Journal of Food and Dairy Sciences

Journal homepage: www.jfds.mans.edu.eg
Available online at: www. jfds.journals.ekb.eg

Assessment of Knowledge, Dietary Habits and Nutritional Status among Mansoura University Students

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ABSTRACT

Nutritional status of undergraduates is a priority to ensure a sustainable healthy adulthood, which is affected by their nutritional knowledge, dietary habits and activity. However, there aren't sufficient national research and epidemiological investigations in this area. This study aims to estimate nutritional knowledge, relevant habits and nutritional status among undergraduates. A randomized stratified survey of 658 students (37.5% males and 62.4% females), aged 17 to 25, were chosen from Mansoura university (Agriculture ,Commerce and Nursing colleges).Students filled out a self-reported questionnaire about nutritional knowledge, dietary practices and nutrition assessment. Anthropometric measurement height, weight, and BMI were assessed. Data were statistically analyzed. A Suggested master meal was designed on scientific balanced basis to m*eet al*most of the daily dietary needs that suit this age group, which composed of all nutrients. Results revealed that, students of normal BMI were a majority (56.5%) as (21.2% males compared to 35.3% females). Right nutritional knowledge formed (78.1%), fair nutritional attitude (80.7%) was detected among students. Eating habits demonstrated (51.8%) eating meals regularly. Students announced that daily consumption of breakfast (45.3%), soft drinks (76.6%) and snacks (32.2%). Also, students preferred home (40.7%) as eating site. Results illustrated that, students don't apply healthy diet habits even with good knowledge. Although most of the students are in normal weight, our findings indicate weight gain and bad dietary habits linked to moderate nutritional knowledge which needs investigation to reduce tendency to gain weight and maintain healthy eating habits. Also public educational program in healthy diet practices should be applied.

Keywords: Nutritional Knowledge, Habits, Status, undergraduates, BMI

INTRODUCTION

Proper nutrition is a key practice to develop strong generation especially in emerging adulthood growth stage . University students are representing a critical population with special emphasis on nutritional requirements . It also a high risk time for adverse diet habits . These emerging adult years may be a mostly important time to converge on nutrition-related issues, especially given the fast increases in obesity dispersal at this age (Gordon-Larsen *et al*., 2004), as well as the impact that more weight gain in early puberty may have on long-range health (Norman *et al*., 2003 and Carnethon *et al*., 2004). The transmission to puberty is also a key developmental age when long- range weight manner patterns may be confirmed (Nelson *et al*., 2008). So it is crucial ,to ensure standard growth , physiologically and overall health status.

Nutritional status is markedly dependent on nutritional habits, practices and knowledge. Nutritional practices of undergraduate students are influenced by several factors such as culture, socioeconomic status, age, profession, dietary beliefs, and good nutritional knowledge, level of students and mothers (Vereecken and Maes, 2010) and McLeod *et al*., 2011). Recent studies backing that most undergraduate students do not have enough nutritional knowledge, attitude and practices nor do they select healthy food, have a diverse diet or healthy lifestyle (Hakim *et al*., 2012 ; Schnettler *et al*., 2015 ; Lupi *et al*., 2015 and Ruby *et al*., 2016).

Youth are mostly tending to take on harmful dietary habits, like skipping breakfast, avoiding drinking milk, eating fish, fresh fruits and vegetables, and excessive consumption of fast food, goodies, and sugar-sweetened liquids (Musaiger *et al*., 2017). Dietary practice and nutritional case has been declared to have steady relationship with cardiovascular diseases biomarker in students (Zarrazquin Arizaga *et al*., 2018).

A balanced diet is one that supply the body with all the essential nutrients, vitamins, and minerals desired to, preserve cells, tissues, and organs as well as to function correctly. A diet that is poor in nutrients can bring to many various health problems ranging from tiredness and lack of energy to critical problems with the function of vital organs and deficiency growth and development (Swetaa *et al*., 2018). Thus , aim of this work was to investigate and assessment of knowledge and relevant practices among university students in Mansoura university and giving recommended basic meal plan that are approachable and matching this group nutritional requirements.

METHODS

A randomized stratified study has been conducted on undergraduate university students in Mansoura university at Mansoura city, Dakahliya governorate, Egypt . The study covered three colleges in the university campus (Agriculture

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DOI: 10.21608/jfds.2019.59749

,Commerce and Nursing colleges). The study standard in the academic year 2017/ 2018. Sample students were aged from 17 to 25 years . Our sample 658 students formed 3% of whole three faculties counts .In formed consents and ethical committee approval were fulfilled before starting the study . Involvement in the study was anonymous, confidential and voluntary (ul Haq *et al*., 2018).

Study Population

Inclusion Criteria : Undergraduate students , their age from 17 to 25 years old , Apparently healthy, Compliant .

Exclusion Criteria : pregnancy , chronic diseases , Smoking because smokers consume low diet quality as their consumption of essential nutrients is lower as compared to nonsmokers (Raatz *et al*., 2017). Also, smoking is an independent risk factor for chronic diseases like cardiovascular diseases, diabetes, chronic kidney disease, chronic respiratory diseases, and various types of cancers (Yang *et al*., 2018).

Data Collection Tools and Materials

Pre-testing of Questionnaire

Pretesting of questionnaires were done by 10 students. Time duration for filling of questionnaire was noted and unnecessary questions were excluded. Modification were done (Kharde *et al*., 2013).

Anthropometry

Anthropometric parameters, including weight, height and body mass index (BMI) measurements were determined. The anthropometric measurement were provided by students themselves (Genena and Salama, 2017). BMI can be calculated using the following formula:

$$\mathbf{BMI = WB \backslash H^2}$$

(WB) weight kilograms , $(H)^2$ height meters^2

Body weight classification based upon (BMI) values as follows: (WHO, 2004).

Below 18.5	Underweight
18.5–24.9	Normal weight
25.0–29.9	Pre-obesity
30.0–34.9	Obesity class I
35.0–39.9	Obesity class II
Above 40	Obesity class III

Questionnaire

This questionnaire is inverted from (Kinyua, 2013), which has been modified and adapted to Egyptian food culture and habits. The questionnaire consisted of questions related to students' demographics, nutritional knowledge, nutritional attitude, and dietary practice. 40 questions were divided into three sections as follows: nutritional knowledge ,nutritional attitude and dietary habits.

Data Analysis

All collected data were coded and analyzed by using Statistical Package for Social Science (SPSS for version 20.0). Anthropometric data was recorded in Ms Excel to figure out BMI indices after which it was recorded in SPSS (Ozgen, 2016). Descriptive data were accomplished to get general characteristic of the data. Quantitative statistics was investigated to check for outliers. This was accomplished by operating frequencies, means, and dispersion and cross tabulation. Quantitative factors were analyzed using student's *t-test*, while chi-squared analyses were conducted for qualitative factors. All announced *p*-values were two-sided, and a *p*-value less than .05 was considered statistically significant (Yahia *et al.*, 2016).

