The effect of educational programs for healthy nutrition on the composition of children’s breakfasts

**Abstract**

The aim of present study was to examine the effectiveness of two distinct intervention programs intended to improve dietary breakfast habits in two age groups of students: 31 preschool children and 44 fifth-grade students in two elementary school classes.

An intervention program was conducted in each group to educate the children about healthy nutrition. Each program was tailored to the target age group: For the preschool children, a short intervention program was developed, comprising 12 sessions of 20 minutes each. The program for the fifth-graders was a national program comprising 15 two-hour sessions.

The composition of the children’s breakfast was recorded for a period of 30 days for the preschool children and 12 days for the fifth-grade children. This was done both before and after the intervention program. Every food item received a score according to its nutritional quality, and the sum of the scores was calculated for each meal. T-tests were performed in order to determine the significance of differences between the nutritional quality of the children’s breakfast items before and after the intervention.

It was found that the nutritional quality of all groups of breakfast components as well as the overall nutritional quality of breakfast improved significantly in both age groups.

The study’s results indicate that the intervention program is effective for a range of young ages, and that this type of program can be conducted starting in preschools, and subsequently in schools.

**Research Aim**

To examine the effectiveness of two intervention programs in improving the composition of breakfasts that preschool and fifth-grade children bring from home.

**Design**

Intervention programs were conducted in order to educate the children about healthy nutrition. Breakfast items that the children brought from homes were monitored for a period of 30 days (preschool children) or 12 days (fifth-grade children), both before and after the program. Each item of food received a score according to its nutritional quality, and the scores of the items in each meal were summed. T-tests were performed to determine the significance of the change in nutritional quality of the children’s breakfasts and the items they included, before and after conducting the program.

**Setting**

A preschool class in a rural community and two 5th-grade classes in an urban elementary school.

**Participants**

Thirty-one preschool children and 44 fifth-grade children of intermediate socioeconomic status.

**The Intervention Program**

A short intervention program comprising 12 sessions of 20 minutes was developed for preschool children, while a national program comprising 15 sessions of two hours each was conducted for fifth-graders.

**Results**

The nutritional quality of the breakfast component groups and the overall nutritional quality of the breakfasts improved significantly in both age groups.

**Conclusions and Implementation**

It is important to conduct intervention programs to improve the nutritional quality of food among both children and adults. Furthermore, it is important to involve families within the framework of these programs.

**Literature Review**

Nutritional habits in children

Correct, balanced nutrition is one of the main factors necessary for healthy growth and development in children, from both physiological and psychological perspectives. Fostering healthy dietary habits in children has been found to be effective in preventing nutritional and developmental problems, as well as in preventing acute and chronic disease.1 2 One of the main health problems facing parents and pediatricians in the United States, Europe and other countries is an increase in the average weight of children and young adults. In the last 30 years this phenomenon has tripled3 and recent statistics show that one in five American children aged 6-19 suffers from obesity, while one in three are overweight or obese.4 5 The definition of obesity or overweight is not uniform, and may vary among different populations. It also depends on age and gender, varies among different countries and regions around the world, and is based primarily on statistics (determining the percentile within the population above which the weight-to-height ratio is found).6 Among children, it is particularly difficult to determine the weight above which a child is considered overweight, mainly because children are continually growing and developing. Therefore, for the sake of convenience, overweight is generally defined as a body mass ratio (BMI; the ratio between weight and the square of height) of above 25 kg/m2; obesity is defined as a body mass ratio of 30 or more.7

The dramatic increase in overweight and obesity in children in recent decades is attributed, among other factors, to increasing exposure of children to foods that cause weight gain, combined with a decrease in their physical activity.8 The overexposure of children to such foods is expressed both at home, in their families, and outside of it – at school and social gatherings. In many countries, the entire population, not only the children, has demonstrated a significant increase in weight.8

