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The impact of family-based nutrition education intervention program on eating habit among obese school age children in Rania city / Iraq

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Abstract---Background and objectives: Childhood obesity nowadays is a main health issue and growing disease that has become a global major public health concern. The children obesity can be decreased by changing eating habits. The aim of this study was to explore the impact of family-based nutrition education intervention program on eating habit among obese children in Rania city. Methodology: A quantitative design, quasi-experimental study was conducted in Rania city. Purposive samples of 47 obese school children with their parents were comprised. Participants were divided into intervention and control groups. Nutrition education program was. Mediterranean Diet Quality Index questionnaire was used to assess participant's adherence to the Mediterranean Diet. Student t-test was used to compare between two means and paired t-test to test a group at twice (at pre and post-test). Results: The findings revealed that, 55% of obese children were male. The highest level of obese children (29.8%) were 10-years old. Primary school education was the highest level of education of both parents. The majority of families, 85.1% were within barely sufficient economic status. Among obese children, 63.8% of them were poorly adhere to the healthy Mediterranean Diet. In the intervention group the change in mean of adherence to the Mediterranean diet was statistically significant from pre to post-test. However, in the control group, the change was not significant. Conclusion: Following applying intervention program, it appeared that

the program was highly effective in improving eating habit toward healthy pattern of the food.

Keywords---Childhood obesity, Nutrition education, Eating habit, Mediterranean diet.

Introduction

Obesity nowadays, is a pandemic and main health concern and continues increasing disease that affect children worldwide. In 2016, over 340 million children and adolescents aged 5-19 were overweight or obese all over the world (1). Overweight and obesity as defined by World Health Organization (WHO) are abnormal and excessive body fat accumulation that directly affect health state (2). American Mayo Clinic Foundation defined obesity as “a complex disease involving an excessive amount of body fat” (3). It is a medical condition which is more than a cosmetic issue that raises the risk of developing other diseases and health issues like heart disease, diabetes, high blood pressure, and some malignancies (3, 4).

While the high level of childhood obesity disease is defined worldwide, its steady uprising prevalence in Iraq and Kurdistan region is confirmed (5). According to The World Obesity Federation (World Obesity / Global Obesity Observatory) which presented 2022 data on the prevalence of obesity in Iraq, it is documented that 17.4% and 7.9% of 13 to 15-year-old children were overweight and obese (4). Furthermore, it is estimated that by 2030, 24.72% and 19.33% of 5 to 9 and 10 to 19-year-old children would be obese in Iraq, respectively (4). Dietary or eating habits are the decisions made by individuals or groups of people about what foods to eat on a regular basis. Vitamins, minerals, carbohydrates, proteins, and fats must all be consumed as part of a balanced diet and healthy eating habit (6).

Bede, Cumber (7) defined eating habit and stated that “eating habit refers to why and how people eat, which foods they eat and with whom they eat, as well as the ways people obtain, store, use and discard food”. Unhealthy eating habit is significantly associated with the development of unhealthy weight status of an individual especially if adopted in early life. The Mediterranean diet is an eating style based on the traditional cuisines of Greece, Italy, and other Mediterranean countries. Adopting a Mediterranean Diet style eating pattern reduces not just body fat mass and obesity risk, but also the development of a variety of health disorders (8).

During adulthood, it is too difficult to change behaviors established in childhood. Hence, it would be more effective to prevent obesity and its complications during childhood (9). Additionally, evidences show that children at the age of primary school have acquired greater autonomy to internalize knowledge and change attitudes towards food and physical activity (10). The study aimed to explore the impact of nutrition education intervention program on obese children and promote appropriate healthy eating habit in Rania City.

Methodology

A quantitative method, quasi-experimental pre and post-test design were used. A non-probability, purposive sample of 70 (3-6 grads), 8 to 12 years old primary school children who had been identified as obese (BMI-z score > 2SD) in a preliminary study with their parents were recruited. Parents had no role in the intervention program, they involved as audience to amplify the effectiveness of the program through maintain healthy environment at home and to direct their children to follow the program.

