# Evaluation of obesity prevalence and nutritional knowledge in adolescents in a semi urban area of Turkey

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**Summary.** *Objective:* The objective of this study was to determine obesity prevalence and healthy nutritional knowledge among adolescents. *Subjects and methods:* Planned cross-sectional onset and intervention afterwards, participants were 6th&7th grade students. Socio-demographic variables, wealth, perceived body image, nutritional habits and knowledge was questioned face to face. Weight and height was measured and evaluated via BMI percentiles. Nutritional knowledge was determined via 15 multiple choice questions. An interactive nutrition education program consisted of presentation, a game, songs and animated videos were conducted and after the intervention, nutritional knowledge was re-assessed as a post-test. Independent and dependent samples t test, logistic regression analysis, chi-square tests were conducted for analysis. p<0.05 was considered significant. *Results:* Among 462 participants, 18.2% were obese (24.8% for boys, 11.9% for girls), 68.0% of the mothers were unemployed, 23.8% of the households were in the low wealth group. Nutritional knowledge score increased significantly from 11.75±2.07 to 12.09±1.97 (p<0.001). *Conclusions:* Obesity was more frequent than expected. Nutrition education increased nutrition knowledge significantly. In order to prevent obesity in adolescence, multicomponent, holistic school interventions must be conducted.

**Key words:** Obesity, adolescence, nutrition intervention, school health

«VALUTAZIONE DELLA PREVALENZA DI OBESITÀ E DELLA CONOSCENZA NUTRIZIONALE NEGLI ADOLESCENTI IN UNA ZONA SEMI-URBANA DELLA TURCHIA »

**Riassunto.** *Obiettivo:* L'obiettivo di questo studio era di determinare la diffusione dell'obesità e la promozione di una nutrizione sana tra gli adolescenti. *Soggetti e metodi:* E' stato pianificato uno studio trasversale all'esordio e di intervento in seguito, i partecipanti erano studenti di grado 6° e 7°. Sono state valutate con interviste dirette le variabili socio-demografiche, la ricchezza, l'immagine percepita del corpo, le abitudini e le conoscenze. Il peso e l'altezza sono state misurate e valutate tramite percentili del BMI. La conoscenza nutrizionale è stata determinata con un questionario di 15 domande a risposta multipla. E' stato condotto un programma di educazione alimentare interattivo che consisteva di una presentazione, un gioco, canzoni e video animati e dopo l'intervento, sono state rivalutate le conoscenze nutrizionali come un post-test. Per l'analisi statistica sono stati utilizzati il t test per campioni dipendenti e indipendenti, l'analisi di regressione logistica e il test del chi-quadrato. E' stato considerato significativo un valore di p<0.05. *Risultati:* Tra i 462 partecipanti, il 18,2% era obeso (24,8% per i maschi, 11,9% per le femmine), il 68,0% delle loro madri erano disoccupate, il 23,8% delle famiglie appartenevano ad un ceto sociale più basso. Il punteggio della conoscenza nutrizionale era aumentato significativamente da 11,75±2,07 a 12,09±1.97 (p <0.001). *Conclusioni:* L'obesità era più frequente del previsto. L'educazione alimentare ha aumentato in modo significativo la conoscenza nutrizionale. Al fine di prevenire l'obesità in età adolescenziale devono essere programmati interventi scolastici multicomponenti e olistici.

**Parole chiave:** Obesità, adolescenza, intervento nutrizionale, scuola che promuove la salute

Adolescent obesity is increasing worldwide; it is considered an emerging public health concern (1, 2). A review article published in Turkey indicated that the overall prevalence of overweight was 15-20% among adolescents; rates varied according to age groups and geographical area (3). Obese adolescents experience many physical and psycho-social problems such as type II diabetes, hyperlipidemia, hypertension as well as depression, social isolation and low self-esteem (4-7). Published studies showed that not only socio-demographic factors such as age and sex but, socio-cultural and biological factors and lifestyle including nutritional habits and physical activity may affect adolescent obesity (8). Similarly good dietary behavior may be influenced by cultural, physical and social environment as well as personal factors such as nutritional knowledge, taste and preferences (9). Thus, for tackling obesity epidemic worldwide, adolescence is an important period for building dietary habits which may influence later life. Schools have been identified as a key setting for public health strategies to prevent obesity (10) and they provide a very good opportunity for implementing good nutritional habits (11-14). It was shown that nutrition education at school improves nutrition-related knowledge, attitudes and behaviors towards healthy food choices (15).

