

## ASSESSMENT NUTRITIONAL STATUS OF FEMALES MEDICAL STUDENTS AND NON-MEDICAL STUDENTS AT UNIVERSITY OF SCIENCE AND TECHNOLOGY IN SANA'A CITY, YEMEN, 2018

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### ABSTRACT

**Background:** Nutrition plays an important role in maintaining health and preventing diseases. Assess nutritional status among medical and non-medical female students at university of science and technology in Sana'a city, was the objective of present study. Methods: Cross-sectional study, was performed on a period of two month from January to February 2019. The sample size enrolled in the study was 120 female students. The data analyzed using SPSS version 21. Result: One hundred and twenty students were enrolled in this study. Their ages ranged between 18-30 years. The most frequent age group (56.7%) was located between 21-23 years. Elevated & high risk of metabolic complication of waist circumference (WC) 12(52.2%) & waist-hip ratio (WHR) 15(55.5%) in students of English department higher than nutrition department. The risk of metabolic complication of waist-

height ratio (WHtR) regarding to morbidly obese & very overweight 11(64.7%) in students of English department higher than nutrition department. Categorized of Body mass index (BMI) regarding to obese & overweight 13(52%) in students of English department higher than nutrition department. In conclusion, strong positive correlation between WHtR and BMI (p value < 0.05). WHtR can explain 50% of BMI as indicated by  $R^2$  linear =0.500. This study imply that nutrition education is needed for everyone. It means that general nutrition education curriculum is compulsory in every study field.

**KEYWORDS:** Nutritional Status, English Department Students, Nutrition Department Student.

## INTRODUCTION

Nutrition plays an important role in maintaining health and preventing diseases.<sup>[1]</sup> University students represent a major segment of the young adult population.<sup>[2]</sup> Medical students are exposed to many risk factors that result from the peculiar ways of education and stressful environment during their courses and examinations, which may affect their psycho-social wellbeing.<sup>[3]</sup> Many health and health related problems may be encountered and are slightly prevalent among medical students.<sup>[4]</sup> Also, medical students have been shown to exhibit early risk factors for chronic diseases.<sup>[5]</sup> Studies have shown that medical and paramedical students especially who stay in hostels away from their home are susceptible to irregular dietary habits, lack of exercise, and addiction.<sup>[6]</sup>

The college student population is a unique group that requires the specific attention of the dietetics professional. The lifestyle patterns students learn during their college years can predispose them to future health problems associated with overweight and obesity.<sup>[7]</sup> Students in 'emerging adulthood' (age classification of 18-25 years old) have increasing independence and autonomy; this is where lasting health behavior patterns are developed.<sup>[8]</sup>

Times of transition, such as leaving home and increased decision-making power while still being financially dependent, define many in the 'emerging adulthood' group.<sup>[9]</sup> In addition, this population may not have adequate self-regulatory skills, such as planning and self-monitoring, to maintain healthful behaviors in the college environment.<sup>[10]</sup> Dietary changes occur during a college student's freshman year as they transition from adolescence to young adulthood.<sup>[11]</sup> Diet quality also changes during this time period, resulting in college students not meeting the recommended dietary guidelines.<sup>[12]</sup> The diet of most college students is typically lacking in fruit, vegetable, and dairy consumption but is high in fat, sodium, and sugar. College students also have limited food variety, high snacking frequency, high incidence of meal skipping for weight loss, and a high consumption of fast foods.<sup>[13]</sup> Poor consumption of fruit, vegetables, and dairy products, diets lacking in nutrient quality, and sporadic meal patterns increase nutritional risk and unwanted weight gain.<sup>[14]</sup> The diets of college students tend to be high in fat, saturated fat, cholesterol, and sodium while they are low in fiber; vitamins A, C, and E; folate; iron; and calcium.<sup>[15]</sup>

Overweight and obesity are defined as abnormal or excessive fat accumulation that may impair health. Body mass index is a simple index of weight-for-height that is commonly used in classifying overweight and obesity in adult populations and individuals.<sup>[16]</sup>

