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Research Article

Assessment of Nutritional Status and Its Related Factors among Undergraduate Students in Juba University, Sudan

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Abstract: The objective of this study was to assessing the nutritional status and its related factors among undergraduate Sudanese University students. As a cross-sectional research, the present study was conducted with the participation of 200 students (111males and 89females) from University of Juba, Sudan . The relevant information was obtained through the anthropometric measurements, a 24-hour diet recall questionnaire were taken for these students. Also, biochemical measurements were taken for 147 students. Majority of the students (61%) were of normal Body Mass Idex (BMI) , 25%, and 14% were underweight, and overweight/obese, respectively. The findings showed that the mean daily intakes of energy, and iron (females only) were less than the RDA(Recommended Dietary Allowances) values. The results showed that 24.49% of the students were anemic, 14.97% iron deficiency anemia, and 3.40% iron deficiency. Hence, a significant relationship was observed between BMI and monthly income, parent's level of education, father occupation, mother occupation, and household size, number of meals, number of snacks, soft drink taken per day, Appetite during exam period, duration daily activities, watching television, anemia ($p< 0.05$). Regarding BMI categories, some of malnutrition including both underweight and overweight /obese were observed among the students, both these cases are to be considered. Examining the consumed food indicated qualitative and quantitative deficiencies as compared with standard recommendations. The hemoglobin measurement indicated high prevalence of anemia among the students.

Keywords: Undergraduate Students, Juba University, Sudan.

INTRODUCTION

Nutritional status is the sum total of an individual's anthropometric indices as influenced by intake and information obtained by physical ,biochemical ,and dietary studies (Durnin and Fidanza,1985; &Omage, Omuema 2018) .It is a result of interrelated factors influenced by quality and quantity of food consumed and the physical health of the individual .An adolescent's nutritional status has important implications for his health ,development of several chronic diseases ,and plays a key role in breaking the cycle of malnutrition (Omage, Omuema 2018).The transition from adolescence to adulthood is an important period for establishing behavioral patterns that affect long-term health, weight gain, and chronic diseases risk (Meg *et al.*,2012)(Edmonds *et al.*, 2008) (Pullman *et al.*, 2009).University students seem to be the most affected by this nutritional transition (Baldini,Pasqui,Bordoni,&Maranesi,2009) .

In other words, in addition to the significant psychosocial instabilitycharacteristic of adolescence and young adulthood, entering the university environment provides new social relations and the adoption of new behaviors Brumboiu *et al.*, 2018) ,such as different eating patterns ,physical activity ,and smoking , which can interfere with the physical, social and biological formation of this group and may make these individuals vulnerable to health problems (Van den Berg *et al.*, 2012). Studies have reveal that university students show low prevalence of healthy eating with a high intake of fat, carbohydrates, and added sugar and a low intake of milk, fruits, and vegetables (Al-Rewashdeh,2010, Martinez-Alvarez *et al.*, 2015; Musaiger *et al.*, 2016). Such practices, associated with a low level of physical activity, may contribute to increasing prevalence of obesity in this population (Delvarianzadeh *et al.*, 2016). Notwithstanding, few studies have investigated the nutritional status of university students and its related factors in Sudan. Such data could be useful in guiding the planning and implementation of health interventions at the university –an institution considered to be important in forming student's habits (Costa 2013). The objective of this study, therefore, was to investigate the nutritional status and its related factors among undergraduate students in Juba University in Sudan.

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MATERIALS AND METHODS

This was across sectional, descriptive study conducted on 200 students at the college of community studies and rural development, university of Juba, Sudan(111males and 89 females), This represented 26% of total students in the college of community studies and rural development (770 students). The data were collected during march to June 2005, through a questionnaire.

A self –reported validated was used to gather the data .Detailed information on the reliability and validity of the questionnaire has been published elsewhere (Musaiger *et al.*, 2011).

The questionnaire consisted of information on socio-demographic characteristics, dietary habits, anthropometric measurements, physical activity, and biochemical measurements (Hemoglobin, and ferritin). Anthropometric measurements were taken with the respondents wearing light clothes and no shoes.

Weight was measured to the nearest 0.1 kg using seca scale, the scale was zeroed before the respondent stopped into it. The respondents were asked to remove any heavy items from their pockets, and remove any heavy items of clothing or apparel.thy were asked to look straight ahead and stay still on the scales .The body weight (kg)was measured to the nearest 0.1kg.