In Turkey, there are many cross-sectional studies investigating prevalence of obesity but as far as we could reach, this is the first nutrition intervention study conducted in schools. This is a very important start point to open a path for implementing comprehensive, multilevel intervention programs at schools to increase nutritional knowledge and to accomplish behavior modification.

Thus the objective of this study was to determine obesity prevalence and healthy nutritional knowledge among adolescents in a semi-urban area of Turkey.

## Methods

Planned cross-sectional at the onset and intervention afterwards, the study was conducted in two schools located in center area and two schools in rural area on 6. and 7. grade students in a semi urban district. This district is located ten minutes from down-
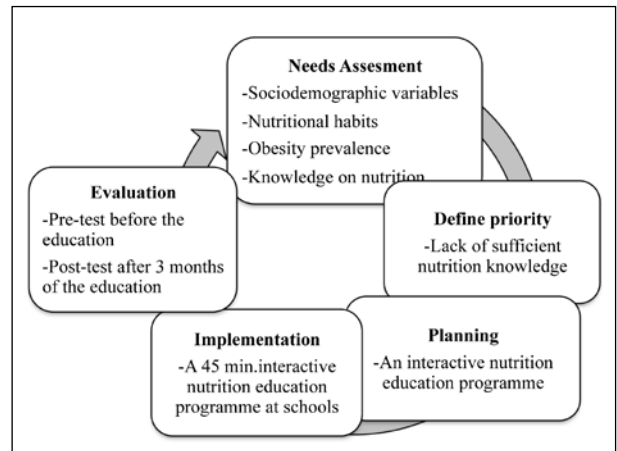


**Figure 1.** Theoretical framework of the study

town, abundantly provided with means of transportation. Small industrial plants and orchards, especially cherry production, are the main sources of income; this setting gave us the opportunity to evaluate different socio-economic groups. Theoretical framework of study was presented in Figure 1.

As it was depicted in Figure 1, students' socio-demographic attributes, nutritional habits, obesity prevalence and nutritional knowledge were determined in the needs assessment stage. There is a general paradigm saying that new knowledge would yield attitude change which, in turn, would lead to behavior modification (16). According to knowledge, attitude and behavior (KAB) theory, it was premised that knowledge is necessary for appropriate behavior (17). Moreover since there are studies which demonstrate the positive influence of nutritional knowledge level on healthy dietary behaviors, "resolving the lack of nutritional knowledge" is determined as top priority (9, 15, 18). A 45-minute (1 class-hour) interactive nutritional education program was prepared to resolve this lack of knowledge. This education program was practiced in schools. To determine the success level of this education, a pre-test before the education and a final-test three months after the education were performed.

### Participants

The students who were registered to the 6th or 7th grade of primary school in the spring term of 2012 in

a semi-urban district were determined as the population. There were a total of 2995 students in 25 primary schools in the district, which provided this level of education. According to Turkish Nutrition and Health Survey (2010) Obesity prevalence was found to be 9.8% in 12-14 years of age (19). With a 10% estimated prevalence, 2% precision and within the 95% confidence interval the smallest necessary sample size was 505 students. A design effect of the heterogeneity of schools was considered and the sample size increased by 50% which would yield to 758 students. Four schools among the 25 in the district were randomly selected, two from the center and two from the rural area (n=876).

*Instrumentation*

Socio-demographic factors, household wealth, perceived body image of the parents, correct knowledge of the subject's body weight, nutritional habits and knowledge were questioned. To evaluate household wealth, household assets questioned that are similar to those used in World Health Survey (WHS) and explained elsewhere (20). The perception of the body image for the parents and the subject was classified as 'thin, normal, overweight, obese'. To evaluate the accuracy of self-reported weight, the participants were asked to write their body weight before being weighed. If the stated weight was within ±%10 of the measured weight it was accepted as 'correct weight known'. For nutritional habits, consuming soft drinks 'once in a week or less' and 'not adding salt to a meal before tasting it' and 'having breakfast regularly' and 'consuming fresh fruits everyday' was considered as 'good nutritional habits'. Nutritional knowledge was determined via 15 multiple choice questions with only one correct answer. Wrong answers didn't affect the total score, thus number of total correct answers determined the nutritional knowledge score.

