nutrición clínica y Dietética Hospitalaria

Artículo Original

Nutr Clín Diet Hosp. 2020; 40(4):55-62
DOI: 10.12873/404malekzadeh

Nutritional literacy status and its related factors in students of Yasuj University of Medical Sciences

Tooba BAHRAMFARD[1], Sayed OMID SALEHI[2], Mehdi AKBARTABAR TOORI[1], Azizollah POURMAHMOUDI[1], Mohammadreza JOWSHAN[1], Soraya PARVIN[1], Zohreh KHOSRAVANI[1], Janmohamad MALEKZADEH[1]

1 Yasuj University of Medical Science, Yasuj, Iran.
2 Tehran University of Medical Sciences, Tehran, Iran.

Recibido: 20/junio/2020. Aceptado: 4/septiembre/2020.

ABSTRACT

Introduction: it is necessary to evaluate the level of nutritional literacy before performing any educational measurement related to nutrition. As a matter of fact, an effective education is the result of proportional education level with the level of understanding the target group. This study is aimed to determine nutritional literacy status.

Objectives: In this study, students of Yasuj University of Medical Sciences were considered as research sample set. Then, factors affecting the nutritional literacy status were designed and implemented for the study.

Methods: A total of 397 students were selected for this descriptive-analytical study. A systematic sampling method was developed and nutritional literacy status was assessed through a localized questionnaire based on the Evaluation Instrument of Nutrition literacy on Adults (EINLA). SPSS Statistics 23 software package was employed for statistical analysis.

Results: In this study, students participated in 11 disciplines with the mean and standard deviation of 22.04 ± 2.33 years. The results showed that the mean score of students' nutritional literacy was 24.9 out of 35. According to the results, 1% of students were dealt with the problem of inadequate nutritional literacy and 50.9% and 48.12% of students had borderline nutritional literacy and adequate nutritional literacy, respectively. In addition, the results revealed that higher semester students had more nutritional literacy than other students. Furthermore, nutritional literacy was significantly correlated with the semester, field of study, students' residence and body mass index ($P<0.05$).

Conclusion: The results demonstrated that most of the students had borderline and sufficient nutritional literacy, but they had a significant weakness in determining their nutritional units.

KEYWORDS

Information Literacy, Students, Nutritional Science.

INTRODUCTION

Healthy diet, physical activity and maintaining a healthy weight provide not only a positive health effect but also prevent and cure some physical and mental illnesses[1,2]. Worth Health Organization (WHO) estimated that 80% of chronic diseases (e.g. cardiovascular disease, diabetes and cancers) are caused by unhealthy lifestyle and dietary factors[3,4,5]. A study demonstrated that more than 19% of gastrointestinal cancers, 12% of heart disease and 10% of strokes worldwide are rooted in an unhealthy diet, especially inadequate consumption of fruits and vegetables. Reports showed that annually 2.7 million deaths and 26.7 million years of life lost can be attributed to this behavioral risk factor[4]. In overall, an unhealthy diet is the cause of more than one-sixth of the world's diseases. Whereas, it may reach one-third in developing areas[6].

The Iranian household consumption survey showed more than 75% inadequate calcium intake and 43% inadequate iron intake, and also vitamin A, C and riboflavin deficiencies among Iranian households[7]. Also Nasrabadi et al. demonstrate that 18-19% of Iranian people suffer from the side

Correspondencia:
Janmohamad Malekzadeh
malekjmd@yahoo.com

effects of excessive carbohydrate intake[8]. It means that Iranian people are simultaneously exposed to overnutrition and undernutrition. Although human behavior especially nutrition-related behaviors cannot easily be modified, some studies have revealed that nutrition literacy plays a key role in modifying nutritional behaviors[9,10].

Nutrition literacy is defined as the degree to which an individual has the capacity to obtain, process and understand nutrition information and his/her own necessary skills. Thus, he/she would be able to make proper nutrition decisions[11]. The purpose of nutritional literacy is to increase the ability of a person to make informed decisions about dietary intake and know which food is better and how much it is needed for his/her health[12]. To prevent a growing rate of chronic diseases, it should be essential to perform more nutritional interventions on the communities, in particular young age groups[13].