Body mass index (BMI): BMI referred to the relationship between current weight and current height ( $\text{BMI} = \text{weight (kg)} / \text{Height (m}^2\text{)}$ ). The BMI was classified according to the WHO international classification of BMI (Underweight:  $\text{BMI} < 18.5$ , Ideal:  $18.5 \leq \text{BMI} < 25.0$ , Overweight:  $25.0 \leq \text{BMI} < 30.0$ , Obese:  $\text{BMI} \geq 30$ ). BMI: is a measure of body size. It combines a person's weight with the height. The result of a BMI measurement can give an idea whether a person is at correct for their height. Waist to height ratio: is a simple measurement for assessment of lifestyle risk and overweight. Compared to just measuring waist circumference, waist to height ratio is equally fair for short and tall persons. This calculator is valid for children and adults. Hip: The area below the waist and above the legs at either side of the body, or the joint connects the leg to the upper part of the body.<sup>[17]</sup> Waist circumference: is a measurement taken around the abdomen at the level of the umbilicus (belly button). Health experts use waist circumference to screen patients for possible weight-related health problems. Higher Risk Waist Circumference Measurements: women: 35 or more inches or 89 centimeters or more.<sup>[18]</sup>

Waist to hip ratio: is an important tool that helps you determine your overall health risk. People with more weight around their waist are at greater risk of lifestyle related diseases such as heart disease and diabetes than those with weight around their hips. Waist to hip ratio is a simple and useful measure of fat distribution.<sup>[19]</sup>

Literature review: In Islamabad, may 2015 the result the mean age of participants was 21.2 years  $\pm 1.387$  SD. Among these 20 % (30) were males and 80% (119) were female participants. The mean weight was 57.35 kg + 12.528 SD. The mean height was noted to be 165.0 cm + 8.750 SD. In the study sample, the mean BMI was  $20.86 \pm 4.481$  SD. About 59.7% subjects under study had normal weight, 28.9% were under weight, 9.4% over weight while 2.0% obese. Regarding waist circumference, the mean value was 75.249 + 10.553 SD. Based on waist to hip ratio, 31.5% had central obesity and on the basis of waist to height ratio, it was found that 12.8% had centrally obesity.<sup>[20]</sup>

In a Utah State University, 2015 This study concluded that weight gain during the first semester of college may be associated with identifiable and in some cases modifiable risk factors such as hypertension and diabetes. This study suggest that strategies aimed at preventing overweight/obesity and weight gain among college freshmen may decrease risk of obesity and related health problems later in life. in American, 2005 The results from this study support the notion that freshmen gain weight upon entering college and this weight gain is

accompanied by an increase in fat mass in women. Furthermore, individuals who maintain moderate physical activity appeared to be protected from this weight gain. This study concluded that the follow up study suggest that this weight gain may not be sustained over an entire year.<sup>[21]</sup>

In American, 2006 this study found that there was a significant change in alcohol consumption, physical activity, and specific food consumption such as vegetables and fruits when examining practices before and after leaving home, this was found to be true from both those who lost weight and those who did not lose weight. This study concluded that there was a substantial amount of changes in student's nutrition related behavior after they leave home for college.<sup>[22]</sup>

In University of Kentucky, 2015 The study found that weight gain may be attributed to those who consume breakfast less often than others, have a decrease in moderate exercise they previously participated in, and that the change from high school to college can impact students greatly in their dietary habits. Researchers also found strategies that can help college student decrease the risk of weight gain. Those included nutrition education for students entering college, an increase in moderate activity, and that in increase in overall nutrition knowledge can lead to better eating habits. It was also noted that nutrition education should consider the differences between males and females. Lastly, it was concluded that long term weight prevention can linked to overall healthy habits.<sup>[23]</sup>

In Saudi Arabia, 2010 the result indicated that 21.8% of the students were overweight and 15.7% were obese. The total body fat exceeded its normal limits in 55.2% of the participants. The most common eating habits encountered were eating with family, having two meals per day including breakfast together with frequent snacks and fried food consumption. Vegetables and fruits, except dates, were not frequently consumed by most students.<sup>[24]</sup>

In Lebanese University, 2008, the result showed that the majority of the students (64.7%) were of normal weight (49% male students compared to 76.8% female students). The prevalence of overweight and obesity was more common among male students compared to females (37.5% and 12.5% vs. 13.6% and 3.2%, respectively). In contrast, 6.4% female students were underweight as compared to 1% males.<sup>[25]</sup>

In Virginia, 2004 The study found that eleven students maintained their body weight. Initial BMI and percentage body fat were higher in subjects who lost weight, although differences were not statistically significant. Mean daily servings of dairy products were significantly greater in subjects who maintained weight. Subjects who gained weight ate breakfast on fewer days per week than those who did not eat breakfast regularly. This study suggested possible targets to be utilized to develop nutrition education materials for college students to help prevent weight gain.<sup>[26]</sup>