Obesity was defined via BMI percentiles; 85-94 percentiles was considered as overweight and ≥95th percentile was considered as obese (2, 15, 21). BMI was calculated as weight (kg) divided by the square of the height (m) and was evaluated according to age- and gender-specific percentiles using the AnthroPlus software by World Health Organization (WHO).

*Nutrition education.* Educations were performed in the classrooms or in the conference hall of the school using computer barcovision and sound system. This education pack, which lasted approximately 45 minutes, included a game, songs and short videos. Summary slides were used in order to summarize these materials used.

Class presentation: Education started with class presentation. Information about nutrition, adequate and balanced nutrition and the importance of it, nutrients, food groups and energy balance was given in this presentation, which lasted approximately 10-15 minutes.

Game: It was designed by researchers to discuss food groups. Posters of My Plate and a waste bin were hanged on the wall. Food pictures from each food group were handed to the students. Pictures of unhealthy food like French fries, mayonnaise and coke were handed as well as pictures of healthy food. Students accompanied with mentors were allowed to attach the picture of food in their hands either on an appropriate place in the My Plate pattern or onto the waste basket. Once all the pictures were attached, the educator counted and summarized the foods on My Plate and on the waste basket. The duration of the activity changed depending on the number of participants and was between 15 and 20 minutes.

Videos: Four video animations with durations between 2.5 and 5.5 minutes were shown during education. The Ministry of National Education had these animations prepared by a team that includes a dietician as well. Nutrition adventures of two monkeys are demonstrated in the videos using songs. The topics of the videos were "food groups", "meals", "food choice" and "I eat my food at home" in order. The videos lasted 15 minutes in total.

Songs: New lyrics were written to three songs which were popular in the country back then. The lyrics about nutrition were projected to the wall while the music was playing in the background and the students were asked to sing along. The theme of the songs was usually preferring healthy food and avoiding consuming unhealthy ones. The songs lasted approximately 5 minutes in total.

*Evaluation of education:* Before the education, the participants were asked 15 multiple-choice questions

about nutrition. The post-test was performed three months after the education using the same 15 questions.

*Procedure*

Planning phase of the study began in September 2011 and data was collected in May 2012 for needs assessment and September-October 2012 for post-tests. Nutrition and Dietetic students supported the study by working as pollsters in the needs assessment, pre-test and post-test stages. These students were given a brief training on data collection form, weight and height measurement and communication skills before the data collection period started.. A self-administered questionnaire was completed at the schools under the supervision of trained pollsters for needs assessment. Height was measured with a stadiometer in the Frankfurt plane and weight was measured by a Medisana digital scale with light clothing and shoes on by trained nutrition and dietetic department students. After data collection weight and height measurements were re-adjusted for the shoes for all. For post-test a self-administered questionnaire was completed at the schools three months after the education. Study was approved by the fund commission of the school of health and the university. Permissions from local health and education authorities and from the administrative bodies of the schools were obtained. School teachers accompanied the research team during data collection.

*Data analysis*

Sample size was determined via StatCalc by Epi-Info and BMI percentiles according to age and sex was calculated using AnthroPlus by WHO. Power analysis after the intervention was done via NCSS-PASS program. SPSS (Statistical Package for Social Sciences) vers. 15.0 was used for statistical analysis. Continuous variables were presented as means ± 1 standard deviation and categorical variables were summarized as percentages. Odds ratios were determined via single binary logistic regression and presented with their 95% confidence intervals (95% CI). Body image and obesity status according to sex was evaluated via chi-square test. A logistic regression analysis, enter method

was performed to determine the associated factors of obesity. Model was constituted of significant factors in univariate analysis, good nutritional habits and nutritional knowledge score. Comparison of knowledge scores before and after the education was performed by dependent samples t test. A p-value <0.05 was considered significant.

## Results

Among the 876 students registered to schools, a total of 462 (226 boys, 236 girls) who participated in the needs assessment, education and post-test stages were taken into evaluation. Accession rate was 52.7%.

*Needs assessment*

The mean age of students was 12.2±0.6 years. Among students, 73.8% study in the schools that were in the center. Among them, 17.1% had a mother who had high school or higher education whereas for father's it was 34.0%. Two thirds (68.0%) of their mother were unemployed. Nearly one fifth (18.2%) of the household heads were not covered by a social security scheme. According to WHS, wealth was distributed as: 44.8% in high, 31.4% in middle and 23.8% in low group.

