Nutrition Literacy is Associated with Income and Place of Residence but not with Diet behavior and Food Security in the Palestinian Society

Nihal Natour (✉ n.natour@najah.edu)

An-Najah National University

Mariam AL-Tell

An-Najah National University

Osama Ikhdour

An-Najah National University

Research Article

Keywords: Diet, nutrition literacy, obesity, food security

Posted Date: August 26th, 2021

DOI: <https://doi.org/10.21203/rs.3.rs-684751/v1>

License: This work is licensed under a Creative Commons Attribution 4.0 International License.

[Read Full License](#)

Version of Record: A version of this preprint was published at BMC Nutrition on November 18th, 2021.
See the published version at <https://doi.org/10.1186/s40795-021-00479-3>.

Abstract

Introduction: Palestinian society is going through health transition associated with increase in chronic diseases due to poor dietary habits so adequate integration of nutrition information is important.

Aims: The aim of this study is to find the association between nutrition literacy and diet behavior among a group of Palestinian participants.

Methods: A sample of 101 Palestinian participants were recruited to participate in the study. Using an online survey which was distributed through educational and social internet platforms was used to collect data on sociodemographic variable. Newest Vital Sign quiz was used to collect information on nutrition literacy and Short Format of the Diet Health and Knowledge Survey (SFDHKS) was used to collect information on diet behavior and USDA food security questionnaire was used to collect data on food security. Data was analyzed by SPSS 21.

Results:

This study included 101 participants, mean age $22.7 \text{ y} \pm 8.7 \text{ y}$, mainly females. 5.7% of the study participants were obese, 13.8% overweight and 10.3% were underweight. The prevalence of adequate nutrition literacy was 24%. There was minimal association between diet behavior and nutrition literacy, food security and BMI categories, but significant association with income and living in city relative to village ($p < 0.05$). Only 11 participants had some form of food insecurity.

Conclusion: There is low prevalence of adequate nutrition literacy. Nutrition literacy depends on social and economic aspect but further research is need to understand relationship to diet behavior.

Introduction

Diet is a major risk factor for chronic diseases including diabetes mellitus 2, cardiovascular diseases and cancer. Chronic diseases are on the rise globally(1). Some studies indicate that poor dietary habits account for 16% of all-cause mortality in USA adults according to data from National Health and Nutrition Examination Survey (NHANES 1999–2010) and healthy eating index of 2015(2). Moreover, diet related problems such as obesity account for increased health cost and lower quality of life (3, 4). Measuring dietary patterns and habits seems to be a better approach to understand the complexity of human diet than single nutrients and food items (5). Some studies indicate the presence of differences in healthy dietary habits according to socioeconomic factors in different sections of the society, data from NHANES indicate that healthy eating index was 4 times higher for adults with high versus low education and 2 times higher for food secure versus food insecure(6). Based on author experience, older Palestinian generation seems to be more attached to Mediterranean diet style with focus on high intake of olive oil, legumes, fruits and vegetables, whereas younger Palestinian generation although has good level of adherence of MD(7), they are inclined to consume westernized diet such as fast food and ready take away meals (8).

Data on the impact of nutrition knowledge on Palestinian people level of commitment to healthy diet is scarce. Also, the way income and education shape the Palestinian society dietary habits was not studied before. Food literacy is an important concept that was not studied before in Palestinian society. Food literacy can be defined as the ability to understand, use, analyze and communicate nutrition information (9), whereas nutrition literacy means the ability of a person to seek, understand and apply basic nutrition information (10). The categories of nutrition literacy include functional, interactive and critical literacy (11). Functional nutrition literacy (FNL) represents the basic understanding and application of nutrition information. Integrative nutrition literacy (INL) is defined as the effective cognitive comprehension and communication of nutrition knowledge with other people including professionals and partners. Finally, critical nutrition literacy (CNL) means the ability of person to evaluate nutrition information and raise awareness to them(10, 11). Nutrition literacy can impact dietary habits and hence lead to healthier life style (12).