## METHODS AND MATERIALS

The study was conducted among medical and non-medical female students at university of science and technology in Sana'a, and the study was conducted from October 2018 to May 2019. Student of Clinical Nutrition and Dietetics department, level two up to level four as the medical female student and student of English department level two up to level four as the non-medical female student. Cross-sectional study, description, was performed using a systematic random sampling technique from student of Clinical Nutrition and Dietetics department, level two up to level four as the medical female student and student of English department level two up to level four as the non-medical female student. Data was collected by face-to-face interviews using pre-designed, semi-structured questionnaires on a period of two month from January to February 2019 to assessing nutritional status among medical and non-medical female students at university of science and technology in Sana'a, all the questionnaires was developed in two sections: section A: socio demographic questionnaire, section B: anthropometric questionnaire. a systematic random sampling technique from student of clinical nutrition and dietetics department, level two up to level four as the medical female student and student of English department level two up to level four as the non-medical female student, during the data collection periods are included and an estimated size of the sample was 120 student enrolled in the study. Dependent variables: nutritional status and independent variables include: age, marital status, residency, faculty, department, academic year, number of family members, occupation of parents, sources of nutrition information, previous nutrition courses, anthropometric measurements.

BMI: is a measure of body size. It combines a person's weight with the height. The result of a BMI measurement can give an idea whether a person is at correct for their height. Hip: The area below the waist and above the legs at either side of the body, or the joint connects the leg to the upper part of the body waist to height ratio: is a simple measurement for assessment of

lifestyle risk and overweight, compared to just measuring waist circumference, waist to height ratio is equally fair for short and tall persons, this calculator is valid for children and adults.<sup>[17]</sup> Waist circumference: is a measurement taken around the abdomen at the level of the umbilicus (belly button). health experts use waist circumference to screen patients for possible weight-related health problems. Higher risk waist circumference measurements: women: 35 or more inches or 89 centimeters or more. Waist to hip ratio: is an important tool that helps you determine your overall health risk. People with more weight around their waist are at greater risk of lifestyle related diseases such as heart disease and diabetes than those with weight around their hips. It is a simple and useful measure of fat distribution.<sup>[19]</sup>

The questionnaires were tested prior to the study among 5-10% of the total estimated sample size to assess, consistency, length, competency, clarity and the time required to carry out face to face interview smoothly. The Data was cleaned and coded then analyzed using SPSS version 21. Descriptive analysis was done by using table, graphs and figures for frequency distributions, proportions and percentage. Suitable tests were chosen according to the aim and types of variables. Descriptive statistics were performed to describe nutritional status, anthropometric measurement and socio-demographic variables. Data described by frequencies, percentages, means & SD; and presented in tables and figures. Chi square test was used to test variable differences. Test considered to be significant if (p value) < 0.05.

The research protocol approval and ethical clearance was obtained from UST faculty medicine and health sciences and clinical nutrition department; also, permission was obtained from the directors of the target department. The data collectors informed the students that their participation in the study was be voluntary and they have full right to accept or refuse to participate in the study after details explanation of the purposes of the study. The responses of the student unnamed to keep the confidentiality.

## RESULTS

One hundred and twenty students were enrolled in this study. All of them were females in English department and clinical nutrition and dietetics department. Their ages ranged between 18 years and 30 years, with a mean of  $24.3 \pm 3$  years. The most frequent age group 68(56.7%) was located between 21-23 years, followed by age group of 18-20 years 33(27.5%), followed by age group of 24-26 years 17(14.2%). Only 2 (1.7%) students were more than 27 years. Most of study sample students 99(82.5%) were unmarried. Only 19(15.8%) were married, and 2(1.7%) were divorced. Minority of students 4(3.3%) lived in



university hostel, and majority of them 116(96.7%) lived out of University hostel. The sample was evenly distributed between clinical nutrition and dietetics department 60(50%), and English department 60(50%). The sample was equally distributed between 2<sup>nd</sup>, 3<sup>rd</sup>, and 4<sup>th</sup> level; 40(33.3%) each. Majority of students' fathers were either employees 58(48.3%) or worked in free business 50(41.7%). However, most of mothers 98(81.7%) were housewives, followed by employees 19(15.8%). Other jobs were less frequent. Table below illustrates that 45(37.5%) of students got their information from nutritionists, 31(25.8%) got their information from parents, 19(15.8%) got their information from trainers, and about 24(20%) got their information from media (TV & magazines). Only 19(16%) of students attended nutritional courses. The remaining portion 101(84%) did not attend any course. Half of students were living with families that have 1 to 7 individuals, 49(41%) living with families that had 8 to 13 individuals, and 10(8%) living with families that had more than 13 individuals.

