

# **The University of Jordan Students' Concerns and Awareness about Trans-Fatty Acids**

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## **Abstract**

Total Trans Fatty Acids (TFAs) intake was associated with an increased risk of coronary and cardiovascular diseases and their mortalities. The World Health Organization highlighted the seriousness of TFAs intake and called to ban TFAs from foods or to limit their intake to less than 1% of the total amount of the energy intake. Fast foods are considered to have a high percentage of TFAs. University students spend most of their time outside home which makes them the suitable population to consume these kinds of food. The purpose of this descriptive study was to assess the University of Jordan students' concerns and awareness about TFAs. Four hundred and seventeen students answered a self-reported questionnaire about TFAs from October, 2015-January, 2016. Descriptive statistics, independent sample t test and multiple regression were used to analyze the data. Results showed that students at the University of Jordan were found to have moderate concern relevant to TFAs (Mean±

SD;  $20.0 \pm 5.1$ ), and moderate awareness relevant to TFAs health risks (Mean $\pm$ SD;  $51.5 \pm 15.2$ ). Awareness was predicted from the faculty of students (health faculties), female gender, living status, and family income, which explained 30% of the variance. In conclusion, it is known that high levels of TFAs are associated with increased risk of cardiovascular diseases and obesity, especially in young adults. The results of this study showed that concern and awareness of the students about health risks and dietary sources of TFAs was insufficient to make decisions of healthier food selection.

**Keywords:** Total Trans Fatty Acids, concerns, awareness, knowledge, University Students, Jordan

## **Introduction**

Trans Fatty Acids (TFAs) are unsaturated fats that act like saturated fats because of their chemical structure [1]. Total TFAs intake was associated with an increased risk of coronary and cardiovascular diseases [2, 3, 4, 5], and their mortalities [6]. They may naturally exist in small amounts in dairy products and meat. The industrial or artificial form of TFAs results by industrial processing of vegetable oils and heat treatments of food [7, 8, 9]. Therefore, TFAs may present as high as 50g/ 100g in a variety of baked, manufactured and processed restaurants' foods where hydrogenated oils are used in this processing such as cooking, frying, and baking [10].

The amount as well as the quality of dietary fat intake has been highlighted in recent literature [5]. In 2008, the World Health Organization (WHO) highlighted the seriousness of TFAs intake and called to ban TFAs from foods [11], or to limit their intake to less than 1% of the total amount of the energy intake. The U.S Dietary Reference Intake (USDRI) in 2010 recommends that TFAs should be completely eradicated from all food supplies by the year 2018 [12].

Trans Fats or TFAs are used in the packaged and restaurants' food in order to make them more palatable, stable over time, and to increase the shelf life of these foods [8, 9]. Thirteen food groups were identified as containing TFAs, deep fried food and fast foods ( i.e., falafel, Popeye's, Mc Donald's, Kentucky Fried Chicken, French Fries); pie crust (light flaky bakeries); margarine; shortening; frosting (i.e., creamy chocolate); bisquick (i.e., waffles and pancake); non-dairy creamers (i.e., three in one drink); microwave popcorn; animal fat and dairy products; store – bought cookies and cakes and packed bakeries; crackers and snacks (i.e., chips) and biscuits; creamy frozen drinks; and refrigerated dough [13].

There is an existing evidence supporting that young people intake of products with few nutrients but high in saturated fats and TFAs is associated with overweight and obesity [14]. In turn, young people who become overweight or obese are at higher risk for a variety of nutrition-related chronic diseases that can affect the rest of their lives [15, 16]. University students consist a major section of

this group because their numbers are high and they spend most of their times outside home. This makes them the suitable population to consume these kinds of food.

