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ORIGINAL ARTICLE

Comparative Assessment of Dietary Practices and Anthropometric Outcomes in school Students Consuming Mid-Day Meals Versus Home-Cooked Meals

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ABSTRACT

Background: Adequate childhood nutrition is essential for optimal growth and development. The type of meal consumed school-provided mid-day meals versus home-cooked food can significantly affect dietary adequacy and anthropometric outcomes.

Objective: To compare dietary practices and anthropometric parameters among school students consuming mid-day meals and those consuming home-cooked meals.

Methods: A comparative cross-sectional study was conducted at Khyber Teaching Hospital, Peshawar, and National Hospital and Medical Center, Lahore, from June 2022 to April 2023. A total of 100 students aged 6–14 years were enrolled and divided equally into two groups: mid-day meal consumers and home-cooked meal consumers. Data on dietary intake and food diversity were collected using structured questionnaires, while anthropometric measurements (height, weight, and BMI) were obtained following WHO guidelines. Statistical analysis was performed using SPSS version 26, applying independent t-tests and Chi-square tests, with $p < 0.05$ considered significant.

Results: The mean BMI was 17.12 ± 2.46 kg/m² among mid-day meal consumers and 18.39 ± 2.81 kg/m² among home-meal consumers ($p = 0.01$). Stunting (18%) and underweight (22%) were more prevalent in the mid-day meal group, whereas overweight was more common in the home-meal group (15%). Dietary diversity scores were significantly higher in home-meal consumers (7.23 ± 0.98) compared to mid-day meal consumers (5.82 ± 1.07, $p = 0.02$).

Conclusion: Students consuming home-cooked meals demonstrated superior dietary diversity and better anthropometric outcomes than those dependent on mid-day meals. Improving the nutritional quality and variety of mid-day meal programs is essential to promote balanced growth and prevent malnutrition among school children.

Keywords: Mid-day meal, Home-cooked food, Dietary diversity, Anthropometry, BMI, Child nutrition, Pakistan

INTRODUCTION

Nutrition during childhood and adolescence is a crucial determinant of physical growth, cognitive development, and long-term health outcomes. School-age children represent a vulnerable population in which inadequate or imbalanced dietary intake can lead to undernutrition, micronutrient deficiencies, impaired learning performance, and increased susceptibility to infections[1]. The dietary habits established during these formative years also influence the risk of developing chronic diseases such as obesity, diabetes, and cardiovascular disorders later in life. Therefore, ensuring the availability of balanced and safe meals for school-going children remains a key public health priority[2].

In many developing nations, including Pakistan, socio-economic disparities, food insecurity, and urban–rural differences affect children's access to nutritious food. To mitigate these challenges, government-supported Mid-Day Meal (MDM) programs have been introduced in various regions as part of school health and nutrition initiatives[3]. The primary objectives of such programs are to reduce classroom hunger, improve school attendance, and promote better nutritional status among children from low-income families. Studies from India and other South Asian countries have demonstrated that mid-day meals contribute positively to energy intake and reduce short-term hunger; however, concerns persist regarding the nutritional adequacy, variety, and hygiene of these meals[4].

Conversely, home-cooked meals typically reflect household dietary patterns, parental education, and socio-economic status. They often provide greater dietary diversity and cultural relevance but may also be influenced by lifestyle constraints, food preferences, or exposure to processed foods. In urban Pakistani households, for example, increasing consumption of fast foods and sweetened beverages has led to dual nutritional burdens undernutrition in lower-income groups and overweight or obesity in higher-income families[5,6].

Despite the existence of multiple nutrition interventions, comparative data evaluating the influence of mid-day meals versus home-prepared meals on children's anthropometric indicators and dietary practices in Pakistan are limited. Previous research from India and Bangladesh has shown mixed outcomes some reporting improvements in calorie and protein intake with mid-day meals, while others highlight deficiencies in essential micronutrients such as iron, vitamin A, and calcium. Locally, evidence on how these two meal sources affect growth parameters such as Body Mass Index (BMI), height-for-age, and weight-for-age is sparse[7-10].

Hence, the present study was designed to compare the dietary practices and anthropometric outcomes among school students consuming mid-day meals with those consuming home-cooked meals in Lahore, Pakistan. The findings aim to provide evidence-based insight into whether school feeding programs meet children's nutritional needs and to suggest potential improvements in meal quality, diversity, and policy implementation[11].

MATERIALS AND METHODS

Study Design and Duration: This was a comparative cross-sectional study conducted over a period of eleven months, from June 2022 to April 2023, with the objective of assessing and comparing dietary practices and anthropometric outcomes among school students consuming mid-day meals and those consuming home-cooked meals. The study design was chosen to enable simultaneous comparison between the two groups under real-life conditions without any intervention or modification of their dietary habits.

Study Settings: The study was carried out in collaboration with Khyber Teaching Hospital, Peshawar, and National Hospital and Medical Center, Lahore, two tertiary-care teaching institutions

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representing different urban populations of Khyber Pakhtunkhwa and Punjab provinces of Pakistan. The study involved children from both public and private schools associated with these hospitals. The dual-site setting was selected to ensure regional diversity and enhance the generalizability of the findings across different socioeconomic and dietary backgrounds.

