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## THE NUTRITIONAL CONTENT OF THE FOOD SUPPLIED BY FOOD VENDORS TO STUDENTS IN A SOUTH AFRICAN UNIVERSITY

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## ABSTRACT

University students often overlook the nutritional content of the food supplied by food vendors, either due to lack of knowledge or being unable to afford the variety of nutritious foods. With the relentless threat of the corona virus (Covid-19) lurking over South Africa and the ongoing search for a vaccine postulating that underlying health risks including diabetes and obesity may be an impediment in the fight of this pandemic, good nutrition is now essential. There is, therefore, a need to provide insight on food consumption and purchasing behaviours in South Africa with particular reference to the youth. Food vendors provide convenient access to affordable meals for university students. Whether the food provided is balanced or not is unknown. This study was, therefore, carried out to examine the nutritional value of the foods sold to university students by food vendors that were contracted to the four campuses of the Durban University of Technology (DUT). Utilising the qualitative approach, technical information was sourced using an observation technique and a structured menu recording sheet. Thus, data was collected by weighing the cooked and pre-cooked items individually to provide accurate nutrient assessment using an electronic food scale. Whilst this study only focused on the macronutrients, it was found that the nutritional value of foods served by these vendors was not balanced due to the fact that the top 15 meals contained more than the World Health Organisation's (WHO) recommended fat 15-30% contributing to energy. Furthermore, the contribution of carbohydrates (CHO) was less than the recommended percentage of 55-75%. Notably, the students who consumed two or three of the top 15 meals in a day exceeded the recommended intake of fat and energy for that day revealing a high probability that university students can be overweight. This study recommends a menu improvement and a strong collaboration between the food vendors and the university's Department of Food and Nutrition to develop healthier menu options and assist students in making informed decisions regarding their health and consumption behaviours. The main limitation of this study is that it only focussed on the macronutrients as recommended by WHO of the most popular meals, this study still provides valuable insight into student nutrition and contributes to food consumption patterns by university students.

**Key words:** Nutrition, obesity, overweight, food vendors, university students, eating behaviours, energy, fat

## INTRODUCTION

The popularity of food vending and street food has grown at a rapid pace and, South Africa is no different as food vendors represent 14.6% of total non-agricultural employment in the country. Several studies have been conducted in many countries to assess the quality of different street foods which has proven as positive causes of food-borne illnesses [1, 2, 3, 4]. Other research in South Africa identifies that these foods are often unhealthy as a result of being high in saturated fat, trans fats, salt and sugar, which are energy dense and may contribute to the increasing trends of obesity [5, 6]. In light of this argument, there is a paucity of studies relating to the nutritional value of foods sold by vendors in South Africa, more especially food vendors that target university students. Similarly, a recent study postulates that dietary behaviours which eventually result in obesity are associated with accessibility and affordability of foods [7], and food vendors are often a source of inexpensive and convenient access to a meal in university grounds.

However, more often than not, these meals from food vendors are limited in their nutritional value. Notably, commercially prepared food contains less fibre and more saturated fat, than meals which are prepared at home, and the concern is that there is an increase in takeaway consumption in young adults particularly following university enrolment [8]. Other researchers support this concern that the environment within the educational institution has a huge impact on students' food choices [9,10,11]. Similarly, university students are well known for 'nutritionally poor food choices' which include eating unhealthy snacks, avoiding important meals like breakfast, as well as eating food high in sugars, sodium and saturated fat [12,13].

In line with this concern, the coronavirus 2019 (Covid-19) pandemic has forced the world to be more mindful of their hygiene as well as their nutrition. Whilst good hygiene is imperative to survive the Covid-19 pandemic, a strong immune system with good nutrition and healthy eating habits are ways to prevent infection of the virus whilst in anticipation of the Covid-19 vaccine to be developed [14]. For this reason, the issue of nutrition will become prevalent. This paper aims to assess the nutritional value of food sold to university students by food vendors. Therefore, the objective of this paper is to provide a deeper understanding of the nutritional quality of food from food vendors sold to university students, and subsequently contribute to the food vending literature which is scarce from a higher education perspective.