RESULTS AND DISCUSSION

Socio-demographic distribution of university students:

Features of the participants are presented in Table 1. An overall of 658 students (247 male students 37.5% and 411 female students 62.5%), with average age of 19.84 ± 1.39 years, fully completed the survey. Approximately Two thirds of the students were non-science majors and most were in their first and second of undergraduate study. These results were coordinated with the findings of similar studies that found more than half of students were female. In addition, almost of students in first and second academic year (Van den berg *et al.*, 2012 and Samy, 2015), Further description of the sample can be found in Table (1) .

Table 1. Socio-demographic distribution of university students

Gender characteristics	Males (*n* = 247) Mean ± SD	Females (*n* = 411) Mean ± SD	Total (N = 658) Mean ± SD
Age (years)	20.16 ± 1.49	19.65 ±1.29	19.84 ± 1.39
Weight (kg)	75.22 ± 14.51	63.51±12.39	67.90 ± 14.38
Height (cm)	174.73 ±8.08	161.84± 7.16	166.68 ± 9.77
BMI (kg/m2) (Mean ± SD)	24.63 ± 4.40	24.21 ± 4.23	24.37± 4.29
Normal weight (BMI ≤ 24.9)%	21.27	35.25	56.53
Above normal (BMI ≥ 25)%	14.74	22.79	37.5
Major of study (%)			
Science(Faculty of Agriculture - Faculty of Nursing)	29.5	70.5	
Non-Science (Faculty of Commerce)	41	58.9	
Year in school (%)			
First-year undergraduate	31.7	68.2	
Second-year undergraduate	30.7	69.2	
Third-year undergraduate	49	50.9	
Fourth-year undergraduate	41.4	58.5	

SD: standard deviation , BMI: body mass index , N: number of students

Anthropometric measurements:

The lower prevalence of overweight/ obesity among our female students might be due to the worry of females about the weight and shape of their body than males, specifically at this age (Sheldon, 2010). The sociocultural environment in colleges prefers 'thinness' in women and promotes 'thinness' as a sign for beauty. During college stage, women face a great pressure to decrease their weight to reach the 'thin ideal' body. As body model being thin is more likely to gain peers' attention (Ferguson *et al.*, 2011). These figures are in opposite to the data from recent studies related with obesity prevalence in Egypt and targeted to analyze the results; indicating that a specific issue in Egypt is that spread of

obesity is more than double in females (46%) as compared to males (22%) and that obesity increases among Egyptian females with age, urban, residency, unhealthy diet, wealth and physical inactivity (Alebshehy *et al.*, 2016). Regarding our results, body weight, 56.44% of female and 56.68% of male students were within the normal BMI range. While 39.24% and 36.47% were either obese or overweight, respectively (Figure 1). These results were consistent with the finding of similar study (Genena and Salama, 2017), indicated that about half of the participants (55.8%) were of normal weight (49.6% of males compared to 59.1% of females), while almost one third (28.9%) of the sample was overweight, 11.8 % was obese and 3.5% was underweight.

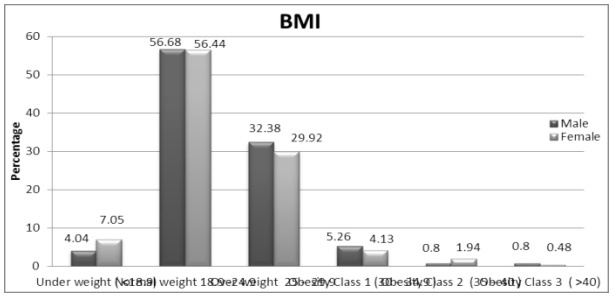

Figure 1. Classification of Weight Based on body mass index (BMI)for male and female Students Under Study

The mean estimated BMI for all students was 24.37 kg/m^2 (SD = ± 4.29 kg/m^2) and for females was 24.21 kg/m^2 (SD = ± 4.23kg/m^2), whereas for males, the mean BMI was 24.63 kg/m^2 (SD = ± 4.40 kg/m^2 . However, results were within the normal range for both genders (Table 1) and (figure 1). The results of this study declare that most of students were of regular weight possessed regular (BMI). However, close to maximum normal 24.37kg/m^2 . These results were coordinated with the findings of similar studies in other Middle East and Western countries that reported high spread of obesity and overweight among undergraduate university students, (Yahia *et al*., 2008 ; Yahia *et al*., 2016 ; Genena and Salama, 2017). Yahia *et al*., 2008 reported mean BMI of 23.6 ± 4.1 among Lebanese university students , Yahia *et al*., 2016 stated mean BMI of 24.1 kg/m2 (SD = 4.33 kg/m2) among Central Michigan university students and Genena and Salama, 2017 announced mean BMI of 24.84 kg/m^2 (SD = 4.35 kg/m^2) among university students Alexandria.

Classification of Weight Based on body mass index (BMI)for Students Under Study

Distribution of students according to body mass index (BMI) categories according to (WHO, 2004) was revealed in Figure (2). It is noticed that, 56.5% of the students were normal body weight, while 5.9% were underweight. Only 30.9% of the students were overweight and 6.7% were suffering from obesity. These results were coordinated with the findings of similar studies (Al Mahmoud, 2013 and Demirci *et al.*, 2018).

However are the majority of students in normal weight, the results show weight gain. Obesity has a remarkable effect on student health in the future; it raises morbidity of chronic diseases such as CVD (Cardio Vascular Disease), Type 2 diabetes, hypertension, dyslipidemia, osteoarthritis and some kinds of cancers (Schaub and Marian, 2011). These results were coordinated with the findings of similar studies (Al Mahmoudand, 2013).

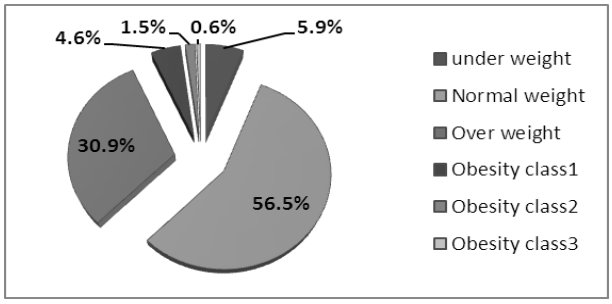

Figure 2. Classification of Weight Based on (BMI) of Students Under Study

Nutritional knowledge

The findings announce in general that, students had an average score of 31.7204 (±3.83934) with an extreme score of 42 and least score of 20 . Table (2) presents the distribution of students according to their nutritional knowledge score. students who had excellent score were fewer than those who had good score of nutritional knowledge were 16.1% and 78.1 % of the respondents respectively. In addition, The percentage of students who had the bad nutritional knowledge was very low (5.8%).