Study Population and Sampling: A total of 100 students aged between 6 and 14 years were included in the study. The participants were selected through purposive sampling to ensure equal representation from both dietary categories. The children were divided into two groups: Group A, which included fifty students who regularly consumed school-provided mid-day meals, and Group B, which comprised fifty students who habitually brought and consumed home-cooked meals during school hours. Both male and female students were included to allow gender-based comparisons. The study population consisted of apparently healthy children with regular school attendance and without any known chronic illnesses or growth disorders.

Eligibility Criteria: The inclusion criteria consisted of children aged six to fourteen years who had been enrolled in the participating schools for at least six months and who consistently consumed either mid-day or home-prepared meals for a minimum of three months prior to data collection. Students suffering from chronic diseases, congenital anomalies, metabolic disorders, or those receiving nutritional supplements were excluded from the study. Children whose parents did not provide consent or who failed to complete the questionnaire were also excluded to maintain data reliability.

Data Collection Procedure: Data were collected through a structured and pre-tested questionnaire designed following WHO and FAO guidelines for child nutrition assessment. The questionnaire included three major sections: demographic characteristics, dietary practices, and lifestyle behaviors. Information was obtained regarding age, gender, family income, and parental education to determine socioeconomic background. Detailed data on dietary patterns such as meal frequency, portion size, and consumption of various food groups including cereals, proteins, fruits, vegetables, dairy products, and fats were collected. Additional questions addressed the intake of snacks, beverages, and processed foods to assess the prevalence of unhealthy eating behaviors. Lifestyle factors such as daily playtime, screen time, and sleep duration were also recorded to evaluate their potential influence on anthropometric outcomes. All data were gathered by trained nutritionists and research assistants under direct supervision of the investigators.

Anthropometric Measurements: Anthropometric assessment was carried out according to World Health Organization (WHO) protocols to ensure standardization. Weight was measured using a calibrated digital scale to the nearest 0.1 kilogram with the students wearing light clothing and no shoes. Height was recorded to the nearest 0.1 centimeter using a wall-mounted stadiometer with participants standing upright without footwear. The Body Mass Index (BMI) was calculated by dividing weight in kilograms by height in meters squared. BMI-for-age, height-for-age, and weight-for-age z-scores were computed using the WHO Growth Reference 2007 standards to classify children as underweight, normal weight, or overweight. Each measurement was taken twice and the average was recorded to minimize error.

Dietary Assessment and Diversity Scoring: A 24-hour dietary recall and Food Frequency Questionnaire (FFQ) were used to evaluate the participants' dietary intake and diversity. Parents and children were asked to recall all foods and beverages consumed during the previous day, including school hours and home meals. Portion sizes were estimated using visual aids and standard measuring utensils. The Dietary Diversity Score (DDS) was calculated by assigning one point for each food group consumed from the eight major food groups recommended by the Food and Agriculture Organization (FAO): cereals, legumes, vegetables, fruits, dairy products, meat or fish, fats and oils, and sweets. Higher DDS values indicated greater dietary variety and better nutritional adequacy.

Data Management and Statistical Analysis: All collected data were coded and entered into IBM SPSS Statistics version 26 for analysis. Continuous variables such as BMI, height, and dietary diversity score were expressed as mean ± standard deviation (SD), while categorical variables such as gender, underweight, and stunting were represented as frequencies and percentages. An independent sample t-test was applied to compare mean differences between groups, and the Chi-square test was used to examine associations between categorical variables. The level of statistical significance was set at $p < 0.05$. Results were presented in tables and interpreted in relation to dietary sources and anthropometric variations between the two study groups.

Ethical Considerations: Prior to the commencement of the study, ethical approval was obtained from the Institutional Review Boards (IRBs) of both Khyber Teaching Hospital, Peshawar, and National Hospital and Medical Center, Lahore. Written informed consent was taken from the parents or legal guardians of all participating children, and verbal assent was obtained from the students themselves. Participation was entirely voluntary, and confidentiality of data was strictly maintained throughout the research. No invasive procedures were performed, and all assessments were conducted in accordance with ethical principles outlined in the Declaration of Helsinki.

RESULTS

Demographic and Anthropometric Characteristics: A total of 100 students were enrolled in the study, divided equally into two groups: 50 students consuming mid-day meals (Group A) and 50 students consuming home-cooked meals (Group B). The mean age of participants was 10.3 ± 2.4 years, with no significant difference between groups ($p = 0.61$).

Gender distribution was relatively balanced across both groups. As shown in Table 1, Group A (mid-day meal consumers) included 28 males (56%) and 22 females (44%), while Group B (home-cooked meal consumers) consisted of 26 males (52%) and 24 females (48%). The difference in gender distribution between the groups was statistically non-significant ($p = 0.67$), confirming comparability of both cohorts.