**Table 1: Summary of demographic characteristics of the sample.**

Feature	Category	Count	Percent
Age	18-20 years	33	27.5%
	21-23 years	68	56.7%
	24-26 years	17	14.2%
	> 27 years	2	1.7%
Marital status	Single	99	82.5%
	Married	19	15.8%
	Divorced	2	1.7%
Residency	University hostel	4	3.3%
	Out of University hostel	116	96.7%
Department	Clinical Nutrition and Dietetics	60	50%
	English Department	60	50%
Study level	2 <sup>nd</sup> level	40	33.3%
	3 <sup>rd</sup> level	40	33.3%
	4 <sup>th</sup> level	40	33.3%
Fathers' occupations	Employees	58	48.3%
	Free business	50	41.7%
	Professionals	5	4.2%
	Others	4	3.3%
	Workers	3	2.5%
	Employees	58	48.3%
Mothers' occupations	Housewives	98	81.7%
	Employees	19	15.8%
	Professionals	1	.8%
	Free business	1	.8%
	Others	1	.8%
Source of nutritional	Nutritionist	45	37.5%

information			
	Parents	31	25.8%
	TV	19	15.8%
	Trainer	19	15.8%
	Magazine	5	4.2%
	Other	1	.8%
Attending nutritional courses	Yes	19	15.8%
	No	101	84.2%
Family members	1 - 7 individuals	61	50.8%
	8 - 13 individuals	49	40.8%
	> 13 individuals	10	8.3%

### Waist circumference (WC) and Metabolic risk

In the table below, waist circumference categorize as the metabolic risk according to Cut-off points of metabolic risk into "Reduced risk", <80 "Elevated risk" 80 – 88 and "High risk" >88. So, WC indicates that 7(70.0%) had high risk of metabolic complications in student of English department. 8(61.5%) had elevated risk of metabolic complications in student of clinical nutrition and dietetics department. While 49(50.5%) and 48(49.5%) indicates that as reduced risk in nutrition and English department respectively. In general elevated & high risk of metabolic complication of WC 12(52.2%) in student of English department higher than nutrition department.

**Table 2: Waist circumference (WC) and Metabolic risk.**

Risk of metabolic complications	Cut-off points <sup>[34]</sup>	English Department	Clinical Nutrition and Dietetics Department	Total
		n (%)	n (%)	n (%)
Reduced risk	<80	48 (49.5%)	49 (50.5%)	97 (100%)
Elevated risk	80 – 88	5 (38.5%)	8 (61.5%)	13 (100%)
High risk	>88	7 (70.0%)	3 (30.0%)	10 (100%)

### Waist-hip ratio (WHR) and Metabolic risk

In the table below, WHR categorize as the metabolic risk according to Cut-off points of metabolic risk into "Reduced risk", <0.80 "Elevated risk" 0.81 – 0.85 and "High risk" >0.85. So, WHR indicates that 7(58.3%) had high risk of metabolic complications in student of clinical nutrition and dietetics department. 10(66.7%) had elevated risk of metabolic complications in student of English department. While 48(51.6%) and 45(48.4%) indicates that as reduced risk in nutrition and English department respectively. In general elevated &



high risk of metabolic complication of WHR 15(55.5%) in student of English department higher than nutrition department.

**Table 3: Waist-hip ratio (WHR) and Metabolic risk.**

Risk of metabolic complications	Cut-off points <sup>[40]</sup>	English Department	Clinical Nutrition and Dietetics Department	Total
		n (%)	n (%)	n (%)
Reduced risk	≤0.80	45 (48.4%)	48 (51.6%)	93 (100%)
Elevated risk	0.81 – 0.85	10 (66.7%)	5 (33.3%)	15 (100%)
High risk	≥0.85	5 (41.7%)	7 (58.3%)	12 (100%)

### Waist-height ratio (WHtR) Scoring and Metabolic risk

In the table below, WHtR categorize as the metabolic risk according to Cut-off points of metabolic risk into " Slim ", " Healthy " , " Overweight " , " Very overweight " and " Morbidly obese ". So, WHtR indicates that 6(60%) had morbidly obese of metabolic complications in student of English department. 5(71.4%) had very overweight of metabolic complications in student of English department. 12(66.7%) had overweight of metabolic complications in student of nutrition department. 14(56%) had slim of metabolic complications in student of English department. While 31(51.7%) and 29(48.3%) indicates that as healthy in nutrition and English department respectively. In general elevated & high risk of metabolic complication of WC 12(52.2%) in student of English department higher than nutrition department. In general the risk of metabolic complication of WHtR regarding to morbidly obese & very overweight 11(64.7%) in student of English department higher than nutrition department.