The relationship between diet and health is well established in the literature [17]. The role of nutritional knowledge in maintaining health, improving quality of life, and preventing certain diseases such as CVD is also documented in scientific research [17]. In order to have a positive impact of the diet on the health outcomes, people should be knowledgeable (concerned and aware) about the nature of the food they are eating and apply this knowledge during their daily habits [18, 19]. Based on that, the relationship among knowledge, concerns and awareness relevant to food item selection was emphasized in the modern literature ([17, 18, 19, 20].

Jordanian population in general was within the recommendations of TFAs intake as 0.7g as an average daily intake [21]. This corresponds to 0.2% of the total daily energy consumption [21] and that was explained by relative shifting of using oils on the expense of ghee in cooking. This report might only reflect the household consumption of food. This is because it was based on the household budget survey where people used to process their traditional food at home which is considered cost beneficial than purchasing ready restaurant-sold foods [21]. While, university students are mostly dependent on restaurants'-made, fast, packaged, and prepackaged foods as they stay longer times outside their homes.

Identification of individuals' knowledge (concerns and awareness) pertinent to TFAs can help in identifying the positive behaviors to be reinforced and negative behaviors to be modified. Also, identification of the knowledge level relevant to TFAs may help policy makers to identify strategies to increase awareness about TFAs and the health risks associated with this dietary substance. Therefore, the general purpose of this study was to assess the University of Jordan (UoJ) students' knowledge (concerns and awareness) level relevant to TFAs.

## **Methodology**

Specific aims: The study was planned to a) assess the UoJ students' concerns level related to TFAs, b) assess the UoJ students' awareness level related to TFAs, c) determine if there a difference in knowledge level (concerns and awareness) based on socio-demographic variables and sample characteristics, and d) determine the predictors of knowledge/ awareness from socio-demographic variables and characteristics of the study sample.

Design and Setting: A non-experimental, descriptive cross-sectional correlational design was used to meet the objectives of this study. This study took place at the UoJ which is located in Amman, the capital of Jordan. There are about 43,000 national and international students enrolled at all faculties [22]. National students are coming to the UoJ from all governorates of Jordan. At the UoJ, there are eight restaurants for the fast foods and fifteen bars for snack foods; cookies, chips, chocolates, and drinks. Moreover, the UoJ is located in an area that is surrounded by a large number of shops, markets, restaurants and fast foods' outlets.

Sample and Sampling: A convenience sampling technique was used for the purpose of this study. To make sure that the sample size is sufficient to get statistical significant, sample size was determined using G\* power 3.1 software [23]. Using a power level of 0.80, an alpha level of 0.05, and a relatively small effect size of 0.05 with ten predictors, the estimated sample size needed for regression analysis was 400 students. To participate in this study, the students should be: a) 18 years or above, b) willing to participate in the study by signing an informed consent.

#### Data Collection Procedure

Data were collected through face-to-face interview with students during their availability at the university. The researchers themselves collected the data from students. This was carried out by: individual recruitment of the students during their availability at the university, in their faculties, milk bars, and restaurants, or through pre-arranged sessions with the instructors to interview the students at their classrooms for the first or last fifteen minutes of the lecture. The researcher explained the way of completing the questionnaire after voluntary approval for participation by the students. The invitation letter and the information sheet were administered first with clarification about the study and its purpose. The signed informed consent was obtained from all students.

#### Ethical Considerations

The study was approved by the ethical committee at UoJ. Moreover, this study was totally anonymous, and no identifications were required from the participants. The participation in the study was voluntary and all participants signed informed consent prior to data collection after a detailed explanation about the study and its purposes. Participants were assured that they have the right to withdraw from the study at any time, with no obligation to give a rationale for withdrawal. All collected data were coded and entered to a pass-word protected computer with access only to the principal investigator and the co-investigators. Only aggregate data were used for publication purposes.

