for exercising. Participants indicated the most common reasons to use DS were to boost energy levels, enhance physical performance and boost immunity.

Source of dietary supplement information

Participants indicated that the internet, friends, family members and pharmacists were common sources of information for DS (Table 4).

Table 4. SOURCES OF INFORMATION

Source	Frequency
Internet	8
Friend	7
Family member	7
Pharmacist	7
Book	6
Television	6
Medical doctor	6
Instagram	5
Blog	4
Coach	4
Dietician	4
Journal article	4
Magazine	4
Facebook	2
Twitter	2
Newspaper	1
Teacher/lecturer	1
Trainer	1
Other healthcare professional	0

DISCUSSION

Prevalence of DS use among university students

The current study showed 13.6% of students used DS. Similarly, students studying dietetics at the University of KwaZulu-Natal reported a relatively low prevalence of DS, at 23%. In the United Arab Emirates, DS prevalence among university students was 35.6% (Radwan *et al.*, 2019). These findings are consistent with other studies conducted at Jouf University and Princess Nourah Bint Abdulrahman University that reported low DS prevalence of 29.5% and 32.3% among students, respectively (Al Tamimi, 2019).

However, recent research has suggested that the use of DS among university students may be higher than the reported statistics (Lieberman *et al.*, 2015; Alfawaz *et al.*, 2017; Alowais & Selim, 2019; Vidović *et al.*, 2022). For instance, a study by Liu *et al.* (2018) reported that 58.9% of Chinese university students used DS. In five United States universities, approximately 60% of students reported using DS at least once a week (Lieberman *et al.*, 2015). This upward trend is observed in multiple studies worldwide, with more than 76.6% of students in Saudi Arabia reportedly using DS (Alfawaz *et al.*, 2017). Similarly, 65% of Egyptian

students were found to be using DS (Hegazy *et al.*, 2020). In Bangladesh, research found that private university students and pharmacy students were particularly likely to use DS, with motivations tied to perceived health benefits (Jahan *et al.*, 2021). In Lebanon, 68% of students reported using DS, with females more likely to do so than males (Lawand *et al.*, 2023). Among medical students at Tabuk University in Saudi Arabia, DS use stood at 50%, primarily for promoting general health and addressing nutritional deficiencies (Alatawi *et al.*, 2024). These variations indicate that there are numerous cultural and contextual factors which influence the uptake of DS among university students.

Academic field of study seem to have influence on DS usage. Health sciences students have been shown to exhibit higher likelihood of using DS than non-health science students (Liu *et al.*, 2018; Naqvi *et al.*, 2018). This trend is consistent with the results of the present study, where health science students demonstrated a higher prevalence of DS usage when compared with non-health science. This pattern might be attributed to their curriculum, which often emphasises health, wellness and nutrition. Similar findings were reported among pharmacy students in Bangladesh, where curriculum exposure appeared to influence DS use (Jahan *et al.*, 2021). However, some studies have noted lower DS usage among health science students compared with non-health sciences, highlighting the complex interplay of factors influencing DS use (Alowais & Selim, 2019).

While the role of age in DS use among university students remains underexplored, broader population studies suggest that individuals aged 40 and above tend to use more DS, primarily for health-related reasons, in contrast to younger individuals (Dickinson & MacKay, 2014; Gahche *et al.*, 2017). This trend may differ among younger university students, where factors such as physical activity levels, exposure to media and peer pressure might play significant roles in DS usage.

In this study, while the sample contained more female participants, there was no statistically significant difference in DS use between female and male students ($p=0.06$). The current study showed that females are more likely to use DS than males. However, a previous study has shown that females aged 18 years and older tend to use DS more frequently than their male counterparts (Li *et al.*, 2020). Other research has similarly indicated that female students have a higher DS usage and were more likely to use DS than male students (Alfawaz *et al.*, 2017; Alowais & Selim, 2019). For example, studies conducted among dietetics students at the University of KwaZulu-Natal also reported higher DS use in females than males, and Lebanese university students reported that females were more likely to use DS, primarily to enhance energy and vitality (Pillay & Pillay, 2019; Lawand *et al.*, 2023). Similarly, a study at Tabuk University found no significant demographic predictors of DS use, but females often exhibited positive attitudes toward DS (Alatawi *et al.*, 2024). Notable, males are commonly associated with protein supplements to gain muscle mass, while females use multivitamins (Aguilar-Navarro *et al.*, 2021; Sundgot-Borgen *et al.*, 2022), possibly due to greater concern about nutrient intake among women.