The tendency of young people to lose weight and maintain fitness along with poor nutritional knowledge leads to the elimination of healthy foods from their diet. As a majority of young people are university students, a study on the students showed various inappropriate eating habits including eliminating breakfast, inadequate intakes of milk, fish, as well as fruits and vegetables. In contrast, the students had high intakes of fast foods, sweets and sugary drinks[14]. Studies have shown that poor dietary patterns and poor nutrients intake among young people, especially college students, can trigger a variety of illnesses[15]. The findings of a study on the lifestyle of students in three European countries demonstrated that female students consumed more inappropriate sugary foods, but they ate fewer vegetables and fruits. These situations have led to greater stress experience among female students than male students[16].

Halsam et al. also found that students' dietary restriction was associated with anxiety and other psychological problems[17]. Studies on the nutritional status of college students indicate that this population may have an unhealthy diet[18]. This situation reveals that it should be essential to pay more attention to their nutrition education and provision of opportunities for their proper nutritional performance[19,20]. Before launching any nutrition education, it is necessary to evaluate the level of nutritional literacy. As a matter of fact, an effective education is the result of appropriate intervention according to the nutrition literacy in the target group[10]. As there are very limited studies on Iranian students' nutritional literacy, this study is aimed to investigate the nutritional literacy among students at Yasuj University of Medical Sciences.

MATERIALS AND METHODS

Current study was conducted after receiving the Code of Ethics from the Ethics Committee of Yasuj University of Medical Sciences (ir.yums.rec.1397.166). A total of 397 students were selected as sample set for this research. These students were studying at Yasuj University of Medical Sciences. In this study, systematic random sampling method was utilized for sampling process. By taking into account the total population of students (1890 students) and the required sample size (397), one out of every 5 students was selected as a sample using the names list.

Several variables were recorded in a questionnaire form including students' age, sex, height, weight, field of study, school year, recent residency, family life, marital status, as well as parental education level and occupation. The nutrition literacy assessment tool was a localized questionnaire based on the Evaluation Instrument of Nutrition literacy on Adults (EINLA). It is comprised of 35 questions in 5 different domains of nutrition literacy[11]. The questionnaire was re-evaluated by nutritionists to be prepared for using in the present study. In this regard, a few changes were made to the questionnaire form. The domains were included in general nutritional information (10 items), nutritional content understanding (6 items), food group determination (10 items), as well as food unit calculations and nutritional calculations (3 items) and reading and understanding of food labels (6 items). Each correct answer was scored 1 and incorrect answers were scored 0. The maximum and minimum achievable scores were 35 and zero, respectively. Based on the achieved scores, participants were divided into 3 groups comprising inadequate nutrition literacy (11 or less), borderline nutrition literacy (12 to 25) and adequate nutrition literacy (25 or more)[11].

The data were initially analyzed by the Kolmogorov-Smirnov test to examine deviations from normal states. Non-parametric Mann-Whitney U tests were used for analyzing variance between two groups. The Kruskal-Wallis test was also employed for comparing three or more groups. Tukey's post hoc test was utilized for group differences when the variables had equal variances. Dunnett T3 post hoc test was considered when the variables had unequal variances. Spearman correlation test was also used to investigate the correlation between variables.

RESULTS

11 different fields of study were reported by the 397 students at Yasuj University of Medical Sciences. Findings showed that the number of 224 (56.4%) participants were female. The mean and standard deviation (SD) of the participants' age was 22.2 ± 4.33 years. The mean and SD of the participants' body mass index was 22.89 ± 3.20 kg/m^2 and their median body mass index was 22.87 kg/m^2. Most of the students (41.9%) were studying general medicine and the least of them were studying environmental health engineering (4.8%), (Table 1).

The results of the study demonstrated that respectively 48.12%, 50.88% and 1% of students had adequate nutritional literacy, borderline nutritional literacy and inadequate nutritional literacy, respectively (Chart 1). The mean score of total students' nutritional literacy was 24.92 out of 35. The average Score of Nutritional Knowledge domain was 7.47 out

Table 1. Demographic information of participants.