#### Measurement of the variables

Because there is a difference in the nature of food in Arabic developing countries compared with the developed countries; the researchers adopted a 99-question survey from Cogent Research in conjunction with the American Heart Association which was developed by Eckel, et al. in 2009 [20]. This survey is originally covering the topics of concern with the amount and type of fat consumed; awareness of specific fats and oils; awareness of the FDA guidelines, trans-fat labeling requirement; knowledge of sources of saturated and trans fats; knowledge of the effects of specific fats and oils on heart disease; behaviors related to fats for grocery store purchases and cooking; and behaviors at restaurants [20].

To make sure that this survey suits Jordanian norms, the used questions were structured as a scale format and some items were modified by the researcher. The new structured questionnaire and the modifications were validated by seven professors as the following: Three experts in the field of nutrition, two experts in the public health, and two experts in instrument developments in the field. A pilot

study on 10% of the sample size (40 participants, excluded from the main study sample) was done to make sure that the instrument is clear, understood and appropriate to culture. No changes were necessary based on piloting. The test-retest-reliability coefficient was 0.86. Moreover, the reliability of the instrument was checked by measuring the Cronbach's Alpha for the three sections and for the total instrument. The concern subscale has a Cronbach's Alpha of 0.71, the awareness subscale 0.92, and the total score 0.89. Based on these results, the instrument was considered as valid and reliable by the experts.

The new instrument consisted of the following sections: Section one: was about participants socio-demographic variables and characteristics (age, gender, faculty, specialty, level of education, year of study, living status (alone, with students or with the family), number of study days at the university, monthly income for the family, average daily expenditure for food and drinks, way of affording food (preparing food by him/ herself or depends on restaurants' and fast foods outlets), and nationality.

Section two: Measuring the participants' knowledge (concerns part) of overall health related to TFAs intake. This section contains six items likert scale with 5-point response. A score for overall concern about overall health related to TFAs was obtained by calculating the mean of the responses. Items of the subscale of concern were scored as not at all concerned = 1, rarely concerned = 2, sometimes concerned = 3, often concerned = 4, and extremely concerned = 5. The original author of the questionnaire has identified that responses of not at all concerned and rarely concerned responses are equivalent to low concern, sometimes concerned is equivalent to moderate concern, and often and extremely concerned is interpreted as high concern [20]. To estimate the level of concern, as identified by the original authors of the questionnaire, the responses of 4 (often concerned) and 5 (extremely concerned) were interpreted as concerned. The student was considered as concerned if the mean of his/her responses were 24 and above [20].

Section three: This is a 20- item subscale assessing the knowledge (awareness part) about TFAs in foods and its risks to health. The answers have a 4-point response format. Items were scored as don't know= 1, know somehow =2, have fair knowledge =3, knows very well= 4. To judge the level of the awareness of students in this study, the responses of 3 (have fair knowledge) and 4 (knows very well) were interpreted as knowledgeable [20]. So, the student was considered knowledgeable if his mean knowledge responses were 60 or above, of moderate knowledge if his mean was between 40-59, and unknowledgeable if his mean was below 40.

Section four: This section assessing knowledge about 23 food items known to be not containing/containing unsaturated, saturated, or TFAs in an aided way. A list of familiar and commonly consumed food (relative to culture) was arranged. Response to each item was formatted as: know it does not contain= 1, know it contains= 2, don't know= 3. Responses were dichotomized into two categories: 'correct' (correct response given) or 'incorrect' (including incorrect response and don't know). Turrell and Kavanagh [24] referred to this clustering of

responses as 'strict' scoring in that both incorrect and don't know responses are considered equally indicative of a lack of knowledge. Frequencies and percentages of correct responses versus incorrect responses were estimated. The higher percentage of correct answers indicates the higher level of knowledge.

#### Data analysis

All data were coded and entered to SPSS software. Categorical variables (gender, faculty, and specialty, level of education, living status, food preparation, and nationality) were expressed as frequencies and percentages; continuous variables (level of knowledge (concerns and awareness relevant to TFAs)) were expressed as means  $\pm$  SD. To test specific aims one and two, descriptive statistics with frequencies and percentages or means  $\pm$  SD were used. To test specific aim number three independent sample t-test was used. To test specific aim number four, first a serial of bivariate correlation between sociodemographics and knowledge (concerns and awareness) were done. Then, multiple liner regression analyses models were used.