In parallel to the increase in weight, a significant increase in the consumption of foods rich in sugar and saturated fats, as well as sweet drinks, has been observed among children in recent decades; a correspondingly marked decrease has been observed in the consumption of fresh fruits and vegetables. Children’s nutritional behavior and their nutritional knowledge have been identified as significant mechanisms contributing to weight increase. The positive relationship found between consumption of sweet drinks and foods rich in saturated fats and increased weight in childhood aligns with the positive relationship between increased consumption of fruits and vegetables during childhood and a lower risk of weight increase and obesity.1 2 Unfortunately, most children in the United States do not follow the most recent nutritional recommendations, to consume at least four servings of fruits and vegetables per day.5 In fact, some children do not even consume fruits or vegetables on a daily basis, and it turns out that these same children did not undergo an appropriate process of developing a preference for healthy food during early childhood.9

The negative nutritional change that has occurred within the population during recent decades in Western countries has led to increasing illness among children. These illnesses include chronic diseases related to obesity, such as type II diabetes, kidney disease and high blood pressure. Additional diseases related to obesity in adults are beginning to be expressed in children, including cardiovascular diseases, metabolic syndrome, chronic inflammatory disease and even different types of cancer.10 However, obesity in children is not manifested only in physiological problems; psychological problems such as negative body image and low self-esteem have also appeared,5 as well as mental health problems such as depression. Overweight children often suffer from teasing and bullying by their peers and from social isolation.

According to the World Health Organization, the obesity epidemic in children is not confined to the United States; it exists in other countries as well.5 For example, research has found a significant increase in childhood obesity has been found in recent years in China.11 Lately, China has been characterized by an increase in the standard of living, greater availability of unhealthy foods, and a lack of knowledge about healthy nutrition and its importance. The researchers of that study concluded that educational and intervention programs must begin being implemented at a young age, since such programs improve knowledge, and subsequently, nutritional habits among children, primarily among those in elementary school.

Among researchers and therapists, there is a broad consensus as to the appropriate recommendations to help children maintain a healthy lifestyle: transitioning to healthy nutrition, reducing screen time and increasing time spent engaging in games and physical activity, and ensuring an adequate amount of sleep. Although the nutritional habits and preferences of young children originate in the home, repeated exposure to healthy food outside the home, such as in school or preschool, can also lead to an improvement in children’s preferences and in their desire to consume healthy food and drinks.12

The effect of intervention programs on knowledge and on changes in nutritional habits among children

Studies that examine education for healthy nutrition among children emphasize the need for and the advantages of conducting intervention programs designed to encourage appropriate dietary habits beginning from a young age.12 This approach has two main motives: The first relates to the worrying changes that have occurred in recent decades in dietary habits in the Western world, and the serious health consequences of these changes, expressed as a decline in the health of children and young adults. The second stems from research evidence indicating that educational programs for correct nutrition can indeed significantly improve the dietary habits of children and young adults. Researchers agree that it is very important to conduct intervention programs to promote the implementation of the above recommendations, and that these programs should be designed for both children and their parents. Dietary habits and physical activity are acquired mainly at home; changes toward healthy nutrition and increased physical activity have been found to have a positive influence on children’s weight and good feelings.5 Durbin et al. reviewed studies on the relationship between the development of dietary habits in children, physical activity, and weight gain, during the period 2012-2017. Their clear conclusion is that healthy dietary and physical activity habits can be developed during childhood, and educational programs should be developed in this direction. Such positive changes have further influence in encouraging the acquisition of healthy lifestyle habits, leading to consistent changes in indices of health and well-being among today’s children, who, of course, are tomorrow’s adults. Since dietary habits and food preferences develop at a young age,13 the guidance and influence of programs on food preferences at this age can serve as an effective and promising approach to promoting the consumption of healthy food, including fresh fruits and vegetables, whole grains, and plant proteins, as well as drinking water.

In an attempt to understand how intervention programs work on children, Moss et al. showed that nutritional education programs led not only to the development of health literacy among young children, but also led them to prefer fruits and vegetables over other foods.14 Keiko et al.15 found that children’s knowledge about food has an influence on their choices, their preferences, and their food habits in practice. These researchers found an unequivocal relationship between children’s knowledge about healthy nutrition and increased vegetable consumption, emphasizing the importance of instilling this knowledge already at a young age. Akta et al.12 conducted a 10-week intervention program for 74 children in a public preschool in Turkey. They found that the improvement in children’s food habits was even more significant when the families of those preschool children were involved in the implementation of the program and, moreover, that the improvement in dietary habits was also expressed in the other members of the family. Other studies found that programs that integrate existing school vegetable gardens can also be effective in promoting nutritional knowledge and behavior. Nevertheless, many schools avoid implementing such programs due to a lack of space, resources and experience.14 Therefore, despite the importance of developing healthy nutritional behavior and nutritional knowledge, and despite the fact that a number of nutritional education programs have been found effective in elementary schools, few teachers actually implement these programs in their classrooms.