Variable	(Percentage) relative abundance	
Sex	Male	173 (43/6)
	Female	224 (56/4)
Academic year	first year	73 (18/4)
	Year Two	102 (25/7)
	Year Three	73 (18/4)
	Year four	77 (19/4)
	Fifth year	29 (7/3)
	Sixth year	25 (6/3)
	Seventh year	18 (4/5)
Major	medical	166 (41/9)
	Dentistry	31 (7/8)
	nutrition science	19 (4/8)
	surgery room	20 (5)
	Radiology	24 (6)
	Laboratory sciences	21 (5/3)
	Anesthesia	23(5/8)
	Nursing	29 (7/3)
	Midwifery	24 (6)
	general Hygiene	21(5/3)
	Environmental Health	19 (4/8)
Family location	City	355 (89/4)
	Village	42 (10/6)
Current Location	University's dormitory	273 (68/7)
	Rental home	17 (4/3)
	with family	107 (27)

Table 1 continuación. Demographic information of participants.

Variable	(Percentage) relative abundance	
Marital status	Single	361 (91)
	Married	36 (9)
Father's job	Unemployed	14 (3/5)
	Permanent worker-employee	127 (32)
	Senior-manager	154 (38/8)
	Freelance job	102 (25/7)
Mother's job	housewife	286 (71/8)
	Employed	111 (28/2)
Father's literacy level	illiterate	12 (3)
	Elementary	32 (8/1)
	Tips	33 (8/3)
	High school	74 (18/6)
	Academic	246 (62)
Maternal literacy level	illiterate	34 (8/5)
	Elementary	62 (15/7)
	Tips	78 (19/6)
	High school	81 (20/4)
	Academic	142 (35/8)
BMI	Less than 18/5	27 (6/7)
	24/9-18/6	288 (72/7)
	29/9-25	74 (18/8)
	More than 30	8 (1/8)

of 10; Content Understanding domain score was 5 out of 6; the food group identification domain score was 6.30 out of 10 and the food label understanding domain score was 1.78 out of 3. The domain of computational literacy and label reading had a mean score of 4.32 out of 6 (Table 2 and Chart 2).

The mean nutritional literacy scores were 24.60 and 25.17 for male and female students, respectively. But the observed difference was not statistically significant (P = 0.265, Table 3). The results showed that students whose fathers were illiterate had an average nutritional literacy score of 24.46 and those whose fathers had a college education had a nutritional literacy score of 25.5. The statistical test indicated that there is no significant difference between students' nutritional literacy in different parental education levels. Students whose mothers were illiterate had a mean score of 25.15, those whose mothers had a college education level had a mean score of 22.64. But there

Chart 1. Yasuj University of Medical Sciences Students Frequency Percentage by Nutrition Literacy Status.

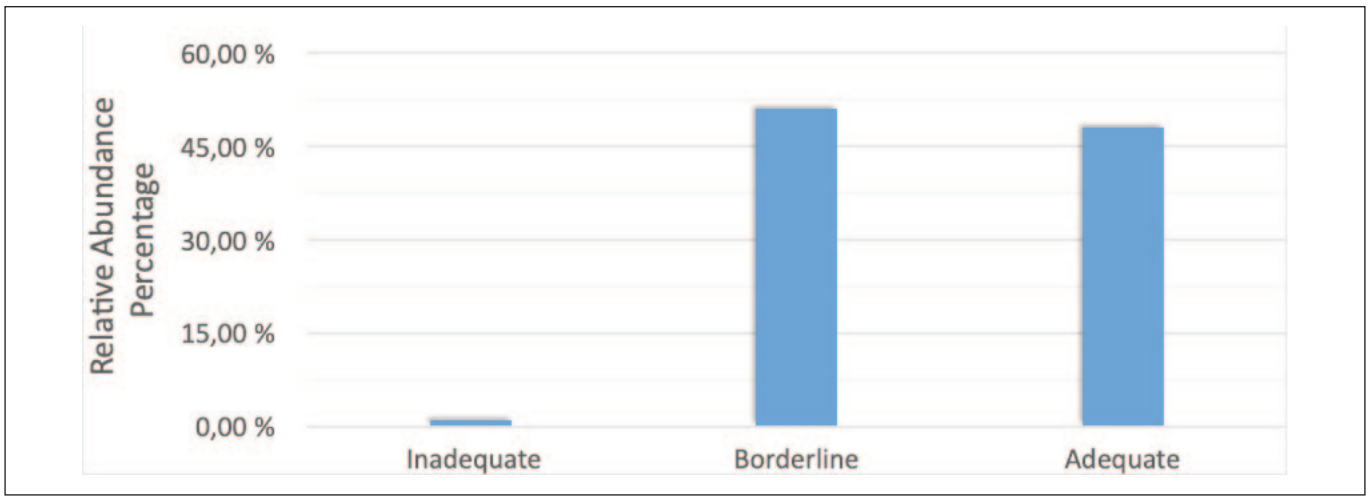

Table 2. Nutritional literacy status of the students under study.

