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ASSOCIATION BETWEEN SEDENTARINESS, EATING HABITS AND BODY COMPOSITION AMONG ESWATINI UNIVERSITY STUDENTS

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ABSTRACT

Sedentariness and varied eating habits influence body composition and increase the risk of developing lifestyle diseases. The study aimed to investigate the sedentary levels, eating habits and body composition of university students in Eswatini, as well as unpacking the association of body composition with sedentariness and eating habits. The study recruited 158 participants, 82 females with a mean age of 21.3±2.1 years and 76 males with a mean age of 22.2±2.48 years, using random sampling at the University of Eswatini, Kwaluseni Campus. A seven-day self-administered sedentary measurement questionnaire and the 24-hour diet recall questionnaire were administered, in addition to Body Mass Index (BMI) calculations. The students presented with high levels of weekday sedentary behaviours of 6.7±0.92 hours. A high daily carbohydrate of 7.1±2.81 servings and high meal intake of 3.7±0.99 servings were noted. Snacking habits were prevalent (36.8%). The majority of the students (95%) did not skip breakfast. There was a high prevalence of overweight and obesity (40.4%). The correlation between body composition and sedentary behaviours was positive, but not significant (r=0.146; p=0.068). Despite this weak correlation, the study confirms unhealthy behaviours amongst university students and highlights the need for health promotion intervention programmes for Eswatini university students.

***Key words*:** Body Mass Index (BMI); Breakfast intake; Dietary patterns; Health promotion programmes; Physical activity.

INTRODUCTION

Overweight and obesity are the fifth leading risk of global deaths and responsible for at least 2.8 million adult deaths (WHO, 2013). Most studies on sedentariness have focused on childhood and adult obesity in various settings, with little research conducted on university students in African settings (Tapera *et al*., 2017). This group of future leaders and key members of society is important for the socio-economic well-being of a country as they are regarded as role models (Tafireyi, 2017).

University students may encounter many challenges due to new responsibilities experienced with university life and the nature of the environment. These challenges may contribute to compromised eating habits, altered dietary patterns and sedentary behaviours, among others (Reyes, 2016). Sedentary lifestyles and poor eating habits are key drivers of illnesses, such as cardiovascular diseases and some types of cancers (Hai *et al*., 2017).

Sedentary behaviour is a crucial contributor to higher mortality rates, type 2 diabetes, and cardiovascular disease (Tafireyi, 2017). Zust (2016) argues that university students spend up to 72% of their day in sedentary states. Furthermore, a study by Pengpid and Peltzer (2014) on

a South African bivariate study, which analysed the correlation between physical inactivity and associated factors among university students, found that 33% of students engaged in low physical activity.

The dynamics of university life may lead to unhealthy habits, with poor eating habits being a major public health concern among young adults who experience transition into university (Gan *et al*., 2011). This trend has been observed in dietary patterns of Zimbabwean university students. Manwa (2013) reported changes to healthy eating due to the new challenging landscape of university life. These compromised dietary changes include a low nutrient intake, skipping breakfast, additional snacking and increased fast food intake (Manwa, 2013). A study in Malaysia concluded that medical students often skipped breakfast, thereby affecting their dietary patterns (Gan *et al*., 2011). However, the same study indicated that medical students had better dietary patterns compared to their counterparts undertaking other courses due to health education being part of their course (Gan *et al*., 2011). Furthermore, 33.3% of male students and 29.1% of female students consume fast food several times a week. Hakim *et al*. (2012) also confirmed unhealthy eating habits, mainly snacking fast foods among university students in Malaysia.

Similarly, studies among African university students in developing countries show a high prevalence of overweight and obesity, such as Nigeria 10%, Egypt 25.3–59.4% and South Africa 10.8–24% (Abolfotouh, 2007). The prevalence and factors associated with overweight and obesity among University of Botswana students were identified as a concern, as evidenced by a high prevalence of overweight and obesity of 36.8% in the study by Tapera *et al*. (2017).