## Results

### Sociodemographics of the sample

Five hundred students were accessed among which 417 completed and returned the questionnaires (response rate 83%) and were included in the analysis. Table 1 represents the sociodemographics of the sample. Approximately 70% of the included students were females. Almost one third of the students (i.e. 33.1%) were enrolled in the health faculties, 28.8% were from the scientific faculties, and the rest were studying either in the humanities or higher education. Most of the students (82.3%) were from the bachelor level, living with their families, and 75.5% of them reported intake of ready-made foods. The majority of the students were Jordanians; their family income was higher than 500 JDs, with a mean age of  $22 \pm 3.1$  years.

Table 1: Sociodemographics of the sample.

Variable	N=417 Frequency (%)
<b>Gender</b>	
Male	128 (30.7%)
Female	289 (69.3%)
<b>Faculty</b>	
Higher education	70 (16.8%)
Health	138 (33.1%)
Science	120 (28.8%)
Humanities	89 (21.3%)
<b>Level of education</b>	
Bachelor	347 (83.2%)
Master	70 (16.8%)

<b>Living status</b>	
Living alone	74 (17.7%)
Living with family	343 (82.3%)
<b>Preparing food</b>	
Home prepared food	102 (24.5%)
Ready food	315 (75.5%)
<b>Nationality</b>	
Jordanian	377 (90.4%)
Non Jordanian	40 (9.6%)
<b>Family income</b>	
Less than 500JD	45 (10.8%)
501-1000JD	139 (33.3%)
1001-1500JD	105 (25.2%)
More than 1500JD	128 (30.7%)
Age in years	22.0±(3.1)
Number of days at the	4.2±(1.0)
Expenditure on food and Drinks	5.0±(3.9)

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The UoJ students' concerns level related to TFAs: The mean of total concern was  $20 \pm 5.5$  and the scores ranged between 6 and 30. This result indicated that the students were moderately concerned about the food they are eating. Table 2 shows the frequency distribution for each item regarding the concern level.

The UoJ students' awareness level related to TFAs: The mean of the total awareness  $51.5 \pm 15.2$  and the scores ranged between 22 and 80. This result indicated that the students have a moderate awareness about their food. Table 3 shows the frequency distribution for each item regarding the awareness level.

Items containing artificial TFAs: Responses were dichotomized as correct/incorrect. Of the studied sample, slightly more than half of the students answered about the Margarine (the major source of artificial dietary TFAs) as "Incorrect" or as "doesn't contain TFAs". Also, a high percentage of students, more than 80%, were unknowledgeable about artificial TFAs sources as they responded incorrectly to certain types of foods (dairy products, shawerma, falafel, and doughnut). Additionally, high percentages of students, above 80%, indicated 'Incorrect' responses to other types of fats (unsaturated) that present in Avocado, nuts, seeds, fish, and liquefied vegetable oils (table 4)

Difference in knowledge level (concerns and awareness) based on socio-demographic variables and sample characteristics:

An independent sample t test showed that female students having higher concern than male students ( $20.7 \pm 5.2$  vs.  $18.0 \pm 5.6$ ,  $p < 0.001$ ). Students who are living alone had higher concern than those living with their families ( $21.8 \pm 4.5$  vs.  $19.5 \pm 5.6$ ,  $P < 0.001$ ). All other sociodemographics did not show any significant difference. In term of awareness, female students have significantly higher scores than male students ( $53.5 \pm 15.2$  vs.  $46.8 \pm 14.3$ ,  $p < 0.001$ ).

Table 2: Frequency Distribution of students' answers related to (knowledge; concerns).