In interviews conducted by Schmitt et al.3 among teachers in an elementary school, teachers claimed that the absence of short and easily implementable intervention programs and the lack of time for assimilating independent study programs are the main reasons they do not educate for healthy nutrition in their classrooms. Teachers were interested in implementing short intervention programs within the framework of health and science lessons. Schmitt et al.3 developed a short program in accordance with international standards for nutritional education that were formulated to improve children’s nutritional knowledge and behavior. The study involved 131 children in 10 second-grade classes in the United States. Among these, 82 children participated in the intervention program and 49 did not. The program was conducted twice a week for six weeks; it included provision of health information encouraging a preference for fruits and vegetables over other foods. It was found that even such a short intervention program could be successful. In its wake, the children reported that they preferred to consume fruits and vegetables over other foods (actual consumption was not examined).

Hu et al.16 also emphasized the importance of having intervention programs for teachers and students as early as preschool, as this is when they acquire important life habits. The researchers claimed that parents in China tend to spoil their children and give them harmful snacks, fast foods and sweetened drinks, resulting in increased morbidity. The researchers were convinced that children should already acquire appropriate dietary habits in early childhood, which they will carry over the course of their lives.

We can see, therefore, that despite the important role of families in instilling appropriate dietary habits, the intervention programs studied in preschool or school do not always merit the cooperation of the families. It has been found that during the summer vacation children’s food composition tends to change negatively and their food quality decreases significantly.17

Many families lack information and are not sufficiently aware of the importance of healthy nutrition and physical activity, and some even intentionally avoid being aided by educational programs to promote their children’s health.8 18 Many of the studies described above report on the children’s actual nutritional knowledge and preferences.17 19 20 The uniqueness of the current study lies in examining the direct effect of two intervention programs on dietary habits expressed by the composition of the breakfast that the children bring from their homes. The children’s food consumption was documented in real time; we documented the breakfast food items brought by preschool and fifth-grade children, both before and after conducting the intervention programs.

The research aimed to examine the effectiveness of intervention programs in improving the composition of breakfast among children in preschool and in fifth grade.

The research questions were:

1. Will short nutritional education programs improve the overall nutritional quality of breakfast among preschool children (aged 4-6) and fifth-grade children (aged 9-10), and if so, to what extent?
2. In the event that these programs indeed have an effect, in which food components will we find a significant change in consumption following exposure to the program?

**Methodology**

Study population

The study was conducted in three classes:

1. A preschool class in the south of Israel, comprising 31 children aged 4-6. The preschool population is heterogeneous with an intermediate socioeconomic status. The children bring breakfast from home and eat it at preschool.
2. Two fifth-grade classes in an elementary school in the south of Israel with a total of 44 children aged 10-11 with an intermediate socioeconomic status. The children bring breakfast from home and eat it in the classroom.

The intervention programs

1. The preschool intervention program

The program was developed by the preschool teacher, who is conducting research with professional academic guidance by an expert in the creation of educational programs, and in collaboration with a naturopathic nutritionist. The program comprised 12 weekly sessions of 20 minutes each. The study themes included understanding the components of the food pyramid, diverse eating, healthy eating habits and the importance of and familiarity with different food products (such as fruits and vegetables, grains, plant and animal proteins, vitamins, natural food and processed food, types of oils and fats, dietary fiber, water and soft drinks). Furthermore, the program familiarized participants with methods to identify food types, and accompanying eating habits such as increased chewing, hygiene and esthetics in eating. The children established a vegetable garden, prepared fruit and vegetable salads, prepared healthy sandwiches, cooked vegetable soups, baked small pastries using whole wheat flour, prepared cookies using whole grains and coconut oil, squeezed citrus juice and produced oil. The program also included involvement of parents who came to the preschool for a health day. The parents enjoyed a healthy breakfast prepared by the children, heard a lecture from a nutritionist about the importance and characteristics of healthy nutrition, received recommendations on the composition of sandwiches and the types of foods that should be sent with the children to preschool. Each activity also included games, songs and stories about healthy food. As customary in preschools, parents received an information page elucidating the importance of healthy food and of improving children’s eating habits. Each week the parents received detailed information about what was being learned in the preschool, experiments that the children did, new concepts that were learned, and the health benefits of different foods, as well as recipes that were prepared in preschool. The parents were asked to cooperate with and be supportive of the intervention program.