When nutrition habits of participants were analyzed, it was determined that 11.5% of them put salt to their meal before tasting it, 42.9% consumed soda at least once a week, 68.2% had breakfast regularly every day, 82.9% consumed fruits every day. When these habits (not putting salt to the meal before tasting it, consuming soda less frequently than once a week, having breakfast regularly every day and consuming fruits every day) come together, they form the good nutrition habits. Only one fourth of the participants (28.4%) have "good nutrition habits".

When students' level of nutritional knowledge was analyzed, mean nutritional knowledge score was found as 11.75±2.10 (median: 12.0, minimum:3.0-maximum: 15.0). Girls had a significantly higher nutritional knowledge score compared to boys whereas age, school, level of welfare, obesity or having good nutrition habits did not significantly affect the average

**Table 1.** Students' body images and obesity status (n=462)

|                                          | All sample | | Boys | | Girls | | P |
|------------------------------------------|-----|------|-----|------|-----|------|---------|
|                                          | N   | %    | N   | %    | N   | %    |         |
| Not knowing his/her weight correctly     | 255 | 55.2 | 107 | 47.3 | 148 | 62.7 | 0.001   |
| Discontentment of his/her look           | 131 | 28.4 | 63  | 29.0 | 68  | 29.6 | 0.984   |
| Perceiving himself/herself as overweight | 76  | 16.5 | 45  | 19.9 | 31  | 13.2 | 0.069   |
| Percentile values according to BMI       |     |      |     |      |     |      | 0.001 (*) |
| Normal (<85 percentiles)                 | 309 | 66.9 | 170 | 75.2 | 208 | 88.1 |         |
| Overweight (85-94 percentiles)           | 69  | 14.9 |     |      |     |      |         |
| Obese (≥95 percentiles)                  | 84  | 18.2 | 56  | 24.8 | 28  | 11.9 |         |

*Chi-Square test; (*) Obese vs. non-obese comparison*

knowledge score. Table 1 presents students' body images and obesity status.

More than half of the participants did not know his/her weight correctly, whereas one fourth was not content with their look. When percentile values according to BMI are assessed, it is seen that one third (33.1%) of the students are either overweight or obese. Boys know their weight correctly at a significantly higher rate (p=0.001), whereas they are significantly more obese (p=0.001). The factors associated with obesity are presented in Table 2.

According to logistic regression analysis, being a boy, a single child, having a father who owns his business, mothers' appearance as overweight/obese and not knowing his/her weight correctly increased obesity significantly but nutritional knowledge score or having good nutritional habits didn't affect obesity status significantly.

*Evaluation of nutrition education*

The power of the study was found as 97%. The rate of correct answers increased after the education in 86.6% of the questions. The average knowledge level was 11.75±2.07 before the education and it increased significantly after the education to 12.09±1.97 (p<0.001). The factors that might affect the increase in level of knowledge and their influence on level of knowledge are presented in Table 3.

Mean knowledge scores have increased significantly in total after the education. This increase was

**Table 2.** Factors associated with obesity (n=462)

| Factor | OR | 95%CI |
|--------|-----|-------|
| **Sex – being a boy** | **2.849** | **1.615-5.027** |
| Age (continuous) | 1.198 | 0.829-1.731 |
| **Being a single child** | **2.260** | **1.149-4.446** |
| **Having a business owner father** | **3.021** | **1.585-5.758** |
| **Not knowing his/her weight correctly** | **2.919** | **1.651-5.162** |
| **Mothers' appearance as overweight/obese** | **2.214** | **1.264-3.876** |
| Nutritional knowledge score (continuous) | 0.962 | 0.850-1.089 |
| Having good nutritional habits | 0.838 | 0.476-1.476 |

*Multivariate logistic regression analysis, bold indicates significance*

significant in boys. Education was successful at the age of 11; that those who studied in the center benefit more from education but mean knowledge score significantly increased after education in those who studied in the peripheral. Education was not successful in those with poor level of welfare. However, it was determined that education increased the mean knowledge score significantly in other welfare groups, especially in those with moderate welfare level. Mean nutritional knowledge scores increased in those who were obese before the education, in those who were not, in those who had good nutrition habits and in those who did not. However, the education was more successful