<b>The Item</b>	<b>Not at all concerned n (%)</b>	<b>Rarely concerned n (%)</b>	<b>Some-times concerned n (%)</b>	<b>Often concerned n (%)</b>	<b>Extremely concerned n (%)</b>
I am concerned with my overall health	14 (3.4)	19 (4.6)	114 (27.3)	178 (42.7)	92 (22.1)
I am concerned with my body weight	37 (8.9)	38 (9.1)	88 (21.1)	132 (31.7)	122 (29.3)
I am concerned with the type of food I choose to eat	33 (7.9)	44 (10.6)	110 (26.4)	154 (36.9)	76 (18.2)
I am concerned with the amount of food I choose to eat	45 (10.8)	67 (16.1)	110 (26.4)	121 (29.0)	74 (17.7)
I am concerned with the amount of fat content in the food I choose to eat	82 (19.7)	70 (16.8)	101 (24.2)	101 (24.2)	63 (15.1)
I am concerned with the type of fat in the food I choose to eat	103 (24.7)	78 (18.7)	86 (20.6)	99 (23.7)	51 (12.2)

Table 3: Frequency Distribution of students' answers related to (knowledge; awareness).

<b>Knowledge item</b>	<b>Don't know n (%)</b>	<b>Know some- how n (%)</b>	<b>Have fair knowledge n (%)</b>	<b>Know very well n (%)</b>
The food is considered an important factor affecting health	9 (2.2)	35 (8.4)	161 (38.6)	212 (50.8)
There are two types of cholesterol	128 (30.7)	73 (17.5)	99 (23.7)	117 (28.1)
The first type is the "good cholesterol" which is healthy	133 (31.9)	60 (14.4)	90 (21.6)	134 (32.1)
The other type of cholesterol is the "bad cholesterol" which is harmful.	134 (32.1)	66 (15.8)	84 (20.1)	133 (31.9)
There are two types of fatty acids: saturated fatty acids and unsaturated fatty acids.	37 (8.9)	71 (17.0)	133 (31.9)	176 (42.2)

Table 3: (Continued): Frequency Distribution of students' answers related to (knowledge; awareness).

Unsaturated fatty acids help in increasing the good cholesterol".	128 (30.7)	89 (21.3)	99 (23.7)	101 (24.2)
Unsaturated fatty acids help in decreasing the risk for coronary artery diseases.	112 (26.9)	97 (23.3)	107 (25.7)	101 (24.2)
Saturated fatty acids help in increasing the risk for coronary artery diseases.	80 (19.2)	84 (20.1)	110 (26.4)	143 (34.3)
<b>Knowledge item</b>	<b>Don't know n (%)</b>	<b>Know some- how n (%)</b>	<b>Have fair knowledge n (%)</b>	<b>Know very well n (%)</b>
There is a group of fatty acids called Trans Fats or TFAs.	113 (27.1)	75 (18.0)	104 (24.9)	125 (30.0)
TFAs are contained in several food items like fast foods and snacks for example.	113 (27.1)	78 (18.7)	101 (24.2)	125 (30.0)
The maximum daily allowance of TFAs intake is 1% of the total energy requirements.	222 (53.2)	85 (20.4)	51 (12.2)	59 (14.1)
There are two types of Tran's fatty Acids according to their sources: Natural and Artificial.	178 (42.7)	103 (24.7)	70 (16.8)	66 (15.8)
Milk and its products and meat are considered the natural source for TFAs	148 (35.5)	97 (23.3)	93(22.3)	79 (18.9)
The artificial source of TFAs is derived when vegetable oils are hydrogenated or exposed to heat.	122 (29.3)	94 (22.5)	96 (23.0)	105 (25.2)
The artificial form of TFA is considered to be more harmful to their health.	93 (22.3)	81 (19.4)	118 (28.3)	125 (30.0)
TFA is contained in the fast foods in variable amounts.	85 (20.4)	71 (17.0)	132 (31.7)	129 (30.9)
TFAs increase the risk for coronary artery diseases.	64 (15.3)	80 (19.2)	109 (26.1)	164 (39.3)
TFA increases the risk for diabetes mellitus.	122 (29.3)	75 (18.0)	113 (27.1)	107 (25.7)
TFA increases the risk for cancer.	88 (21.1)	92 (22.1)	114 (27.3)	123 (29.5)
My consumption of more than one TFAs – containing food item means that I have exceeded my daily allowance of TFAs	103 (24.7)	82 (19.7)	106 (25.4)	126 (30.2)