**Table 4: Waist-height ratio (WHtR) Scoring and Metabolic risk.**

Risk of metabolic complications	Cut-off points <sup>[41, 42]</sup>	English Department	Clinical Nutrition and Dietetics Department	Total
		n (%)	n (%)	n (%)
Slim	0.35 – 0.41	14 (56%)	11 (44%)	25 (100%)
Healthy	0.42 – 0.48	29 (48.3%)	31 (51.7%)	60 (100%)
Overweight	0.49 – 0.53	6 (33.3%)	12 (66.7%)	18 (100%)
Very overweight	0.54 – 0.57	5 (71.4%)	2 (28.6%)	7 (100%)
Morbidly obese	≥0.58	6 (60%)	4 (40%)	10 (100%)

### Body mass index (BMI) scoring

In the table below, BMI scoring according to Cut-off points categorization into " Underweight ", " Normal " , " Overweight " and " Obese ". So, BMI indicators from total sample of each scoring indicates that 5(55.6%) had Obese in student of English department. 8(50%) had overweight in student of English department. 37(50.5%) had normal weight in student of English department. While 12(54.5%) and 10(45.5%) indicates that as underweight in nutrition and English department respectively. In general categorization of BMI regarding to obese & overweight 13(52%) in student of English department higher than nutrition department.

**Table 5: Body mass index (BMI) scoring.**

Categorization	Cut-off points (K/M2) <sup>[43]</sup>	English Department	Clinical Nutrition and Dietetics Department	Total
		n (%)	n (%)	n (%)
Underweight	<18.5	10 (45.5%)	12 (54.5%)	22 (100%)
Normal	18.5 - 24.9	37 (50.5%)	36 (49.3%)	73 (100%)
Overweight	25 – 29.9	8 (50%)	8 (50%)	16 (100%)
Obese	≥30	5 (55.6%)	4 (44.4%)	9 (100%)

**Table 6: Summary of anthropometric Indices and Categorization of metabolic risk.**

Measures	Metabolic risk categories	Cut-off points	Count	Percent
WC	Reduced risk	<80	97	80.8%
	Elevated risk	80 – 88	13	10.8%
	High risk	>88	10	8.3%
WHR	Reduced risk	≤0.80	93	77.5%
	Elevated risk	0.81 – 0.85	15	12.5%
	High risk	≥0.85	12	10%
WHtR	Slim	0.35 – 0.41	25	20.8%
	Healthy	0.42 – 0.48	60	50%
	Overweight	0.49 – 0.53	18	15%
	Very overweight	0.54 – 0.57	7	5.8%
	Morbidity obese	≥0.58	10	8.3%
BMI	Underweight	<18.5	22	18.3%
	Normal	18.5 - 24.9	73	60.8%
	Overweight	25 – 29.9	16	13.3%
	Obese	≥30	9	7.5%

### Correlation between age, residency, department, study year and attending nutritional courses with habits, knowledge, and anthropometric measures

Table below shows that there was no a significant correlation between anthropometric measures with demographic variable (department, study year also attended nutritional courses) (all p values < 0.05).

**Table 7: Correlation between demographic variable(age, residency, department, study year and attending nutritional courses) with anthropometric measures.**

Correlation		BMI	WHR	WHtR
Age	Pearson Correlation	.023	.018	-.015-
	P value	.801	.842	.871
	N	120	120	120
Residency	Pearson Correlation	-.047-	.093	-.057-
	Sig. (2-tailed)	.612	.311	.533
	N	120	120	120
Department	Pearson Correlation	-.057-	-.178-	-.041-
	Sig. (2-tailed)	.539	.051	.655
	N	120	120	120
Study year	Pearson Correlation	-.110-	-.091-	-.128-
	Sig. (2-tailed)	.231	.324	.164
	N	120	120	120
Attending nutritional courses	Pearson Correlation	-.010-	-.099-	.037
	Sig. (2-tailed)	.909	.283	.688
	N	120	120	120

\*.Correlation is significant at the 0.05 level (2-tailed).

