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# Assessing the Impact of Nutritional Interventions on Childhood Obesity in Urban Areas

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## ABSTRACT

**Objective:** The aim of this randomized factorial trial was to evaluate the impact of a nutrition intervention on child obesity in urban areas of Pakistan.

**Methods:** In this study, 10 primary schools of urban areas were included. Nutritional interventions (healthy lunch box) were given to 5 schools in group I and 5 schools of group II received planned physical activity of 120 minute. We utilized SPSS 26.0 to evaluate outcome data that measured children's weight and quality of life both at baseline and 9 months after the baseline.

**Results:** Our results showed that children who were given the nutrition intervention were more likely to fall into the underweight/healthy weight BMI category (OR 1.58 95%CI 1.05, 2.45; p = 0.0116), whereas students who were given the physical activity intervention had a smaller waist circumference (mean difference − 1.97 95%CI -2.96, − 0.15; p = 0.0450).

**Conclusion:** We concluded in this study health nutrition intervention resulted high obesity, increased BMI score as compared to only physical activity among children of age group 6-12 years.

***Keywords:*** *Nutritional Interventions, Childhood Obesity, Urban Areas, Children's weight*

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## 1. INTRODUCTION

Worldwide, the epidemic of childhood obesity is a major cause for public alarm. Between the ages of 2 and 5, nearly 10% of American children are extremely obese, and one-third are overweight or obese overall. The prevalence of childhood obesity is disproportionately high among racial and ethnic minorities, as well as those from lower socioeconomic backgrounds. Los Angeles County (LAC) is one of the most economically and racially diverse counties in the United States, and there are considerable racial and ethnic disparities in the prevalence of childhood obesity. The incidence of obesity reached at about 22% in 2009 among preschool-aged children in LAC who participated in the Special Supplemental Nutrition Program for Women, Infants and Children (WIC), with the highest rates of obesity being observed among homes with the lowest incomes. The third In 2005, the Healthy Eating and Active Communities Initiative

was established by the California Endowment to address the concerning increase in kid obesity in Los Angeles County. Six municipalities in California were awarded funding under the project to encourage innovative problem-solving.First 5 Los Angeles, Kaiser Permanente, and the Centers for Disease Control and Prevention (CDC) were among the commercial and public entities that contributed to the expansion of programs aimed at reducing children obesity in the LC. Numbers five and six.

Interventions aimed at preventing childhood obesity can encourage the formation of healthy routines that will have long-term positive effects on children's well-being. During the dynamic years of childhood and adolescence, people's interests, developmental talents, and emotional maturity vary from one another. Younger children grow to rely more on their caretakers when it comes to eating and preparing their own meals, but older children gain greater independence in making dietary decisions [7]. Consequently, treatments must be versatile enough to adjust to many contexts and changing requirements, including the level of engagement at home, in the school, and among peers.

Interventions to prevent childhood obesity improved body mass index (BMI) measures in children aged 6-12 years old, according to a recent systematic review (SR) meta-analysis, also called an umbrella review [8]. Another review summary from 2019 found no effect of preventative interventions on BMI measures in pediatric participants; however, this study did not differentiate between intervention types or age groups in its analysis [9].A recent scoping analysis indicated that there are several current SRs that address different dietary treatments to prevent childhood obesity [10], even if each of these evaluations did cover three to five SRs. A meta-analysis of thirteen SRs found that preventative interventions did not significantly affect adolescents' body mass index (BMI) readings in 2020 [11]. In 2021, the Academy of Nutrition and Dietetics undertook an umbrella study on nutrition interventions with the purpose of informing a Position Paper for nutrition practitioners, funders, and legislators aiming to reduce childhood obesity. The purpose of the article was to discuss this matter [10]. The umbrella review, though, was shelved. The current article offers a comprehensive review of recent research on dietary interventions to prevent infant obesity. This will help professionals in the nutrition sector analyze and advise practice based on particular knowledge.

The environments in which children and teenagers spend the majority of their time have a significant influence on their perceptions of health and the choices they make regarding their own health [12]. Schools have many opportunities to promote healthy habits and implement nutritional interventions as a main means of preventing overweight and obesity among children and adolescents. Nutritional interventions (such as nutrition education) in schools have been the subject of many paired meta-analyses and systematic reviews.However, these reviews failed to take overweight or obesity into account as outcomes, only included randomized controlled trials that did not include nutrition, only included children aged 5 years or younger, concentrated on interventions that involved both nutrition and physical activity or sedentary behavior, or compared one nutritional intervention (such as school food environment policies) to a control group.[15]

We can't know for sure what parts of school-based treatments to prevent childhood obesity are most helpful because there haven't been enough factorial trials, and we can't create better, more efficient ways to do it. Therefore, this study set out to assess the results of a randomized controlled trial that used a factorial design to examine the effects of two interventions—one focusing on physical activity and the other on nutrition—on children's weight status and quality of life.