Nutritional Literacy ScoreScope	Mean ± SD	Middle	Minimum score	Maximum score	Total score for each section
Total nutritional literacy	24/92±4/44	25	7	34	35
General nutritional information	7/47±1/54	8	0	10	10
Nutritional content understanding	5±1/021	5	0	6	6
Food group determination	6/30±2/263	7	0	10	10
Food label understanding	1/78±1/016	2	0	3	3
Reading and understanding of food labels	4/32±1/59	5	0	6	6

Chart 2. Percentage of nutrition literacy score obtained in each domain.

Table 3. Comparison of scores of nutritional literacy with demographic variables.

VARIABLE		Number	Mean score of nutritional literacy; standard deviation	Middle	Mean Rank	P-value
Sex	Man	173	24/60±4/6	25/00	191/25	P*= 0/265
	Female	224	25/17±4/29	26/00	204/13	
Academic year	First year [a]	73	23/62±4/61	23/98	167/53	**P**= 0/0001**
	Second year [a]	102	24/63±4/53	25/0	193/55	
	Third Year [a]	73	24/81±4/65	25	192/84	
	Fourth year [a]	77	25/14±3/89	25	196/32	
	Fifth year [a]	29	25/72±5/02	27	227/76	
	Sixth year [a]	25	25/62±3/39	25	209/30	
	Seventh year b	18	29±1/60	30	321/97	
Major	Medicine a	166	25/66±4/47	27	223/44	**P**= 0/0001**
	Dentistry [a]	31	24/90±4/6	25	199/92	
	Nutrition Sciences [a]	19	27/47±4/14	27	259/97	
	Operating room [b]	20	20/50±3/88	20/0	80/63	
	Radiology	24	23/37±3/47	24	147/90	
	Laboratory sciences	21	23/79±4/39	24	163/62	
	Anesthesia [a]	23	24/69±2/72	25	187/15	
	Nursing	29	23/93±4/39	25	174/19	
	Midwifery	24	24/92±3/21	24/50	185/27	
	general Hygiene	21	24/65±4/15	24/50	186/65	
	Environmental Health	19	25/58±5/61	27	223/42	
Family location	City	355	24/60±4/46	26/00	201/22	P*= 0/236
	Village	42	23/15±4/20	24/00	175/55	
Current Location	University dormitory [a]	273	25/33±4/29	26	209/96	**P**= 0/008**
	Rental home	17	29/25±2/68	25	197/53	
	With family [b]	107	23/81±4/68	24	169/15	
Marital status	Single	361	24/86±4/68	25	218/50	P*= 0/222
	Married	36	25/57±4/42	25	196/56	
Father's job	Unemployed	14	26/31±4/80	27	216/65	P**= 0/037
	Seasonal worker-farmer	18	19/15±6/33	26	209/25	

Table 3 continuación. Comparison of scores of nutritional literacy with demographic variables.

VARIABLE		Number	Mean score of nutritional literacy; standard deviation	Middle	Mean Rank	P-value
Father's job	Permanent worker-employee	109	25/47±4/45	27	223/25	P**= 0/037
	Senior Management Officer a	154	24/98±3/88	25	188/30	
	Freelance job [b]	102	24/30±4/78	24	177/92	
Mother's job	housewife	286	24/98±4/5	25	199/98	P*= 0/56
	Employed	111	24.73±4/5	25	192/94	
Father's literacy level	illiterate	12	24/46±4/64	28	217/42	P**= 0/375
	Elementary	32	21/98±5/79	25	183/63	
	Tips	33	24/41±4/15	25	193/26	
	High school	74	24/90±4/58	27	220/26	
	Academic	246	25/5±4/23	25	192/10	
Maternal literacy level	illiterate	34	25/15±5/54	26/00	204/73	P**= 0/935
	Elementary	62	24/36±4/11	25/00	186/61	
	Tips	78	24/99±4/41	25/00	196/33	
	High school	81	25/60±5/12	25/00	202/54	
	Academic	142	22/46±4/21	25/00	199/77	
(BMI)	Less than 18/5[a]	27	23/81±5/53	24/50	170/38	**P**= 0/041**
	18/6-24/9[a]	288	25/40±3/98	26	202/80	
	25-29/9[a]	74	24±5/32	24	176/01	
	More than 30a	8	20±6/36	22	116	