The Palestinian society is in health transition associated with open food market with different countries (5). In a recent study by a group of Palestinian researchers the prevalence of being overweight or obese is 65.3% and metabolic syndrome is 33%(13). Traditional MD in Palestine, Lebanon and Syria is common cuisine with a wide range of traditional dishes (14) with some studies indicating some level of adherence to this diet(14), although according to author knowledge, younger generation of Palestinian mothers are less skillful in preparing the Palestinian traditional cuisine which indicate that the level of adherence to this diet is declining. Traditional food adherence in societies that were under imperialist domination represented means towards food security and diet and health optimization(15), yet with current adoption of western lifestyle near crowded urban centers changes to generation dietary habits is prevalent in many countries(16). The aim of this paper: 1) To study the level of FNL nutrition literacy among a group of Palestinians 2) To study the relationship between dietary habits and FNL nutrition literacy. 3) To the differences in dietary habits according to BMI categories and food security categories.

Methods

A cross-sectional design was used to evaluate nutrition literacy, food security and its association with dietary habits. Palestinians older than 18 y were recruited through an electronic data collection tool which was distributed through

different social methods that included facebook and professional, social and student facebook groups, in addition to the university website. The population consisted of all Palestinians living in the West Bank, Gaza, and in Israel. A convenient sampling method was adopted to reach the determined, we were able to include sample size of n=101 adults in this study.

The data collection tool was adopted based on a Literature review(11, 17). Information on age, weight, height, diet, use of food label, items of food label used, gender, education, income were obtained. Nutrition literacy was measured using Newest Vital Sign (NVS) (a 5 item measure was adapted according to available information)(18). NVS assessed participants to understand and calculate basic nutrition information using two nutrition fact labels obtained from Palestinian common products (18). Participants were given one point for each correct answer, then total

score was calculated and if they had from 0-1 this indicated lack of nutrition literacy, 2-3 indicated possibility of limited nutrition literacy and more than this indicated adequate nutrition literacy. NVS was validated before (18). A translated to Arabic version was used in our study.

Arabic translated version of dietary habits was used and consisted of nineteen questions from the Short Format of the Diet Health and Knowledge Survey (SFDHKS) (19) that measure use of food labels, consumption of low-fat/low-calorie foods, consumption of fiber, and avoidance of extra fat were used to assess nutrition behaviors. A short form of USDA food security scale was used and we used questions AD1 and AD1a after converting the answers to likert scale numbers to classify the a

Ethical Consideration: The research was conducted in accordance with Declaration of Helsinki and approval from the IRB at An Najah National University was obtained before conducting the study. Agreement of participants was ensured through acceptance of the invitation and answering the questionnaire.

Consent for Publication: was obtained adults into food secure or insecure(20).

Statistics:

The ordinal data for the answers of SFDHKS was converted into Likert scale numbers. Proportions of various sociodemographic, nutrition literacy, obesity and food security were calculated. Normality of continuous variables was calculated. Non-parametric test was used to compare SFDHKS, BMI and age between food secure and insecure and medians and range were reported. One way ANOVA was used to compare food behavior variables across food literacy groups and BMI categories. Chi-square was used to study association between categorical variables.

Results

This study included 101 participants, mean age $22.7 \text{ y} \pm 8.7 \text{ y}$ (Graph 1). Relatively there was low prevalence of obesity, but higher prevalence of overweight and underweight participants (graph 2). Table 1 describe study main variables. The study group were mostly females, the prevalence of adequate literacy was slightly less than quarter of the study participants. Most of the study participants reported a household income of 3000-5000 shikel and having or doing bachelors degree. Only 11 participants reported some form of food insecurity. Table 2 describe comparison of dietary habits between food literacy groups. Participants with adequate literacy reported lower use of high fat cheese, higher use of low calorie seasoning. Other variables were not significantly different between nutrition literacy. Table 3 show comparison of study variables between food secure and insecure adults, food secure were more likely to use mayonnaise and cheese as addition to their food and less likely to remove the skin of the chicken. Table 4 describe differences of study diet variables between BMI categories. Use of low fat milk

was least common among adults with normal BMI. Underweight participants did not care to consume low fat and low calorie products.

Nutrition literacy was not different according BMI, food label, food security and gender categories. Figure 3 show the relationship between income and nutrition literacy. Adequate nutrition literacy is more common among participants from cities compared to villages.