Pretest assessments were performed for all of the obese children participated the first appointment (first session), which was held on April 3, 2021. In the beginning, pre-test (baseline) children and parent's sociodemographic characteristics were taken. Following that children's eating habit (level of adherence to Mediterranean diet) was assessed. By the end of the first appointment, participants had been assigned into two groups: intervention (35) and control (35). Control group had received nothing without instructions at the time of pre-test. Conversely, intervention group had received weekly intervention program. Moreover, the intervention group received a booklet containing healthy lifestyle intervention program guide. They were also given several leaflets outlining the various educational aspects of the intervention process.

Homogeneity of the participant's sociodemographic characteristics was attained. At the first appointment before dividing participants to the groups, the detailed study process was explained. Additionally, it was clarified that participants in the control group need to be involved only twice, today and a day by the end of the intervention program. Meanwhile the participants in the intervention group should involve in the process of 12 weekly plan. Therefore, some of the participants in both groups complained and want to change their groups due to several excuses otherwise they cannot participants. Consequently, homogeneity and equivalency of the groups were lost.

By the end of the program, out of the 70 obese children, only 47 of them were included in the post-test and used in the data analysis. In the intervention group, 13 obese children out of 35 left the program for different reasons and only 34 of them returned for the post-test. On the other hand, in control group, 10 obese children out of 35 left the program and only 25 of them returned for the post-test. Mediterranean Diet Quality Index in children and adolescents (KIDMED) questionnaire was used to assess obese children's eating habit. The KIDMED was first published in Public Health Nutrition in 2004 (11). According to a recent study, the KIDMED questionnaire is the most extensively used scoring system for determining MD adherence in children and adolescents and has a higher psychometric property (12).

This study achieved conformity with the scientific and ethical committee of the college of nursing and university of Raparin. At the beginning of the appointment informed consent was obtained from all participants (children and their parent) and the confidentiality of all data was assured. The intervention program that had used in this study was a knowledge-based and practical-based interventional educational program. It was a behavioral changing program that focused on

several domains such as providing general knowledge on different aspects of nutrition, eating habit, food preparation and their impact on health. This educational program was set based on extensive review of literature and children's needs to change their lifestyle toward healthy. Its validity was confirmed by a panel of 13 experts from different specialties such as (nursing, community medicine and dietitian). It was set in a very simple language that all children from the grade 3 to 6 be able to read and understand. It explained every small point of healthy eating habit, type and nutrients value of different and common consumed foods. The intervention program continued for 12 weeks. It was composed of eight 90 minute sections of different activities that conducted over 12 weekly sessions (Table 1). The program was performed through theoretical lectures (discussion), video display, practical workshops and games.

Table 1: Overview of the nutrition education program algorithm

Program plan overview				
Session	Nutrition education section	Additional activity section	Participants	Groups
Session One	Pre-Assessment and program explanation	Offering fruit and vegetables servings	Children & parents	IG* & CG**
Session Two	Overview of obesity and its impact on health (psycho-health)	Icebreaker activity (Creation game)	Children & parents	IG
Session Three	Nutritional knowledge and balanced diet	Workout exercise	Children & parents	IG
Session Four	Healthy eating habit	- Basket or can? - Fruit and vegetable alphabet	Children & parents	IG
Session Five	Traffic light diet programs	-Healthy food, Junk food -Step away from the screen	Children & parents	IG
Session Six	Individual or group counselling, finding out challenges and providing solution	-Workout exercise - Healthy hero	Children & parents	IG
Session Seven	Be positive and maintaining change	- Workout exercise - Healthy shopping	Children & parents	IG
Session Eight	Re-Assessment	Healthy food preparation	Children & parents	IG & CG

*IG: Intervention Group **CG: Control Group

Results

Sociodemographic features of obese children and their parents

The sociodemographic features of the obese children and their parent's in this study were presented in the Tables below. Table 2 illustrates obese children's sex and age. In terms of participant's sex, as it is seen in all the study sample there was a slightly higher percentage (55.3%) of males. There were also a greater proportion of males in the intervention group (77.3%). While, in control group the figure is different in which 64% of participants were female. Consequently, there was a statistically significant difference at P-Value = 0.004 between intervention and control groups with regard to the participant's sex.

Additionally, Table 2. shows the participant's age among different groups. As it is seen, among all participants, 10-years is the highest age group which is denoted as 29.8% while the youngest (8 years) and oldest (12 years) ages groups were only 6.4% and 10.6%, respectively. Finally, the difference between the participant's age in intervention and control groups was statistically not significant at P-Value = 0.83.