Height was measured in full standing position to the nearest 0.1 cm using a portable stadiometer (Peltzer 2018). Body mass index (BMI); was used to determine the nutritional status, it calculated as the weight in kilograms divided by the square of the height in meters. It is classified according to the WHO 2000(AL-Rethaiaa *et al.*, 2010) classification criteria for adults as underweight (BMI less than 18.5) normal (18.5- 24.9), overweight (25-30) ,and obese (BMI above 30) (WHO 2012) .

The dietary information's were investigated with a 24-hour diet recall (based on three consecutive days), and food frequency questionnaire (Hall *et al.*, 2009). In the 24-hour diet recall questionnaire, the students were asked to recall and report their consume food material during the previous 24 hour including drinks and dietary complements. Since this questionnaire relies on the respondent's memory, the food frequency questionnaire was implemented to reduce the errors that might have arisen from the first questionnaire (Delvarianzadeh *et al.*, 2016,shaneshin *et al.*,l 2013).The recall method for assessing food consumption in the following manner :upon obtaining information from the students and with due consideration of the standard requirements for each students, the relevant values were calculated from the raw and cooked food composition tables (Boutros 1986) .These tables present analysis of 100 g samples for all nutritional compositions (raw and cooked) used in various Sudanese dishes . The mean food intake values had been duly recorded, some items such as the amounts of food intake, i.e. carbohydrates, proteins, and other nutrients were calculated and compared with the recommended dietary allowance(RDA) values.

The biochemical measurements, Hemoglobin, and ferriten) level was assessed using the sahli's Haemoglobin ometer. According to WHO guidelines hemoglobin concentration of <11.5g/dl (female),< 13g/dl (male) was considered as anemic (WHO/UNICEF/UNU 1998), and frriten concentration of < 12microgram/letter (female and male) was considered as iron deficiency (Indian 2004,Fisher1992).

Student of other college except the Juba university college of community studies and rural development will be excluded from the study .None of the studied female were pregnant or breast feeding at the time of the study .At the same time, the students who had diseases such as diabetes, hypertension, etc., were excluded from the study.

SPSS (version 21) was used to analyze the data. The differences between mean of age, height, weight, Body Mass Index (BMI), Hemoglobin (HB), frriten, and energy intake in females and males were tested for significance using Independent t-test. To know about the nutritional status of participants according to gender in table (2) chi-squared test was applied. In table 4, correlation coefficients were obtained using Pearson's correlation. To know about the Prevalence of Anemia, Iron deficiency anemia, and Iron deficiency according to sex in table (5) chi-squared test was applied. In table 6, relation between BMI and anemia was obtained using chi-squared test. The significance level was set at $p< 0.05$.

RESULTS

Overall, 200 students were studied. The anthropometric characteristics of students are shown in table 1 .mean ±SD of age, height, weight, BMI, HB, frriten, and energy intake was 23.28±2.53year, 168.69±11.95cm, 59.63±10.59kg, 21.19±0.78, 13.45±2.56g/dl, 78.71±77.51, and 1974±750.35,respectively. A significant difference was observed in age, height, weight, BMI, , HB, Ferritin , and energy intake between male and female students (p 0.05).

Table 1. Gender-specific anthropometric characteristic of participants

Variables (Mean± SD)	**Total (n=200)**	**Female (n= 89)**	**Male (111)**	**P- value**
Age(years)	23.28±2.53	22±1.8	24.42±2.43	0.001
Height	168.69±11.95	161.7±10.3	174.21±10.14	0.001
Weight	59.63±10.59	56.4±10.7	62.20±9.76	0.001
BMI	21.19±0.78	21.8±3.8	20.64±3.67	0.022
	(n=147)	(n=71)	(n=76)	0.001
HB	13.45±2.56	12.15±2.6	14.64±1.9	
	(n=147)	(n=71)	(n=76)	
Ferritin	78.71±77.51	36.95 ±33.43	119.94 ±81.81	0.001
Energy Intake	1687±750.35	1699.861± 760.075	1670.231 ±599.89	0.001

The nutritional status of participants according to gender is given in table 2. Of participants, 61.0%were at normal weight, whereas25%of them were underweight .The prevalence of overweight &obese was slightly higher among females (19.11%) than males((9.91%).there was significant difference between males and females regarding BMI ($p < 0.05$).