Table 1

Description of Main Study Variables

Variable	N (%)
Newest Vital Sign	
High Likelihood of Limited Health Literacy	39/100 (39%)
Possible Limited Health Literacy	37/100 (37%)
Adequate Health Literacy	24/100 (24%)
Gender	
Male	17/101 (16.8%)
Female	84/101 (83.2%)
Income	
Less than 3000 Shikel	22/99 (22.2%)
3000-6000 Shikel	44/99 (44.4%)
More than 6000 Shikel	33/99 (33.3%)
Place	
Refugee Camp	3/100 (3%)
City	55/100 (55%)
Village	42/100 (42%)
Education	
High School or less	7/101 (7%)
College	12/101 (11.9%)
Bachelor	78/101 (77.2%)
Postgraduate education	4/101 (4%)
Label USE	
Use of food Label	
May be	24/101 (24%)
No	33/101 (33%)
Yes	44/101 (43%)
Looking at food Label	
May be	
No	16/98 (16.3%)
Yes	42/98 (42.9%)

	40/98 (40.8%)
Look at health claim on food label	
May be	13/99 (13.1%)
No	56/99 (56.6%)
Yes	30/99 (30.3%)
Look at calories on the food label	
May be	25/101 (24.8%)
No	41/101 (40.6%)
Yes	35/101 (34.7%)
Look at serving size on food label	
May be	38/101 (37.6%)
No	31/101 (30.7%)
Yes	32/101 (31.7%)
Look at health benefit on Label	
May be	35/101 (34.7%)
No	39/101 (38.6%)
Yes	27/101 (26.7%)
Food Security	
Food Secure	89%
Modest insecurity	8%
Severe insecurity	3%

Table 2

Comparison of Diet Behavior Variables according to Food Literacy Groups

Variable	Limited Literacy	Possible Limited Literacy	Adequate Literacy	F, p-value
Age (y)	22.8±9.6 (36)	23.2±9.4 (37)	20.4± 2.95 (23)	0.81, 0.45
BMI (Kg/m ²)	22.7±4.3 (36)	22.6± 3.9 (36)	22.1±3.5 (24)	0.16, 0.85
Consumption of low-fat/low-calorie foods	2.05±0.88 (37)	2.24±0.86 (37)	2.25±0.94 (24)	0.54, 0.59
Eat lower fat lunch meats	1.57±1.17 (35)	2.31±1.18 (35)	1.74±1.21 (23)	3.69, 0.03
Drink skim or 1% milk	1.87±1.53 (37)	2.0±1.47 (36)	1.73±1.72 (22)	0.21, 0.81
Low fat cheese	1.51±1.19 (37)	1.81±1.17 (36)	1.08±1.28 (24)	2.58, 0.081
Frozen Yogurt	1.28±1.37 (36)	1.31±1.45 (35)	1.22±1.57 (23)	0.03, 0.97
Use low calorie dressing	1.22±1.13 (37)	1.81±1.27 (37)	1.04±1.00 (24)	3.96, 0.022
Eat fried Potatoes	2.30±1.30 (37)	2.41±1.10 (37)	2.60±0.58 (23)	0.61, 0.55
Frying veggi	2.17±1.93 (36)	1.97±1.67 (37)	2.0±1.76 (24)	0.33, 0.719
Adding cheese and mayonise	1.64±1.31 (36)	2.46±1.89 (37)	2.21±1.64	2.38, 0.098
Eat butter, bread, cake	1.38±1.32 (34)	1.38±1.38 (37)	1.70±1.77 (23)	0.42, 0.66
Avoid extra fat	2.33±1.24 (36)	2.46±1.15 (37)	2.58±0.97 (24)	0.37, 0.69
Fried chicken	2.14±1.06 (37)	2.00±1.12 (36)	1.57±0.84 (23)	2.17, 0.12
Remove skin from chicken	2.92±1.36 (34)	3.11±1.28 (36)	3.12±1.03 (24)	0.28, 0.75
Data expressed as means±SD				

Table 3

Comparison of Study Variables between Food Security Groups

Variable	Food secure	Food Insecure	Nonparametric, p-value
Age (y)	19(32) (n=87)	20 (29) (n=11)	0.18
BMI (Kg/m ²)	21.6 (16.9) (n=87)	22.7 (13.5) (n=10)	0.56
Consumption of low-fat/low-calorie foods	2(4) (n=98)	2(4) (n=11)	0.52
Eat lower fat lunch meats	2(4) (n=84)	1(4) (n=11)	0.22
Drink skim or 1% milk	2 (5) (n=86)	1(5) (n=11)	0.65
Low fat cheese	1 (4) (n= 88)	1(4) (n=11)	0.77
Frozen Yogurt	1 (5) (n= 87)	2(5) (n=9)	0.11
Use low calorie dressing	1 (4) (n=89)	1(4) (n=11)	0.77
Eat fried Potatoes	3 (4) (n=88)	2(4) (n=11)	0.08
Frying veggi	2 (5) (n=88)	2(5) (n=11)	0.99
Adding cheese and mayonise	2(5) (n=88)	3(5) (n=11)	0.03
Eat butter, bread, cake	1 (5) (n=88)	2(5) (n=11)	0.24
Avoid extra fat	2 (4) (n=88)	2(4) (n=11)	0.1
Eat Fried chicken	2 (4) (n=87)	2(4) (n=11)	0.32
Remove skin	4 (4) (n=88)	2(4) (n=11)	0.08
Data is expressed as median (range)			