Sociodemographic characteristics of the parents

Table 3 displays socio-demographic characteristics of study samples regarding level of education. As it is seen, parent's level of education extends from illiterate (unable to read and write) to the highest degree of education which was postgraduate (master or doctorate degree). Overall, primary school education level was the highest level among all of the education levels which accounts for 31.9% in both parents. On the other hand, among all of the fathers and mothers only 2.1% of them were within the postgraduate level. Moreover, mothers who were unable to read and write were within the third highest class in the education level and they represent 25.5%. In comparison with mothers only 2.1% of the fathers were have no ability to read and write. It also appears that the distribution of parent's level of education were about equal in both intervention and control groups. Regarding to the differences in both fathers and mother's level of education in the intervention and control groups, statistically there were no significant differences at P-value = 0.76 and P-Value = 0.18 in both fathers and mothers, respectively.

Likewise, Table 3 shows participant's family economic status. It was considered based on family monthly income, most of them (85.1%) were within the barely sufficient and their economic status were as usual. So, the highly sufficient and insufficient economic status families were in minority level as they represent (6.4%) and (8.5%), respectively. Moreover, the distribution of family monthly income was about equal in both groups as (86.4%) in intervention and (84%) in control group were in a barely sufficient level. Regarding to the differences between groups, it is seen that statistically there is no significant differences between intervention and control groups in terms of family economic status at P-Value = 0.89.

Table 3 also presents parents' occupation; it is seen that all of the fathers were employed or they self-employed and none of them were jobless or retired. Among all of the study sample, 55.3% of the fathers were employed and the remaining 44.7% of them were self-employed. Moreover, group differences depend on father's occupation is statistically not significant at P-Value = 0.26. On the other hand, among all study sample, the majority of the mothers 89.4% were house wife. As a result, the remaining mothers which were (8.5%) were governmental employed, and 2.1% of them were self-employed. Similarly, just like fathers, mother occupation differences between intervention and control groups were statistically not significant at P-Value = 0.31.

Table 3: Distribution of the child and parent's sociodemographic characteristics among different groups

Variables	Categories	Intervention group		Control group		All		P-Value (Sig)* Fisher's exact test
		F	%	F	%	F	%	
Sex	Male	17	77.3	9	36	26	55	0.004* (S)
	Female	5	22.7	16	64	21	45	
Age	8	2	9.1	1	4.0	3	6	0.83** (NS)
	9	5	22.7	7	28.0	12	26	
	10	8	36.4	6	24.0	14	30	
	11	4	18.2	9	36.0	13	28	
	12	3	13.6	2	8.0	5	11	
Father education	Unable to read and write	1	4.5	0	0.0	1	2.1	0.76 ** (NS)
	Able to read and write	11	50.0	4	16.0	15	31.9	
	Primary school degree	5	22.7	10	40.0	15	31.9	
	Secondary school degree	1	4.5	3	12.0	4	8.5	
	Undergraduate	4	18.2	7	28.0	11	23.4	
	Post graduate	0	0.0	1	4.0	1	2.1	
Mother education	Unable to read and write	5	22.7	7	28.0	12	25.5	0.18**(NS)
	Able to read and write	9	40.9	4	16.0	13	27.7	
	Primary school degree	6	27.3	9	36.0	15	31.9	
	Secondary school degree	1	4.5	3	12.0	4	8.5	
	Undergraduate	1	4.5	2	8.0	3	6.4	
	Post graduate	0	0.0	0	0.0	0	0.0	
Family monthly income	Highly sufficient	1	4.5	2	8.0	3	6.4	0.89**(NS)
	Barely sufficient	19	86.4	21	84.0	40	85.1	
	Insufficient	2	9.1	2	8.0	4	8.5	
Father occupation	Employed	10	45.5	16	64	26	55.3	0.26 ** (NS)
	Self-employed	12	54.5	9	36	21	44.7	
Mother occupation	House wife	21	95.5	21	84	42	89.4	0.31**(NS)
	Employed	0	0.0	4	16	4	8.5	
	Self-employed	1	4.5	0	0.0	1	2.1	

* Chi-square test, **Fisher's Exact test

Level of adherence to the healthy Mediterranean diet among obese children at baseline

Figure 1 displays the participant's level of adherence to the Mediterranean diet (MD). It is clear that most of the obese children (63.8%) were poorly adhere to the healthy Mediterranean diet, while only about one third (36.2%) of the children were within the average level of using Mediterranean diet. Interestingly, no one of the children was highly stick to the healthy MD.

