

Dietary Pattern and Body Composition Anthropometric Indices Among Biochemistry Undergraduate Students in Katsina; A Cross-Sectional Study

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ABSTRACT

University students often experience changes in dietary habits due to increased independence and exposure to diverse food environments influencing dietary patterns and body composition with potential implications for future health outcomes. This study assessed dietary pattern and body composition anthropometric indices among biochemistry undergraduate students of Federal University Dutsin-Ma, Katsina State. A cross-sectional descriptive study was conducted among 100 biochemistry undergraduate students selected through convenience sampling. Dietary pattern was assessed using modified 11-item food frequency questionnaire covering major food groups. Body mass index (BMI), body fat percentage, muscle composition, visceral fat and resting metabolism were measured using an Omron BF511 body composition monitor. Daily consumption was highest for oil (54%), spices and condiments (53%), cereals (42%), vegetables (34%) and sweets (32%). Dairy products (34%), beverages (32%), and fruits (25%) were predominantly consumed 3–4 times weekly, while roots and tubers (42%), legumes (34%) and poultry (29%) were mostly consumed 1–2 times weekly. Most students (79.0%) had normal BMI, while 13.0%, 6.0%, and 2.0% were underweight, overweight and obese respectively. Males had significantly higher muscle composition ($p < 0.001$) and resting metabolism ($p < 0.001$) while females had higher body fat percentage ($p < 0.001$). Nearly all respondents (99.0%) had normal visceral fat levels. Students demonstrated dietary pattern characterized by frequent consumption of cereals, vegetables, oils, spices, and sweets. Although majority had normal BMI and visceral fat, significant gender differences existed in body composition parameters. Continuous nutrition education is recommended to encourage healthier dietary choices and prevent future nutrition-related disorders.

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INTRODUCTION

Diet plays a fundamental role in promoting and maintaining good health (Al-Mutairi *et al.*, 2022). It is closely associated with several major causes of morbidity and mortality worldwide, including diabetes mellitus, coronary heart disease, stroke, atherosclerosis, and certain forms of cancer (Jackson and DiPlacido, 2020). Evidence from numerous studies has shown that dietary intake can either increase or reduce the risk of developing these conditions, highlighting the crucial role of nutrition in health maintenance and longevity (Ramón-Arbués *et al.*, 2021). Dietary pattern refers to the overall combination, quantity, quality, diversity, and frequency of foods and beverages consumed by an individual. It also encompasses meal timing, eating locations, and habitual food choices (DCAG, 2015). Healthy dietary patterns are generally characterized by increased consumption of fruits, vegetables, legumes, whole grains, fish, and low-fat dairy products. They further reflect food preferences, preparation methods, cooking practices, and meal-serving habits. Consequently, dietary patterns provide valuable information about the availability and nutritional quality of foods consumed by individuals and populations (Idialu and Uwameiye, 2024).

Transitioning to University life often leads to significant changes in eating behaviours and lifestyle practices. Many students gain greater independence from family supervision and consequently adopt dietary habits that differ from those practiced at home. Exposure to diverse social environments and increased autonomy may encourage behaviours that negatively affect nutritional status. In many cases, students rely heavily on convenient and inexpensive fast foods because of limited time, financial constraints, and easy accessibility (Omaga and Omuemu, 2018). University campuses typically provide a wide variety of food outlets, catering services, student residences, and food-related activities that collectively shape dietary preferences and food choices among students (Shaw *et al.*, 2018; Middha *et al.*, 2021). Recognizing this influence, the World Health Organization has identified universities as important settings for promoting healthy dietary behaviours among young adults during a critical stage of personal development (Hasan *et al.*, 2021). Body composition assessment provides valuable information regarding nutritional and health status and contributes to the diagnosis and management of various diseases. The quantity and distribution of body tissues are closely linked to health outcomes across all age groups (Liang *et al.*, 2018). Body composition is influenced by multiple factors, including age,