Table 2. General Nutrition knowledge of the students

Level of Nutritional knowledge	Percent (%)
Bad 15 - <25	5.8
Good 25 - <35	78.1
Excellent 35 - 45	16.1

Nutritional Knowledge in Macronutrient in foods

Carbohydrate

Only 31% gave the high answer concerning carbohydrate function. Energy food sources were correctly considered by 29.5%. For food that gives higher energy or calories, only 26.1% responded correctly .One-third of students have little knowledge about carbohydrates that's indicate a high need for developing their nutritional knowledge. More than half of the students were aware of the problems that could occur when not eating sufficient amounts of fibers, the correct answer is constipation by 52.1% .

Fat

19.8%of the students said that the good fats are found mainly in vegetable oils and dairy products together, is the most accurate answer, which is a small percentage, which indicates a misconception that the fats of the dairy products are not good. The fat that nutritionists recommend to reduce their consumption 29.3% chose saturated fats, which is the correct answer. Solid fat contains more than fatty acid, the correct answer was saturated fat for 11.4%.

Results showed that student's nutritional knowledge about fats need to be corrected.

Protein

The students' knowledge of high-protein foods was excellent, with the correct (Fish, milk, eggs and liver) response rate of 86.6% .

Nutritional Knowledge in Micronutrient in foods

Vitamins and Minerals

The highest percentage of answers to the question of vitamins that need fat to be absorbed in the body is

38%(vitamin A, D, E and K) and this result indicates the good knowledge of lipid-soluble vitamins. The nutritional knowledge of the students about vitamin, which is an antioxidant was medium, where the proportion of the largest answer was 37.4%(Vitamin C, B and A) but the accurate and correct answer to (Vitamin A, C and E) by20.5%. Results indicate excellent knowledge for students about metals and vitamins that should be consumed to prevent anemia. Nearly half of the students chose the right answer (Iron and Vit.C) by 48.3% .The students' knowledge of vitamins and minerals for bone growth was excellent as the majority of students responded with a correct answer (Calcium and Vit.D) of 65.2%. The results showed that the response of students about when to eat fruits was 40.9% before a meal and this is the best time for digestion to be better. In general, the nutritional knowledge of university students was good, requiring more precision in selection and better access to information.

Water:

The students' knowledge of the amount of water to be used on a day was excellent, with 71.9% responding to 2 liters per day . whereas the body is largely made up of water and good hydration is crucial for optimal body functions (Smolin and Grosvenor, 2008). WHO, (2005) the water requirements refer to total water from drinked water, water contained in beverages and water included in food. The recommended water intakes range from 2.5–3.7 l per day for adult men, and from 2.0–2.7 l per day for adult women. The draft (EFSA, 2008) recommendations (2.5 l per day for men, 2.0 l per day for women) are at the lower end of these ranges. IoM, (2005) the adequate intakes for water refer to total water intakes (including drinking water, water in beverages and water that has been part of food).The recommended water intakes for Adult (men) 19–30 years 3.7/ day, for Adult (women) 19–30 years 2.7/ day.

Nutritional information sources for university students :

Students have a broad ground of nutritional information. Despite of that, family keeps to be a path through which most of students acquire nutrition information. Figure (3) shows the origin of nutritional information of students. Most of respondents (61.9%) had acquired nutritional knowledge from family and small percentage (15.3%) through books, pamphlets and publications. Other origins from that students acquired nutritional information involve friends on average 44.4% which reveals the influence of friends on gaining nutritional knowledge. On the other hand, the most unreliable source of access to nutritional information are nutritionists (36.3%), Although it is the source that must be trusted and relied upon in their nutritional knowledge. These findings were different with the result of (Kinyua, 2013) which small proportion of students gained nutrition information from family(13.5%) but similar in Books and Social media .

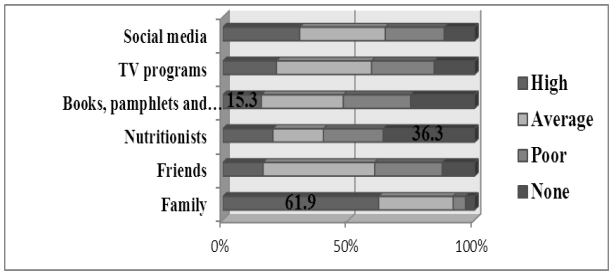

Figure 3. Sources on which the university students depend on their nutritional information

Nutrition Attitude status among Mansoura university students:

The study results present that most (80.7%) of the students has a just perspective towards nutrition habits which is a good sign of nutritional attitude. Out of overall score of 45 the least score was 15 and the top score was 45. The mean attitude score was 36.86 ±3.711.

Table 3. General Nutrition Attitude of the students

Nutrition Attitude	Percent (%)
Negative 15 - <25	10.3
Fair 25 - <35	80.7
Positive 35 - 45	9.0

Nutrition Attitude

Table (4) reflects that majority (81.9%) of students believe that it is true that students consume 3 master meals and 1 snack a day to preserve good health. In addition of (62.8%) them believe that whole grain products are healthy compared to refined products.as well students believe that (79%) cooking methods by boiling or steam are better than baking in the oven and frying (Yahia *et al*., 2016) . Also believe that (56.2%) women of the correct reproductive age took folic acid supplements 1 to 3 months before birth to avoid birth defects in the nervous system .Finally, more than half (54.7%) of students believe It is not simple to attain a balanced nutrition diet for university students, that indicates the influence of the surrounding environment at college stage that negatively affects students attitude of achieving balanced diet. These results were coordinated with the findings of similar studies (Manwa, 2013).