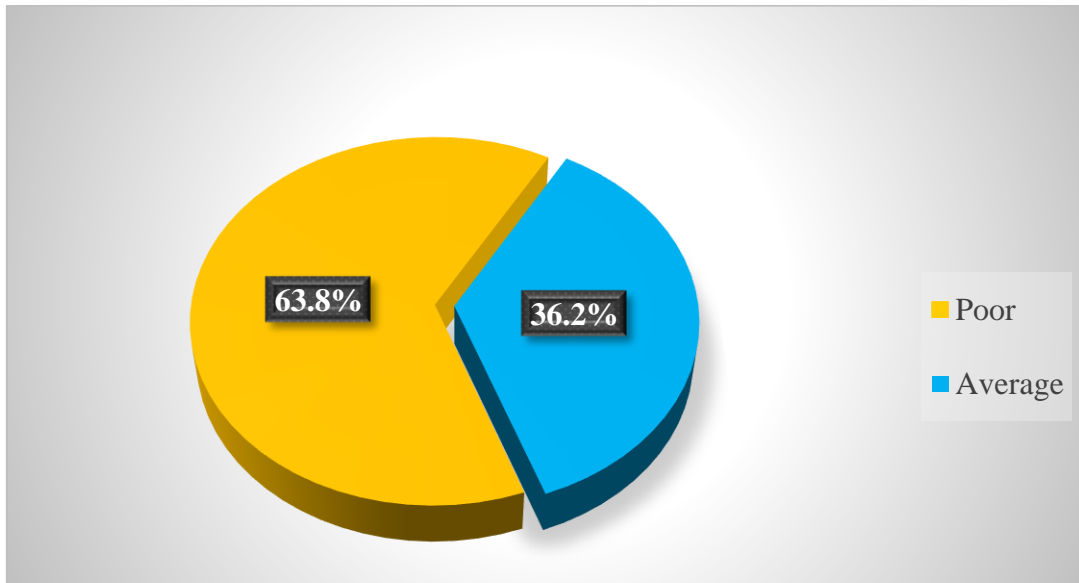


Figure 1: The distribution of the study sample according to their level of adherence to the Mediterranean Diet at baseline

The differences in mean level of adherence to the Mediterranean diet between groups (intervention and control) in pre and post-tests

As it is seen in the Table 4, at pre-test, in the intervention group, the mean level of adherence to the MD was 1.4 with ± 0.5 standard deviations, while in the control group the mean level was 1.32 with ± 0.47 standard deviations. From this point, it is clear that statistically there was no significant difference between groups at P-Value= 0.53. On the other hand, at post-test the, mean level of adherence to MD in the intervention groups was 2.09 with 0.68 SD and in the control groups it was 1.36 with ± 0.48 SD. Interestingly, in the post-test, within group differences in the mean of adherence to the MD was significant at P-Value < 0.01.

Within group differences in level of adherence to the Mediterranean diet between pre and post-tests

Table 4 also displays within group differences between pre and post-tests in each of the intervention and control groups. It is clearly seen that the differences in the intervention group was statistically significant at P-Value < 0.01. Conversely, in

the control group the mean level of adherence to the MD between pre and post-tests was not significant at P-Value= 0.66.

Table 4: The differences in mean level of adherence to the Mediterranean diet between and within groups (intervention and control) in pre and post-tests

Assessment	Groups	N	Mean	SD	P-Value (Sig)* Independent t-test
Pre-test	Intervention	22	1.4	0.50	0.53 (NS)
	Control	25	1.32	0.47	
Post-test	Intervention	22	2.09	0.68	< 0.01 (HS)
	Control	25	1.36	0.48	

The relationship between participant's level of adherence to Mediterranean diet with some children and parent's sociodemographic characteristics

Sex:

Table 5 illustrates the association between participants' level of adherence to Mediterranean diet with their sexes. As it is seen, the association between these two variables was not significant at P-Value = 0.76.

