

Association between major socio-demographic and psychosocial factors with the dietary pattern among elderly people in Amman, Jordan

Mohammed O. IBRAHIM

Department of Nutrition and Food Technology, Faculty of Agriculture, Mu'tah University, Karak, Jordan.

Recibido: 22/febrero/2021. Aceptado: 11/abril/2021.

ABSTRACT

Introduction: The population of elderly people has increased significantly in recent decades. Their health is partially influenced by the nature of dietary pattern they choose. This study was designed to identify the association of major psychosocial and socio-demographic factors with the dietary pattern among elderly people in Amman, Jordan.

Methods: Cross-sectional studies of 116 elderly Jordanian participants were enrolled in the study. The data about participants were collected using socio-demographic questionnaire, MEDFICTS dietary assessment questionnaire, perceived stress scale (PSS), centers for epidemiological studies depression scale (CES-D), and multidimensional scale of perceived social support (MSPSS). Statistical analysis was conducted using SPSS (version 23), with statistical significance set at p -value < 0.05 .

Results: The average total score of MEDFICTS questionnaire was 55.79 ± 8.82 . The attitude of participants was more concentrated on snacks, table fat, convenience foods, in baked goods, and frying foods. About 44.8% of participant scored ≥ 70 in the MEDFICTS questionnaire. Consumption of unhealthy dietary pattern has positive significant associations among females ($\beta=0.59$, $p=0.001$) and participants with lower monthly income ($\beta=0.39$, $p=0.003$). Higher scores of depressive symptoms and perceived stress were found to be significantly higher for those participants who scored ≥ 70 in the MEDFICTS questionnaire and vice versa regarding social support.

Conclusion: The socio-demographic and psychosocial factors in this study play crucial role in determining the tendencies toward unhealthy food patterns among elderly people. It is highly recommended to investigate the role of other factors through longitudinal studies among elderly people.

KEY WORDS

MEDFICTS, MSPSS, PSS, CES-D, psychosocial

INTRODUCTION

Recent decades witnessed significant increase in the proportion of elderly population¹. This increase needs depth awareness on how to provide this population with appropriate tools to live successful aging with high quality of life and health². It was reported in the "global strategy and action plan on ageing and health" that healthy ageing is a process that covers the whole life course and that can be relevant to anyone, not just those who are now free of disease³.

A survey was carried by Mahasneh⁴, reported that elderly people in Jordan had several chronic diseases with a percentage of about (48.6 %, 37.4%, 26.9%, 14.0%, and 11%) for from arthritis, high blood pressure, diabetes, heart problems and accidents and falls, respectively. In Jordan, sedentary life with other factors such as smoking, obesity, and following unhealthy diet are significantly the most serious risk factors of non-communicable diseases, such as diabetes, cardiovascular diseases, and cancer⁵.

As an important population, elderly people are more susceptible to age-related diseases, functional dysfunction, and physical inability which all may affect significantly their nutritional status⁶. Nutrition plays a crucial role in the prevention and management of chronic diseases occurring in the elderly. Malnutrition can cause serious problems in various systems

Correspondencia:
Mohammed O. Ibrahim
mohammed_omar_81@yahoo.com

of the body especially in the digestive, excretory, and immune system¹.

Aging refers to a multidimensional process in humans that include changes in the social and psychological parameters. Overtime, elderly populations in Jordan have faced many daily life challenges including social and psychological challenges that affect on their desirable health outcomes⁷. Knowing the roles of socio-demographic and psychosocial factors in changing the diet of elderly people is important for appropriate assessment their nutritional status and development of appropriate intervention programs to improve diet quality in elderly population. The aim of this study was to examine the association between socio-demographic and psychosocial factors on consumption of unhealthy dietary pattern in a cross-sectional study of older community.