Table 4

Comparison of Diet Behavior Variables between BMI Categories

Variable	Underweight 11	Normal 66	Overweight and Obese (21)	F, p-value
Age (y)	19.0±1.2	21.0±6.2	30.5±13.4	12.3, p<0.0001
BMI (Kg/m ²)	17.6±0.7	21.3±1.82	28.8±2.30	171.4, p<0.0001
Low calorie fat	1.64±1.21	2.24±0.84	2.24±0.70	2.4, 0.09
Low fat meat	1.55±1.13	1.89±1.27	2.0±1.11	0.50, 0.61
Low fat milk	2.46±1.97	1.52±1.37	2.65±1.53	5.50, 0.006
Low fat cheese	1.18±1.08	1.55±1.34	1.38±0.80	0.52, 0.6
Frozen Yogurt	1.56±1.33	1.17±1.54	1.35±0.93	0.37, 0.70
Low calorie seasoning	1.18±1.17	1.39±1.23	1.38±1.11	0.15, .86
Fried Potatoes	2.0±1.34	2.59±1.01	2.42±1.07	2.39, 0.097
Frying veggi	2.1±1.66	2.14±1.90	1.43±1.12	1.35, 0.27
Adding cheese and mayonise	2.20±2.0	2.06±1.70	2.10±1.37	0.03, 0.97
Butter, bread, cake	1.46±1.51	1.45±1.46	1.48±1.40	0.003, 0.99
Avoid fat	2.10±1.22	2.60±1.14	2.10±0.89	2.26, 0.11
Fried chicken	2.36±1.12	2.03±1.10	1.67±0.86	1.73, 0.18
Remove skin	3.36±1.12	3.19±1.18	2.57±1.36	2.37, 0.099

Discussion

This study involved participants from the Palestinian society from different age groups through online recruitment, however females and younger adults were more willing to participate in the study. In our study 24% of the study group had adequate nutrition literacy which is slightly lower than what was reported in other groups (17). Our study group were low to middle income group, with the group with higher income having better literacy than compared to other groups. Studies and public campaigns to improve the general Palestinian society on nutrition awareness and skills to read food labels and perform simple nutrition calculations are not present. We have performed a study of food label use among Palestinian group and found that although the use of food labels among Palestinian society is very common, they only seeked information on crude values of calories, sugar and fat without looking into important information such as sodium content and types of harmful lipids(21) in food products which indicate that nutrition education in Palestinian society is imperative and should be supported with

appropriate funding that direct resources on important tools such as raising awareness to nutrition comprehension skills among the various sectors of the society.

Similar to what others found(20), majority of study participants did not answer the calculation question correctly. The first three question required document literacy and numeracy literacy skills but the other two did not require that. This is in accordance with what was found for a group of Americans which could indicate that numeracy represents a challenge for many. Dietitian and nutritionists should perform more efforts in trying to simplify nutrition guidance which requires some numeracy skills by providing the client with more simplified information.

Income and whether the participant is from village or city were significantly related to nutrition literacy. Participants with higher income and from cities had higher nutrition literacy than participants from villages and lower income. Since most of our study participants were females this could represent more patriarchy (22) than mere socio-demographic variables as the income gap and geographical locations of Palestinian villages is not very remote from cities centers, and despite the fact Palestinian cities have higher concentration of nutrition care services, reaching out to these centers is feasible with the strong transportation system in the West Bank(23).

Most of our study participants did not use food label, or used information on them on calories, health benefits of the product. Less than half of our study group did not use low fat or low calorie diet or even low fat milk products, despite the fact that 50% reported using low fat meat. The low use of food label could be because the participants do not understand them and the low purchase of low calorie or low fat milk products could be related to the fact they are expensive and our study group were mostly from low to middle income category (24, 25).