Various factors contribute to the relationship between sedentary behaviour and body composition. Amongst these factors is study time, which is negatively associated with cardiovascular endurance but positively associated with hip flexibility and sedentary behaviour (Kutty *et al*., 2015). A study by Peterson *et al*. (2018) concluded that there was a lack of evidence to support a relationship between sedentary time and increased body composition.

Hakim *et al*. (2012) reported a correlative relationship between eating habits and body composition. However, in the study cited above, eating habits correlated with underweight body composition stratification among university students (Hakim *et al*., 2012). Contrarily, a similar study failed to establish a positive relationship even in the wake of unhealthy eating habits (Calestine *et al*., 2017). These researchers concluded that there was no association between eating habits and BMI in this cohort, which comprised of nursing students, even after confirming unhealthy eating habits (Calestine *et al*., 2017).

PURPOSE OF STUDY

The paucity of research on sedentariness, eating habits and body composition levels of university students necessitated an investigation on the above aspects for students in Eswatini. Decisions on possible behaviour changes that could affect lifelong health of students need to be based on empirical data, and establishing the relationship between behaviour change and lifelong health hence the purpose of this research.

METHODOLOGY

Participants

In this descriptive quantitative, cross-sectional, correlational research study design involving 2600 university students on the Kwaluseni campus, Eswatini, a sample of 235 students was

randomly selected, of which 158 voluntarily took part in the study. The sample size was used to reduce the margin of error to less than 5%, with a confidence level of 95%.

Measures

For the height measurement, a SECA stadiometer measuring to the nearest 0.1cm was used, according to the ISAK Manual protocol (ISAK, 2008). A Seca electronic scale measuring to the nearest 0.1kg was used to measure body mass. Height and weight measurements were used to calculate Body Mass Index (BMI) according to the protocol of Liang *et al*. (2014).

Standard norms of BMI were used to classify participants in BMI categories of underweight (<18.5 kg/m^2), normal (18.5-24.9 kg/m^2), overweight (25.0-29.9 kg/m^2) and obese (30.0kg/m^2). Sedentariness was measured by using a 7-day self-administered sedentary measurement questionnaire (SBQ) (Rosenberg *et al*., 2010). Eating habits were measured using a self-administered Multiple 24-hour diet recall questionnaire (NIH & NCI, 2018). These questionnaires were administered to establish the relationship between sedentary behaviour, eating habits and body composition.

Statistical analysis

The Sedentary Behaviour Questionnaire results, multiple 24-hour diet recall questionnaire and the anthropometric measurements were analysed using descriptive statistics, such as frequencies and percentages for the entire group stratified by gender. Inferential statistics were used to analyse the relationship between sedentariness and eating habits on body composition, and Pearson Chi-square were used to compare the different associations between the variables. For all statistical tests, a p-value of <0.05 was considered statistically significant. Data entry and statistical analysis were performed with the IBM SPSS Statistics version 16.

Ethical clearance

The study was approved by the University of KwaZulu-Natal, Biomedical Research Ethics Committee (UKZN-BREC). The required ethics courses, including good clinical practices, before being approved to conduct the study, were completed. The UKZN-BREC ethics approval number for the study was BE461/18.

RESULTS

Demographic profile

From the 235 students randomly selected to participate, 158 agreed and consented to participation, resulting in a 67% response rate. The sample comprised of 76 males and 82 females. The age range was 18–26 years, with a mean age of 22±2.29 years. Table 1 reveals that the majority of the students in the sample (58%) self-cater for their food. Twenty-two percent (22%) buy their food from the college refectory and 20% use both self-catering and the refectory. The trend is common across genders. All the participants in the sample (n=158) are resident at the campus. The larger group of the sample (58.2%) pursue courses in the Humanities Faculty.