Table 4. Distribution of students according to their beliefs scores level

No	Statement	Correct answer (%)
1	It is true that students consume 3 main meals and one snack a day to maintain good health.(Agree)	81.9
2	A fat woman is more likely than a slimmer woman.(Disagree)	83.4
3	Brown sugar is a healthy alternative to white sugar. (Agree)	34.4
4	Fermented products are more useful than non-fermented products. (Agree)	44.1
5	Vegetables have no taste and are hard to cook. (Disagree)	83
6	Women of the correct childbearing age took folic acid supplements 1 to 3 months before birth to avoid birth defects in the nervous system. (Agree)	56.2
7	Oil / fat intake is important for the body to absorb vitamin A. (Agree)	40
8	It is not easy to achieve a balanced diet for university students. (Disagree)	54.7
9	Maintaining good nutrition for female students will have good results in motherhood. (Agree)	89.4
10	Fast food are convenient healthy food good for students. (Disagree)	81.3
11	Whole grain products are healthy compared to refined products. (Agree)	62.8
12	As we age it is preferred to eat less protein, carbohydrates and fat but eat more fruits and vegetables. (Agree)	77.8
13	Cutting green vegetables before washing does not lose them useful nutrients. (Disagree)	55.8
14	Cooking methods by boiling or steam are better than baking in the oven and frying. (Agree)	79
15	It is better to take a glass of milk instead of soft drink. (Agree)	82.1

Dietary Practices

The findings shown in this segment represent dietary practices in terms of meal intake patterns, snacks types consumed, meals sources consumed, frequency of consumption of diverse foods, soft drinks intake.

A comparison by gender shows eating habits of the students (Table 5). The outcomes in Figure (5) show preference of eating places by students. Home was the maximum desired as eating place (40.7%) came next the college canteen 38.6%. A few students preferred college cafeteria (20.7%). These results were coordinated with the result of a similar study (Kudo *et al*., 2017) which showed that 58% of students brought the lunches from home, 25% bought at the convenience store, and 14% ate at the cafeteria . On the other hand these findings were different with the result of (Kinyua, 2013) which presented that junk food restaurants were the most desired eating places (34.2%) came next the college cafeteria 25.1% while 22.3% prepared cooked food for themselves and 8.8% took packed foods from home.

Table 5. Student's response to questions related to their nutritional practices

Statement	Response		Males	Females	Total	P-value
			%	%	%	
1. What are the most possible places to take or buy your own meals in university campus?	a) College Canteen		41.7	36.73	38.6%	.019
	B) cafeteria		24.29	18.49	20.7%	
	C) Homemade meals		34	44.76	40.7%	
2. How many meals do you have a day?	a) meal		5.66	9.24	7.9%	.024
	b) two meals		36.03	42.82	40.3%	
	c) Three meals		58.29	47.93	51.8%	
3. How often do you have the following meals a week? (Choose one answer per meal)?	1.Breakfast	a) Every day	51.82	41.36	45.3%	.013
		b) sometimes	42.51	48.41	46.2%	
		c) None	5.66	10.21	8.5%	
	2.Lunch	a) Every day	79.3	82.72	81.5%	.519
		b) sometimes	15.38	13.38	14.1%	
		c) None	5.26	3.89	4.4%	
	3. Dinner	a) Every day	48.58	29.68	36.8%	.000
		b) sometimes	40.89	52.55	48.2%	
		c) None	10.52	17.76	15.0%	
	4. Snacks	a) Every day	25.50	36.25	32.2%	.016
		b) sometimes	56.85	48.17	51.5%	
		c) None	17.40	15.57	16.3%	
4. if you eat Snacks Which do you consume?	a) sweets		39.27	31.14	34.2%	.033
	b) Nuts		14.17	14.35	14.3%	.948
	c) Fruits / Vegetables		53.84	59.61	57.4%	.148
5. Do you drink soft drinks?	a) Yes		83.40	72.50	76.6%	.001
	b) No		16.59	27.49	23.4%	
6.How often do you take soft drinks?	a) Every day		28.34	25.06	26.3%	.016
	b) Once a week		42.10	35.52	38.0%	
	c) Once a month		12.95	11.92	12.3%	
7. Soft drinks have any damages / diseases?	a) Yes		28.74	24.81	26.3%	.006
	b) No		54.65	47.68	50.3%	
8. What are the causes of drinking soft drinks?	a) Osteoporosis		17.81	11.92	14.1%	.036
	b) Obesity		6.07	3.40	4.4%	.107
	c) digestive system		7.68	8.99	8.5%	.608
9. Are you sure you are applying a balanced diet when choosing and preparing your own foods?	a) Yes		29.14	27	27.8%	.553
	b) No		70.85	72.99	72.2%	

In Table (5) and Figure (4), Half of students (51.8%) reported taking meals regularly. These results were coordinated with the result of similar study (Van den berg *et al.,* 2012) which declared that the majority of participants (59%) ate three meals a day. On the other hand these findings were different with (Al-Mahmoud, 2013) which showed that (60.4%) of the students were taking meals irregularly. Almost half (45.3%) of students eat breakfast daily. These findings were different with (Persson and Flodmark, 2017) which showed that the majority of students did not eat breakfast every day of the week. Healthier eating habits were shown by male students compared to female students in expressions of breakfast consumption and meal frequency. Comparing male students and female students by 51.82% and 41.36 % respectively related to eating breakfast daily . There was a considerable gender difference in the frequency of meal intake (P = 0.001). Most of the students (51.8%) announced eating three meals per day. Among males, 58.29% announced eating two meals a day as compared to 47.93% females. Consuming vegetables and fruits was popular among students. An overall of 57.4% of the students announced daily intake of colored vegetables and fruits without gender differences (53.84% males versus 59.61% females). These results were coordinated with the result of a similar study (Yahia *et al*., 2008 and Yahia *et al*., 2016) .On the other hand these findings were different with the result of (Al-Mahmoud, 2013) which stated that consumption of colour vegetables and fruits was uncommon among students. Soft drinks consumption was common among students. The studied students consumed soft drinks at all and most of students (76.6%%) declared drinking soft drinks and 38.0 % reported to once a week. These results were coordinated with the results of similar

studies (Genena and Salama, 2017) which presented that more than two thirds of students (72.4%) reported the intake of soft drinks . On the other hand these findings were different with (Abraham *et al.*, 2018) which showed that a vast majority of participants (81.8%) reported that they either rarely or never drink soda. Daily consumption of snacks away from regular meals was more common among females than males (25.5% vs. 36.25% respectively) with a statistically significant difference among males and females (p=.016). Finally, more than half (72.2%) of students believe not applying a balanced diet when choosing and preparing their own foods .These results were coordinated with the results of similar studies (Zaborowicz *et al.,* 2016).

Meal Consumption Patterns:

The students consumed average number of meals 2.4392 in a day. The outcomes show in Figure 4 that most of the students consumed lunch (81.5%), breakfast (45.3%) and Dinner (36.8%) daily while daily snacking was low (32.2%).