Table 2. Nutritional status of participants according to gender

Nutritional status	**Male N (%)**	**Female N (%)**	**Total N (%)**
Underweight	32 (28.83)	18 (20.22)	50 (25)
Normal	68 (61.26)	54 (60.67)	122 (61)
Overweight& Obese	11 (9.91)	17 (19.11)	28 (14)

Sig = 0.04 Chi Square=4.45

Table 3.presents the mean daily intake of some nutrients. According to these findings, in both sexes, the mean daily consumption of protein was adequate. However, the mean carbohydrate consumption was very high .Nevertheless, the total caloric intake was below the RDA. The mean iron consumption in male students was more than RDA standard, but in female was less than RDA standard .

Table 3. Mean and SD of nutrients intakes

Nutrients	**Female**	**Standard for Female**	**Male**	**Standard for Male**
Protein (g/d)	55.138±22.176	46	59.154± 29.642	56
Fat (g/d)	80.560±48.624	-	83.702±56.246	-
Carbohydrate(g/d)	211.552±73.401	130	214 .654± 66.832	130
Energy(k ca /d)	1699.861± 760.075	2403	1670.231 ±599.89	3067
Iron (mg/d)	10.5 ± 3.8	18	11.4±3	8

The associations between BMI categories and some factors of socio-economic status, Eating Habits, Physical activity are presented in table 4. As is shown in the table ,a significant association was observed between BMI categories and all presented factors except- Specialty, Breakfast intake, place of breakfast intake, and type of snake ($P < 0.05$).

Table 4. mean of BMI according to some characteristics of subjects and association between BMI categories and these characteristics

Characteristics	mean of BMI	BMI Categories			Total N (%)	P-value
		Underweight N (%)	Normal N (%)	Overweight/Obese N (%)		
Socio-economic						
Specialty						
Communication	19.93	8(4.00)	21(10.50)	1(0.50)	30(15.00)	
Library	21.25	4(2.00)	7(3.50)	2(1.00)	13(6.50)	
Rural development	21.35	20(10.00)	54(27.00)	16(8.00)	40(20.00)	
Community studies	21.42	8(4.00)	20(10.00)	6(3.00)	34(17.00)	0.063
General	21.58	10(5.00)	20(10.00)	3(1,50)	33(16.50)	
P – value 0.108						
Father Education						
Illiterate	20.33	9(4.50)	11(5.50)	2(1.00)	22(11.00)	
Khalowa	20.07	7(3.50)	26(13.00)	6(3.00)	39(18.50)	
Primary	20.88	6(3.00)	25(12.50)	3(1.50)	34(17.00)	
Intermediate	20.35	16(8.00)	21(11.50)	5(2.50)	42(21.00)	0.003
Secondary	21.08	8(4.00)	19(9.50)	5(2.50)	32(16.00)	
University/Post	22.30	4(2.00)	20(10.00)	7(3.50)	31(15.50)	
P-value .0.000						
Mother Education						
Illiterate	20.78	19(9.50)	37(18.50)	7(3.50)	63(31.50)	
Khalowa	12.38	8(4.00)	23(11.00)	4(2.00)	35(17.50)	
Primary	21.40	12(6.00)	30(15.00)	9(4.50)	51(25.50)	
Intermediate	21.38	4(2.00)	19(9.50)	4(2.00)	27(13.50)	0.048
Secondary	21.10	2(1.00)	7(3.50)	1(0.50)	19(9.50)	
University/Post	22.22	2(1.00)	2(1.50)	1(0.50)	5(2.50)	
P-value .0.034						
Father Occupation						
Unemployed	20.82	**17(8.50)**	**25(12.50)**	**8(4.00)**	50(25.00)	
Retired	21.75	**1(0.50)**	**2(1.00)**	**1(0.50)**	4(2.00)	
Worker	20.52	**11(5.50)**	**35(17.50)**	**3(1.50)**	49(24.50)	
Officer	21.48	**11(5.50)**	**29(14.50)**	**8(4.00)**	48(24.00)	0.015
Business	21.90	**10(5.00)**	**31(15.50)**	**8(4.00)**	49(24.50)	
P-value 0.038						
Mother Occupation						
House wife	21.07	35(17.50)	83(41.50)	22(11.00)	140(70.00)	
Retired	21.88	3(1.50)	12(6.00)	2(1.00)	17(8.50)	
Worker	19.81	7(3.50)	9(4.50)	0.00	16(8.00)	0.001