Table 1. **CHARACTERISTICS OF STUDENTS (N=158)**

Variable		Number	Percentage
Gender	Male	76	47%
	Female	82	53%
Main meal source	Self-cater	91	58%
	Refectory	67	42%
Residential status	Resident at campus	158	100%
Degree studies	Humanities & Social Science	92	58%
	Commerce	31	20%
	Computer science	14	9%
	Science & Engineering	21	13%

According to the BMI norms (ACSM, 2014), most of the students in this sample had a BMI in the normal category, 24.7±5.4kg/m^2. The mean BMI for the male and female participants were respectively 24.3±0.11kg/m^2 and 25.03±0.17kg/m^2. High levels of sedentary behaviours were noted amongst university students included in the sample. As indicated in Table 2, the minimum number of hours spent sitting or being sedentary was five hours and the maximum nine, with the average being between 6.72±0.92 hours.

Table 2. **SEDENTARY BEHAVIOUR OF STUDENTS (n=158)**

Behaviour	Minimum	Maximum	M±SD
Weekday sedentary hours	5	9	6.7±0.92
Weekend sedentary hours	4	9	6.3±0.99

Table 3 shows that positive eating habits were found in the breakfast intake of the participants, with most (93%) taking breakfast daily and 7% skipping breakfast. The students in the sample consumed *carbohydrates***,** with a minimum of two servings a day and a maximum of 15 servings and a mean of seven servings. In this sample, university students included very few foods from *dairy products*, ranging from zero to two portions a day. Another unhealthy eating habit common among university students was the lack of a *fruit intake* where fifty-three percent (53%) of the sample (n=85) did not take any fruit serving at all, while a mean intake of one serving of *vegetables* was noted, The majority of students had more than *three meals a day*. A smaller percentage of the students (4.4%) took six meals per day, while 9.4% had two meals. The average number of meals per day amounted to 3.72±0.99. The mean *snacking* was one serving for the group. A mean intake of one serving of *vegetables* was noted as 1.06±1.113 and the mean *protein* serving intake of the current study was 1.94±0.97.

***Table 3*. EATING HABITS OF STUDENTS**

Variable	Minimum	Maximum	M±SD
Breakfast	0	1	0.93±0.26
Carbohydrates	2	15	7.09±2.81
Diary food	0	2	0.56±0.56
Fruit	0	4	0.62±0.80
Number of meals	2	6	3.72±0.99
Snacking	0	3	1.13±0.97
Vegetables	0	10	1.06±1.11
Proteins	0	4	1.94±0.97

A positive, non-significant and weak correlation between body composition and weekday sedentary behaviours was observed (r=0.146; p=0.068) for all the participants (Table 4).

***Table 4.* RELATIONSHIP BETWEEN BODY COMPOSITION (BMI) AND WEEKDAY SEDENTARY BEHAVIOUR (WAB)**

Group	BMI (kg/m^2)	WAB (hours)	N/n	r	p-value
Total group	24.7	6.70	158	0.146	0.068
Males	24.3	6.72	76	0.085	0.466
Females	25.0	6.72	82	0.192	0.083

There was a non-significant relationship of body composition with the following eating habits: snacking, nutrient intake (protein, vegetables, dairy, carbohydrates, fruits), and breakfast intake. A non-significant relationship of body composition with the number of meals per day for all the participants was noted (Table 5).

***Table 5.* RELATIONSHIP BETWEEN BODY COMPOSITION (BMI) AND NUMBER OF MEALS PER DAY**

Group	BMI (kg/m^2)	No. meals pd	N/n	r	p-value
Total group	24.7	3.7	158	0.033	0.683
Males	24.3	3.6	76	-0.178	0.123
Females	25.0	3.8	82	0.007	0.952

Due to the high frequency of carbohydrate intake of 7.09±2.81 servings (Table 3), the correlation coefficient was tested between body composition and carbohydrate intake. A non-significant, weak negative relationship (r= -0.077; p=0.336) between body composition and carbohydrates intake for the whole group was established (Table 6).