sex, genetics, socioeconomic status, nutrition, disease conditions, and environmental factors (Abubakar and Shehu, 2022). Body mass index (BMI) remains one of the most widely used indicators for assessing overweight and obesity (Gandy, 2014). Similarly, body fat percentage is useful for evaluating chronic disease risk (Arisa *et al.*, 2020), while visceral fat accumulation has been associated with metabolic syndrome and other cardiometabolic disorders due to ectopic fat deposition in vital organs (Borel *et al.*, 2018). Resting metabolism reflects the minimum amount of energy required to sustain essential physiological functions and is largely determined by lean body mass (Woods *et al.*, 2018). Muscle composition is also an important indicator of health, as adequate muscle mass contributes to maintaining amino acid balance during periods of nutritional stress, whereas muscle depletion has been associated with increased mortality risk (Abubakar and Shehu, 2022).

The University years represent a crucial period during which lifelong dietary habits are formed. The diverse ethnic, social, and cultural backgrounds within University communities, coupled with increased independence, expose students to a wide range of dietary practices. Continuous assessment of dietary behaviours among this population is therefore essential. Although several studies have examined the nutritional status of University students, there is limited information regarding the dietary patterns and body composition characteristics of students at Federal University Dutsin-Ma. Consequently, this study was conducted to assess dietary patterns and body composition anthropometric indices among biochemistry undergraduate students of the institution. The study hypothesized that the dietary patterns and body composition anthropometric indices of biochemistry undergraduate students may vary within the study population.

MATERIALS AND METHODS

Study Area and Design

Dutsin-Ma LGA in Katsina state is located on latitude 12°26' 00"N and longitude 07°29' 00"E. It shares boundary with Kurfi and Charachi LGAs to the North, Kankia LGA to the East, Safana and Dan-Musa LGAs to the West and Matazu LGA to the South-east. The area has an approximate land mass of 552.3 km² with a population of 169,829 (Liberty and Bello, 2021). A cross-sectional descriptive based study was conducted using convenience sampling to assess dietary pattern and anthropometric indices. The inclusion criteria comprised of biochemistry undergraduate students of Federal University Dutsin-Ma willing to participate. Those with complications or severe concomitant diseases that require specific medical treatment were excluded from the study.

Sample Size Determination

This study was a secondary analysis of data obtained from a larger cross-sectional study that investigated "Dietary diversity, dietary habits, dietary pattern, anthropometric indices and anaemia related outcomes among Biochemistry undergraduate students of Federal University Dutsin-Ma". A total of 100 participants were included in the parent study. The sample size was determined based on available resources and logistical considerations and all participants recruited into the parent study were included in the present analysis.

Ethical Approval and Informed Consent

Ethical approval was obtained from Katsina State Ministry of Health and the ethical number MOH/ADM/SUB/1152/1/1038 was assigned. Participants were given informed consent after which they were duly briefed about the research. The provision of the Helsinki declaration was respected at every step of the study.

Data Collection

Assessment of Dietary Pattern

A semi-structured questionnaire was used to collect data from respondents as described by FAO, (2018) with some modifications. A modified 11-item food frequency questionnaire was used to assess the dietary pattern. The frequency of intake of 11 food groups was assessed, namely: dairy, poultry, cereals, legumes, roots and tubers, vegetables, fruits, oil, spices, beverages and sweets. Each food group had a choice of 6 frequencies, namely: daily, 3-4 times per week, 1-2 times per week, 1-3 times per month, less than once a month (seldom) and never.

Assessment of Anthropometry

For anthropometric data collection height of the study participants was measured using a stadiometer to the nearest 0.1 cm by a tape measure as described by Abubakar and Shehu, (2022). The height and age were inputted into a Body Composition Monitor (Omron, BF511, Japan) and body mass index, resting energy expenditure, body fat, muscle composition and visceral fat were recorded. BMI (kg/m²) of respondents was categorized into underweight (<18.5), normal (18.5-24.9), overweight (25.0-29.9) and obese (>30.0). Body fat (%) was categorized into low (<21.0), normal (21.0-32.9), high (33.0-38.9) and very high (>39.0). Muscle composition (%) was categorized into low (<24.3), normal (24.3-30.3), high (30.4-35.3) and very high (>35.2). Visceral fat (%) was categorized into normal (1-9), high (10-14) and very high (15-30). Resting Energy Expenditure (kcal/day) was categorized into four quintiles; Q1 (<1270), Q2 (1270-1342), Q3 (1343-1474) and Q4 (>1474).