**Table 3.** The increase in level of knowledge and socio-demographic and nutritional variables (n=462)

| Socio-demographic and nutritional variables | Knowledge score (Average ±S) | | |
| --- | --- | --- | --- |
| | Before Education | After Education | p |
| Total (n=462) | 11.75±2.07 | 12.09±1.97 | <0.001 |
| Sex | | | |
| Boy (n=226) | 11.13±2.28 | 11.62±2.24 | 0.002 |
| Girl (n=236) | 12.33±1.64 | 12.54±1.54 | 0.086 |
| Age | | | |
| 11 (n=193) | 11.67±2.08 | 12.07±1.86 | 0.008 |
| 12 (n=202) | 11.75±2.10 | 12.03±2.04 | 0.052 |
| 13 (n=66) | 11.94±1.96 | 12.29±2.05 | 0.203 |
| School | | | |
| Center (n=341) | 11.83±2.09 | 12.14±2.01 | 0.006 |
| Peripheral (n=121) | 11.50±1.99 | 11.93±1.85 | 0.024 |
| Level of welfare | | | |
| Low (n=55) | 12.13±2.05 | 11.64±2.33 | 0.151 |
| Moderate (n=190) | 11.81±2.02 | 12.38±1.74 | <0.001 |
| High (n=211) | 11.55±2.12 | 11.91±2.04 | 0.012 |
| Being obese before education | | | |
| No (n=378) | 11.83±2.03 | 12.12±1.92 | 0.007 |
| Yes (n=84) | 11.34±2.19 | 11.94±2.17 | 0.015 |
| Having good nutrition habits before education | | | |
| No (n=327) | 11.64±2.17 | 11.99±2.09 | 0.004 |
| Yes (n=131) | 12.07±1.78 | 12.31±1.62 | 0.047 |

*Dependent samples t test*

in those who were not obese and who had good nutrition habits before the education.

## Discussion

In the conducted research, prevalence of obesity was found as 24.8% in boys and 11.9% in girls, 18.2% in total. Being the only child and a boy, father being an employer, not knowing his/her weight correctly and mother looking overweight increased obesity risk significantly. Mean nutritional knowledge score was 11.75±2.10 before the education and it increased significantly to 12.09±1.97 after education. The education was more successful in boys, in younger age groups, in those who study in the central schools, in those with moderate or higher level of welfare, in those who were not obese before the education and in those who did not have good nutrition habits before the education.

The obesity prevalence found in our study is higher than some other reports from studies conducted in Turkey but similar to United States. The recent study conducted in US stated that obesity prevalence was 18.7% for 6-19 years (22). Bereket et al stated in a review that even though obesity rates differ according to region and children's age, overweight prevalence is 10-15%, with 2-8% for obesity (3) a proportion smaller than in our study. Obesity peaks in adolescence, in peripubertal period and in puberty (3, 15). This difference might arise from the fact that the age group was as wide as 6-18 in Bereket et al.'s study but in the performed study it was between 11-14, which overlaps with peripubertal and pubertal periods. According to Turkish Nutrition and Health Survey, obesity prevalence in 6-18 years of age was 8.2%, whereas between 12-14 years of age reached up to 9.8% as the highest prevalence (19). In addition to regional variations, the use of different cut-off points for obesity or the use of different percentile tables might explain such differences. In adolescents, obesity is determined by age-specific and gender-spe-

cific body mass index (BMI) percentiles; there is, however, no consensus on appropriate cut-off points for obesity. Thus there are cut-off points such as 85, 90, 95, 97 percentiles (1, 2, 15, 23). To define overweight in this study, we used a software (AnthroPLUS) prepared by the World Health Organization. While in Turkey percentiles for Turkish adolescents compiled by Neyzi (24) or the International Obesity Task Force (25) are also among the preferred instruments.