Our study indicated low association between health literacy and food behavior. People with adequate literacy were more likely to eat reduced fat meat and to avoid eating fried chicken. One possible conclusion from this finding is that even people with adequate health literacy are unable to understand nutrition messages sent by nutrition practitioners in the society. In a previous study(26) for us under review, although most of participants health field students were able to understand how to use MyPlate American application, they reported their low efficiency in applying what they learn from this website on their practical life. Which indicate to health care providers need to simplify nutrition by providing practical workshops with graphs and cooking skills to the participants who wish to change their diet style.

Our study indicate that food security issues is not common in the studied group of mostly young Palestinians. Food security was very rare in this study, given that all studied participants had access to internet to participate in the study, it is expected that food security was uncommon. Previous studies on food security in Palestinian society indicated that prevalence of severe food insecurity 24.6%. Food insecurity was related to poverty, unemployment, low education and having more than seven members in the family(27). We did not find any common poor dietary habit among the 11 participants who reported some form of food insecurity, neither had we found differences in BMI category or food literacy.

We studied the relationship between BMI category and food habits and food literacy. Obesity and being underweight were not related to food literacy, whereas obese adults were more likely to practice healthier habits and underweight less likely to practice health habits. In a study among university female students obese, overweight and normal weight females did not have significant difference in dietary habits or sleeping duration(28). Although obese youth may avoid some unhealthy food items, they may have unhealthy practices such as skipping breakfast(29).

In summary in a group of Palestinian adults mostly in their twenties and females, we found low prevalence of nutrition literacy and use of food label. The studied group had high rate of unhealthy dietary habits but low food security. Nutrition literacy, food insecurity were related to only few unhealthy habits, whereas unhealthy dietary habits were common among underweight Palestinians.

Abbreviations

USDA: United States Department of Agriculture; BMI: Body Mass Index

Declarations

Competing interest

None

Author Contributions:

NN designed the study, collected data, analyzed data and wrote part of the manuscript. M.T obtained IRB approval, revised the manuscript. OI participated in data collection

Funding

None

Ethics Approval and Consent to Participate

This study was approved by Najah University IRB board. The goals of the study were discussed in social media platforms and participants were asked to fill online survey if they want to participate in the study and filling the form was considered consent to participate in the study.

Consent for publication

All the study authors read and approved the manuscript for publication

Acknowledgement

We would like to thank members of the Palestinian society who participated in this study

References

1. Williams RL, Rollo ME, Schumacher T, Collins CE. Diet quality scores of Australian adults who have completed the healthy eating quiz. *Nutrients*. 2017;9(8):880.
2. Wang J, Haslam D, Ruan M, Chen F, Du M, Zhang FF. Diet Quality in Association with All-Cause, Cardiovascular, and Cancer Mortality Among US Adults: NHANES 1999–2010 (OR14-04-19). *Current Developments in Nutrition*. 2019;3(Supplement_1).
3. Lee Y, Mozaffarian D, Sy S, Huang Y, Liu J, Wilde PE, et al. Cost-effectiveness of financial incentives for improving diet and health through Medicare and Medicaid: A microsimulation study. *PLoS medicine*. 2019;16(3):e1002761.
4. Fritsch J, Garces L, Quintero MA, Pignac-Kobinger J, Santander AM, Fernández I, et al. Low-fat, high-fiber diet reduces markers of inflammation and dysbiosis and improves quality of life in patients with ulcerative colitis. *Clinical Gastroenterology and Hepatology*. 2021;19(6):1189–99. e30.
5. Abu-Saad K, Murad H, Lubin F, Freedman LS, Ziv A, Alpert G, et al. Jews and Arabs in the same region in Israel exhibit major differences in dietary patterns. *The Journal of nutrition*. 2012;142(12):2175–81.
6. Orr CJ, Keyserling TC, Ammerman AS, Berkowitz SA. Diet quality trends among adults with diabetes by socioeconomic status in the U.S.: 1999–2014. *BMC Endocrine Disorders*. 2019;19(1):54.
7. Hamdan M, Badrasawi M, Zidan S. Factors Associated with Adherence to the Mediterranean Diet among Palestinian High School females' students in Hebron city: Cross-sectional study. *Iraq Medical Journal*. 2020;4(3).
8. Mikki N, Abdul-Rahim HF, Shi Z, Holmboe-Ottesen G. Dietary habits of Palestinian adolescents and associated sociodemographic characteristics in Ramallah, Nablus and Hebron governorates. *Public health nutrition*. 2010;13(9):1419–29.
9. Brooks N, Begley A. Adolescent food literacy programmes: A review of the literature. *Nutrition & Dietetics*. 2014;71(3):158–71.
10. Velardo S. The nuances of health literacy, nutrition literacy, and food literacy. *Journal of nutrition education and behavior*. 2015;47(4):385–9. e1.
11. Ndahura NB. Nutrition literacy status of adolescent students in Kampala district, Uganda: Høgskolen i Oslo og Akershus; 2012.
12. Kalkan I. The impact of nutrition literacy on the food habits among young adults in Turkey. *Nutrition research and practice*. 2019;13(4):352–7.
13. Damiri B, Dudin B, Sharqiah Q, Khlaif H, Bsharat R, Amir M. Prevalence of low high-density lipoproteins (HDL) cholesterol and its related factors in adult Palestinians: a cross-sectional study.