Table 4: Descriptive statistics of items containing artificial TFAs.

Food Item	Correct n (%)	Incorrect n (%)
Vegetable Ghee	195 (46.8)	222 (53.2)
Butter	256 (61.4)	161 (38.6)
Hard Margarine	179 (42.9)	238 (57.1)
Luncheon Meat	156 (37.4)	261 (62.6)
French Fries	323 (77.5)	94 (22.5)
Milk	88 (21.1)	329 (78.9)
Fried Chicken	108 (25.9)	319 (74.1)
Arabic deserts (Baqalawa&Kenafa)	297 (71.2)	120 (28.8)
Chips	339 (81.3)	78 (18.7)
Raw Vegetables	234 (56.1)	183 (43.9)
Dairy Products	69 (16.5)	348 (83.5)
Shawarma	60 (14.4)	357 (85.6)
Falafel	47 (11.3)	370 (88.7)
Doughnuts	48 (11.5)	369 (88.5)
Fruits	300 (71.9)	117 (18.1)
Croissant (Kerwasan)	228 (54.7)	189 (45.3)
Biscuits	254 (60.9)	163 (39.1)
Avocado	60 (14.4)	357 (85.6)
Nuts (Walnut, Almond, Hazelnut, Cashew)	66 (15.8)	351 (84.2)
Seeds (Melon Seeds, Wheats, Sesame)	64 (15.3)	353 (84.7)
Fish	64 (15.3)	353 (84.7)
Liquefied Vegetable Oils	67 (16.1)	350 (83.9)
Pizza	288 (69.1)	129 (30.9)

However, those living alone had significantly higher awareness score compared to those living with their families ( $56.7 \pm 15.0$  vs.  $50.3 \pm 15.1$ ,  $p < 0.001$ ). Students in health sciences (medicine, pharmacy, dentistry, nursing and laboratory) have significantly higher scores than other students ( $58.9 \pm 13.1$  vs.  $47.0 \pm 15.6$ ,  $p < 0.001$ ). All other sociodemographics did not show any significant difference. Predictors of knowledge (concerns and awareness) from socio-demographic variables and characteristics of the study sample.

Results showed that concern had no significant relationship with any of the studied students' characteristics. There was a significant weak positive correlation between awareness and the number of study years, number of study days/week, daily expenditure on food and income of the family,  $r = 0.16, 0.10, 0.17$  and  $0.12$  respectively,  $p < 0.01$ . In the regression model: age of the student, faculty (i.e. higher education, health, science and humanities), total behavior frequency, gender, income of family, living status (alone vs. with family), number of study days at the university/week, total behavior of food label use, educational status of the student and total concern were used. All of the previous variables, except the

faculty, were either dichotomous or continuous. Dummy variables (health faculties' students vs non-health) were entered for the faculty variable.

The adjusted R square showed that 30% of the variance in the total (knowledge/awareness) score was explained by the model (which includes the variables of health faculty, gender, income of family, and living status) and the model was significant ( $p < 0.001$ ). Table five shows the variables included in the final model and which contributed to the prediction of the total knowledge/awareness score. The largest standardized absolute Beta value was 0.24, which is for health faculties' students, indicating that this variable makes the strongest unique contribution to explaining the total knowledge score. Gender of the student, income of family, and living alone were all predictors associated with an increase in the total knowledge/ awareness score.