was no significant relationship between students' nutritional literacy and their mothers' level of education (P = 0.935) (Table 3). The study revealed that the mean score of nutritional literacy was 23.98 for first-year students. But the mean score of nutritional literacy was 29 for 7th year medical students. There was a statistical association between the students' nutritional literacy and their school years (r = 0.19, P = 0.001) (Table 3). The study of students' mean nutritional literacy in the field of study showed that the mean scores of students' nutritional literacy were 25.41, 24.90 and 27.47 in general medicine students, dentistry students and nutrition sciences students, respectively. From statistical point of view, there was a significant difference between students' nutritional literacy within the fields of study. In this case, the nutrition science students had the highest score of nutritional literacy and operating room students had the lowest score of nutritional literacy (Table 3 and Chart 2).

The mean scores of nutritional literacy were 25.33, 25.29 and 23.21 for students living in university dormitories, rented students' dormitories and living with their parents, respectively (P = 0.01) (Table 3). The study of students' nutritional literacy based on their body mass index showed a statistically significant relationship between body mass index and NL (P = 0.041). However, the findings of the post hoc tests demonstrated that there was no significant difference between the mean nutritional literacy of students in the body mass index groups (Table 3). The results also revealed that there was no significant relationship between students' nutritional literacy and their mothers' job (P = 0.56). But there was a statistically significant relationship

between students' nutritional literacy and their fathers' occupation (P = 0.037) (Table 3).

DISCUSSION

The study findings showed that all students have already had enough and relatively enough nutritional literacy level. The results of the study performed by Hemmati et al. showed that 22.7% of school teachers had inadequate nutritional literacy[11]. A research was carried out by Zoellenro et al. in the area of assessing the nutritional status of adults in Mississippi. Their research results indicated that 48% of people had adequate nutritional literacy[21]. Aihara et al. also found that 30.7% of the Japanese population had adequate nutrition literacy[22]. In a similar study on health care workers in Brazil, Sampaio et al. represented that 5.3% of them had inadequate nutritional literacy[23]. Among the mentioned studies, the Sampaio study was more consistent with our study, showing that medical students and health care staff have more information on health and nutrition.

In the present study, the lowest literacy was related to the skills of determining food portions and identifying food groups. Whereas, the highest percentage of literacy was coincided with the field of comprehension. The results of the study performed by Hemmati et al. were similar to our work and showed that the minimum correct responses were consisted of nutrition portion skills, nutritional calculations, and perception and evaluation of food labels[11]. In this case, similar results were also observed in the study presented by Ballance et al.[24]. Gibbs et al. revealed that the lowest percentage of correct responses was associated with the area of food measuring (food unit designation)[25].

Comparing the students' nutritional literacy by demographic variables showed that the mean of students' nutritional literacy grew up with the increment of academic year. There was a meaningful association between nutritional literacy and students' academic year. As the school year increases, the student nutritional literacy levels increase. It is due to the students become exposed to nutritional science subjects. The results of the study presented by Ramazani et al. demonstrated that the nutritional knowledge of students increased by enhancement of education duration[4]. The results of the study performed by Hemmati et al. were coincided with our study and showed that increment of education level led to a higher level of nutritional literacy[11]. The results of the studies developed by Zollner et al. and Aihara et al. demonstrated that there is a direct relationship between nutritional literacy status and education level of individuals[21,22]. Studies on American women have also shown that higher levels of education directly increased the average healthy nutrition index in this population group[26].

In the present study, various disciplines of students led to different nutritional literacy status. There was a statistically significant difference between the levels of nutrition literacy based on their field of study. Indeed, the students of nutrition sciences had the highest level of nutrition literacy in comparison with other groups of students. Azizi et al. showed that students of physical education had the highest nutritional knowledge and nursing students had the best nutritional practices[27]. According to Maverick study, women's nutritional literacy score was higher than men's, but there was no significant difference between them. Zollner et al. developed a study in which its results were consistent with our study and showed that the mean score of nutritional literacy in women was not significantly higher than men[21]. Also, the results of studies by Doe et al.[28] and Kozaki et al.[29] showed that females had higher nutritional literacy and healthy nutrition than males.