Statistical Analysis

Data was analyzed using STATA Statistics Data Analysis software version 15.0 (Texas, USA). Data was expressed as frequency and percentage. Chi-square test was used to examine the association between qualitative variables. P-values <0.05 were considered significant.

RESULTS AND DISCUSSION

Dietary Pattern of Undergraduate Students in Federal University Dutsin-Ma, Katsina

Figure 1 shows the dietary pattern of undergraduate students in Federal University Dutsin-Ma Katsina. The most consumed foods daily include: Oil (54%), Spices and condiments (53%), Cereals (42%), Vegetables (34%) and Sweets (32%). The most consumed foods 3-4 times per week are: Dairy (34%), Beverages (32%) and Fruits (25%). And the most consumed foods 1-2 times per week include: Roots and tubers (42%), Legumes (34%) and Poultry (29%).

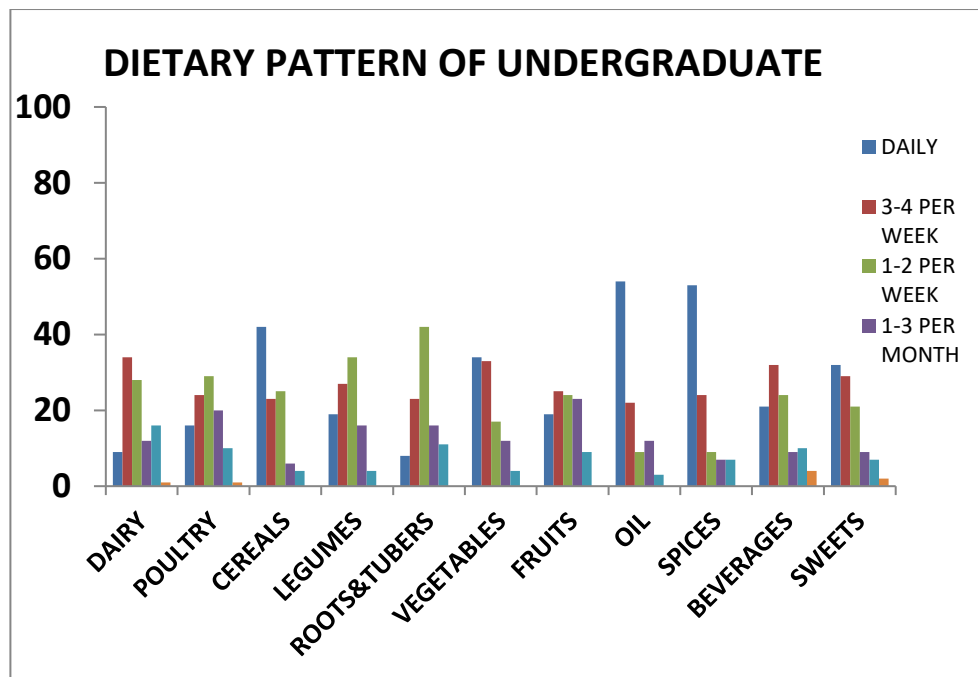


Figure 1: Dietary Pattern of Undergraduate Students in Federal University Dutsin-Ma, Katsina

Dietary Pattern of Male Undergraduate Students in Federal University Dutsin-Ma, Katsina

Figure 2 shows the dietary pattern of male undergraduate students in Federal University Dutsin-Ma Katsina. The most consumed foods daily are: Oil (60%), Spices and condiments

(56%), Cereals (42%), Vegetables (40%), Sweets (34%), Beverages (26%) and Fruits (22%). The most consumed food 1-2 times per week include: Roots and tubers, Legumes, Poultry and Dairy with frequencies 38%, 36%, 36% and 26% respectively.