The reasons for using DS can vary across cultures, but there are consistent patterns in terms of motivations related to physical health, energy and immunity. In the present study, the most common reasons for DS use were “to boost energy level”, “to enhance physical performance” and “to boost immunity”. A similar trend was shown in a Croatian study, where maintaining

good health was the most common reason for DS use among students (Žeželj *et al.*, 2018). Similarly, Bangladeshi students cited general health and well-being as their primary motivations (Jahan *et al.*, 2021). At Tabuk University, motivations included addressing nutritional deficiencies and improving general health (Alatawi *et al.*, 2024), while Lebanese students prioritised energy and vitality (Lawand *et al.*, 2023). Strengthening the immune system, improving energy levels and enhancing physical health were the most common reasons for DS use among University of KwaZulu-Natal dietetics students (Pillay & Pillay, 2019). DS use among students is reportedly related to physical activity and the existence of health problems, although no health-related questions were asked in the current study (Radwan *et al.*, 2019). The literature suggests that health is a factor in students' use of DS, and maintaining health and well-being is a priority for this community (Lieberman *et al.*, 2015; Kobayashi *et al.*, 2017; Jovičić-Bata *et al.*, 2019; Lawand *et al.*, 2023).

Knowledge of dietary supplements of health science and non-health science students

The current study found that primary sources of DS information were the internet, friends, family members and pharmacists, in this order, among DS users in the current study. Similar findings also suggest that students' knowledge of DS is predominately obtained from media platforms (Lieberman *et al.*, 2015; Žeželj *et al.*, 2018). This trend extends to gym-going medical students, where a significant proportion of users also failed to consult dieticians or experts prior to supplement use, relying instead on informal sources (Sankar *et al.*, 2024). The choice of students in health and medical fields to use DS are rarely influenced by DS knowledge associated with medical evidence or literature (Bukic *et al.*, 2018). Similarly, a study in Bangladesh reported high prevalence and positive attitudes towards DS among undergraduate female students, with general health and physician recommendations cited as key motivations for use (Jahan *et al.* 2021). Sources of DS information that are considered more reliable within the scientific community, such as journal articles, medical doctors and dieticians, were rarely mentioned by the students. The rising popularity of DS, fuelled by aggressive media advertising and the widespread sharing of beliefs and knowledge over the past decade, may contribute to the underutilisation of evidence-based sources (Sirico *et al.*, 2018).

The advertised benefits of DS often overshadow the risks associated with using these supplements. Doping agents have been identified in the past through testing samples for sports drugs in DS products (Walpurgis *et al.*, 2020). These do not only violate antidoping rules, but also make unsuspecting consumers vulnerable to substances that may be harmful to their health. In some cases, the DS users were reportedly unaware that their DS products were contaminated with performance-enhancing prohibited substances. DS labelling information was perceived as unhelpful, as harmful active ingredients are not listed on the labels (Axon *et al.*, 2017). In contrast, studies conducted at the College of Medicine, University of Lagos, Nigeria, and a university in Jordan reported that many students trusted the labelling on DS as much as they trust over-the-counter (OTC) medications (Aina & Ojedokun, 2014; Elshahry *et al.*, 2023). In a Saudi Arabian university, similar results were reported, where more than half of the students believed that DS were safe (Alqrache *et al.*, 2021).

Health sciences students were more knowledgeable on DS than non-health sciences students in the current study. Similarly, literature suggests that students enrolled in health-related courses were more knowledgeable on DS (Bukic *et al.*, 2018; Naqvi *et al.*, 2018). In the current study, less than half (45.5%) of health sciences students believed that DS are not regulated the same way as OTC medications; while only 22.7% of non-health science students shared that sentiment.