MATERIALS AND METHODS

Study Design and Participants

About 212 elderly people aged ≥ 60 years located in 6 local nursing homes (LNH) in Amman. A cross-sectional study was carried on this population and an estimated sample (stratified by the six locations of local nursing homes) was consisted of 116 participants. Personal face to face interviews were conducted to all participants between Jan 2020 and Mar, 2020. At the beginning of the study, a consent form regarding the aim of the study was signed by all participants and their contribution in the study was explained precisely. The content of the interview (including all questionnaires) was translated into Arabic version and explained precisely to participants and informed consents were signed from them before the beginning of the study. Participant with any diet restrictions were excluded from the study. Age, gender, living situation and other demographic information were collected using the socio-demographic questionnaire. Ethical approval was given by Ethics Committee of the Faculty of Agriculture/ Mu'tah University (Approval number 2705191). Jordanian community in general is witnessing rapid transition to Westernized dietary habits and facing a huge increase in the number of patients with chronic diseases due to higher intake of energy than recommended intake. Therefore, we used a one of the remarkable validated instruments that is called (MEDFICTS) which reflects the intake of nutrients with higher energy content and related to higher prevalence of chronic diseases.

Instruments

MEDFICTS Questionnaire

First questionnaire was oriented to quantify healthy dietary pattern using the MEDFICTS dietary assessment questionnaire⁸. It is an interested instrument consisting of 8 food categories: **M**eats, **E**ggs, **D**airy, **F**ried foods, **I**n baked goods, **C**onvenience foods, **T**able fat, and **S**nacks. Through each of these categories, the food choices are classified to either

group 1 (undesirable) or group 2 (desirable) based on their total fat content. Participants choose their weekly consumption and also the serving size from the eight categories. The final score of the questionnaire is calculated by summing the quality adjusted intake quantity. No points are given for the foods in Group 2 except giving six points for those respondents who ate large portion size for Group 2 meats. The range of scores is possibly between 0 and 216 points. A participant that scored ≥ 70 is considered following high fat diet that contains high total fat, saturated fat, and cholesterol and the interpretation of their scores suggest that they have to make dietary changes.

Perceived Stress Scale

Next questionnaire concern stress and it was measured using the perceived stress scale (PSS)⁹. It is a 10-item self-report instrument using a 5-point Likert scale with scores that ranges from 0 (never) to 4 (very often). The scores are obtained by reversing the responses to the four positively stated items. After that, all scale items are summing across. Higher stress is indicated by higher scores.

Depression Scale

Third questionnaire regarding depression and measured by using the centers for epidemiological studies depression scale (CES-D)¹⁰. It is a 20-item self-administered instrument. It is based on measuring the components of depression through asking the respondent to describe depressive feelings and behaviors over the past week. The range of scores is between 0 to 60 points on a 4-point frequency scale (< 1 day) which equals 0 points; (1-2 days) which equals 1 point; (3-4 days) which equals 2 points; and (5-7 days) which equals 3 points. Presence of clinically significant depression is indicated by higher scores (16 or greater).

Multidimensional Scale of Perceived Social Support

Finally, social support score from family, friends, and significant others was measured using the multidimensional scale of perceived social support (MSPSS)¹¹. It is a 12-item measure that comprising 3 subscales: support from family, support from friends, and support from significant others. Through each per subscale, there are 4 items and each with response options that are ranging from 1 (Very strongly disagree) to 7 (Very strongly agree). Higher levels of perceived support are indicated by higher scores on each of the subscales. The sum of the 3 scales will yield the total score.

Statistical analysis

The statistical software package (SPSS; version 23, IBM, NY) was used for the analysis of data. Chi-square analyses were conducted for non-parametric variables while parametric variables were analyzed using the Student's *t*-test. To investigate independent associations between unhealthy diet pattern

and socio-demographic factors, linear regression model was conducted. The level of significance was set to $p < 0.05$.

RESULTS

Major socio-demographic factors are shown in (Tables 1). This study had 116 elderly participants with nearly equal figures of males and females. The age range was 60-76 years with a mean of 67.33 ± 1.26 years and they were predominantly between 60-70 years. More than half (84.5%) of the participants weren't live alone. About 69% of participant were above healthy body weight with either overweight or obese body mass index. Moreover, the overall mean of psychological factors including depressive symptoms, perceived stress, and social support are illustrated in (Table 1).

The total score of MEDFICTS nutrition questionnaire that was filled by elderly participants was 55.79 ± 8.82 . The average scores of each single component of MEDFICTS are shown in (Table 2). It shows that the scores of the questionnaire indicated that there was an orientation of these participants to increase the intake from the second half of food categories of the questionnaire with average scores of (9.61, 7.64, 6.91, 6.58, and 7.60) for snacks, table fat, convenience foods, in baked goods, and frying foods, respectively. Table 2 indicated that the least scores were given to participants' intake of frozen desserts category followed by the two sub-categories of dairy products.