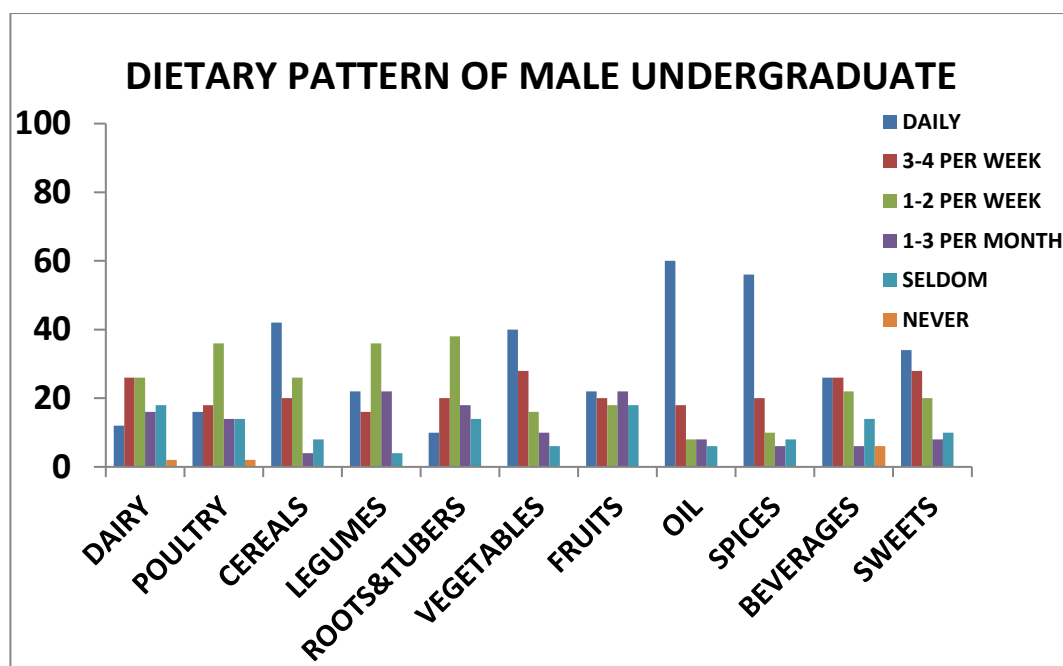


Figure 2: Dietary Pattern of Male Undergraduate Students in Federal University Dutsin-Ma, Katsina

Dietary Pattern of Female Undergraduate Students in Federal University Dutsin-Ma, Katsina

Figure 3 shows the dietary pattern of female undergraduate students in Federal University Dutsin-Ma Katsina. The most consumed foods daily are: Spices and condiments (50%), Oil

(48%), Cereals (42%) and Sweets (30%). The most consumed foods 3-4 times per week include: Dairy (42%), Legumes (38%), Vegetables (38%), Beverages (38%) and Poultry (30%). The most consumed foods under 1-2 times per week are Roots and tubers (46%) and Fruits (30%).