1. The fifth-grade intervention program

The intervention program was based on the Ministry of Education program called “Food and Nutrition”. Two classes, one with 24 students and the other with 20 students, participated in the program, which comprised 15 sessions of two hours each. The program comprised four components: a. human nutrition – the importance of water and food for the human body and familiarity with the main food groups; b. health, food and nutrition – technological aspects, means and behaviors for wise and healthy nutrition; c. the structure and function of the respiratory system and the digestive system; d. the body as a system – on the relationship between the body’s systems and its health. Experimentation by the children included planning healthy menus, self-monitoring of meal components and familiarity with food processing methods.

The research process

In each class where the intervention program was conducted, the breakfast items that the children brought from home to eat in the school were monitored and recorded before and after conducting the program. In the preschool class, the monitoring took place over approximately six weeks, both before and after the intervention program (six school days per week); data were processed and analyzed from 30 days with complete data of every child’s breakfast in each six-week period. In the school classes, the monitoring took place over approximately three weeks before and after the intervention program, from which 12 days with complete data for each student were chosen from each three-week period. It was not possible to use all of the data collected during the monitoring because some students were often absent both before and after the program was conducted. Most of the children usually brought a sandwich comprising two slices of bread with some kind of spread, extra protein comprising egg, cheese, salami etc., and either a fruit or a vegetable. The children often also brought a snack, namely, an item of processed and packaged food rich in sugar or salt, such as a cookie, chocolate, wafer, fried or fat-rich snack based on potato, peanuts or corn. The preschool children drank only water that they received from the preschool teacher while the school children often brought a drink from home.

Each of the food items brought by the children was classified into one of four groups – type of bread or grain, sandwich filling or spread, fruit or vegetables, drink (see Table 1) and received a health score. The score was higher when the food item was healthier and contained less undesirable components. Items that contained simple sugars, sweet drinks, processed or preserved food and a high content of saturated and trans fats received the lowest score. Items that contained whole grains, foods rich in proteins and vitamins, fruits and vegetables and water to drink received the highest score. The score, that was determined in consultation with a naturopathic dietician, followed an integrated approach that places importance on including components from the different food groups while avoiding or reducing the abovementioned undesirable components. In the preschool, drink was provided by the preschool teacher; therefore, both before and after the intervention program the children drank only water at breakfast. In contrast, some fifth-grade children brought sweetened drinks from home.

The lowest score for an item of food or drink was 1, indicating poor nutritional value. The highest score was 6 and expressed high nutritional value without negative ingredients. All the scores were positive (>0) for the statistical analysis. We treated snacks like any component with poor nutritional value, and counted the number of children who brought a snack during each of the monitoring days. A positive nutritional value for this component would be considered not bringing it at all, meaning, a low average daily number of snacks brought by the children would be preferred to a high number.

To test the research hypothesis that the nutritional quality of the children’s breakfasts would improve after the intervention program, a paired sample t-test was conducted to compare the scores of each component before and after the program. To compare the effect of the intervention program on the overall quality of the breakfast, a t-test was conducted on the overall scores (before and after the program) of the nutritional quality of the breakfast, comprising the sum of its four scores (bread/grain, spread/filling, fruit/vegetable and drink).