Consistent with the current study, the existing literature indicates that students generally lack sufficient knowledge regarding DS products and their safe usage (Liu *et al.*, 2018; Alowais & Selim, 2019). It is recommended that students receive education regarding the safe use of DS and awareness of potential side effects associated with DS consumption (Alfawaz *et al.*, 2017; Alqrache *et al.*, 2021). However, it is noteworthy that, in most cases, significant differences in knowledge of DS have been shown between DS users and non-users (Radwan *et al.*, 2019). This study showed that knowledge of DS may be lacking amongst university students, irrespective of the course in they are enrolled in. Further, medical students in Saudi Arabia demonstrated positive attitudes toward DS but lacked knowledge about potential side effects, paralleling findings from this study (Alatawi *et al.*, 2024).

Association of dietary supplements with physical activity status

A significant association between exercise frequency and DS usage was reported in the current study. Approximately 41.7% of DS users exercised at least 3–4 days a week, with only 16.7% rarely/never exercising. By contrast, 36.8% of DS non-users rarely/never exercised, with a further 36.8% only exercising 1–2 days per week. Practising an active lifestyle is one of the determining factors for DS use among students, as seen in Jordanian and Egyptian university students, where moderate physical activity was a key factor (Aziz *et al.*, 2020; Elshahry *et al.*, 2023). According to Sirico *et al.* (2018), approximately 53.5% of students who used DS engaged in regular exercise, with a mean of 1.7 training sessions of 45 min. Furthermore, students who regularly exercise for longer periods (more than 300 min per week) were most likely to use DS (Hegazy *et al.*, 2020). In another study, students who used DS had a significantly higher metabolic equivalent of task (MET) min/week and higher total Kcal/week during physical activity (Martinovic *et al.*, 2021). However, DS use is not exclusive to physically active students (Sirico *et al.*, 2018).

The findings in this study suggest that students who are regularly physically active are more likely to use DS. Similarly, physical activity was associated with DS use among students at an Egyptian university. Students with the highest percentages of DS use reported moderate physical activity as a factor associated with DS use (Lieberman *et al.*, 2015; Jović-Bata *et al.*, 2019). Other studies have also suggested that a positive association exists between exercise and DS consumption exists (Alfawaz *et al.*, 2017).

The positive relationship between DS use and physical activity among university students has been associated with factors such as knowledge (Martinovic *et al.*, 2021). Physically active students and DS users had better general knowledge of DS than those who were less physically active and were DS non-users (Martinovic *et al.*, 2021). Although several studies, including the current study, have suggested a positive relationship between physical activity and DS use,

a recent study reported no positive association between physical activity and DS use (Erzurum Alim *et al.*, 2021).

Reasons for exercising showed no significant differences between DS users and non-users. However, the top two reasons for exercising among DS users were reported to be health reasons (41.7%) and stress relief (41.7%), while the most common reason for DS non-users was health reasons (32.9%). Approximately 30.3% of DS non-users reported that they do not exercise. Similar findings were reported by Sanker *et al.* (2020), where health and stress relief were equally common motivations for DS users, health dominated for non-users. To our knowledge, this is the second study to compare the reasons for exercising between DS users and non-users.

Limitations of the study

This study used purposive sampling, which restricts the generalisability of the results. To enhance representativeness, future studies should consider using random sampling techniques. Furthermore, it is noted as a limitation that the pilot study involved sport science students, who may have better knowledge of DS compared with students from other disciplines.

CONCLUSION

The study found a low prevalence of DS use among HS and NHS students at the University of Kwazulu-Natal Westville campus. Of the DS users, physically active participants tend to use DS more than physically inactive participants. The study also showed that a lack of DS knowledge was also evident among DS users. Therefore, there is a need for educational interventions to provide DS knowledge to the students, especially the physically active students. Such interventions will help the students understand the risks associated with the consumption of DS and the active ingredients of DS products.

Future research should focus on a larger and more diverse university populations within the South African context to help us better understand the prevalence of DS use, knowledge, and its association with physical activity status among university students in the South African context. Random sampling techniques should be employed to improve the generalisability of the finding and to explore other variables, such as socioeconomic and cultural factors, that may influence DS use among students.

Conflicts of interest

The authors declare no conflicts of interest regarding the research conducted and the publication of this article.

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