Table 3 depicts participant characteristics and comparing participants in relation to their MEDFICTS score. Fifty-two of the participants (44.8%) scored ≥ 70 in MEDFICT questionnaire and based on this they named as "Unhealthy pattern" while the rest scored < 70 and named as "Healthy pattern". Regarding socio-demographic factors, it was shown that there were significant differences between the two patterns regarding gender and monthly income ($P < 0.001$). On the other hand, no significant differences were present with regard to age, living situation, or work activity. Table 4 shows that a significant positive association were shown between consumption of unhealthy diet and both variables females and income that less than 500 JD with ($\beta = 0.59$, $p = 0.001$; $\beta = 0.39$, $\theta = 0.003$) respectively.

Meanwhile, and regarding psychological factors, (Table 5) had shown that higher depressive symptoms ($p = 0.01$) and higher perceived stress ($p = 0.03$) were found to be significantly higher for those who scored ≥ 70 in MEDFICTS "Unhealthy pattern" compared to those who scored lower than 70 "Healthy pattern". In contrast, lower social support from family ($p = 0.005$), friends ($p = 0.001$), and significant others ($p = 0.002$) was found to be significantly lower for those who scored ≥ 70 in MEDFICTS "Unhealthy pattern" compared to those who scored lower than 70 "Healthy pattern".

Table 1. Socio-demographic, economic and psychological characteristics of the elderly people living in Amman (N=116).

Variable	n (%)	M (SD)
Age		
60 -70 years	83 (71.5%)	
> 70 years	33 (28.5%)	
Sex		
Female	59 (50.8%)	
Male	57 (49.1%)	
Live alone		
Yes	18 (15.5%)	
No	98 (84.5%)	
Work activity		
Working	61 (52.6%)	
Retired	55 (47.4%)	
Income		
Less than 500 JD	49 (42.2%)	
More than 500 JD	67 (57.8%)	
Body mass index		
<18.5 (Underweight)	9 (7.8%)	55.79 (8.82)
18.5-24.9 (Healthy weight)	27 (23.3%)	
25-29.9 (Overweight)	41 (35.3%)	
≥ 30 (Obese)	39 (33.6%)	
MEDFICTS score		
Depressive symptoms		16.45 (5.4)
Perceived stress		12.44 (3.9)
Social support		
Family		18.9 (5.4)
Friends		19.2 (4.9)
Significant other		17.8 (6.1)

The values are expressed as frequency (n) and percentages (%) or as means (M) and Standard Deviations (SD).

Table 2. Average, minimum, and maximum scores of elderly participants filled MEDFICTS nutrition questionnaire.

Food category	MEDFICTS score			
	<i>M</i>	<i>SD</i>	<i>Min</i>	<i>Max</i>
Meat (Group1)	5.93	3.96	0	21
Meat (Group2)	0.31	1.34	0	6
Eggs	4.34	2.61	0	9
Dairy				
<i>Milk</i>	3.10	1.97	0	6
<i>Cheese</i>	2.66	2.08	0	6
Frozen Desserts	0.98	1.41	0	3
Frying Foods	7.60	3.83	0	21
In Baked Goods	6.58	1.78	0	14
Convenience Foods	6.91	2.62	0	14
Table Fats	7.64	2.58	3	14
Snacks	9.61	3.45	3	21

The values are expressed as mean (*M*), Standard Deviation (*SD*), minimum (*Min*), and maximum (*Max*).

Table 3. Descriptive characteristics of the study population according to MEDFICTS nutrition questionnaire.

Variable	Participants (N=64) with MEDFICTS score < 70 Healthy pattern	Participants (N=52) with MEDFICTS score ≥ 70 Unhealthy pattern	<i>P</i>
	<i>n (%)</i>	<i>n (%)</i>	
Socio-demographic factors			
Age			0.33
<i>60 -70 years</i>	46 (55.7%)	37 (44.3%)	
<i>> 70 years</i>	18 (54.3%)	15 (45.7%)	
Sex			<0.001***
<i>Female</i>	24 (40.9%)	35 (59.1%)	
<i>Male</i>	40 (70.1%)	17 (29.8%)	
Live alone			0.66
<i>Yes</i>	10 (61.5%)	8 (44.4%)	
<i>No</i>	54 (55.1%)	44 (44.9%)	
Work activity			0.72
<i>Working</i>	34 (55.7%)	27 (44.3%)	
<i>Retired</i>	30 (54.5%)	25 (45.5%)	
Income			<0.001***
<i>Less than 500 JD</i>	24 (42.1%)	33 (57.9%)	
<i>More than 500 JD</i>	40 (67.8%)	19 (32.2%)	

The values are expressed as frequency (*n*) and percentages (%), Chi-square conducted. **P*<0.05, ***P*<0.01, ****P*<0.001.