Table 1. Table of scores of children’s breakfast items

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Score | Type of bread/grain | Type of spread/filling | Vegetable/fruit | drink |
| 1 | BourekasMelawach | PastramiChocolate spread |  | Sweetened juiceColaCarbonated drink |
| 2 |  | Strawberry jam |  | Choc milk |
| 3 | White breadPizzaCrackers | Garlic-dill cheeseButterYellow cheese |  |  |
| 4 | Rice cakes |  |  |  |
| 5 |  | Omelet/herb omeletVegetableTuna spreadTuna and eggTahini | One vegetable or fruit | Milk |
| 6 | Whole wheat bread | White cheeseCottage cheeseBulgarian cheeseTzfat cheeseHard-boiled eggAvocadoCarob spread | Two vegetables or fruits | Water |

**Results**

Preschool children

To test the research hypothesis that the nutritional quality of the breakfast would improve after the intervention program, 30 measurements were conducted for each child in the preschool class both before and after the intervention, for three of the research indices: the bread/grain, the spread/filling and the fruit/vegetable component. Moreover, for each student an overall score was calculated for the nutritional quality of the breakfast that was the sum of the scores of the meal components. For each component and for the overall score a paired sample t-test was calculated. Table 2 presents the average scores given to the preschool children’s breakfast items, for 30 days before the intervention program and for 30 days after the program. In accordance with the research hypothesis, we found a significant difference in the quality of the meal between the first measurement before the intervention program and the second measurement after it, with a strong effect size (t = 16.09, p < 0.001, d = 2.89). The overall nutritional quality of the breakfast was lower before the intervention program (M = 10.34, SD = 1.69) than after it (M = 13.02, SD = 1.60).

The intervention program significantly improved the nutritional quality of three components: bread/grain, spread/filling and fruit/vegetable (t = 7.96, p<0.001; t = 6, p < 0.001; t = 5.39, p < 0.001; respectively, Table 2). The preschool teacher did not permit the children to bring snacks for breakfast. Similarly, the preschool children did not bring drinks from home; rather, the preschool teacher gave them water. Therefore, there is no treatment of these components as part of the breakfast and there is no difference in their consumption before and after conducting the intervention program. An improvement in the nutritional quality of the preschool children’s breakfast means that more children began bringing sandwiches made with whole wheat bread, increased the amount of fruit and vegetables they consumed, and consumed more healthy spreads/fillings in their sandwiches, such as cheese, avocado or egg, and less salami or chocolate spread.

Table 2. Nutritional quality of preschool children’s breakfasts before and after the intervention program (N=31)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Before |  | After |  |  |
|  | *M* | *SD* | *M* | *SD* | *T(df=30)* |
| Bread/grain | 2.97 | 0.09 | 4.05 | 0.74 | 7.96\*\* |
| Spread/filling | 3.25 | 0.75 | 3.78 | 0.59 | 6.00\*\* |
| Fruit/vegetable | 2.14 | 1.30 | 3.12 | 0.78 | 5.39\*\* |
| Overall nutritional quality | 8.35 | 1.70 | 10.95 | 1.60 | 16.66\*\* |

\*\* p< 0.001

School children

Forty-four 5th-grade children were monitored using the same method that was used for the preschool children, but the number of days was less – 12 days before and after the intervention program. In accordance with the hypotheses, we found a significant effect of the intervention on the fifth-grade children (Table 3), with a very strong effect size (t(44) = 21.35, p < 0.001, d = 3.21). The nutritional quality of the breakfast was lower before the intervention program (M = 11.03, SD = 2.25) than after it (M = 19.79, SD = 1.96).

Table 3. Nutritional quality of school children’s breakfasts before and after the intervention program (N=44)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Before |  | After |  |  |
|  | M | SD | M | SD | t |
| Bread/grain | 2.86 | 0.47 | 3.58 | 0.52 | 7.79\*\* |
| Spread/filling | 2.66 | 0.81 | 4.85 | 0.48 | 16.39\*\* |
| Fruit/vegetable | 2.69 | 1.44 | 6.59 | 1.48 | 12.39\*\* |
| Drink | 2.80 | 1.03 | 4.75 | 0.72 | 13.77\* |
| Overall nutritional quality | 11.03 | 2.25 | 19.79 | 1.96 | 21.35\*\* |