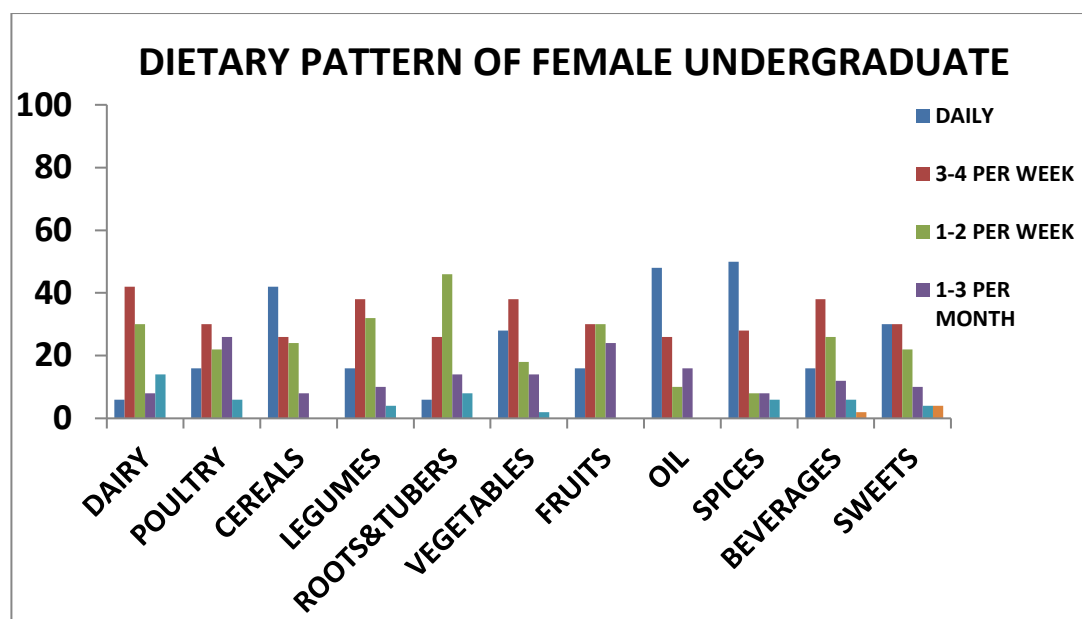


Figure 3: Dietary Pattern of Female Undergraduate Students in Federal University Dutsin-Ma, Katsina

Table 1: Body Composition Anthropometric Parameters of Undergraduate Students in Federal University Dutsin-Ma, Katsina

Parameters	Total (n=100)	Male (n=50)	Female (n=50)	Chi ²	P
Body Mass Index (kg/m²)					
Underweight	13(13.0)	6(12.0)	7(14.0)	2.1908	0.534
Normal	79(79.0)	41(82.0)	38(76.0)		
Overweight	6(6.0)	3(6.0)	3(6.0)		
Obese	2(2.0)	0(0.0)	2(4.0)		
Resting Metabolism (kcal)					
Q1	24(24.0)	0(0.0)	24(48.0)	72.0615	0.000
Q2	26(26.0)	4(8.0)	22(44.0)		
Q3	25(25.0)	22(44.0)	3(6.0)		
Q4	25(25.0)	24(48.0)	1(2.0)		
Body fat (%)					
Low	43(43.0)	38(76.0)	5(10.0)	49.8931	0.000
Normal	37(37.0)	12(24.0)	25(50.0)		
High	17(17.0)	0(0.0)	17(34.0)		
Very high	3(3.0)	0(0.0)	3(6.0)		
Muscle Composition (%)					
Low	5(5.0)	1(2.0)	4(8.0)	72.8416	0.000
Normal	38(38.0)	2(4.0)	36(72.0)		
High	11(11.0)	3(6.0)	8(16.0)		
Very high	46(46.0)	44(88.0)	2(4.0)		
Visceral fat					
Normal	99(99.0)	50(100.0)	49(98.0)	1.0101	0.315
High	1(1.0)	0(0.0)	1(2.0)		

Values expressed as n(%)

Table 1 shows the body composition anthropometric parameters of Undergraduate Students in Federal University Dutsin-Ma, Katsina. With respect to BMI (79%) and visceral fat (99%) most study participants were classified as normal. Only 13% were underweight, 6% were overweight and 2% were obese. With respect to body fat most males (76%) have a low body fat whereas half of the females (50%) have a normal body fat. With respect to muscle composition majority of the males (88%) had a very high muscle composition and majority of the females (72%) had a normal muscle composition. There is a strong significant association between males and females with respect to resting metabolism, body fat and muscle composition.

Discussion

This study evaluated the dietary patterns and body composition anthropometric indices of undergraduate students at Federal University Dutsin-Ma, Katsina State. The findings showed that cereals, oils, spices and condiments, vegetables, and sweets were the food groups most frequently consumed on a daily basis. In contrast, dairy products, beverages, and fruits were consumed moderately, while roots and tubers, legumes, and poultry were consumed less frequently. These findings reflect dietary patterns commonly reported among University students in Nigeria, where cereal-based meals dominate because they are affordable, culturally

accepted, and readily available. Similar trends have been documented among students in southern Nigeria, where food choices were influenced primarily by convenience and accessibility within the University environment (Omaga and Omuemu, 2018).