Table 6. RELATIONSHIP BETWEEN BODY COMPOSITION (BMI) AND DAILY CARBOHYDRATE INTAKE (DCI)

Group	BMI (kg/m^2)	DCI	N/n	r	p-value
Total group	24.7	7.00	158	-0.077	0.336
Males	24.3	7.29	76	-0.113	0.332
Females	25.0	6.90	82	-0.170	0.126

DISCUSSION

The participants recorded *sedentary behaviours* with a mean of 6.3 hours during the weekend and a mean of 6.7 hours for weekdays. This result corroborates the findings of Zust (2016), who concluded that young adults at Iowa State University led a primarily sedentary lifestyle, possibly due to the dynamics of university life. Factors promoting sedentary behaviours among university students include the structure of lectures, long hours of studying and researching, among others (Zust, 2016).

The participants from the current study consumed a minimum of two servings of *carbohydrates* a day and a maximum of 15 servings, with a mean of seven servings. Kaczmarek *et al*. (2017) found that the daily food ratios of female and male students were incorrectly balanced and characterised by a high amount of total and animal protein, phosphorus, vitamin A, cholesterol and insufficient intake of carbohydrates, dietary fibre, and vitamin C.

Research by Alakaam *et al*. (2015) indicates that a high carbohydrate intake among university students may indicate some changes in their dietary or eating habits due to limited food availability and access. It is concerning, as university students need physical and mental strength, which enables them to meet the daily demands of their academic work and achieve their healthy goals as well.

The mean of 1.9 servings for *protein* intake in this study is 24%-37% which is below the recommended Australian Dietary guidelines (NHMRC, 2015) for both men and women. Researchers also observed that most students might not meet the daily nutrient requirement from their food selection (Papadaki *et al*., 2007; Manwa, 2013). Protein intake is important, as protein consumption enables muscle synthesis and repair, which reduces the amount of muscle loss from breakdown (Potgieter, 2013; Williamson, 2016). Although not investigated in this study, the low protein intake may be related to economic factors and affordability. Another researcher reported that college students' barriers to eating healthy are primarily time and money (Reyes, 2016). The finding is supported by Varela-Mato *et al*. (2012), who discovered unhealthy habits prevalent among Spanish university students due to several factors, including time and resources.

Lack of calcium in the body, which comes from *dairy products*, may lead to loss of Bone Mineral Density (BMD) (Meier, 2018). In this sample, university students included very few foods from dairy products, ranging from zero to two portions a day, with a mean of 0.55 servings. According to the Australian Dietary Guidelines (NHMRC, 2015), both men and women should consume at least 2½ servings of dairy foods selected from milk, yoghurt and cheese.

The mean *vegetable* intake was less than one serving per day in the current study. The Australian Dietary Guidelines (NHMRC, 2015) recommend an intake of six servings of vegetables for men, and five for women, selected from vegetables and legumes. Micronutrients

play a central part in food metabolism and maintaining tissue function (Shenkin, 2006). Low vegetable intake can thus be regarded as a poor eating habit. The findings of this study correspond with those of Varela-Mato *et al*. (2012), who found that university students have unhealthy habits, including poor food choices.

In this study, the mean *fruit* intake was less than one serving per day, with 47% taking at least one serving of fruit per day. This finding contrasts with the recommendations of the Australian Dietary Guidelines (NHMRC, 2015) that recommends a fruit intake of two servings. The findings of Manwa (2013) imply that they do not consume many fruits as part of their diets. The low fruit intake by the participants in this study is concerning when considering the findings of a study by Pem and Jeewon (2015), who associated low intake of fruits and vegetables with chronic diseases, such as cardiovascular diseases, high blood pressure, hypercholesterolemia, osteoporosis, many cancers, chronic obstructive pulmonary diseases, respiratory problems, as well as poor mental health.

Breakfast skipping is associated with poor nutrient intake and low energy requirements for the day (Mfrekemfon & Okey-Orji, 2015). At least 93% of the participants from the current study took breakfast daily. The findings of this study contrast with the findings of Musaiger (2015), who reported that more than 50% of the health science Bahrain student participants did not consume breakfast daily.