\*\* p < 0.001

We found a significant and positive effect of the intervention program on each of the components that comprise the overall score (bread/grain, spread/filling, fruit/vegetable and drink). The smallest effect was found on the bread/grain component (t = 7.79); more meaningful effects were found on the spread/filling (t = 16.39), type of drink (t = 13.77) and fruit/vegetable (t = 12.39) components. Regarding the drink component, the school children tended to replace sweetened or carbonated drinks with water following the intervention program. For three of the meal components – bread/grain, spread/filling and amount of fruit/vegetables – the score was higher among the fifth-grade children than among the preschool children. Similarly to the preschool children, the school children transitioned from consumption of white bread and fillings such as pastrami and chocolate spread to consumption of whole wheat bread and spreads with improved nutritional value and healthier ingredients, such as cheese, egg, avocado or carob spread.

Consumption of snacks before and after the intervention

Monitoring of snack consumption could be done only among the fifth-graders, since the preschool children were not permitted to bring snacks. For the category of snacks, we only tested whether the children brought processed snacks enclosed in packaging, such as sweetened breakfast grains, cookies and chocolates, as well as fried snacks with a high content of fat and salt. Another disadvantage of such snacks is that they were mostly consumed between meals, which may disrupt the consumption of healthy components during the children’s meal. Snack consumption decreased significantly following the intervention program (t = 7.08). The average consumption decreased from 0.45 snacks (SD = 0.22) per child per day before the program to 0.18 snacks (SD = 0.12) per child per day after the program. Some children stopped consuming this component entirely. In parallel to the decrease in snack consumption, we observed an increase in the number of fruits and vegetables consumed by the fifth-grade children following the intervention program. We assume that some children replaced consumption of snacks with consumption of fruit or vegetables.

**Discussion**

This study aimed to examine the effects of an educational program about healthy nutrition on the actual consumption of the breakfast components that students brought from their homes to eat in school. Two age groups were studied: preschool children (aged 5-6) and fifth-grade children (aged 9-10); the intervention programs were tailored to the children’s ages. The uniqueness of this study lies in the fact that it examined actual consumption of the meal components, in contrast to many other studies that examined reports or attitudes expressed by the subjects about their food consumption. In the current study, monitoring was conducted to document the breakfast components brought by the children from their homes for a period of 30 days (preschool children) or 12 days (fifth-graders) both before and after the program; thus it was possible to compare and test whether a change in these components had occurred and whether the children consumed healthier ingredients after they were exposed to the intervention programs. The research results demonstrate that in both age groups the intervention programs were found to be very effective. In three food components, the type of bread/grain, the type of spread/filling and the fruit/vegetable, there was a significant improvement in both groups. For the bread/grain component, the effect in both groups was similar and we observed a transition among the children from consumption of white bread to consumption of whole grain bread. For the spread/filling component, we observed a transition in both groups from sugar-rich spreads such as jam and chocolate spread to healthy spreads based on cheese, egg, avocado or carob spread. The change in the type of spread was greater among the school children compared to the preschool children. Similarly, we observed a significant increase in both groups in the consumption of fruits and vegetables following the intervention program, and in this case too, the improvement was greater among the school children than among the preschool children. Furthermore, the overall quality of the breakfast increased significantly in both groups, once again to a greater extent among the school children than among the preschool children. It is possible that the higher effect sizes of nutritional quality of the breakfast and of some of its components among school children than among preschool children (d = 3.08 vs. d = 2.89) stems from the fact that school children have a greater influence than preschool children both on the foods they consume and on the food items they take to school. Nevertheless, both age groups consisted of young children, and in most cases the parents prepare the children’s breakfast or at least are involved in choosing the meal items. Since parents have an essential role in shaping the knowledge and nutritional behavior of their children,21 it is necessary to promote an intervention program for those same parents in order to achieve ongoing, continued involvement in maintaining healthy nutrition throughout their children’s childhood and adolescent years.22

Regarding the other two groups of items, the snack component and the drink component, no change in consumption was found for preschool children in this study following the intervention program because the children received water to drink from the preschool teacher (they did not bring drinks from him), and were not permitted to bring cookies or sweets to preschool. In contrast, the school children could bring whatever drinks or snacks they wanted to bring from home for breakfast. Our results show that the intervention program managed to change habits related to drinking sweetened drinks and consuming snacks among the school children – they began to consume more water at breakfast and reduced their consumption of sweetened or carbonated drinks. Similarly, they reduced their consumption of cookies and sweet snacks.