The results of the present study revealed that students with normal body mass index had higher mean nutritional literacy than other students. In addition, there was a significant relationship between nutritional literacy and student body mass index. The results of the study performed by Hemmati et al. also showed that teachers with normal body mass index had higher nutritional literacy than lower and higher BMI groups[11]. The results of the study accomplished by Zollenro et al. showed a higher, but non-significant nutritional literacy in obese people than other groups[21].This discrepancy in results could be due to the fact that body mass index is multifactorial and not merely influenced by nutritional literacy status[30].

The results also indicated that students living in rented home and university dormitories had higher nutritional literacy and there was a statistically significant relationship between students' nutritional literacy and their residence. The results of the study performed by Mozaffari et al. also expressed that clinical students who lived in student dormitories had higher nutritional awareness than their peers who lived with their families[30]. Some of the limitations of this study were the lack of access to all students in different fields of study and the small sample size of students in other majors except medicine.

CONCLUSION

In conclusion, findings of our study revealed that students' nutritional literacy status at Yasuj University of Medical Sciences was in a satisfaction circumstance. However, the areas of food portion and food groups determination.

ACKNOWLEDGMENTS

No financial or material assistance has been received from any institution or company in conducting this study. We thank all the students who helped us with this study.

REFERENCES

1. Gibbs HD, Ellerbeck EF, Befort C, Gajewski B, Kennett AR, Yu Q, Christifano D, SullivanDK. Measuring nutrition literacy in breast cancer patients: development of a novel instrument. Journal of Cancer Education. 2016; 31(3): 493.

2. Baba Nejad M, Soleimani S, Shade MiriK, Delishe A. Relationship between physical activity and nutritional habits with stress management in medical students. Journal of Clinical Research in Medical Sciences. 2014; (2): 84-91.

3. Cesur B, Koçoğlu G, Sümer H. Evaluation instrument of nutrition literacy on adults (EINLA) a validity and reliability study. Integr Food NutrMetab. 2015; 2(1): 30-127.

4. Ramazani, Mousavi Gh, Sabahi Bigdeli M. Comparison of Knowledge, Attitude and Nutritional Function and its Relationship with Body Mass Index (BMI) of Kashan University of Medical Sciences Students in 2009. Jundishapur Journal of Health Sciences. 2012; 2(4): 55-48

5. Laberge, M. (2011). Nutrition literacy Retrieved February 13, 2011, from http://www.diet.com/g/nutrition-literacy#D.

6. World Cancer Research Fund / American Institute for Cancer Research. Food, Nutrition, Physical Activity, and the Prevention Global Perspective. Washington, DC: AICR, 2007.

7. Pasdari, Mozafari H, Darbandi M, Niazip H, Hashemi A. The Relationship between Academic Achievement with Nutritional Status and Growth of Elementary School Students in Kermanshah, 2011. Koomesh. 2014 No. 15 (4): 541-550.

8. Mohammadi Nasrabadi F, Mirmiran P, Omidvar N, Mehrabi, Azizi F. Evaluation of Adolescent Knowledge, Attitude and Nutritional Performance and their Relationship with Body Mass Index and Serum Lipids in Adults Residing in District 13 of Tehran during 2001-2001. Journal of Shahid Beheshti University of Medical Sciences. 2004; 5(9): 269-261.

9. Barzui A, Azadbakht L. Characteristics of dietary habits in Isfahan young girls Assessment of tea consumption, processed foods, fats and cooking methods. Journal of Health Research of the Year. 2010; 2 (6): 164-157.

10. Tavakkoli R, Sanai Nasab H, Karimi AK, Tavakkoli R. Evaluation of knowledge, attitude and performance of official and contract military personnel on proper food consumption and nutrition. Army Medical Journal. 2008 No. 10 (2): 129-136.

11. Hati M, Akbar Tabari M, Shams M, Behrouz Pour A, Rezaei A. Nutrition literacy assessment of primary school teachers in Yasuj. Armaghane Danesh Journal. 2018 No. 23: 125-133.

12. Doustmohammadian A, Omidvar N, Keshavarz-Mohammadi N, Abdollahi M, Amini M, Eini-Zinab H. Developing and validating a scale to measure Food and Nutrition Literacy (FNLIT) in elementary school children in Iran. PloS one. 2017; 12(6): e0179196.