The results show that the lunch meal was the most meal eaten by the students by 81.5%. In contrast, the breakfast meal was moderate consumption and therefore a large proportion of students were skipping breakfast, although, it has very important role in preventing short-term hunger thereby, improving cognition, short term memory and concentration (Kant and Graubard, 2006). Skipping breakfast is associated with low nutritional status and the risk of cardiovascular disease (Demirci *et al*., 2018). For university students, improved cognition and concentration are necessary for effective learning, therefore, breakfast is an important meal that should be eaten by all students, so the greatest dependence on the lunch as a main meal for students in college or in the house immediately after college, which explains that about one-third of the students eat dinner at 36.8% because the meal is late and contains a lot of fat and carbohydrates, which gives them a feeling of satiety so they ignore dinner, so we recommended a balanced healthy meal specifically for lunch as the major taken meal to supply them with their nutritional needs.

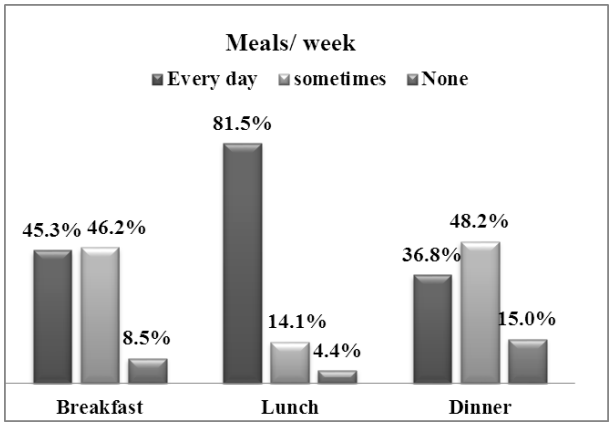

Figure 4. Meal Consumption Pattern

Relationship between lunch and breakfast

The table shows that students who eat the breakfast meal every day eat the lunch meal every day by a percentage 81.2% . These results were coordinated with the result of similar study (Medin *et al.*, 2019) which stated that 82% of adolescents eat both breakfast and lunch. Which indicates obvious impact of eating breakfast habit on regulating satiety and hunger feelings in body thus, regular meals eating in organized times has beneficial effect on body physiological mechanisms and requirements. Other studies have observed that breakfast skippers had a higher mean number of servings of discretionary foods (Smith *et al*., 2017) and a higher mean percentage of daily energy from added sugar (Smith *et al.*, 2017) and saturated fat (Fayet-Moore *et al*., 2017), than breakfast consumers.

Table 6. Relationship between lunch and breakfast

lunch		
		Percent
Valid	Never consumed	3.4
	Sometimes	15.4
	Everyday	81.2
	Total	100.0

Source of Food Consumed

Represented findings in Figure (5) show preferences of eating sites by students. Home was the most preferred eating site (40.7%) followed by the college canteen 38.6%. A few students preferred college cafeteria (commercial restaurant meals) (20.7%). In order to make healthy food choices available and affordable for university students , we highly recommend to make it supplied inside the university . Which will replace the fast food items served there with higher nutritional quality substitutes. This finding is similar to a previous study where (Pelletier and Laska, 2013). explained 44.6% of students purchased on food/beverages on or near Campus area purchasing ≥3 times/week, About one-fifth of the sample purchased food from à la carte dining facilities and food/beverages from restaurants or stores near campus ≥3 times/week. Bringing food from home to consume on campus was also common, with 46% of students doing so ≥3 times/week .

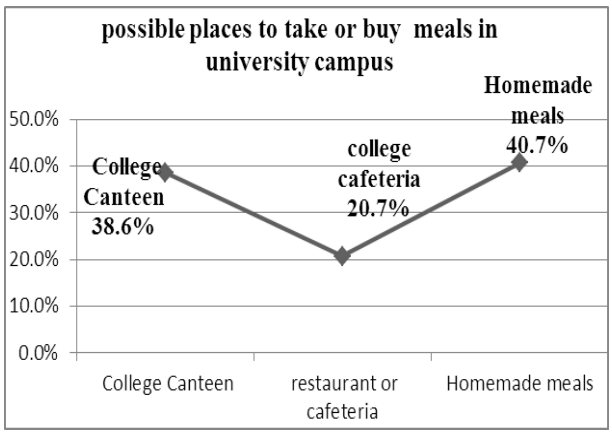

Figure 5. Source of Food Consumed

Snacks Consumed

As shown in figure (6), snack foods consumed by university students varied among fresh fruits and vegetables or candies or nuts . Surprisingly , fresh fruits and vegetables formed the greatest portion with 57.4% among snacks types (including fresh clean whole or chipped fruits and vegetables brought from home). However candies (including Tortilla, puffs , chips ,bakery , sweets and candies) were still dominating the easy to get snacks food in the university campus with 34.2% . Nuts

like peanuts, sunflower kernel , pumpkin pulp ,almonds, walnuts and hazelnuts were consumed by 14.3% of students. These findings were different with the result of (Kinyua, 2013) which stated that the most consumed by students were snacks high in fats and sugar while the least consumed were healthy snacks such as fruits and nuts with a percentage of 6.9% and 8.3% respectively.

Fortunately, diet pattern in Egypt based on plenty of fresh plant- based foods which is considered affordable , easy to handle and agreeable for families . as a result, fruit-snacking is a healthy homebuilt diet habit students adopt . That covers major nutritional requirements for this group.

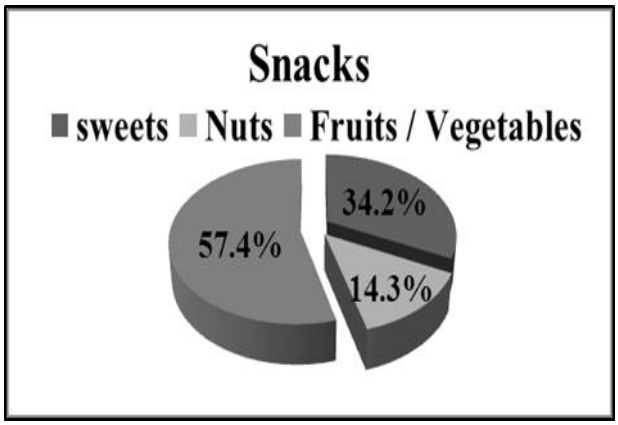

Figure 6. Snacks Consumption Patterns

Soft drinks Pattern

The study findings report that most of the respondents taking soft beverages (76.6%) while a proportion of 23.4% did not consume soft drinks. These findings were similar with the result of (Genena and Salama, 2017) which stated that more than two thirds of students (72.4%) reported the intake of soft drinks. Scientific studies have declared how a one or two soft drinks a day can increase one's risk for many health problems. Some of them are obesity, diabetes, tooth decay, osteoporosis, nutritional deficiencies, heart disease, and many neurological disorders (Kharde *et al.*, 2013 and Hamad, 2019). For the percentage that consumed soft drinks, most of the students (38 %) intake were soft drinks one time a week and a small percentage (12.3%) once a month as shown in Figure (7).