Table 4. Association between unhealthy pattern and the socio-demographic factors of the elderly.

Variables	N (%)	Participants with MEDFICTS score \geq 70 "Unhealthy pattern"	
		Linear regression	
		β	P
Age			
60 -70 years	37 (44.3%)	0.09	0.714
> 70 years	15 (45.7%)	-0.02	0.905
Sex			
Female	35 (59.1%)	0.59	0.001**
Male	17 (29.8%)	0.48	0.075
Live alone			
Yes	8 (44.4%)	0.28	0.575
No	44 (44.9%)	-0.32	0.305
Work activity			
Working	27 (44.3%)	0.06	0.642
Retired	25 (45.5%)	0.28	0.575
Income			
Less than 500 JD	33 (57.9%)	0.39	0.003**
More than 500 JD	19 (32.2%)	-0.02	0.905

The values are expressed as frequency (*n*) and percentages (%), Chi-square conducted. * $P < 0.05$, ** $P < 0.01$, *** $P < 0.001$.

Table 5. Psychological characteristics of the study population according to MEDFICTS nutrition questionnaire.

Variable	Participants (N=64) with MEDFICTS score < 70 Healthy pattern	Participants (N=52) with MEDFICTS score \geq 70 Unhealthy pattern	p*
	M (SD)	M (SD)	
Depressive symptoms	14.6 (2.7)	19.4 (3.6)	0.01*
Perceived stress	10.8 (3.4)	16 (4.1)	0.03*
Social support			
Family	19.6 (3.7)	16.5 (2.1)	0.005**
Friends	19.3(4.4)	15.9 (1.9)	0.001**
Significant other	18.9 (2.6)	15.3 (3.1)	0.002**

The values are expressed as means (*M*) and Standard Deviations (*SD*), t-tests were conducted. * $P < 0.05$, ** $P < 0.01$, *** $P < 0.001$.

DISCUSSION

Jordan has gone through fast transitions from Bedouin societies to Westernized habits which are associated with unhealthy lifestyle that increased the chronic diseases risk factors¹². Moreover, Jordan is facing an incredible increase in the number of patients with metabolic syndrome diseased such as diabetes and cardiovascular diseases. Therefore, nutrition assessment programs are urgently needed to be considered throughout the preparation, implementation and evaluation phases of such programs. One of the crucial tools that could be used in these assessment programs is MEDFICTS questionnaire. This research examined socio-demographic and psychosocial variables in relationship to estimate of how frequently foods high total fat, saturated fatty acids and cholesterol are eaten and this relationship was expressed through MEDFICTS scores. Elderly people in our study concentrates their intake of foods high in total fat, saturated fat, and cholesterol on food categories of snacks, table fat, convenience foods, in baked goods, and frying foods. In contrast, their intake was very low from frozen dessert and dairy products. Their intake of meat and eggs were in the middle of the average scores of food categories of MEDFICTS questionnaire. According to high fat meat consumption, our results indicate low levels of consumption which range between zero to 21 (around intake more than 5 ounces on daily basis). The average intake was 5.93 that mean around 15 ounces within 3 days. This low intake of high fat meat and meat product was in accordance with a study on meat consumption in old age (65 to 80 years) which showed that high fat meat consumption slightly decreases with age and that the consumption of meat and meat products was lowest in the highest age group¹³.

Also, our results in indicated that whole egg consumption score of our study group was 4.34 ± 2.61 which means that their consumption was between one to six eggs per week. This result was not in accordance with a study by Houston et al.¹⁴ that indicated that 37.8% of older adults' intakes of whole eggs was less than once per week and the intake of eggs between 1–2 times per week was 40.4% in the study population. Concerning whole milk and fatty cheese consumption among our population, our results revealed that around 1 to 2 cups/week of milk and 1 to 2 ounces of cheeses were taken by elderly people. This quantity was very low comparing to a study carried by Chollet et al.¹⁵ on elderly (50–81 yr old) living in Switzerland. His study showed that older adults on average consumed around 2.6 servings of dairy products per day. On the other hand, and as mentioned before that the lowest score 0.98 ± 1.41 was shown for the frequency of consumption of frozen desserts among elderly people. Actually, studies that discussed this point were very rare and this is could be due that elderly people are not interested in general to consume such food items.