Officer	22.17	3(1.50)	13(6.50)	2(1.00)	18(9.00)	
Business	21.55	2(1.00)	5(2.25)	2(1.00)	9(4.50)	
P-value .0.016						
Family monthly income(SD)						
Less than 10000	21.88	15(7.50)	41(20.50)	5(2.50)	61(30.50)	
10000-20000	21.48	18(9.00)	33(15.50)	10(5.00)	61(30.50)	
20000-30000	21.75	10(5.00)	21(10.50)	8(4.00)	39(19.50)	0.001
More than 30000	21.55	7(3.50)	17(8.50)	12(6.00)	39(19.50)	
P- value 0.003						
Family Size						
Less than or equal 3	19.71	2(1.00)	8(4.00)	4(2.00)	14(7.00)	
4-6	20.78	23(11.50)	56(23.00)	10(5.00)	89(44.50)	
More than or equal 7	21.77	25(12.5)	58(29.00)	14(7.00)	97(48.50)	0.009
P- value 0.001						
Eating Habits						
Number of meals/day						
` Less than three	19.93	15(7.50)	48(24.00)	5(2.50)	68(34.00)	
Three	21.75	28(14.00)	56(28.00)	20(10.00)	104(52.00)	
more than three	21.77	7(3.50)	18(9.00)	3(1.50)	28(14.00)	0.001
P- value 0.000						
Breakfast intake						
Daily	22.55	28(14.00)	65(32.50)	20(10.00)	113(65.50)	
Infrequently	21.11	20(10.00)	55(27.00)	2(1.00)	80(40.00)	0.071
Never	19.80	2(1.00)	2(1.00)	3(1.50)	7(3.50)	
P-value 0.012						
Place of breakfast						
At home	19.90	15(7.50)	52(26.00)	3(1.50)	70(35.00)	
At university (cafeteria)	22.50	35(17.50)	70(35.00)	25(12.50)	130(65.00)	0.063
P-value 0.061						
Number of snacks (week)						
One	19.93	15(7.50)	48(24.00)	5(2.50)	68(34.00)	
Two	21.75	28(14.00)	56(28.000	20(10.00)	104(52.00)	0.000
Three	21.77	7(3.50)	18(9.00)	3(1.50)	28(14.00)	
P-						

value 0.012						
Type of snacks						
Juices/Biscuits	21.88	15(7.50)	41(20.50)	5(2.50)	61(30.50)	
Soft drinks	22.48	18(9.00)	33(16.50)	10(5.00)	61(30.50)	0.095
Sweets /Chips	22.89	10(5.00)	21(10.50)	8(4.00)	39(19.50)	
Nuts	21.10	7(3.50)	17(8.50)	12(6.00)	39(19.50)	
P – value 0.065						
Appetite during exam period						
Low	20.19	12(6.00)	9(4.50)	3(1.50)	24(12.00)	
Moderate	21.42	25(12.50)	85(42.50)	20(10.00)	130(65.00)	0.000
High	22.11	13(7.50)	28(14.00)	5(2.50)	46(23.00)	
P- value 0.000						
Physical activity						
Duration of exercise(min/day)						
Less than 30	22.67	25(12.50)	22(11.00)	15(7.50)	62(31.00)	
30	21.91	17(8.50)	7(3.50)	10(5.00)	97(48.50)	0.03
More than 30	20.12	8(4.00)	30(15.00)	3(1.50)	41(20.50)	
P – value 0.030						
Sedentary activity (computer/TV)(hour/day)						
Less than hour	19.99	10(5.00)	25(12.50)	3(1.50)	38(19.50)	
1- 3	20.74	12(6.00)	39(18.50)	5(2.50)	56(28.00)	0.001
More than three	22.43	28(14.00)	58(29.50)	20(10.00)	106(53.00)	
P- value 0.000						

The Prevalence of Anemia, Iron deficiency anemia, and Iron deficiency according sex are presented in table 5 .As shown in the table,24.49%were anemic ,14.97% iron deficiency anemia, and 3.40% iron deficiency.

The Prevalence of Anemia, and Iron deficiency anemia among female students was more than male students. there was significant difference between males and females ($p< 0.05$).