Our findings about the effectivity of the intervention programs on healthy nutrition are in line with previous reports1 14 19 and with the firm recommendations to conduct intervention programs not only among children but also among their parents,17 both for elementary school children and preschool children.12 The two programs conducted in the current study were different from each other in their content because they were tailored to the children’s ages. Moreover, they differed in the extent of parental involvement. The preschool teacher involved the parents actively, inviting them to a joint breakfast activity in the preschool and to a lecture from a nutritionist, as well as sending information to the parents on a weekly basis. In contrast, the fifth-grade teacher did not initiate direct activity with the parents. The results we received, showing that the improvement in the nutritional value of the breakfast components among school children was greater than the improvement among the preschool children, may demonstrate that this change for the good can be credited mainly to the children.

Nonetheless, the fact that the preschool children also managed to change and improve certain nutritional habits shows that it is important to instill healthy nutritional habits already in early childhood.12 13 Furthermore, as the findings of the current study show, it is important to continue to educate for healthy nutrition also at older ages, as correct guidelines and effective programs have an important effect and significant potential for change and improvement in nutritional habits also – and even more so – at school age.

The intervention programs were relatively short, lasting only 12–15 weeks. The main reason for this is that this type of program is part of the science and health study program and the Israeli education system does not allocate more hours of study to nutritional education. The monitoring of the changes that occurred among the children was also relatively short and lasted only a few weeks. Therefore, it is possible that the nutritional improvement found in the two age groups will not last long, since long-term behavioral change is a complex process and is not usually achieved after such a short intervention. There are reports showing that teachers prefer to conduct relatively short intervention programs for nutritional change3 but other reports indicate higher effectiveness of long-term programs. There is evidence that year-long and even six-year programs have a more significant effect on improving the nutritional habits of children and reducing their weight.23 24 It is therefore recommended to re-examine the effect of short-term programs on nutritional changes and eating habits after more time has elapsed, to assess whether the new habits have become established and to what extent they have become permanent.

Another limitation of this study relates to the difference in the study period for the two age groups. It is possible that because the monitoring was shorter among the fifth-graders, we found a greater improvement in the meal components shown by these children in comparison to the preschool children. A longer monitoring period would enable better examination of the extent of the effect of the intervention program. A further limitation of this study is that the monitoring was carried out only on the breakfast that was brought to school or preschool, while the meals the children ate in their homes were not monitored. We do not know whether a change also occurred in the children’s nutrition in the other meals consumed in the home. Future studies will test the students’ reports on lunches and dinners as well as on food consumption between meals. We also note that the food items consumed received quality scores according to the accepted treatment of breakfast components, but it is possible that other nutritionists would evaluate the food components differently.

This study was conducted before the COVID-19 crisis and was written during the crisis. The current crisis empowers and emphasizes the importance of health education among children, and no less among parents, since the parents are the primary actors in preparing and determining the composition of children’s food and drinks during and between meals. During the current crisis, schools in many countries were closed; among the other consequences of this, the nutrition of children confined to their houses changed and was fully dependent on was served to them at home. In many countries, there are programs for subsidized meals at school.25 During the COVID-19 crisis and lockdown periods, all responsibility for meals was transferred to the family, as children were confined to their home. This may be comparable to periods of summer vacation, where it has been found that when children leave the school environment, their food composition tends to deteriorate and they experience a decrease in nutritional quality.17 Seeing that children’s nutrition is so dependent on their adult caregivers, we thus propose that nutritional education be provided to both children and adults. Such a program was tested in 2016 in the United States;17 it was found to be effective and led to an improvement in nutritional habits, namely, an increase in the consumption of fruits and vegetables and a decrease in the consumption of sweets and foods rich in salt.

It is important to conduct follow-up studies on educational intervention programs intended to improve children’s nutrition, in order to promote correct nutritional habits among children and their families and to ensure the persistence of children’s healthy nutritional habits for optimal development, disease prevention, and well-being.