## 2. MATERIALS AND METHODS

In this study 10 primary schools of urban areas were included. Each school had 100 children. Primary schools typically cater for children aged 6–12 years were included. If a school met one of the following criteria, it was not included in the study: (i.) it did not serve students with special needs; (ii.) it did not serve students in the academic years 2013–2018; or (iii.) it was involved in another initiative promoting healthy eating or physical activity. The principals of schools that may be eligible for participation were randomly assigned to receive recruitment packets that contained a statement about the study and a consent form. Participation in the study was confirmed by having schools sign a formal permission form.

A nutrition intervention aimed at getting parents to pack their kids healthier lunches was the main focus of the trial, while a secondary goal was to see how well an activity intervention got schools to incorporate more MVPA (moderate-to-vigorous physical activity) into the school day. For students attending these schools, the policy states that they must bring their own lunches from home to eat while at school. Nonetheless, there are school cafeterias where students may buy food and drinks.

The 2016 Socio-Economic for regions (SEIFA) Index was used to classify regions as either low or high socioeconomic deprivation, and student postcodes were utilized for this purpose. Areas with modest social disadvantage were defined as those whose residents scored in the top 5%, and areas with severe social disadvantage were defined as those whose residents scored in the bottom 5%. The demographic information of teachers, including their gender and whether they were certified PDHPE specialists, was collected by a paper survey.

At both the baseline and follow-up assessments, children whose parents gave their agreement had their height and weight taken objectively by certified data collectors. Prior to data collection, a recognized weighing business calibrated the devices. The youngsters were requested to take off any bulky outerwear, belts, shoes, or heavy items in their pockets before the

measurements were taken. Students were directed to get onto the scales with their backs to hide the measures and not to be informed their weight by the trained helpers in order to allay any worries they may have had about the measurements. Each youngster had their weight and height measured twice, with the average of the two serving as the final metric. To find a child's body mass index (BMI), we divided their weight by the square of their height (in meters). Underweight, healthy weight, overweight, and obese were the four body mass index (BMI) classifications determined according to the World Health Organization's criteria, which take into account both gender and age. Using the 2007 categorization values provided by the World Health Organization (World Health Organization, 2021), body mass index z-scores were computed.

At baseline and follow-up, all consenting children in Grades 4-6 had their waist circumference objectively measured by certified data collectors. For the sake of precise documentation, we requested that the children remove bulky outerwear.

Applying SPSS 26.0, statistical analyses were carried out. To characterize the research sample, descriptive statistics were utilized, which included proportions, means, and standard devia. The World Health Organization established four categories for body mass index (BMI) based on gender and age: underweight, healthy weight, overweight, & obese. We calculated body mass index z-scores using the World Health Organization's 2007 categorization values (World Health Organization, 2021).

All schools and individuals having baseline data were included in the analysis, and an intention to treat technique was utilized to determine the trial results. Using mixed effects regression models, we looked for strategy differences among groups in order to determine how well the nutrition and exercise programs worked.

## 3. RESULTS

We found in group I, 310 (62%) were females and 190 (38%) were males children and in group II 280 (56%) females and 220 (44%) were males. Mean age of children in group I was 8.18±6.48 years and in group II was 10.15±7.63 years.Most of the children in group I 370 (74%) had poor socio-economic status while in group II 320 (62%) children had poor socio-economic status. Most of the children in both groups were having healthy weight. Mean BMI score in group I was 19.12±8.23 kg/$m^2$ and in group II was 19.20±14.37 kg/$m^2$. BMI-z score was 1.08±48.73 in group I and 1.02±38.67. Mean waist was 65.25±13.53 cm in group I and 66.18±11.39 cm.(table 1).

**Table-1: Characteristics of the presented children of 10 schools**

| Variables | Group I | Group II |
|---|---|---|
| **Gender** | | |
| Female | 310 (62%) | 280 (56%) |
| Male | 190 (38%) | 220 (44%) |
| Mean age (years) | 8.18±6.48 | 10.15±7.63 |
| **SEIFA** | | |
| Poor | 370 (74%) | 320 (62%) |
| Middle/high | 130 (26%) | 180 (38%) |
| **Categories of BMI** | | |
| Healthy weight | 375 (75%) | 330 (66%) |
| under weight | 35 (7%) | 30 (6%) |
| Obese | 25 (5%) | 20 (4%) |
| Over weight | 65 (13%) | 120 (24%) |
| Mean BMI score | 19.12±8.23 | 19.20±14.37 |
| Mean BMI z-score | 1.08±48.73 | 1.02±38.67 |
| Mean waist (cm) | 65.25±13.53 | 66.18±11.39 |

According to our findings, it was observed that children who received the nutrition intervention had a higher probability of falling into the underweight/healthy weight BMI category (odds ratio 1.58 95% confidence interval 1.05, 2.45; p =

0.0116). On the other hand, students who received the physical activity intervention had a smaller waist length (mean difference − 1.97 95% confidence interval -2.96, − 0.15; level of significance = 0.0450).(table 2).