13. Barati M, Yar Mohammadi A, Mostafaei SH, Gholiz, Razani S, Mir Hazawa SA. The Relationship between Attitude and Influential Beliefs in Fast Food Consumption among Students of Hamadan University of Medical Sciences. Journal of Health-System Research. 2014 No. 10 (3): 500-508.

14. Variyam JN, Blaylock JR, Smallwood D, Basiotis PP. USDA's Healthy Eating Index and nutrition information Technical Bulletin No 1866. Washington DC: USDA center for nutrition policy and promotion; 1998.

15. Mariyam Z, Li M, Huang X, Jiang P, Zeb F, Wu X, Feng Q, Zhou M. A Comparative Study of Nutritional Status, Knowledge Attitude and Practices (KAP) and Dietary Intake between International and Chinese Students in Nanjing, China. International journal of environmental research and public health. 2018; 15(9): 1910.

16. Mikolajczyk RT, El Ansari W, Maxwell AE. Food consumption frequency and perceived stress and depressive symptoms among students in three European countries. Nutr J. 2009; 8(1): 31.

17. Haslam C, Stevens R, Haslam R. Eating habits and stress correlates in a female student population. Work & Stress. 1989; 3(4): 34-327.

18. Shimbo S, Zhang ZW, Matsuda-Inoguchi N, Higashikawa K, Nakatsuka H, Watanabe T, Ikeda M. Effects of life away from home and physical exercise on nutrient intake and blood/serum parameters among girl students in Japan. The Tohoku journal of experimental medicine. 2004; 203(4): 86-275.

19. Kłosiewicz-Latoszek L, Ziółkowska A. Assessment of medical students' intake of antioxidants and vitamins essential for homocysteine metabolism. Wiadomoscilekarskie (Warsaw, Poland: 1960). 2002; 55: 41-235.

20. TarighatEsfanjani A, Mahdavi R, Safaeian A, GhaemMaghami J. Energy and nutrient intake in male students of medical sciences. In 8th Iranian Nutrition Congress 2004.

21. Zoellner J, Connell C, Bounds W, Crook L, Yadrick K. Peer reviewed: nutrition literacy status and preferred nutrition communication channels among adults in the lower Mississippi Delta. Preventing chronic disease. 2009; 6(4).

22. Aihara Y, Minai J. Barriers and catalysts of nutrition literacy among elderly Japanese people. Health promotion international. 2011; 26(4): 31-421.

23. Sampaio H.A.C, Carioca A.A.F, Sabry S.D, Sabry M.O.D, Pinto F.J.M, Ellery T.H.P. Assessment of nutrition literacy by two diagnostic methods in a Brazilian sample. ical Nutr.Clin.diet.hosp. 2014; 34(1): 50-55.

24. Ballance D, Webb N. For the Mouths of Babes: Nutrition Literacy Outreach to a Child Care Center. J Consumer Health Internet. 2015; 19(1): 1-12.

25. HD Gibbs. Department of Dietetics and Nutrition, University of Kansas Medical Center, Mail Stop 4013, Kansas City, KS 66160.

26. Hann CS, Rock CL, King I, Drewnowski A. Validation of the Healthy Eating Index with use of plasma biomarkers in a clinical sample of women. The American journal of clinical nutrition. 200; 74(4): 86-479.

27. Azizi M, Aghaee N, Ebrahimi M, Ranjbar K. Nutrition knowledge, the attitude and practices of college students. Facta Universitatis: Series Physical Education and Sport. 2011; 9(3): 57-349.

28. Du W, Fu J, Su C, Zhang Q, Zhai F, Zhang B. Surveys on the nutrition literacy of 802 adults in Jiangxi province. Journal of Hygiene Research 2010, 39(6): 735-738.

29. Kozaki Qom, Cherkezi AR, Shahnazi H, Ekrami Z, Bahador A. Investigating the lifestyle of teachers working in Gorgan city in 2009. Journal of Health System Research. 2010 6(3):135-522;

30. Mozaffari H, Vaziri N, Mohammadi Manesh A, Naderi Z, Danesh H. Nutritional Knowledge of Medical Students in Yazd Sadoughi University of Medical Sciences in 2011. Journal of Yazd Medical Education Research and Development Center. 2013; 8(2):15-24.