On the other side, regarding the food categories that showed higher scores due to high frequency of intake of high

fat and cholesterol from such these categories (snacks, table fat, convenience foods, in baked goods, and frying foods), our results was in accordance with many studies. One of these studies indicated that intake of sweetened beverages, snacks high in fat and sugar, and carbohydrates were the most consumed food items¹⁶. Another Irish longitudinal study on ageing conducted by O'Connor et al.¹⁷ showed that two-thirds of older adults that aged 54 years and over in Ireland consume high amounts of foods and beverages high in fat, sugar and salt and that one-third consume excessive fat and oils.

Results of our study indicated that the difference in three of the socio-demographic factors was not significant. These include age, living situation, and working status. In contrast, the other two variables (sex and monthly income) were significantly associated with higher scores (i.e., ≥ 70) of MEDFICTS. Our study showed that Jordanian females registered higher score of MEDFICTS than males and so they have more desire to consume high fat and cholesterol foods than males. This result was in opposite with a study on of 1486 elderly people living in Mediterranean islands. It was conducted by Polychronopoulos et al.¹⁸ to evaluate the relationships between dietary fats and a group of CVD risk factors. One of the results in their study revealed that men consume higher quantities of total fat and fat from fishes than women. Also, the results of nutrient intakes for Blacks and Whites aged 19 to 74 in the NHANES II survey indicated that males consistently consume more fats than do females and that dietary cholesterol intake is consistently higher among males than females. On the other hand, our study indicated that economic status associated significantly with higher unhealthy dietary pattern among our study population. Our results were in consistent with a study showed that elderly individuals with higher economic status have in general higher intakes of healthy foods choices and lower intakes of unhealthy foods choices with high fat content than individuals with low socio-economic status¹⁶.

On the other side, our study investigated the crucial role of psychological factors and how they affect the attitude toward eating unhealthy foods that are high in fat, saturated fat, and cholesterol. First of all, it is known that depression is considered as one of the most emotional problems for elderly people¹⁹. Our study revealed that the overall mean of depressive symptoms of the total population was 16.45 ± 5.4 and that this factor was significantly ($p = 0.01$) higher among elderly people scored ≥ 70 than those scored < 70 . More than study showed that high intake of saturated fat has been found to be associated with depression^{20,21}. Also, it was reported in longitudinal studies that an increased risk of depression symptoms was associated with unhealthy western dietary patterns²².

Regarding perceived stress; the second psychological factor, the mean among participants scored ≥ 70 was 16 ± 4.1 which was significantly higher than those scored < 70 with a mean of 10.8 ± 3.4 . This result indicated the significant role of stress

in changing the decision to choose and consume more unhealthy food items. A study carried by Laugero et al.²³ to examine associations between life stress and dietary and activity patterns in >1300 Puerto Ricans (aged 45–75 years). Their results were in accordance with our results that they reported that higher perceived stress was associated with higher consumption of salty snacks, and that stress was associated with greater intake of sweets, particularly in those with type 2 diabetes. Moreover, another study carried by D'Amico et al.²⁴ showed that greater perceived stress was associated with low levels of Mediterranean diet adherence. Finally, social isolation has long been reported as a key factor indicating the presence of nutritional problems among elderly population²⁵.

Social disconnection is salient within older populations²⁶. Concerning the role of social support that divided into three subgroups including family, friends, and significant other; the role of social support in our study was significantly associated with lower MEDFICTS score (<70) with ($p=0.005$, $p=0.001$, $p=0.002$, respectively). This is emphasizing the significant role of this factor in the frequency of selecting and consumption of healthy dietary pattern with low fat and cholesterol content. One consistent result was reported by Thoits²⁷ who examined the correlation between psychosocial components and diet quality in a population aged 59-73 years. The Aforementioned study revealed that the diet quality for men and women was positively related to having higher emotional support and that was explained by a greater level of sharing interests, and reciprocity with a person someone feels very close to. Moreover, Lack of social support may cause elderly people to skip healthy meals and replace nutritious foods with snacks, processed, and convenience foods. Also, it may diminish the amount and variety of meals that are consumed²⁸.