Table 5: The relationship between participants' adherence to MD and their sexes

Sex	Mediterranean diet adherence level (Kidmed)			Total
	Poor N (%)	Average N (%)	High N (%)	
Male	16 (34.0)	10 (21.3)	0 (0.0)	26 (55.3)
Female	14 (29.8)	7 (14.9)	0 (0.0)	21 (44.7)
Total	30 (63.8)	17 (36.2)	0 (0.0)	47 (100.0)
P-Value = 0.76 (NS)* Person chi-square				

* Correlations significant at 0.05 level (2 tailed)

Father's level of education:

Table 6 illustrates the association between participants' level of adherence to the MD with their father's level of education. It was appeared that children's level of adherence to MD had no significant association with their father's level of education at P-Value = 0.63.

Table 6: Association between parent's level of adherence to MD with their father's level of education

Father's level of education	Mediterranean diet adherence level (Kidmed)			Total
	Poor N (%)	Average N (%)	High N (%)	
Illiterate	0 (0)	1 (2.1)	0 (0.0)	1 (2.1)
Able to read and write	8 (17.0)	7 (14.9)	0 (0.0)	15 (31.9)
Primary school	11 (23.4)	4 (8.5)	0 (0.0)	15 (31.9)
Secondary school	3 (6.4)	1 (2.1)	0 (0.0)	4 (8.5)

Undergraduate	7 (14.9)	4 (8.5)	0 (0.0)	11 (23.4)
Post graduate	1 (2.1)	0 (0.0)	0 (0.0)	1 (2.1)
Total	30 (63.8)	17 (36.2)	0 (0.0)	47 (100.0)
P-Value (Sig.) = 0.63 (NS)* Fisher's Exact Test				

* Correlations significant at 0.05 level (2 tailed)

Mother's level of education:

Table 7 shows association between participant's level of adherence to MD with their mother's level of education. It is appeared that children's level of adherence to the MD had no significant association with their mother's level of education at P-Value = 0.67.

Table 7: The relationship between mother's level of education and their children's level of adherence to Mediterranean diet

Mother's level of education	Mediterranean diet adherence level (Kidmed)			Total
	Poor N (%)	Average N (%)	High N (%)	
Illiterate	6 (12.8)	6 (12.8)	0 (0.0)	12 (25.5)
Able to read and write	9 (19.1)	4 (8.5)	0 (0.0)	13 (27.7)
Primary school	11(23.4)	4 (8.5)	0 (0.0)	15 (31.9)
Secondary school	3 (6.4)	1 (2.1)	0 (0.0)	4 (8.5)
Undergraduate	1 (2.1)	2 (4.3)	0 (0.0)	3 (6.4)
Total	30 (63.8)	17 (36.2)	0 (0.0)	47 (100.0)
P-Value (Sig.) = 0.67 (NS)* Fisher's Exact Test				

* Correlations significant at 0.05 level (2 tailed)

Family economic status:

In Table 8, the children's level of adherence to the MD association with family economic status is presented. Thus, it is confirmed that there was no significant association between the children's level of adherence to MD and family's economic status at P-Value = 0.57.

Table 8: The relationship between family economic status and their children's level of adherence to Mediterranean diet

Family economic status	Mediterranean diet adherence level (Kidmed)			Total
	Poor N (%)	Average N (%)	High N (%)	
Highly sufficient	3 (6.4)	0 (0.0)	0 (0.0)	3 (6.4)
Barely sufficient	24 (51.1)	16 (34.0)	0 (0.0)	40 (85.1)
Insufficient	3 (6.4)	1 (2.1)	0 (0.0)	4 (8.5)
Total	30 (63.8)	17 (36.2)	0 (0.0)	47 (100.0)
P-Value (Sig.) = 0.57 (NS)* Fisher's Exact Test				

* Correlations significant at 0.05 level (2 tailed)

Discussion

Participants were 8 to 12 years old obese children in both sexes. Furthermore, among all of the study sample, there was a slightly higher percentage of males in comparison to females. As it is shown, about two thirds of the fathers were at the basic level of literacy and had only ability to read and write without official certificates and/or at the level of primary school certificate. Furthermore, fathers with the lowest and highest (illiterate and postgraduate) levels of education were equal and each of them only represents the minority. The lowest level of education (illiterate) in mothers' accounts for a quarter, while no mothers were at the highest level of education (postgraduate). Interestingly, primary school certificate level accounts for about one third for both fathers and mothers. In relation to the family economic status, the majority of the families were within the barely sufficient monthly income, whereas only the minority of the families were within the insufficient and highly sufficient levels.