## STUDENTS' NUTRITION

Students often neglect eating nutritious meals because of their busy schedules and the limited time available to sit down and enjoy a meal resulting in the consumption of junk food [15]. This is often the case with many university students. Furthermore, physical dormancy and unhealthy eating behaviours are among the leading implications that have unfavourable effects on weight in young adults, and subsequently the well-being of adults [16]. Most of the institutions of higher learning rely on cafeterias, canteens, tuck shops and street vendors for the provision of food. Notably these food provision places encourage poor food behaviour resulting in obesity [15, 17]. A

previous study in the United States discovered that the main factors contributing to student's unhealthy diets are: financial constraints, dining out regularly, time limitations, peer pressure, weight consciousness, change in living agreements and lack of proper nutritional knowledge [18]. Similarly, in European countries it was found that students not residing with parents are more susceptible to poor eating behaviour also due to financial constraints [19].

Researchers stipulate that energy and nutrient requirements are larger during the youth stage than in any other time of life [20]. In light of this, the Nutrition Society of South Africa (NSSA), in conjunction with the Association for Dietetics in South Africa (ADSA) and the Department of Health (DoH) approved the eleven South African Food Based Dietary Guidelines (FBDG); which are meant to boost a healthy lifestyle for all South Africans. Therefore, the South African FBDG is intended to modify eating behaviour of the general population that incorporates optimal diets that meet energy and nutrient requirements and simultaneously striving against the development of non-communicable diseases [21].

It was advised that a variety of foods should be consumed including fruits, vegetables, dairy products, fish, chicken, lean meat and be physically active, consume starchy food regularly, all whilst avoiding food and drinks with high sugar and salt content [22]. However, the healthy kinds of food stuffs are out of the financial reach of the average university student. Similarly, it was noted that several models are required when establishing the nutritional needs of students [23]. Whilst the World Health Organisation (WHO) and the Food and Agriculture Organisation (FAO) created the universal standards of food value and nutrient guidance, there are studies that show that in low-income environments the low cost of fast foods and high calorie snacks have been found to be one of the barriers to dietary adherence [24, 25]. The South African Demographic and Health Survey (SADHS) revealed that South African women between the ages of 20-24 years old have a high rate of 20.1% obesity and 32.8% overweight [26]. Supporting this revelation was the fact that Times Live broadcasting that South Africa is among the top unhealthiest countries in the world to live in followed by Brazil, Indonesia and the United States [27]. Furthermore, a study in Bangladesh indicates that fast food preference and food habits of university students can become addictive resulting in obesity and a public health concern [28]. In the social context of eating, these commercially prepared convenience foods actually promote the consumption of larger portions and higher energy-dense foods as compared with eating meals cooked at home [29].

Other studies on university students' food purchasing behaviours revealed that first year students add an average weight of 3.3kg due to poor diet selections and regularly dining out, whilst additional causes of being overweight included peer pressure, being home sick, absence of support and lack of cooking resources [30]. Interestingly, researchers have established that female students were more overweight than males as female students exercise less and consume more chocolate/candy items and less quantity of fruits and vegetables [31,32]. Furthermore, research supports that students not residing at home have bad eating habits [33].



Looking into other arguments on students eating behaviours suggest that students with nutrition knowledge are more likely to make better choices and differentiate between good and healthy fats [34]. A study in a Nova Scotia university indicated that fourth year students consumed fewer grams of total and saturated fat compared to first year students, which emphasizes the significant role nutrition knowledge plays in improving university students' food choices. Similar results were noted in studies amongst Texan and Croatian university students, where significant relationships were found between the students' dietary intake and their nutrition knowledge [32, 35].

In South Africa, the main cause of obesity in Black African people is the move from the old traditional foods that were high in fibre and low in fat, to dairy and meat products that have excessive levels of vegetable oils and saturated fats [36,37]. Moreover, the lack of exercise intensifies the growth rate of obesity and also increases the risk of acquiring cardiovascular and chronic diseases [32].

## MATERIALS AND METHOD

### *Design and sampling*

This paper employed the qualitative approach to locate its nutritional findings. An observation technique was employed and utilised a structured menu recording sheet.

A total of 16 food vendors contracted to DUT surrounded the four campuses of the university. However, only 15 of these vendors prepared hot meals. Thus, 15 vending structures at the university were targeted for the purpose of measuring the nutritional content of the prepared hot food being sold.