As countries develop and pass through epidemiological transitions, the disease profiles change and obesity increases (26). In developed countries, due to high energy-fat dense food consumption and the insufficient opportunities for physical activity, obesity is more frequent in vulnerable societies (27). In such countries, income, parent education and social class show a negative correlation with childhood obesity (1, 28, 29). On the other hand, in developing countries, this structure is different; obesity is seen more often in higher socio-economic groups due to the adoption of western lifestyle and dietary habits (30-32). This latter also represented the situation faced in our study, in which having a business-owner father significantly increased the risk 3.021-fold (95% confidence interval 1.585-5.758) after controlled for age, sex and other confounding factors. Parental obesity is defined as a risk factor for adolescent obesity as a result of both genetic tendency and lifestyle habits. In a study conducted in adolescent girls, it was found that perceived parental obesity significantly increased the subject's obesity risk (33). Another study conducted in Sweden concluded that parental obesity increased adolescent obesity significantly (34). These results also support our findings: after adjusting for age, sex and other socio-economic and nutritional variables, perceived parental obesity still significantly influenced adolescent overweight. Bereket et al., also summarize this situation as high income families and having an obese parent were the two risk factors of childhood obesity in Turkey (3).

It was determined in the interactive nutrition education (Pizza Please) that Powers et al. conducted on 2nd and 3rd grade students that the level of nutritional knowledge of students increased (35). In another study conducted in the secondary schools in urban areas by Fahlman et al., it is determined that the nutrition education given increased the nutritional knowledge scores significantly (36). In a compilation published by Perez-rodrigo et al. in 2001, school based nutrition programs were evaluated and nutritional knowledge levels were found to increase significantly with nutrition education attempts (12). All these results support the performed study.

There were many limitations to the conducted study. The aim of the study was to determine the nutritional knowledge level and prevalence of obesity in adolescents and to increase nutritional knowledge level by giving nutrition education. Studies showed that nutrition education increased the level of nutritional knowledge yet in recent studies it was shown that sufficient knowledge is not always sufficient for behavior modification (17, 18, 37). In order to improve positive behaviors, studies should be conducted on complicated models such as accessibility to the proper food, family, friends, school, environment, media and society influence as well as individual factors like increasing the level of knowledge (9, 17). Moreover, there were studies which show that more comprehensive holistic initiatives such as organizing school cafeterias, providing food service, adding new classes/practices to the curriculum about nutrition and physical activities and making these activities permanent, making school areas more suitable to physical activities, allowing family and society participation were more successful in creating positive behavioral changes (38-41). Yet the study was unidirectional; a 45-minute nutrition education was given to a group of students only once and the effect of given education on nutritional knowledge was assessed. Although this is a limitation, the fact that the education involves interactive elements such as games, songs and videos make the acquired information stick to the mind and make nutritional knowledge scores increase significantly.

The fact that schools were visited only for one day in the needs assessment and initiative stages and especially the fact that the days on which the education was given were within the cherry picking period in the district influenced participation negatively. The students who were absent from school in this period in order to help their families could be considered as from lower socio-economic class. This situation might have both hindered the access to the students who should have

benefited from this education and also disrupted the heterogenic structure of the group.

The most important strength of this study is that, it is the first nutrition intervention study conducted in schools so far as we can reach. Recently, Ministry of Health (MoH) prioritized combating obesity and supporting active life in all society and in 2013, MoH published a report about healthy nutrition and active life program (2014-2017). That report also emphasized that childhood/adolescent obesity is the origin of adulthood obesity and many more chronic diseases and combating with obesity must be started in childhood/adolescence (19). Moreover, lately, MoH had a bilateral agreement with Ministry of Education (MoE) to start a certification program for schools as 'Nutrition Friendly School Program'. Within this protocol, there is a check list to evaluate schools considering their canteen, food service, physical activity areas, dissemination of healthy nutrition messages, access to clean water, spearing enough time for lunch etc. With being the first nutrition intervention study in schools, this study might open path for further multilevel, holistic nutritional intervention studies.

## Conclusions

In the conducted research, prevalence of obesity was determined higher than expected. It is determined that being the only child and a boy, father being an employer, not knowing his/her weight correctly and mother looking overweight all increased the obesity risk significantly.

Even though, this study evaluated the efficacy of a unidirectional nutritional intervention program consisted a single nutrition education, nutritional knowledge scores increased significantly following education. Knowledge and awareness can be considered to be the first steps towards behavioral modification. But studies showed that for behavior modification, sufficient knowledge is not always sufficient to implement healthy behaviors and more condense, multicomponent and holistic interventions such as modifying school curriculum, food services, environment, the community, must be conducted.

In the future studies, multicomponent holistic interventions should be planned, outputs such as behavioral changes and obesity level as well as nutritional knowledge level should be assessed in order to implement healthy behavior or achieve behavior modification and to reduce or prevent obesity.

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