Few studies have evaluated the factors associated with unhealthy foods' consumption in the elderly. As shown in this study, there is a positive relationship between aforementioned foods and some of the socio-demographic and psychosocial factors, but there is no consensus yet. Unfortunately, the unhealthy dietary pattern followed among high percentage of elderly in our study is may be associated with future outcomes that affect their health status. As mentioned before, this pattern is a high fat diet that contains high total fat, saturated fat, and cholesterol. It is well known that such diet is highly correlated with obesity and its complications, insulin sensitivity and metabolic syndrome²⁹. Moreover, recently it was documented that inflammations associated with obesity, dyslipidemic processes, and oxidative stress, can spread to the brain and make alterations in neurotransmitter metabolism and activity where such alterations may contribute to obesity-related neuropsychiatric complications³⁰.

CONCLUSION

This study demonstrated that a significant association was between selected socio-demographic and psychosocial factors

and the attitude of the elderly participants in selecting and increasing the frequency of consumption of unhealthy dietary pattern that contains higher total fat, saturated fat, and cholesterol. Further studies through extra dietary questionnaires should be carried to find out more associations with other factors that may affect food choices among elderly people.

ACKNOWLEDGEMENTS

The author deeply thanks Mu'tah University to give an ethical approval to conduct such fruitful study. Moreover, the author appreciates the cooperation of all participants for their efforts during the interviews in the whole time period of the study.

REFERENCES

1. Kourkouta L, Ouzounakis P, Monios A, Iliadis Ch. Nutritional habits in the elderly. *Progress in Health Sciences*, 2016; 6(2):155-159.
2. Fries JF. Reducing disability in older age. *JAMA*, 2002; 288(24): 31643166. <https://doi:10.1001/jama.288.24.3164>.
3. World Health Organization. Global strategy and action plan on ageing and health. Geneva. 2017: <https://www.who.int/ageing/WHO-GSAP-2017.pdf?ua=1>.
4. Mahasneh SM. Survey of the health of the elderly in Jordan. *Medical Journal of Islamic Academy of Sciences*. 2000; 13(1): 39-48.
5. Al-Nsour M, Zindah M, Belbeisi A, Hadaddin R, Walke H. Prevalence of selected chronic, noncommunicable disease risk factors in Jordan: Results of the 2007 Jordan behavioral risk factor surveillance survey. *Preventing Chronic Diseases*. 2012; 9:1-9.
6. Amarya S, Singh K, Sabharwal M. Changes during aging and their association with malnutrition. *Journal of Clinical Gerontology & Geriatrics*. 2015; 6(3): 78-84.
7. Hayajneh A. Are there health disparities among Jordanian older adults? Potential factors (Part 1). *European Scientific Journal* June. 2015; 2: 247-258.
8. Taylor AJ, Wong H, Wish K, Carrow J, Bell D, Bindeman J, Watkins T, Lehmann T, Bhattarai S, O'Malley PG. Validation of the MED-FICTS dietary questionnaire: A clinical tool to assess adherence to American Heart Association dietary fat intake guidelines. *Nutrition Journal*. 2003; 2:4.
9. El Ansari W, Berg-Beckhoff G. Nutritional correlates of perceived stress among University students in Egypt. *Int J Environ Res Public Health*. 2015; 12(11):14164-76.
10. Coleman S, Berg CJ, Thompson NJ. Social support, nutrition intake, and physical activity in cancer survivors. *Am J Health Behav*. 2014; 38(3):414-9.
11. Nakigudde J, Musisi S, Ehnvall A, Airaksinen E, Agren H. Adaptation of the multidimensional scale of perceived social support in a Ugandan setting. *Afr Health Sci*. 2009; 9 Suppl 1(Suppl 1): S35-41.
12. Eshah NF. Lifestyle and health promoting behaviours in Jordanian subjects without prior history of coronary heart disease. *Int J*