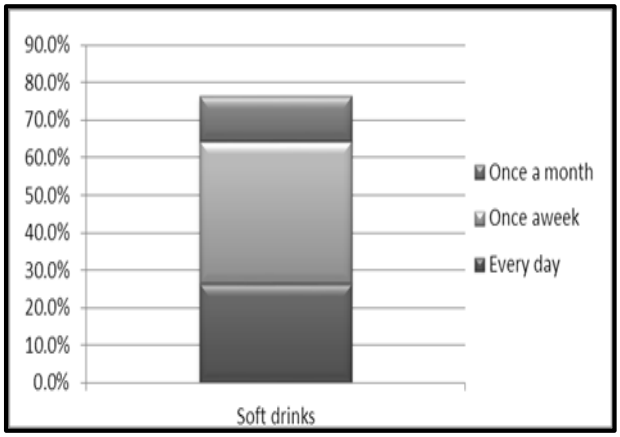

Figure 7. Soft drinks Pattern

Nutrition Consideration in Food Choice

Majority (72.2%) of the respondents disagreed that they regarded nutrition when picking out and selecting meals, while 27.8% considered nutrition, which indicates poor nutritional knowledge about dietary practices that causes nutritional deficiency.

Frequency of Food Consumption

Food frequency findings in Table 7 declare students consume a variety of foods. Briefly, Table (7) and Figure (8) reflects the highest consumption at cereals were white rice by 60.6% and whole bread by 60%, This may be due to , Rice and whole bread are popular foods in Egypt most areas and cultures consequently this might imputed to students selection as main staples regularly consumed. These results were coordinated with the result of a similar study (Okeyo, 2009) which foods consumed at high frequencies on a daily basis included bread (55.6 %). Concerning roots and tubers was potato chips by 49.1%,this choice may lead to obesity and other health problems, For milk and dairy products was yogurt by 23.6% as the most common dairy intake among people's area, with regard to, meat, poultry and meat products were eggs by 36.2%, for legumes and nuts was 45.4% for 1-2 times per week, for fruits were 53.5%, for vegetables were 37.1%, also low daily consupmtion of fruits and vegetables by students in spite of their vital contribution in providing vitamins and minerals that are critical for the functions of the body. About beverages were tea by 58.2%,although tea decreases absorption of iron especially as people drink it directly after meal as they used to, Concerning sweets was biscuits by 33.1%,this is because biscuits are a cheap and affordable snack at college canteen, with regard to sweeteners was natural sugar by 40.1%. These results come in agreement with similar studies (Kinyua, 2013) which food consumed most, the students regularly consumed fruits and vegetables, a percent of 48.2% and 44.1% consuming them daily respectively. Most of students regularly consumed sugar/honey (56.7%) per day, while tea/milo/cocoa (68%) was the most regularly consumed beverage per day.

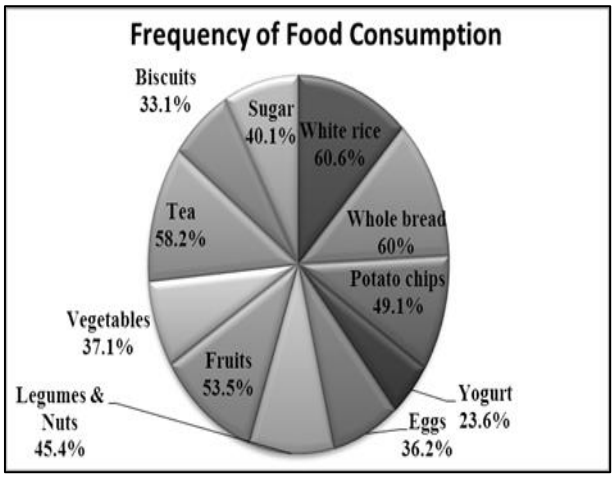

Figure 8. Frequency of Food Consumption

Table 7. Frequency of Food Consumption

Type of food	% Repetition per week			
	Every day	**1-2 per week**	**3-6 per week**	**never consumed**
1. Cereals				
White rice	60.6	18.4	16.0	5.0
Brown rice	3.2	17.6	7.8	71.4
French bread	19.8	41.6	13.1	25.5
Whole bread	60.0	15.5	10.9	13.5
White bread	6.4	15.2	9.7	68.7
Whole grain bread	8.8	10.5	8.4	72.3
Cereal	15.2	15.7	9.9	59.3
2.Roots and Tubers				
Potato chips	49.1	29.2	14.1	7.6
Potato crisps	34.7	37.8	19.1	8.4
Mashed/baked potatoes	13.1	40.7	22.2	24.0
Taro	4.3	23.1	14.1	58.5
Carrots	9.7	37.4	23.6	29.3
Sweet Potato	7.4	37.5	24.5	30.5
3.Milk and dairy products				
Fresh milk	22.2	30.2	11.6	22.2
Yogurt	23.6	35.7	16.3	24.5
ice cream	14.1	38.6	26.0	21.3
4.Meat, poultry and meat products				
eggs	36.2	37.5	15.3	10.9
Fish, Seafood	11.6	61.2	16.0	11.2
Meat	12.2	59.0	21.7	7.1
sausage	4.1	18.5	16.7	60.6
Burger	3.6	23.6	17.5	55.3
5. Legumes and nuts (Legumes:lentils,beans,peas,chickpeas,hazelnut,almonds, peanuts)	27.8	45.4	16.9	9.9
6. Fruits Mango,Strawberry,Orange,Banana,Watermelon,Grape,Peach, Apricot,Tin,Plum, Apple	53.5	26.1	17.8	2.6
7.Vegetable Spinach,cucumber, lettuce,watercress, cabbage,pepper, zucchini,okra, mulukhya	37.1	34.3	18.2	10.3
8.Beverages				
Tea	58.2	16.1	7.9	17.8
juice	30.4	41.8	19.5	8.4
coffee	25.8	22.0	12.8	39.4
Carbonated water	22.0	35.0	16.3	26.7
9. Sweets				
chocolate	23.1	46.7	13.8	16.4
Various sweets	19.5	46.0	19.6	14.9
Cake	12.8	46.0	25.5	15.7
Biscuit	33.1	36.2	16.9	13.8

10.Sweetners	Daily					
	One table spoons/ cup	Two table spoons/ cup	three table spoons/ cup	four table spoons/ cup	more than four table spoons/cup	never consumed
Natural sugar (beet / cane)	40.1	16.4	12.2	3.0	8.8	19.5
Synthetic Sugar	10.8	9.6	6.8	2.7	2.9	67.2
lactose	9.4	5.8	5.8	3.6	2.0	73.4
Dextrin	5.5	5.0	4.0	3.0	1.5	81.0
honey	39.2	14.4	6.1	4.4	4.7	31.2

Suggested main meals for university students

As resulted from the investigated group survey on nutritional habits from part one in our study it has been shown that the majority of them (81.5%) in Figure (4) having the habits to eat lunch meal. Also, breakfast and dinner didn't show noticeable trend in the studied group. Thus, we have chosen lunch meal to suggest a model balanced meal to consume during the day.