It needs to be noted that majority of the students residing outside Durban live in student residences owned by the Institution. Furthermore, a large percentage of students at DUT depend on National Student Financial Aid Scheme (NSFAS) to fund tuition and accommodation costs. As part of the Financial Aid package, students also get meal allowances. Therefore, students granted financial aid by NSFAS can purchase food from all the food vendors on campus as well as from the nearby franchise stores using the student card. This results in limited selection of food that is nutritious because students are interested in purchasing food that is cheap, filling and easily attainable in order to rush to the next class. Although the purchased meal may not have been fully consumed due to time constraints between classes, it is most likely that the student will save the same left over meal for another time, be it for supper or breakfast the next morning.

Vending structures did not specialise in selling and preparing the same menu items. Thus, the top fifteen menu items served by these vendors were identified by managers and food handlers and subsequently were purposefully selected (Table 1). Popular food items were classified as meals that were regularly consumed by students, ranking high in sales because of affordability, portion sizes and heavy filling. Meals were analysed according to the highest energy (kJ) content.

### ***Data collection***

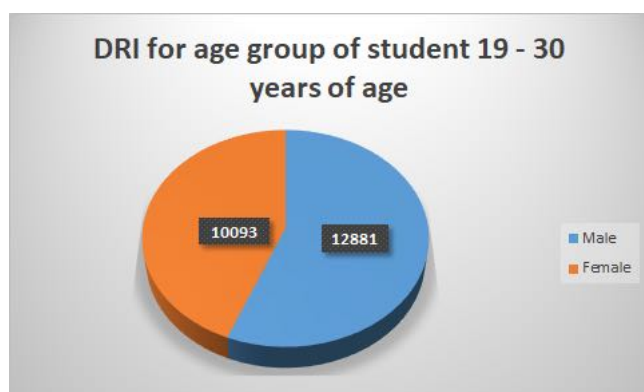
Before data could be collected, the necessary permissions were sought. The Institutional Research Committee (IREC) within DUT was consulted for ethical clearance (Ethics number 078/13) in conjunction with the Human Sciences Research Council (HSRC) guidelines. Additional individual written consent from each vendor was obtained before data could be collected on the day. Subsequent to these permissions, data was collected over a two-month period prior to the Covid-19 pandemic, in 2016.

The menu recording sheet was developed to determine macronutrients for comparisons to daily requirement intake (DRI) of the students (Figure 1) and to examine nutritional value of the food served by food vendors [32]. Food vendors were approached at the start of their day, as the weighing of food items was mainly conducted early in the morning before the stall got busy and in the afternoons when most of the students were gone. Therefore, this process took up to 6 to 8 hours to complete dependent on how busy the food vendors were. Each highlighted popular menu item was analysed once from each food vendor. Subsequently, cooked and pre-cooked items were weighed individually to provide accurate nutrient assessment using an electronic food scale (Scales 2000; Model ACS-Micro CW, 1g – 30kg) in order to regulate portion sizes. Food items were served on standardised take-away packaging, and the weight of the packaging was measured and recorded separately. For example, boerewors roll served with chips: each item that was on the boerewors roll and the portion of chips was weighed separately, and recorded on the menu evaluation sheet

### ***Data Analysis***

The menu items (Table 1) were analysed using the Food Finder 3 software of the Medical Research Council (MRC) [38]. FoodFinder3 is a data capture program which provides the researcher with the tools to convert food intake data into energy and nutrient(s) intake [38]. It can also be utilized for the nutrient analysis of the data. The data was presented in macronutrients for comparisons to DRI of the students (Figure 1).

## **RESULTS AND DISCUSSION**



**Figure 1: The DRI for students [25]**

Figure 1 illustrates that the daily energy requirements for students aged 19-30 years is 12 881 kJ for men and 10 093kJ for women [32]. Previous researchers recommend that South Africa should have policies that have accentuates healthy lifestyle and healthy body weight [39].