\*\*.Correlation is significant at the 0.01 level (2-tailed).

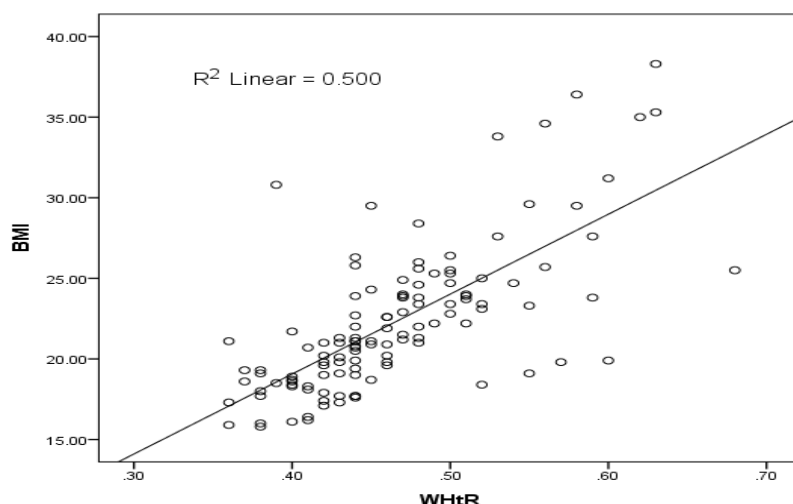
### Correlation between WHtR and BMI

Table below illustrates that there was strong positive correlation between WHtR and BMI (p value < 0.05). WHtR can explain 50% of BMI as indicated by  $R^2$  linear =0.500 in figure 4.15.

**Table 8: Correlation between WHtR and BMI.**

Correlation		BMI	WHtR
BMI	Pearson Correlation	1	.707
	Sig. (2-tailed)		.000
	N	120	120
WHtR	Pearson Correlation	.707	1
	Sig. (2-tailed)	.000	
	N	120	120

\*\*. Correlation is significant at the 0.01 level (2-tailed).



**Figure 1: Correlation between WHtR and BMI.**

## DISCUSSION

One hundred and twenty students were enrolled in this study. All of them were females in English department and clinical nutrition and dietetics department. Their ages ranged between 18 years and 30 years, with a mean of  $24.3 \pm 3$  years. The most frequent age group 68(56.7%) was located between 21-23 years, followed by age group of 18-20 years 33(27.5%), followed by age group of 24-26 years 17(14.2%). Only 2 (1.7%) students were more than 27 years. Most of study sample students 99(82.5%) were unmarried. Only 19(15.8%) were married, and 2(1.7%) were divorced. Minority of students 4(3.3%) lived in university hostel, and majority of them 116(96.7%) lived out of university hostel. The sample was evenly distributed between clinical nutrition and dietetics department 60(50%), and English department 60(50%). The sample was equally distributed between 2<sup>nd</sup>, 3<sup>rd</sup>, and 4<sup>th</sup> level; 40(33.3%) each. Majority of students' fathers were either employees 58(48.3%) or worked in free business 50(41.7%). However, most of mothers 98(81.7%) were housewives, followed by employees 19(15.8%). Other jobs were less frequent. Table below illustrates that 45(37.5%) of students got their information from nutritionists, 31(25.8%) got their information from parents, 19(15.8%) got their information from trainers, and about 24(20%) got their information from media (TV & magazines). Only 19(16%) of students attended nutritional courses. The remaining portion 101(84%) did not attend any course. Half of students were living with families that have 1 to 7 individuals, 49(41%) living with families that had 8 to 13 individuals, and 10(8%) living with families that had more than 13 individuals. In another study 162 students, 146 were female and 16 were male. Their age between 17 years and 42 years. the most frequent age group 21.45.<sup>[27]</sup> Also found in another

study 121 students, 105 were female and 16 were male. Were conducted among students at Kent state university aged 18-34 years old. The most frequent age 18-25 years (98.3%).<sup>[28]</sup>

In present study, waist circumference categorize as the metabolic risk according to Cut-off points of metabolic risk into "Reduced risk", <80 "Elevated risk" 80 – 88 and "High risk" >88. So, WC indicates that 7(70.0%) had high risk of metabolic complications in student of English department. 8(61.5%) had elevated risk of metabolic complications in student of clinical nutrition and dietetics department. While 49(50.5%) and 48(49.5%) indicates that as reduced risk in nutrition and English department respectively. In general elevated & high risk of metabolic complication of WC 12(52.2%) in student of English department higher than nutrition department.