Especially, that could be served as for served as a student service from the university. In working hours in public restaurants inside the campus.

The meal composed of : bulgur , bread whole wheat (balady bread) , roasted chicken breast , mushroom , milk , zucchini , broccoli , carrots , Beans dark red , wheat flour , sauce soy , sun flower oil , orange as shown in the table(8).

Nutritional composition of the recommended meal was based upon (2015-2020 Dietary Guidelines recommended) .The meal covers one third of the whole daily main nutritional requirements .

Meal model (1)

Table 8. Nutritional analysis of recommended meals for university students

Food Item	Bulgur, cooked	Bread, whole wheat, commercial	Chicken, breast, roasted	Mushrooms, raw	Milk, whole, 3.3% M.F.	Zucchini, cooked	Broccoli, cooked	Carrots, cooked	Beans, kidney, Beans dark red, canned, not drained	Wheat flour, all purpose	Sauce, soy	Sun flower oil	Orange	Total
Weight (g)	150	70	100	50	100	50	50	50	50	15	18	14	131	
Serving	1 ½ cup	2.5 slice	1 slice	4 piece	½ cup	½ cup	½ cup	½ cup	½ cup	1 tbsp	2 tbsp	3 tbsp	1 medium	
Energy (kcal)	125	172	158	11	60	8	14	18	43	55	7	122	62	855
Carbohydrate (g)	28.1	32	N/A	1.85	4.6	2.1	2.5	3.8	7.9	11.36	1	N/A	15	110.21
Protein (g)	4.6	6	33.3	1.85	3.1	0.5	1.5	0.6	2.6	1.59	tr	N/A	1	56.64
Fat (g)	tr	2	2.6	tr	3.1	tr	tr	tr	0.26	0.22	tr	14	tr	22.18
Dietary Fiber (g)	4.2	4.8	N/A	0.55	N/A	0.68	1.18	0.87	3.2	0.45	0	N/A	2.3	18.23
Calcium (mg)	15.6	50	N/A	1.8	112.7	6.3	20.1	16.2	11.9	2.27	1	N/A	52	289.87
Iron (mg)	1.4	2.4	0.5	0.27	0.03	0.15	0.36	0.19	0.63	0.7	0.3	N/A	0.1	7.03
Magnesium (mg)	48.4	60	29.3	4.6	10.07	11.05	10.36	5.19	14.02	3.4	1	N/A	13	210.39
Thiamin (mg)	0.15	0.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.11	N/A	N/A	N/A	0.46
Folate (DFE)	26.56	36	4	8.3	5.03	8.4	54.2	6.4	25.6	43.63	2	N/A	39	259.12
Vitamin A (RAE)	N/A	N/A	6.6	N/A	27.9	27.8	49.3	423.37	N/A	N/A	N/A	N/A	8	542.97
Vitamin E (mg)	N/A	N/A	0.26	N/A	N/A	N/A	N/A	N/A	0.29	N/A	N/A	5.7	N/A	6.25
Vitamin D (mcg)	N/A	N/A	0.2	N/A	1.04	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.24
Vitamin C (mg)	N/A	N/A	N/A	0.9	N/A	2.1	32.3	1.29	N/A	N/A	N/A	N/A	70	106.59
Vitamin B12 (mcg)	N/A	N/A	0.34	0.01	0.43	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.78

Energy

Requirements were 855 k. calories Which fulfill 55% of whole RDA of energy from carbohydrate in the form of bulgur and balady bread were (110.21 g). and protein Which fulfill 20% of whole RDA of energy in the form of Chicken breast roasted , Milk and mushrooms were (56.64 g) and fat Which fulfill 25% from both visible and invisible fat which represented in sunflower oil and other component (22.18 g).

Carbohydrates

Bulgur and balady bread was chosen as a healthy complex carbohydrate source for its low simple sugars and high dietary fiber content (4.2 g) linked to higher satiety levels for longer times and lower Glycemic index. Dietary fiber also benefits heart health and improves blood lipid profile . Elevating fiber consumption decreases blood pressure and serum cholesterol levels. Elevated consumption of soluble fiber improves glycaemia and insulin sensitivity in non-diabetic and diabetic individuals. Fiber supplementation in overweight individuals remarkably promotes weight loss. Increased fiber consumption improves a number of gastrointestinal disorders including the following: gastro esophageal reflux disease, duodenal ulcer, diverticulitis, constipation, and hemorrhoids. Prebiotic fibers seem to promote immune function (Anderson *et al*., 2009). Obesity , Diabetes mellitus (DM) and heart disease are common health risk for this age group with increased risk from their retarded nutritional habits and traditional unhealthy food consumption . thus we suggest to involve traditional and complex carbohydrate sources.

protein

Chicken breast roasted (33.3 g) as the main source of high quality digestible of good nutritional quality, unsaturated lipids (mainly found in the skin and easily removed), B-group vitamins (mainly thiamin, vitamin B6, and pantothenic acid), and minerals(like iron, zinc, and copper) make poultry meat a valuable food. Consumption of poultry meat, as part of a vegetable-rich diet, is associated with a risk reduction of developing overweight and obesity, cardiovascular diseases, and type 2 diabetes mellitus. Also, white meat (and poultry in particular) is considered moderately protective or neutral on cancer risk (Marangoni *et al*., 2015). The relevance of poultry meat for humans also has been recognized by the UN Food and Agricultural Organization (FAO), who considers this widely available, relatively inexpensive food to be particularly useful in developing countries, where it can help to meet shortfalls in essential nutrients. Milk and mushrooms are also participate with this meal as a source of good protein. Which mushroom is an ideal food due to its low calorific value, no starch, and little fat and sugars. Mushrooms have been shown to enhance immune function; promote health; lower the chance of developing cancer; prevent tumor growth; assist balancing blood sugar; decrease inflammation; and maintain the body's detoxification mechanisms (Manikandan, 2011). Milk is considered to be an excellent source of essential amino acids for human nutrition, growth, and development(Kanwar *et al*., 2009). Milk fat provides essential vitamins to the body: vitamins A and D .while Vitamin D is essential in the binding of calcium and bone

growth (Mourad *et al*., 2014). The balady bread is participated with (6 g) of protein .