Viewing Table 1, it presents the top 15 meals categorized according to kJ content, starting with the highest to the lowest. Table 1 also presents the energy contribution of each meal by the macronutrients fat, proteins, carbohydrates (CHO) and fibre as recommended by WHO. It was recommended that the energy contribution of fat is 15–30%; CHO is 55-75% and protein 10–15% [40]. The total mean energy content of the meals was around 6012 kJ. The meals add about 47% of Dietary Reference Intake (DRIs) of energy requirement for men and about 60% for women. Meals #1-8 contribute about 51% of the energy requirement for a day for men and 65% for women, whilst meals #9-15 contribute about 42% of energy required for men and 53% of energy for women. Notably, this study has discovered that the male students on an average are consuming up to 14% more kJ than instructed, and female students are consuming up to 27% more kJ than instructed. A study in British University regarding student food preferences and availability revealed that male students purchased food higher in energy than their female counterparts [33]. Recent studies argue that regular eating of such high-energy meals can result in being overweight and obesity among the youth [41, 42].

The average energy contribution made up by fat between meals 1–15 is 45.63%, which is excessive compared to the proposed percentage of (15-30%). The results demonstrate similar findings to the study conducted in a Malaysian medical school where the researchers uncovered that university student's food intake is generally high in fat [43]. Both these results contravene the WHO healthy diet key fact, which specify that to avoid unhealthy weight gain, total fat should not surpass 30% of total energy [40]. Additional studies indicate that when it comes to differentiating between good and healthy eating habits, students with nutrition knowledge are more likely to make better choices [32, 34, 35].

Table 1 also notes the price of each meal that were in the top 15 category. It is evident that the meals were priced from R5.00 and did not exceed the R65.00 range to appeal to the students, especially if they were on the NSFAS package, which is not uncapped scheme. For example, a meal allowance of R1500.00 is allocated monthly to the students for the duration of ten months. This allowance needs to be managed and stretched throughout the month. Analysing these prices reveals that university life seems to be the advancement to poor nutritional lifestyle. Especially considering the food from the vendors are on University grounds making it readily accessible. It is also apparent that a student's main priority is buying food that is fairly low-priced and filling using the NSFAS meal allowance card, without considering the nutritional value of the food item. Literature from both US and European countries acknowledge that financial constraints are more susceptible to poor eating behaviour [18,19].

Meal 1 (grilled meat combo) has the highest energy contribution of 63.50%, meal 15 (chicken curry meal) has the lowest contribution of 34.12%. On the other hand, meal 14



(mutton burger –34.59%) and 15 (chicken curry –34.12%) were the closest to the proposed percentage of energy contribution of fat for the meal. All meals (1-15) were remarkably below the required percentage of (55-75%) on the CHO content, meal 14 (mutton burger) had the largest percentage of 49.86%, while meal 13 (Russian sausage foot long) had the minimum of 31.04%. Despite being served with stiff pap, meal 1 (grilled meat combo) was surprisingly low in CHO content with 18.69%.

The average energy contribution of protein was 15.36%, and most meals were close to the required percentage of 10-15%. Out of the 15 meals, meal 15 (chicken curry) had the maximum percentage of 22.97% and meal 5 (vetkoek) had the minimum percentage of 8.03%. The difference of the protein between the two meals could be accredited to the fact that chicken is naturally a source of protein while vetkoek is rich in CHO because of its ingredients. The boerewors roll meal had a total fat contribution of 47.76% which exceeds the recommended percentage of 15-30%. Despite being a source of protein, it had a low protein content of 8.39%. Beef and mutton burger were the only two meals that fell within the specified percentage of (10-15%) of protein as suggested by WHO [40] with (12.17% and 13.50%) correspondingly.

After examining the macronutrients in Table 1, it was clear that the meals served by vendors at DUT were nutritionally imbalanced. Comparatively, a study in Sri Lanka found that the quality of meals served by the university canteens is below average [44]. As a result, high fat meals were of great concern, as there were possibilities of obesity, cholesterol, high blood pressure and heart disease, which are non-communicable diseases (NCDs). Similar research in Britain shared the same view about unhealthy diet of British university students [33]. Previous research has demonstrated that being a university or college student can be a traumatic experience, and that has a negative influence on eating habits. Subsequently, individuals living in a stressful environment have a tendency of eating more as a way of coping with stress [41, 42].