Concerning the participants' eating habit and their level of adherence to the Mediterranean diet, in the present study it was attained that most of the primary school obese children were not close to the healthy Mediterranean diet and only about one third of the children were at the average level and no one appeared to be at the high level. This result among obese children is supported by a huge of body literature that obese children have low level of healthy eating habit (8, 13, 14).

Between group differences in the participant's sex was statistically significant. It was one of the weak point of the study. In case control and cohort studies, it is required to maintaining equilibrium between intervention and control groups in term of participant's sociodemographic characteristics. Crandon (15) Stated that "Case-control studies should include two groups that are identical EXCEPT for their outcome / disease status". It is vital to match control to the intervention group, specifically in demographic characteristics such as (e.g. age, sex) to minimize its confounds to the results.

Between group difference (intervention and control) in participants' mean level of adherence to Mediterranean diet was examined in both pre and post-tests. In pre-test, the participants' mean level of adherence to MD in the intervention group was 1.4 and in the control group it was 1.32. Besides, the difference between them was statistically not significant. However, in the post-test the features were different, in the intervention group the mean level of adherence to the MD increased and became 2.09, while in the control group it was about the same 1.36. Additionally, the difference between them was significant. This significant between differences in the post-test is indicate of the effectiveness of the intervention program.

On the other hand, within group differences in each of the intervention and control groups between pre and post-tests were examined. This was to assess the effectiveness of the intervention program in improving one's eating habit. In the intervention group, participants' eating habit interestingly improved from pre to post-test and the change was too high. Furthermore, the difference was statistically significant. However, in the control group, participants' eating habit

was slightly improved from just 1.32 to 1.36, and the difference was not significant. Compared to the control group, significant differences in the intervention group, is an indicator of the program effectiveness.

In relation to the association between participants' sex and adherence to the Mediterranean diet as an indicator of healthy eating habit, in the current study males had slightly higher level of adherence as compared to females. However, the difference was not significant, it is matched with several international studies which stated that the level of adherence to the Mediterranean diet is higher among males as compared to females. Whereas, no statistical significant gender differences were attained from most of the studies done on the adherence to the Mediterranean diet worldwide (16, 17).

Regarding to the association between children's level of adherence to the Mediterranean diet and their parents' education level, the current study revealed that there was no significant relationship between these two variables. However, there are many research papers do not support the current study result. Studies in Cyprus, Spain and Iran indicate significant relationship between children's level of adherence to the Mediterranean diet and their parents' level of education (17-19). Regarding the family economic status and its association with the children's level of adherence to the Mediterranean diet, it is presented that there was no significant association between these two variables. This result is not expected as several other study attained different outcomes and found that there is a significant relationship between them (20, 21).

To sum up, as it is seen that at the end of the study and following the intervention program eating habit variable was positively changed. On this basis, it is indicated that the intervention program that had been applied in this study was effective and practicable in declining obesity prevalence through diminishing body weight and changing unhealthy lifestyle and eating habit toward healthy. Multicomponent of the intervention program is considered as one of the behind factors for the effectiveness of the program. As it was mentioned before, this intervention program consisted of and worked on several nutritional domains which were nutritional education, eating habit and food preparation. In a review study, it was described that multicomponent intervention programs were more effective and attain significant improvement in obesity consequence behaviours. Additionally, parent participation was another strong point in this study as they involved in the intensify of the intervention program effectiveness (22-24).

Conclusion

A quasi-experimental, pre and post-test study was carried out among a purposive sample of 47 (8 to 12) years old obese children. More than half of them were males and the majority of them were with the age of 9,10 and 11 years old. Most of the obese children were within poor level of adherence to the healthy Mediterranean diet with the mean level of 1.36. Following performing pre-test, nutrition education program had been applied for the intervention group. The program mainly consists of nutrition education and practice; as well as healthy eating behavior modification. It was a weekly program and continue for 12 weeks. By the end of the program and at the post-test, children were reassessed for their

level of adherence to Mediterranean diet. As a result, participants' eating habit slightly improved as the level of adherence to Mediterranean diet progressed from poor to average with the mean level of 1.7.

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