- Nurs Pract. 2011; 17(1):27-35. doi: 10.1111/j.1440-172X.2010.01902.x. PMID: 21251151.
13. Schütz J, Franzese F. Meat consumption in old age: an exploration of country-specific and socio-economic patterns of eating habits of the European population. Munich Center for the Economics of Aging (MEA). 2018: From http://www.shareproject.org/uploads/tx_sharepublications/201901_SHARE_WP_Series_32_2018_Franzese_Sch%C3%BCtz.pdf.
 14. Houston DK, Ding J, Lee JS, Garcia M, Kanaya AM, Tylavsky FA, Newman AB, Visser M, Kritchevsky SB. Dietary fat and cholesterol and risk of cardiovascular disease in older adults: The Health ABC Study. *Nutr Metab Cardiovasc Dis.* 2011; 21(6):430-7.
 15. Chollet M, Gille D, Piccinali P, Bütikofer U, Schmid A, Stoffers H, Altintzoglou T, Walther B. Short communication: dairy consumption among middle-aged and elderly adults in Switzerland. *J Dairy Sci.* 2014; 97(9):5387-92.
 16. Hurree N, Pem D, Bhagwant S, Jeewon R. A pilot study to investigate energy intake and food frequency among middle aged and elderly people in Mauritius. *Mediterranean Journal of Nutrition and Metabolism.* 2017; 10(1): 61-77.
 17. O'Connor D, Leahy S, McGarrigle C. Consumption Patterns and Adherence to the Food Pyramid. *Health and Wellbeing: Active Ageing for Older Adults in Ireland Evidence from The Irish Longitudinal Study on Ageing.* 2017.
 18. Polychronopoulos E, Pounis G, Bountziouka V, Zeimbekis A, Tsiligianni I, Qira BE, Gotsis E, Metallinos G, Lionis C, Panagiotakos D. Dietary meat fats and burden of cardiovascular disease risk factors, in the elderly: a report from the MEDIS study. *Lipids Health Dis.* 2010; 9:30.
 19. Bulut S. Late life depression: A literature review of late-life depression and contributing factors. *Clinical and Health Psychology.* 2009; 25(1): 21-26.
 20. Merrill RM, Taylor P, Aldana SG. Coronary health improvement project (CHIP) is associated with improved nutrient intake and decreased depression. *Nutrition.* 2008; 24(4):314-321.
 21. Payne ME, Hybels CF, Bales CW, Steffens DC. Vascular nutritional correlates of late-life depression. *Am J Geriatr Psychiatry.* 2006; 14:787-795.
 22. Lang UE, Beglinger C, Schweinfurth N, Walter M, Borgwardt S. Nutritional aspects of depression. *Cell Physiol Biochem.* 2015; 37(3):1029-43.
 23. Laugero KD, Falcon LM, Tucker KL. Relationship between perceived stress and dietary and activity patterns in older adults participating in the Boston Puerto Rican health study. *Appetite.* 2011; 56(1):194-204.
 24. D'Amico D, Huang V, Fiocco AJ. Examining the moderating role of a mediterranean diet in the relationship between perceived stress and cognitive function in older adults. *J Gerontol B Psychol Sci Soc Sci.* 2021; 76 (3): 435-443.
 25. Vesnaver E, Keller HH. Social influences and eating behavior in later life: a review. *J Nutr Gerontol Geriatr.* 2011; 30(1):2-23.
 26. White AM, Philogene GS, Fine L, Sinha S. Social support and self-reported health status of older adults in the United States. *Am J Public Health.* 2009; (10):1872-8.
 27. Thoits PA. Mechanisms linking social ties and support to physical and mental health. *Journal of health and social behavior.* 2011; 52(2):145-61.
 28. Holmes BA, Roberts CL. Diet quality and the influence of social and physical factors on food consumption and nutrient intake in materially deprived older people. *European Journal of Clinical Nutrition.* 2011; 65:538-545.
 29. Coelho DF, Pereira-Lancha LO, Chaves DS, Diwan D, Ferraz R, Campos-Ferraz PL, Poortmans JR, Lancha Junior AH. Effect of high-fat diets on body composition, lipid metabolism and insulin sensitivity, and the role of exercise on these parameters. *Braz J Med Biol Res.* 2011; 44(10):966-72. doi: 10.1590/s0100-879x2011007500107.
 30. Labban RSM, Alfawaz H, Almnaizeh AT, Hassan WM, Bhat RS, Moubayed NMS, Björklund G, El-Ansary A. High-fat diet-induced obesity and impairment of brain neurotransmitter pool. *Translational Neuroscience* 2020; 11: 147-160.