Table 5. Prevalence of Anemia, Iron deficiency anemia, and Iron deficiency according sex

Ferritin Level	**Hemoglobin Level**					**P-value**
	Female		Male		Total	
	<11.5	≥ 11.5	<13	≥ 13		
	N (%)	N (%)	N (%)	N (%)		0.000
< 12	19(26.76%)	5(7.04%)	3(3.95%)	0(0.00%)	27(18.37%)	
≥ 12	11(15.49%)	36(50.70%)	3(3.95%)	70(92.12%)	120(81.63%)	
Total	30(42.25%)	41(57.75%)	6(7.89%)	70(92.12%)	147(100.00%)	

Table 6- showing the relationship between BMI and anemia. 52.78% of anemic students were underweight, 38.89% of them were overweight /obese, while 8.33%were normal BMI.67.57% of normal Hb level students were normal BMI,18.92%, 13.51% of them were underweight and overweight/obese respectively, there was significant relationship .

Table-6 Relation between BMI and anemia

HB	Underweight N (%)	Normal N (%)	Overweight/Obese N (%)	Total N (%)	P- value	P
Anemia	19(52.78%)	3(8.33%)	14(38.89%)	36(100.00%)		0.001
Normal	21(18.92%)	75(67.57%)	15(13.51%)	111(100.00%)	0.001	
Total	40(27.21%)	78(53.06%)	29(19.73%)	147(100.00%)		

DISCUSSION

This is a cross sectional descriptive study to assess the nutritional status and its related factors of undergraduate students studying at Juba University – Sudan. The anthropometric result showed that most of the students had normal BMI, and therefore seem to be well nourished, this result could be similar to the result conducted in Nigeria (Omage, Omuema 2018), and Sudan (66.7%) (AL-Haj *et al.*, 2015), and Romania (70%) (Brumboiu 2018) . The percentage of underweight was 25% and of overweight & obese 14%.This prevalence of underweight is considered higher than that reported in their counterparts in Florianopolis(15.9%) female only (Costa 2013) , china 16.6% (Sakamaki *et al.*, 2005) , Kuwait 10.3% female only (Fareeda 2012), Saudi Arabia 5% male only(Al-Rethaiaa *et al.*, 2010), and Nigeria (9.5%)(Omage, Omuema 2018).The prevalence of overweight & obesity in this study is slightly higher than that reported in their counterparts in Iran (11.54%) (Delvarianzadeh *et al.*, 2016), and Florianopolis (11.8%) female only (Costa 2013), but lower than those in Lebanon (30%)(Yahia *et al.*, 2008), Saudi Arabia (37.5%) (Al-Rethaiaa *et al.*, 2010), Nigeria (20%) (Omage, Omuema 2018), 22country (22%) (Peltzer 2014), and Sudan 16% (Musaiger *et al.*, 2016), 28.5% (Ahmed 2017). Prevalence of overweight and obesity among undergraduate students, this may bay either due to excessive consumption of selected food groups which are mostly energy –dense or refined and a voidance of food groups with low energy and necessary vitamins and minerals, or increasing consumption of high calorie diets and shift of lifestyles towards sedentariness, in developing countries (Malik *et al.*,2013).This is dangerous for their health as obesity or overweight predisposes them to risk of diseases such as cardiovascular, malignancies, diabetes,bondes,and joints complications. (Brumboiu *et al.*, 2018, Micha *et al.*, 2017,WHS 2016, Berg *et al.*, 2013), (Unsworth 2012). The growing problem of overweight and obesity among Sudanese university students should be given high priority in prevention health programs to reduce the risk of high occurrence of chronic diseases in the country.

The result in the current study showed that a significant association was observed between socioeconomic factors such as monthly income, parent's level of education, father occupation, mother occupation, and household size and BMI, this funding in agreement with many studies conducted on socioeconomic factors affecting nutritional status (Delvarianzadeh *et al.*,2016, Suliga *et al.*, 2010) , these factors play an important role in developing countries like Sudan, since large families-particularly their adolescents due to their greater nutritional needs- in these countries cannot otherwise have access to sufficient food . The result in the current study showed that energy intake among students was considerably less than the RDA, the students must be consume greater amounts of energy as compared with other age groups since they have higher brain activity. The energy intake among female students considerably more than that among male students, this may be due to Sudanese female students were more likely to consume fast food than male (5). This result was disagreement with the results obtained by (39) in Iran, and (49) in Turkey. But their carbohydrates intake is greater. Also the mean iron consumption in female students was less than RDA standard.