Fats

Represented in sunflower oil which rich source of Vitamin E is a well-studied antioxidant that is under study for its ability to protect oxidation of the bad LDL-cholesterol. It also keeps our blood free-flowing, by making blood cells less likely to clump and form clots (AOF, 2005).

Minerals and vitamins

Represented in vegetables and fruits. Vegetables include (zucchini , broccoli ,carrots and black beans). zucchini rich in vitamin A(27.8 mcg) which necessary for proper functioning of the human body. Broccoli is an excellent source of vitamin C(32.3 mg) , vitamin A (49.3mcg) and folate (vitamin B9) (54.2mcg). Vitamin C is needed for growth and repair of body tissue. Vitamin C helps the body make collagen, a tissue needed for healthy bones , teeth ,gums and blood vessels. Folate (vitamin B9) Particularly important for pregnant women, folate is needed for normal tissue growth and cell function and necessary component of our daily diets, required for synthesis of DNA. vitamin A shortage may cause night blindness, which can be inverted with improved vitamin A status.

Broccoli contains beta carotene, which body turns into vitamin A. carrots rich in carotenoid which body converts into vitamin A which is crucial for preserve vision, enhancing growth and development, and protecting epithelium and mucus integrity in the body, also is anti-inflammation vitamin because of its critical role in promoting immune function (Huang *et al*., 2018).

Beans rich in folate (25.6mcg) and magnesium (14.02mg) also, Beans are unique among protein-rich foods for their high carbohydrate and low fat content (Messina, 2014). Beans are also rich in fiber (3.4 g). Beans also serve as an economical source of nutrients. Beans provided the highest nutrient value for the lowest cost.

Fruits represented by orange rich in vitamin C which Vitamin C is an essential nutrient that plays a vital role in protecting the body from infection and disease. It is necessary in the synthesis of collagen in connective tissues, neurotransmitters, steroid hormones, carnitine, and conversion of cholesterol to bile acid and enhances iron bio-availability (Robert *et al*., 2000).

Meal preparation and cooking methods

Three cooking methods were used in this meal. At cooking bulgur with Braising and this method is useful in keeping nutritional value and gives variety of presentation and flavor. The chicken were roasted as a healthy method which keeps it juicy and reduces consumed fats which results in reducing cholesterol and heart diseases and preserve body weight. Steam cooking was used as for the cooking of vegetables, that retains maximum color and nutritive value.

CONCLUSION AND RECOMMENDATIONS

Our findings shows a prevalence of almost one third of university students are overweight . Linked to high consumption of rice, bread, and fatty snacks as a dietary practice and habit of this group. Positive news are nutritional knowledge level was reported to record high score 78.1% and also nutrition attitude of the students have a fair attitude with score level 80.7% which indicates a good tendency to improve diet pattern and encourage them to adopt healthier diet habits through a general policy of the university administration to afford a nutritional services to its students in the form of master meal designed and served on scientific balanced basis. In order to ensure the nutritional daily requirements of this group. Which will be a great service from the university for its students offers healthy safe, affordable , approachable and favorable for this group .Our results and recommendations are in parallel with the governmental massive plan for public health sustainability program which started recently. The presidential initiation of (100 Healthy Million) ,which aims at ensuring free virus c individuals and detecting risk factors of non-communicable diseases like hypertension and obesity. This recent attitude launched in October 2018 till April 2019 has a milestone impact in raising the awareness of healthy eating related habits linked to overall and public health.

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تقييم المعرفة والعادات الغذائية والحالة التغذوية بين طلاب جامعة المنصورة

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إن الحالة التغذوية لجيل الشباب وخاصة طلاب الجامعات هي جانب ذو أولوية عالية لضمان مرحلة بلوغ صحية مستدامة, التي تتأثر بمعرفتهم الغذائية وعاداتهم اليومية بالنظام الغذائي والنشاط. ومع ذلك ، فإن المعرفة التغذوية والحالة التغذوية لطلاب الجامعة لم تتم تغطيتها بشكل كاف من خلال الأبحاث المناسبة والتحقيقات الوبائية. و تهدف الدراسة إلى تقدير المعرفة الغذائية والعادات ذات الصلة لدى طلاب الجامعة. دراسة طبقية عشوائية من 658 طالباً (37.5% ذكور و 62.4% إناث) تتراوح أعمارهم بين 17 إلى 25 ، تم اختيارهم من جامعة المنصورة (كليات الزراعة,التجارة و التمريض). ملأ الطلاب استبيان تم الإبلاغ عنه ذاتيًا حول معرفتهم التغذوية والممارسات الغذائية والتقييم الغذائي لهم. أخذت القياسات الجسمية من الطول , الوزن ومؤشر كتلة الجسم. و قد أجريت التحليلات الإحصائية لها. تم استخدام مؤشر كتلة الجسم (BMI) لتقييم حالة وزن الجسم. تم تصميم وجبة رئيسية مقترحة على أساس علمي متوازن لتلبية الاحتياجات الغذائية اليومية التي تناسب هذه الفئة العمرية ، والتي تتألف من جميع العناصر الغذائية. كشفت النتائج أن غالبية الطلاب (56.5%) كانوا من ذوي مؤشر كتلة الجسم الطبيعي (21.2% من الطلاب مقابل 35.3% من الطالبات). المعرفة الغذائية الصحيحة شكلت (78.1 %) من الطلاب ، و تم اكتشاف سلوك غذائي وسطي رائد (80.7 %) بين الطلاب. أظهرت عادات الأكل لدى الطلاب (51.8 %) تناول وجبات الطعام بانتظام. أعلن الطلاب تناول وجبة الإفطار يوميًا (45.3%), المشروبات الغازية (76.6%) والوجبات الخفيفة(32.2%) , أيضاً اختار الطلاب المنزل المكان المفضل لتناول الطعام (40.7%). أوضحت النتائج أن الطلاب اعترفوا بعدم تطبيق عادات غذائية صحية حتى مع المعرفة الجيدة بها. على الرغم من أن غالبية الطلاب في الوزن الطبيعي ، تشير نتائج الدراسة إلى زيادة الوزن والعادات الغذائية السيئة المرتبطة بالمعرفة الغذائية المعتدلة التي تحتاج إلى مزيد من التحقيق لتقليل الميل إلى زيادة الوزن والحفاظ على العادات الغذائية الصحية. كما ينبغي تطبيق البرنامج التعليمي العام في ممارسات الحمية الصحية.

الكلمات الدالة: العادات الغذائية ، المعرفة الغذائية ، التقييم الغذائي ، طلاب الجامعة ، مؤشر كتلة الجسم.