Table 5: Predictors of total knowledge/ awareness score based on regression model.

<b>Predictor</b>	<b>Standardized Beta</b>	<b>T</b>	<b>P value</b>	<b>Part</b>
Health faculties' students	0.24	5.35	<0.001	0.22
Female gender	0.15	3.56	<0.001	0.15
Living alone	0.10	2.29	<0.05	0.09
Income of family of students	0.08	1.92	<0.05	0.08
Adjusted R Square		30%		

Table 5 also presents the part correlation coefficients which when squared indicate how much of the total variance in the dependent variable is uniquely explained by that independent variable and how much adjusted R square would drop if it was not included in the model. The total adjusted R square value, however, includes the unique variance explained by each variable and also that shared.

## **Discussion**

Consumption of TFAs is recognized to be a serious health problem. They are thought to be contained in fast and restaurant foods in high quantities. Students at the UoJ are frequently exposed to consume these foods. This study aimed to identify the level of knowledge (concerns and awareness) about TFAs among students at the UoJ.

Concern to have healthy diet is reported to be an important element in food selection process. It involves attention to purchase healthy food that is labeled to contain TFAs within the allowed limits [20]. Results of this study revealed that students at the UoJ were found to have moderate level of concern for their overall health in regard to TFAs.

Consistent with the available literature [25], females in this study were found to have higher levels of concern than male gender. This could be explained by the trend that females have higher concern with the esthetic aspect of their body image than males [25]. Additionally, concern was attributed to the knowledge and awareness of health-related diet regimen, diagnosis of certain disease, and concern to adhere to dietary guidelines [25, 26]. This may add further explanation to higher levels of concern in female students compared to male students in this study. Another characteristic of the students made concern vary in this study is their living status. Students living away from their families may hold the responsibility of purchasing and preparing their own food. This repeated purchasing could raise their awareness and knowledge toward different food choices [27].

Overall knowledge/ awareness in the current study were considered to be moderate among the students of the UoJ. Although some knowledge/ awareness responses in regard to the amount, type, and daily allowances of TFAs were considered to be low compared to the available data from previous studies [20, 28], but higher than that reported in the French study by Saulais, et al. [29]. Multiple factors were associated with this finding. Knowledge/ awareness was variable among countries related to the announced dietary guidelines and among people with respect to their sociodemographics and socioeconomic position [20, 25, 30].

For example, Saulais, et al. [29] attributed the low level of knowledge/ awareness among French population to the under-notification of TFAs claims on their local products. While this knowledge/ awareness was higher among US and Canadian citizens who were also explained by the same author as relevant to TFAs claims on the products of these states. The TFAs declarations on Jordanian products or its impact on the nutritional knowledge as relevant to TFAs were not evaluated. Further studies are recommended to gain an insight about this issue.

For sociodemographic variables, females were found to be of higher knowledge/ awareness than male students in this study. Only for rare exceptions [25], results of this study were supported by the majority of the studies in this context [20, 25, 30]. Females may possess higher knowledge/ awareness related to their dominant role in dealing with household food [25], or a consequent outcome of the higher level of concern among females may hold an explanation for that. Further studies are indicated to determine this result.

Similar to the reported results by Eckel, et al. [20], students in this study failed to identify food items that were identified as containing TFAs even in an aided manner. Knowledge about the dietary sources of artificial TFAs was assessed in an aided manner. Confusion about types of fat that their food may contain was evident. Responses indicate that students might be unable to differentiate saturated fat, unsaturated fat, and or trans fats. Students' lowest responses were against locally produced food (i. e, falafel and shawerma) that were reported as containing TFAs in a very high quantities [13].