Breakfast is the most important meal of the day as it is known to provide energy for the brain and improve learning. It is also know to contribute significantly to total daily energy and nutrient intake (Ackuaku-Dogbe, *et al.*, ;2014 and Sun, *et al.*, 2013, Ahmed 2017). Several studies report that regular intake of breakfast reduces the risk obesity and some chronic problems (Timlin& Pereira 2007,Purslow*et al.*, 2008, Musaiger *et al.*, 2016) .The majority of Sudanese university students(65.5%) consumed breakfast daily. This percentage is higher than that documented in university students in Ghana (8%) (Dogbe, *et al.*, 2014), and lower than that in Saudi Arabia (68%) female only (Rasheed *et al.*, 1999). The results showed that the snack was taken 2 times a day by the half of the students (52%). A literature review indicates contrasting findings for snacking ,as eating snacks may be a protective factor for obesity and provide essential nutrients. On the other hand, snacking provides extra energy and may contribute to weight gain (Musaiger 2016, Bellisle 2014). However, this depends on the

types of food consumed during snacking time, this finding was higher than Malaysian medical school study and Sudanese medical faculty (42%) of the students consumed snacks at least three times per week (Ganasegeran *et al.,*; 2012, AL-Haj *et al.,*; 2015). Frequently intake of soft drinks is associated with obesity and type 2 diabetes mellitus (Malik and Hu,2012). In this study,30.5% of the students consumed soft drinks at least one time per week ,this finding was low in comparing to California State University survey (51,8% of the students consumed soft drinks at least three times per week (Small *et al.*,2012). Hence, a significant relationship was observed between BMI and number of meals, number of snacks soft drink taken per day, and Appetite during exam period ($p< 0.05$).

Physical activity is the key strategy for reducing the risk of chronic diseases (El-gilany 2011, Ahmed 2017). In the present study ,about one-third (31%) of the students involved in daily exercise activities for less than half an hour .This percentage is lower than that documented in university students in Iran (50.4%)(Delvarianzadeh *et al.*,2016).There is a good evidence that sedentary activities are risk factors for several non- communicable diseases (Musaiger *et al.,* 2016) .It was recommended that screen time, especially for watching television, should not exceed 2 h per day to prevent obesity and its co-morbidity((Musaiger *et al.,* 2016) . The current study shows that about more than half (53%) of the students watched television for more than 3 h per day. Hence, a significant relationship was observed between BMI and duration daily activities, watching television ($p <0.05$).

The biochemical result showed that a quarter of the students(24.49%) were anemic,14.97%were iron deficiency anemia, and4.40% were iron deficiency . This is a risk health problem for university students, because they are in the production stage, also the iron has an effective impact on their mental abilities, this may bay either due to decreasing consumption of high iron diets ,or poor absorption of it.

This prevalence of anemia is considered lower than that reported in their counterparts in Ongole (42%) (Roy &Gunturu 2017), India (39%) (Thankachan *et al.,* 2007), Tehran (40.9%) female only (Shams *et al.,* 2010). This prevalence of iron deficiency anemia is considered higher than that reported in their counterparts in Australia (3.4%) female only (Rangan *et al.,* 1998), but lower than Indian students(20.3%) (Indian,2004). As shown in the table-5, the Prevalence of Anemia (42.25%), and Iron deficiency anemia (26.76%) among female students was more than male students (7.89%) (3.95%) respectively. there was significant difference between males and females ($p< 0.05$).This may be due to menstrual periods in female or to Sudanese food habits such as attention to males more than females when serving food .This result in agreement with Gross,1997 in Indonesia, he found that the prevalence of anemia among females students was more than males students 13.1% , 8.9% respectively, and Roy &Gunturu 2017 in India he found that the prevalence of anemia among females 62% and among male was 38%.The result in the current study showed that a significant association was observed between anemia and BMI, this funding in agreement with Saxena *et al.,* 2011, they observed that association between hemoglobin concentration and BMI in medical students of Himalayan Institute of Medical Sciences in India. But in disagreement with a study conducted by Roy& Guturu 2017 in Medical Students in Ongole, they observed that Anemia in this population is not related to BMI.

CONCLUSION:

Regarding BMI categories, some of malnutrition including both underweight and overweight /obese were observed among the students, both these cases are to be considered. Examining the consumed food indicated qualitative and quantitative deficiencies as compared with standard recommendations. Hemoglobin measurement indicated high prevalence of anemia among the students. Further in-depth investigation with more advanced statistical analysis and larger sample size related to factors associated with nutritional status of adolescents and the young population in Sudan are definitely needed. The author hop that this study provides information for establishing and intervention program to promote nutritional status among university students, as well as providing baseline data for further studies.

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