A smaller percentage of the students (4.4%) took six meals per day, while 9.4% took two. In this study, the average *number of meals* per day amounted to 3.7. The intake of at least three regulated meals per day during the usual times of breakfast, lunch and supper is highly commendable and a positive eating habit to avoid nutrient deficiency. This is supported in the findings of a similar study by Manwa (2013).

Students from the current study had an average of one *snack* per day. A study by Reyes (2016) confirms that poor eating habits tend to cluster, as individuals who engage in other poor eating habits generally engage in other poor eating behaviours, such as an increase in fast food consumption and lower physical activities. Thus, snacking between meals might have a ripple effect of influencing other bad eating habits, such as taking foods with high saturated fat levels. However, the type of food being eaten and the quantities, might minimise the effect of snacking. The selection of unhealthy food, high cost of healthy foods and the ease of availability of fast food may negatively impact university students' eating (Gan *et al*., 2011).

Although the average *BMI* of the participants in this study (54%) falls into the normal weight category, 40.4% of the BMI of the participants collectively falls within the overweight and obesity category. However, the mean BMI does not explain the prevalence of *overweight and obesity* (AHA, 2016). This finding might be attributed to the fact that some well-trained people with dense muscle mass may have a high BMI score with very little body fat, and for them, the waist circumference, the skinfold thickness, or more direct methods of measuring body fat may be more useful measures (AHA, 2016). On the other hand, a person can have a healthy BMI but still carry weight in his/her belly, which can increase their risk for heart disease (AHA, 2016).

Although the relationship between body composition and sedentary behaviours were positive and non-significant to justify the effect of sedentary behaviours on body composition amongst this sample of university students, the results agree with another study, which found a positive and non-significant relationship between sedentary behaviours and a high body composition (Tapera *et al*., 2017). The study by Tapera *et al*. (2017) further concluded that overweight and obesity were found to be higher among physically inactive students, 48.3%, as compared with 21.3%, who were physically active.

A weak relationship between body composition and sedentary behaviours among university students was also established by Peterson *et al*. (2018), who reported a lack of evidence to support a relationship between higher amounts of sedentary time and increased body composition. However, they did not dismiss the relationship between body composition and sedentary behaviours or the influence of sedentary behaviours on body composition. Peterson *et al*. (2018) highlighted that the findings, however, should not be taken to imply that sedentary behaviours do not negatively affect body composition. They further argued that several reasons may account for this seemingly paradoxical result.

The results of the study indicated a positive, insignificant correlation between the number of meals per day and body composition. In contrast, Hakim *et al*. (2012) established a positive and significant relationship between body composition and eating habits among university students, though, in their study, a high prevalence of underweight was reported.

LIMITATIONS

The study was carried out at one campus (Kwaluseni campus) that was purposively selected, making generalisability of findings on body composition of university students not possible. Body Mass Index (BMI) measurements used to estimate body composition was another limitation as it is not an objective indicator of body composition. However, it does give a quick baseline estimate of body composition, generating quick results about the prevalence of underweight, overweight and obesity. BMI is also inexpensive and convenient to administer, and the results can easily be used for intervention programmes.

CONCLUSION

The student cohort showed some characteristics of poor health habits as manifested by high sedentary levels, poor eating habits and a high prevalence of overweight and obesity. Both sedentary behaviours and eating habits had weak, insignificant relationships with body composition. This finding was not to suggest that sedentary behaviours and eating habits do not affect body composition, but there could be other factors that were not researched in this study. Sedentary lifestyles and poor eating habits are major drivers of lifestyle illnesses, such as cardiovascular diseases and the findings of this study underscore the need for health promotion programmes in African countries to address the unhealthy habits of both Eswatini university students and students from other African countries. This is important, not only as they are regarded as future leaders, but for the socio-economic well-being of a country.

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Conflict of interest

The authors declare no conflict of interest and the study did not receive any external funding.

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