Additionally, people did not differentiate between ruminant and industrial TFAs in the given list of food items. A possible explanation for this result, people may think about animal meat as the primary dietary source for fat disregarding other sources. Further studies are indicated to identify that. Also, lack of nutrition education notification about TFAs on the locally produced, prepackaged or unpackaged goods as claimed by the French research [29] are further probabilities associated with these findings.

Knowledge about TFAs in the current study was also found to be higher among students living or reside away from their families. This may follow their concern with having diet that is thought to be healthy. Females may be more interested and concerned about their body image, diet, and health, so they tend to possess more nutrition knowledge than men [31]. Also, students living away from their families may hold the responsibility of purchasing and preparing their own food. This may raise their awareness in this regard. Further studies are indicated to clarify that.

Knowledge was predicted from and associated with various general characteristics of students. Being female students or living alone was found to be more knowledgeable than other students in the study. Socioeconomic status, represented by the family's income and daily expenditure for food and drinks, was found to be of marked influence upon the knowledge about TFAs among students at the UoJ. Students' knowledge were associated with daily expenditure and predicted from family income. These results came in line with the evidences provided by Campos [25] and McKinnon [32].

Multiple explanations were provided by the literature. Socioeconomic groups were found to have different perspectives and priorities concerning food choices. People with lower levels of socioeconomic positions (SEP) were reported to be of lower levels of nutritional knowledge compared with those of high socioeconomic status [24]. This deficit in knowledge related to food may result in lack of motivation to integrate certain practices in their dietary habits such as food label use [30]. Available research provided evidence of diet- health ideology dissociation among people of low SEP. Health and diet concerns are often reported to be higher among people of high socio economic category [30]. Theory of diffusion of innovation [33] may provide an explanation for this finding in the current study and other mentioned studies in the field of nutritional knowledge of TFAs and SEP. Diffusion of innovation theory explains the faster uptake of innovations by people of higher SEP including health recommendations updates. Moreover, people with low SEP were found to be lower users of printed materials that publish dietary guidelines [32] and more dependent on the television as a source for their dietary information [34]. Television may advertise for unhealthy food choices [35]. While people of higher incomes, were found to rely more on the updates of dietary guidelines from their accredited sources. Another possible explanation, knowledge was linked with the affordability of resources that enables consumers frequent purchase of food compared with those of low socioeconomic

as higher frequency of food purchasing is associated with higher nutritional knowledge related to health [36].

Consistent with the conclusion made by McKinnon, et al. [32] and Jacobs, et al. [27], the level of knowledge was predicted from the faculty of students' education. Students enrolled in the health faculties (Medicine, pharmacy, nursing, and laboratories) were found to be more knowledgeable than other students at the UoJ. These students have high school achievement scores in the scientific branch as an entry criterion. This may explain the higher level of knowledge among this category of students. Additionally, diet and health are common topics that are discussed as a part of their formal education. The present study concurred with previous research in this regard (Venter, 2008). Higher levels of all aspects of nutritional knowledge were associated with higher levels of education and number of study years. Similarly, some previous studies [25, 28, 37-38] correlated education with understanding of complicated information available on the food label as a source of dietary knowledge. The level and the type of education may play a role in the extent of the understanding of the information available in the food label, specially, if this information is complicated. Health faculties' students may possess greater ability to read, understand, interpret, retain and recall information from their formal education of health- related topics. This can help them in food label use and knowledge gain which may provide further support for the results of this study. Moreover, the level of this knowledge was found to be higher with the increased number of years of study. This may follow the increased exposure to the topics of health and related issues as explained by Venter [39].

## **Conclusion**

It is known that high levels of TFAs are associated with increased risk of cardiovascular diseases and obesity, especially in young adults. The results of this study showed that concern and awareness of the students about health risks and dietary sources of TFAs was insufficient to make decisions of healthier food selection. Knowledge about other types of protective unsaturated fats' dietary sources was also deficient and students were uncertain about these sources. Students' sociodemographics made great differences in their level of knowledge and behaviors relevant to TFAs.

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