WHO.2000. Reported the variations in these study and others reflect differences in the severity of obesity problems among young adults across nations. Using waist circumference (WC) and waist-hip ratio (WHR), the prevalence of android obesity was 21.2% and 29.5% respectively using the WHO classification.<sup>[18]</sup>

In other study between male and female Malaysian university students a total of 584 students (59.4% females and 40.6% males) aged  $20.6 \pm 1.4$  years from four Malaysian universities waist circumference and percentage of body fat were measured. Results about 14.3% of males and 22.4% of females were underweight, while 14.0% of males and 12.3% of females were overweight and obese.<sup>[29]</sup>

In present study, WHR categorize as the metabolic risk according to Cut-off points of metabolic risk into "Reduced risk", <0.80 "Elevated risk" 0.81 – 0.85 and "High risk" >0.85. So, WHR indicates that 7(58.3%) had high risk of metabolic complications in student of clinical nutrition and dietetics department. 10(66.7%) had elevated risk of metabolic complications in student of English department. While 48(51.6%) and 45(48.4%) indicates that as reduced risk in nutrition and English department respectively. In general elevated & high risk of metabolic complication of WHR 15(55.5%) in student of English department higher than nutrition department.

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In present study, WHtR categorize as the metabolic risk according to Cut-off points of metabolic risk into " Slim ", " Healthy " , " Overweight " , " Very overweight " and " Morbidly obese ". So, WHtR indicates that 6(60%) had morbidly obese of metabolic complications in student of English department. 5(71.4%) had very overweight of metabolic complications in student of English department. 12(66.7%) had overweight of metabolic complications in student of nutrition department. 14(56%) had slim of metabolic complications in student of English department. While 31(51.7%) and 29(48.3%) indicates that as healthy in nutrition and English department respectively. In general elevated & high risk of metabolic complication of WC 12(52.2%) in student of English department higher than nutrition department. In general the risk of metabolic complication of WHtR regarding to morbidly obese & very overweight 11(64.7%) in student of English department higher than nutrition department.

In another research A total of 989 third-year medical students (527 men, 462 women), aged  $22 \pm 2$  years, were recruited from the university of Crete Greece during the period 1989–2001. Anthropometric measures and blood chemistries were obtained. The relationships between obesity indices (body mass index [BMI], waist circumference [WC], waist-to-hip ratio [WHR], waist-to-height ratio [WHtR]) and CVD risk factor variables Approximately 40% of men and 23% of women had  $BMI \geq 25.0$  kg/m<sup>2</sup>. Central obesity was found in 33.4% (average percentage corresponding to  $WC \geq 90$  cm,  $WHpR \geq 0.9$  and  $WHtR \geq 50.0$ ) of male and 21.7% (using  $WC \geq 80$  cm,  $WHpR \geq 0.8$ ,  $WHtR \geq 50.0$ ) of female students. Subjects above the obesity indices cut-offs had significantly higher values of CVD risk factor variables.<sup>[30]</sup>

Sakamaki R, et.al. 2005. Reported the WHR appears to overestimate the prevalence of android obesity as many people with normal BMI were included when it is used. Gender was associated with BMI ( $p=0.026$ ). More female students were significantly either overweight or obese compared to male counterparts. This could be explained from our data by the observation that a significant number of females ( $n=41$ ) than males ( $n=2$ ), using waist circumference, had abdominal obesity. This was similar to findings in Cameroon.<sup>[5]</sup>



In present study, BMI scoring according to Cut-off points categorization into " Underweight ", " Normal " , " Overweight " and " Obese ". So, BMI indicators from total sample of each scoring indicates that 5(55.6%) had obese in student of English department. 8(50%) had overweight in student of English department. 37(50.5%) had normal weight in student of English department. While 12(54.5%) and 10(45.5%) indicates that as underweight in nutrition and English department respectively. In general categorization of BMI regarding to obese & overweight 13(52%) in student of English department higher than nutrition department.