The predominance of cereal consumption and relatively low intake of legumes observed in this study agrees with the findings of Arisa et al. (2020). Legumes often require longer preparation times and greater fuel expenditure compared to cereals and root-based foods, which may discourage frequent consumption. Although vegetables were consumed relatively often, fruit intake remained comparatively low. Similar patterns of inadequate fruit and vegetable consumption have been reported among University students in Nigeria, Cameroon, Saudi Arabia, Croatia, and China (Al-Rethaiaa et al., 2010; Nola et al., 2010; Niba et al., 2017; Haq et al., 2018; Omaga and Omuemu, 2018). Since fruits and vegetables provide essential vitamins, minerals, dietary fibre, and protective phytochemicals, inadequate intake may increase vulnerability to nutrient deficiencies and chronic diseases. Economic constraints, availability, convenience, and personal preferences have been identified as key determinants of fruit consumption among University students (Ramón-Arbués et al., 2021; Solaja et al., 2025). The scarcity of fruit vendors and the relatively high cost of fruits may further contribute to reduced consumption among students (Arisa et al., 2020).

The frequent consumption of sweets, oils, and condiments observed in this study may indicate increasing exposure to energy-dense dietary practices among young adults. Such dietary behaviours are often linked to the availability of processed foods, irregular eating schedules, and lifestyle changes associated with University life. Excessive intake of foods rich in sugar and fat has been associated with increased risks of obesity and diet-related non-communicable diseases (Hasan et al., 2021). This is particularly important in the Nigerian context, where the burden of nutrition-related chronic diseases continues to rise and poses a threat to national health and development goals (Fregene et al., 2025). Assessment of body composition revealed that most participants had normal BMI values, suggesting an overall healthy weight status. Similar findings have been reported among undergraduate populations in Nigeria, where the majority of students fell within the normal BMI range despite varying dietary behaviours (Omaga and Omuemu, 2018). The relatively low prevalence of overweight and obesity in this study may be related to the youthful age of participants, greater engagement in physical activities, and lower levels of sedentary behaviour compared with older adults. Significant differences were identified between male and female students regarding resting metabolism. Males generally exhibited higher resting metabolic rates than females, a finding that is physiologically expected because resting energy expenditure is strongly influenced by fat-free mass and skeletal muscle mass, which are typically higher in males (Woods et al., 2018). Similarly, marked sex differences were observed in body fat percentage and muscle composition. Female students had higher body fat levels, whereas male students exhibited greater muscle mass. These findings are consistent with established biological differences in body composition and align with previous studies that reported higher adiposity among females and greater lean body mass among males (Liang et al., 2018). Hormonal influences, body fat distribution, and differences in physical activity patterns may account for these variations. The finding that almost all respondents had normal visceral fat levels suggests a relatively low risk of cardiometabolic disorders within the study population. Elevated visceral fat has been strongly

associated with insulin resistance, cardiovascular disease, and metabolic syndrome. Therefore, the low prevalence of abnormal visceral fat observed may reflect the generally healthy metabolic status and young age of the participants (Borel et al., 2018).

Overall, the findings indicate that while most students maintained favourable body composition profiles, dietary practices characterized by frequent consumption of sweets and fats alongside low fruit intake may pose long-term health risks if sustained. Because dietary behaviours established during young adulthood often persist later in life, University-based nutrition education and health promotion programmes remain essential.

CONCLUSION

The findings of this study indicate that cereals, oils, spices and condiments, vegetables, and sweets were the most frequently consumed food groups among undergraduate students of Federal University Dutsin-Ma, whereas fruits, legumes, poultry, roots, and tubers were consumed less often. Most students exhibited normal BMI and visceral fat levels, reflecting generally satisfactory nutritional status. Nevertheless, significant sex-related differences were observed in resting metabolism, body fat percentage, and muscle composition. Although the overall body composition profile of the respondents was favourable, the frequent intake of energy-dense foods and relatively low fruit consumption underscore the need for continuous nutrition education and interventions that promote healthier dietary choices. Such efforts may contribute to the prevention of future nutrition-related chronic diseases and support long-term health among University students.

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None

CONFLICT OF INTEREST

There is no conflict of interest.

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