14. Nasreddine L, Shatila H, Itani L, Hwalla N, Jomaa L, Naja F. A traditional dietary pattern is associated with lower odds of overweight and obesity among preschool children in Lebanon: a cross-sectional study. *European journal of nutrition*. 2019;58(1):91–102.
15. Noll S, Murdock EG. Whose justice is it anyway? Mitigating the tensions between food security and food sovereignty. *Journal of Agricultural and Environmental Ethics*. 2020;33(1):1–14.
16. Alizadeh S. Limitation of studies on food intake and dietary pattern in Iran and other Middle East countries: lack of alcohol intake assessment. *Nutrients*. 2017;9(11):1183.
17. Lo S, Sharif I, Ozuah PO. Health literacy among English-speaking parents in a poor urban setting. *Journal of health care for the poor and underserved*. 2006;17(3):504–11.
18. Weiss BD, Mays MZ, Martz W, Castro KM, DeWalt DA, Pignone MP, et al. Quick assessment of literacy in primary care: the newest vital sign. *The Annals of Family Medicine*. 2005;3(6):514–22.
19. York-Crowe EE, White MA, Paeratakul S, Williamson DA. The diet and health knowledge survey: Development of a short interview format. *Eating behaviors*. 2006;7(3):235–42.
20. Speirs KE, Messina LA, Munger AL, Grutzmacher SK. Health literacy and nutrition behaviors among low-income adults. *Journal of health care for the poor and underserved*. 2012;23(3):1082–91.
21. Nihal Natour PhD MS MA-TP, Manwa Al-Ayedi Bsc. Food Label Use and Associated Factors: A cross Sectional Study from Occupied Palestinian Territories. 2021.
22. Yoon HK, Kim GS, Kim S. Parental Factors Associated with Obesity in Korean Adolescents. *International Journal of Environmental Research and Public Health*. 2020;17(14):5126.
23. Hussein A. Prevalence of diabetes mellitus and impaired glucose tolerance in a rural Palestinian population. *EMHJ-Eastern Mediterranean Health Journal*, 6 (5–6), 1039–1045, 2000. 2000.
24. Mushi-Brunt C, Haire-Joshu D, Elliott M. Food spending behaviors and perceptions are associated with fruit and vegetable intake among parents and their preadolescent children. *Journal of Nutrition Education and Behavior*. 2007;39(1):26–30.
25. Christian T, Rashad I. Trends in US food prices, 1950–2007. *Economics & Human Biology*. 2009;7(1):113–20.
26. Nihal Natour PhD MS 1 MA-TP. Introducing MyPlate in the curriculum of nutrition teaching for undergraduate medical and health allied professions of Palestinian students. [Article]. In press 2021.
27. Ahmadi D, Melgar-Quinonez H. Determinants of food insecurity in occupied Palestinian territory: a cross-sectional survey. *The Lancet*. 2019;393:S4.
28. Alhakbany MA, Alzamil HA, Alabdullatif WA, Aldekhyyel SN, Alsuhaibani MN, Al-Hazzaa HM. Lifestyle habits in relation to overweight and obesity among Saudi women attending health science Colleges. *Journal of epidemiology and global health*. 2018;8(1–2):13.
29. Sedibe MH, Pisa PT, Feeley AB, Pedro TM, Kahn K, Norris SA. Dietary Habits and Eating Practices and Their Association with Overweight and Obesity in Rural and Urban Black South African Adolescents. *Nutrients*. 2018;10(2):145.

Figures

Figure 1

Graph 1: Distribution of Age Variable

Figure 2

Graph2: Percentages of Various BMI Categories

Figure 3

Graph 3: Relationship between Income Categories and Health Literacy Chi-Square= 10.9, p-value= 0.027