Bertsias, G., et.al.2003.Results: Mean BMI was 23.24 (SD4. 31). Descriptive analysis revealed that 103 (21.3%) of the study population were classified as underweight, 251 (52%) as normal weight, 99 (20.5%) as overweight, and 30 (6.2%) as obese. Abdominal adiposity, as measured by increased WHR, was present in 56 subjects (11.59%). Partial correlation controlled for age revealed strong positive correlation between BMI and WHR for males. 7.24% had high systolic blood pressure.<sup>[31]</sup>

In other study,. Sop MK, et.al.2019, in Cameroon were 21.8% and 15.7% of university masters level students were overweight and obese respectively.<sup>[32]</sup> Hakim NH, et.al.2012 and Das S, Bose K.2011. Reported underweight tends to be higher compared to overweight or obesity in Asians.<sup>[33,34]</sup> Hakim NH,et.al.2012 and Lin KG, et.al.2002. State that similar studies.<sup>[33,35]</sup>

Monteiro CAD, et.al. 2000, Popkin BM,et.al.1993 and Martorell R, et.al.2000.Reported data of developing countries shows that urbanization and migration directly leads under-nutrition and over nutrition problems.<sup>[36-38]</sup> Chhabra P, et.al.2006, Sharma SK, et.al.2009, Khan B, et.al.2015 and Chhaya S,et.al.2012.Reported the prevalence of overweight is higher among medical students. Several studies done among medical and nursing students in India have observed prevalence of overweight was 11.7, 11, 10 and 17.5 respectively.9-12.<sup>[39-42]</sup>

Agrawal S,et.al.2017, Deshpande K,et.al.2013, Bertsias G,et.al.2003 and Thakkar HK,et.al.2010.Observed lower prevalence of obesity (8%). Other similar study done by Agrawal et al, Deshpande et al, Bertsias et al, Thakkar et al observed obesity prevalence was 22.0%, 29.0%, 36.0% and 23.0% respectively.<sup>[43-46]</sup>

Kaur S, Walia I. 2007, Yusuf S, et.al.2005 and Welborn TA, et.al.2003. Reported obesity according to waist-hip ratio is significantly higher in females as compared to males. Variation in body fat distribution and abdominal fat mass is not measured BMI method. Excess intra-abdominal fat play crucial role in hazards of obesity. Visceral or abdominal fat mass can be measured by Waist circumference (WC) and waist-hip ratio (WHR) method. These methods do not involve the height and muscle mass, risen as valuable predictors of hazards of obesity and its associated diseases and are thus very useful indicators of excess body fat and increased health risk. Some research study revealed that WC and WHR have significant association with myocardial infarction.<sup>[47-49]</sup>

The final finding of present result summaries there was strong positive correlation between WHtR and BMI (p value < 0.05). WHtR can explain 50% of BMI as indicated by  $R^2$  linear =0.500.

As the best of the author's knowledge, results from prior study on this field give approximately similar finding to the present study but still give limited explanation, according to different lifestyle and situation so, it was necessary to assess nutritional among medical and non-medical female students at university of science and technology in Sana'a city, Yemen as the objective of present study.

This study imply that nutrition education is needed for everyone, not to mention those who seem invulnerable, in this case young adults as they undergo the transitional phase of life into adulthood. It means that general nutrition education curriculum is compulsory in every study field.

## CONCLUSION

One hundred and twenty students were enrolled in this study. All of them were females. Their ages ranged between 18-30 years. The most frequent age group (56.7%) was located between 21-23 years. Elevated & high risk of metabolic complication of WC 12(52.2%) & WHR 15(55.5%) in students of English department higher than nutrition department. The risk of metabolic complication of WHtR regarding to morbidly obese & very overweight 11(64.7%) in students of English Department higher than nutrition department. Categorized of BMI regarding to obese & overweight 13(52%) in students of English department higher than nutrition department. In conclusion, strong positive correlation between WHtR and BMI (p value < 0.05). WHtR can explain 50% of BMI as indicated by  $R^2$  linear =0.500.

This study provides the evidence based to advocate the policy maker on enhancing the nutritional education among transitional age group regardless their study field and empower them to become the agent on fostering healthier diet and improving nutritional status. And because of the limitation of our study.

The possible gap to be filled by the future research is by elaborating more on nutritional status with dietary practice on the facets of the Yemeni Balanced Diet (food diversity, physical activity, good hygiene and ideal body weight) to obtain comprehensive views and also, nutritional status could be seen as the combination of an individual's health as influenced by intake and utilization of nutrients and determined from information obtained by physical, biochemical and dietary studies.<sup>[50]</sup>

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