## CONCLUSION

The aim of this study was to examine the nutritional value of the food served by food vendors to university students in and around DUT campuses. Thus, this paper further examined the macronutrients for the purpose of determining the nutritional value of the food consumed. The results of this study presented evidence that the nutritional value of food served by vendors was not nutritionally balanced. All top 15 meals had more than the WHO's recommended 15-30% fat contributing to energy, and carbohydrates (CHO) contribution was smaller than the recommended percentage of 55-75% and that could be attributed to portion control when plating. Furthermore, it is evident if students consumed two or three of the top 15 meals during a day exceeded the recommended intake of fat and energy for that day. Moreover, information obtained from this study uncovered that university life exposes students to a poor nutritional lifestyle which may embellish if the food vendors continue to offer their current convenience prepared food to the students and the surrounding community. Thus, a menu change would be recommended where food vendors can collaborate with the university's Department of Food and Nutrition to formulate a healthy and affordable menu to be offered by DUT vendors. Therefore, assisting students in making informed

decisions about healthy eating and improve students' choices and the nutritional status of the students. The main limitation of this study is that it only focussed on the macronutrients of the most popular meals as recommended by WHO, therefore, future research could investigate this aspect with a rigorous methodological approach. Also considering that this study examined the food sold by food vendors from single institution the findings still provide valuable insight into student nutrition and contributes to nutrition literature respectively. Future research can take on multiple higher education institutions in different parts of the country and including street food vendors not contracted to universities and particularly focusing on the importance of nutrition and its fight against Covid-19.

**Table 1: Top 15 meal items ranked according to kilojoule content**

WHO Goal % of total energy			15-30%	55-75%	10-15%	
1. Grilled meat - Beef brisket (180g) and Boerewors (180g) served with stiff pap (350g).	710g	6908	63.50	18.69	17.65	R50.00
2. Chicken wrap (158g chicken + 131g wrap) with grated carrots (21g), shredded lettuce (21g) and sliced cheese (28g) served with French fries (187g).	551g	6876	50.99	32.56	16.48	R35.00
3. Roasted chicken (230g) served with French fries (355g) and lettuce (12g) and tomato (11g) side salad.	608g	6657	45.95	35.24	18.94	R35.00
4. Boerewors roll (89g boerewors + 60g roll) served with French fries (355g).	504g	6637	47.76	43.76	8.39	R30.00
5. Vetkoek (plain)	426g	6492	42.97	48.97	8.03	R5.00
6. Beef burger (102g burger patty + 66g burger bun) served with French fries (355g).	523g	6427	42.45	45.37	12.17	R25.00
7. Roasted Chicken (225g) served with French fries roll (280g + 60g).	565g	6299	42.14	37.66	20.13	R45.00
8. Vetkoek (372g) served with polony (28g) and sliced processed cheese (14g).	414g	6222	46.03	44.79	9.05	R8.00
9. Beef curry (332g) served with maize meal (289g) and butternut (50g).	671g	5703	46.14	36.40	17.20	R50.00
10. Beef Curry (304g) served with maize meal (268g) butternut (62g), beetroot (50g), mixed fresh vegetables (45g) and potato (68g) salads.	797g	5594	40.58	43.83	15.74	R60.00
11. Giant Toasted Bacon (82g) and egg (94g) sandwich (149g) served with French fries (100g)	425g	5554	47.56	36.03	16.26	R28.00
12. Beef curry (332g) served with maize meal/ samp / rice, (370g) and salad (grated carrots (12.5g), pineapple (12.5g), raisins and orange juice (12.5g + 12.5g))	752g	5391	47.48	35.09	17.31	R65.00
13. Russian (167g) foot long (101g) served with French fries (100g).	368g	5240	52.23	31.04	16.59	R30.00
14. Mutton burger (83g patty + 123g bun) grated carrots (20g) shredded lettuce (20g) served with French fries (217g).	463g	5130	34.59	49.86	13.50	R35.00
15. Chicken curry (409g) served with rice (344g) and beetroot (50g) salad.	803g	5050	34.12	41.35	22.97	R40.00
<b>Mean</b>	<b>572g</b>	<b>6012</b>	<b>45.63</b>	<b>38.71</b>	<b>15.36</b>	

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