**Table-2: Variation in anthropometric results as a result of dietary and exercise programs.**

| Outcomes Variables | Nutritional Intervention (I) | Physical Activity (II) | P Value | (95% CI) |
|---|---|---|---|---|
| BMI score | 19.12±8.23 | 19.20±14.37 | 0.0316 | MD -0.08 (− 0.22, 0.10) |
| BMI z-score | 1.08±48.73 | 1.02±38.67 | 0.7625 | MD -0.05 (− 0.10, 0.08) |
| Waist (cm) | 65.25±13.53 | 66.18±11.39 | 0.2189 | MD -1.86 (− 5.15, − 0.15) |
| Categories of BMI (under/healthy weight) | 410/500 | 360/500 | 0.8901 | OR 0.78 (0.55, 1.24) |

The odds ratio (OR) for being classified as underweight and healthy weight at follow-up was 1.64 (95% CI 1.07, 2.50; p = 0.0221), which is 1.64 times higher for children whose schools received the nutrition intervention compared to schools that did not. Diet and exercise interventions were also not substantially influenced by gender (p > 0.05). At the conclusion of the follow-up course, what proportion of students were underweight, healthy weight, overweight, or obese.(table 3).

**Table-3: Groups of children's body mass index throughout follow-up**

| Variables | Group I | Group II |
|---|---|---|
| **Categories of BMI** | | |
| Healthy weight | 395 (79%) | 350 (70%) |
| under weight | 20 (4%) | 45 (9%) |
| Obese | 30 (6%) | 50 (10%) |
| Over weight | 65 (13%) | 55 (11%) |

## 4. DISCUSSION

This study is novel among its randomized factorial designs in that it examines the efficacy of a dietary and exercise intervention. With p-values of 0.0116 and 0.0450, respectively, the diet and physical activity programs significantly affected the children's waist circumferences or body mass index (BMI) categories. More study is required since these findings suggest that both methods may be useful in reducing the population's fat percentage. There was no intervention method that improved the quality of life for the youngsters.

Disappointingly, there was no change in the body mass index (BMI) of children after participating in school-based nutrition programs, which is in line with the results of a Cochrane review that found similar results (Brown et al., 2019).[16].

Beneficial effects on body mass index (BMI) categories were seen after nutrition intervention (OR1.58, 95%CI1.05, 2.45; p = 0.0116). This backs up previous research showing that calorie restriction programs that encourage nutritious food packing for school lunches alongside additional initiatives are effective (Nathan et al., 2019).[17]. Swinburne et al. (2014) found that students who participated in a lunchbox nutrition program that included intensive in-person instruction and workshops had a 37% lower likelihood of being overweight or obese at follow-up, which is in line with the current findings (OR 0.63, p < 0.001).on the same page as [18]. This weight status indication might be partially explained by the fact that lunchbox-targeted treatments mostly target parents. Previous school-based treatments to reduce adolescent obesity failed to involve parents, according to systematic research (VerjansJanssen et al., 2018)[19]. One possible explanation is that school-based interventions improve home food problems by increasing parents' nutrition knowledge, skills, and competence.

The positive outcomes of the lunchbox nutrition intervention hold a great deal of promise as a means of enhancing public health nutrition and preventing the development of unhealthy weight gain. The intervention was built on technology, which enabled direct parent interaction and scalability using the school's established communication infrastructure. Technology was the intervention's backbone.

There is reason to be optimistic about the fact that the exercise program resulted in a substantial reduction in waist size among the children who participated in the program (mean difference -1.97 95% confidence interval -2.96, -1.15; p = 0.0450). Yuksel et al. (2020) conducted an exhaustive study to determine whether or not school-based physical activity programs are successful in reducing the prevalence of obesity among children. Their findings are in line with the findings that were presented in [20]. According to the findings of the research, four out of the eight studies that investigated the impact of interventions on the waist circumference of students showed substantial improvements, while three of the studies revealed no increase in waist circumference.

In the study that investigated the possible synergistic benefits of the two intervention approaches, there was no statistically significant interaction found between the two strategies with regard to the BMI, WC, and BMI categories of children. Due to the fact that past studies of the sample size acknowledged the limited potential to discern an interaction effect [21,22], it is highly likely that there is no interaction.

## 5. CONCLUSION

The first factorial trial to examine the impact of school food and physical activity programs on kids' weight. Despite reducing waist circumference and improving BMI categories, neither the physical activity nor the dietary interventions enhanced children's BMI

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