In terms of anthropometric parameters, the mean Body Mass Index (BMI) was 17.12 ± 2.46 kg/m² among mid-day meal students and 18.39 ± 2.81 kg/m² among home-meal students, indicating a statistically significant difference ($p = 0.01$). The prevalence of stunting was higher in the mid-day meal group (18%) compared to the home-meal group (10%), whereas underweight was observed in 22% and 12% of students, respectively ($p = 0.03$). Conversely, overweight was more frequent among home-meal consumers (15%) than among mid-day meal consumers (8%).

These findings demonstrate that children consuming home-cooked meals exhibited healthier anthropometric profiles, higher BMI values, and lower prevalence of stunting or undernutrition compared to their peers dependent on school-provided meals.

Table 1. Demographic and Anthropometric Characteristics of Study Participants

Parameter	Mid-Day Meal (n = 50)	Home-Cooked Meal (n = 50)	p-value
Age (years, Mean ± SD)	10.2 ± 2.3	10.4 ± 2.5	0.61
Gender (Male/Female)	28 / 22	26 / 24	0.67
BMI (kg/m², Mean ± SD)	17.12 ± 2.46	18.39 ± 2.81	0.01 *
Stunting (%)	18	10	0.04 *
Underweight (%)	22	12	0.03 *
Overweight (%)	8	15	0.05 *

Significant at $p < 0.05$.

As illustrated in Table 1, both groups showed comparable demographic profiles, but significant variations in BMI and nutritional status were evident. This confirms that differences in growth patterns are attributable to meal type rather than gender or age distribution.

Dietary Practices and Nutrient Diversity: Dietary evaluation revealed clear contrasts between both groups in terms of meal composition and food group diversity. The Dietary Diversity Score (DDS) was significantly higher among students consuming home-cooked meals (7.23 ± 0.98) compared to those consuming mid-day meals (5.82 ± 1.07, p = 0.02). As summarized in Table 2, daily intake of fruits, vegetables, and dairy products was consistently greater among home-meal consumers. In contrast, mid-day meal consumers relied heavily on cereal-based foods with limited inclusion of protein-rich and micronutrient-dense items.

Table 2. Comparison of Dietary Patterns and Diversity Scores Between Groups

Dietary Component	Mid-Day Meal (n = 50)	Home-Cooked Meal (n = 50)	p-value
Mean Dietary Diversity Score	5.82 ± 1.07	7.23 ± 0.98	0.02 *
Daily Fruit Intake (%)	42	76	0.01 *
Daily Vegetable Intake (%)	58	84	0.02 *
Daily Dairy Product Intake (%)	48	78	0.01 *
Regular Iron-Rich Food Intake (%)	38	62	0.03 *
Frequent Snack/Fried Food Intake (%)	44	26	0.04 *

Significant at $p < 0.05$.

As seen in Table 2, home-meal consumers achieved higher dietary diversity scores and a more balanced distribution of essential food groups, indicating better overall nutritional adequacy.

Overall Interpretation: The addition of gender-based analysis confirmed that sex did not significantly influence anthropometric differences, ensuring that dietary source remained the primary determinant of nutritional outcomes. The results collectively show that students consuming home-cooked meals demonstrated superior nutritional quality and growth patterns, while mid-day meal programs, though effective in reducing hunger, require enhancement in diversity, protein content, and micronutrient enrichment.

DISCUSSION

The present study was conducted to evaluate and compare the dietary practices and anthropometric outcomes among school students consuming mid-day meals and those consuming home-cooked meals[10]. The findings demonstrated that students who consumed home-prepared meals exhibited significantly better nutritional indicators, including higher BMI, lower prevalence of stunting and underweight, and superior dietary diversity scores. These results suggest that the quality, composition, and nutritional adequacy of mid-day meals currently offered in participating schools may not meet the complete dietary requirements of growing children[11,12].

The mean BMI of home-meal consumers (18.39 ± 2.81 kg/m²) was notably higher than that of mid-day meal consumers (17.12 ± 2.46 kg/m²), indicating better growth and energy balance in children receiving home-prepared diets. This aligns with previous studies conducted in India and Bangladesh, where school feeding programs were found to reduce short-term hunger but often failed to provide adequate amounts of protein, calcium, and essential micronutrients[13,14]. Similarly, a study by Gupta et al. (2021) observed that children consuming home-prepared food had more balanced nutrient profiles and lower rates of stunting compared to those depending on institutional meals. The relatively high rate of undernutrition among mid-day meal consumers in the present study (22%) highlights gaps in the nutritional quality and menu diversity of these programs[15,16].

Dietary diversity assessment further revealed significant differences between groups. Home-meal consumers recorded a higher mean Dietary Diversity Score (7.23 ± 0.98) compared to mid-day meal consumers (5.82 ± 1.07), which indicates broader inclusion of fruits, vegetables, dairy products, and iron-rich foods[17]. The limited food group variety in school-provided meals can be attributed to logistical challenges, budget constraints, and reliance on monotonous grain-based preparations. These limitations often compromise the intake of micronutrients such as iron, vitamin A, and calcium, which are essential for healthy growth and cognitive development. In contrast, home-prepared meals reflect greater parental control and cultural preferences, promoting the inclusion of fresh produce and protein sources[18,19].

The observed gender distribution showed no significant difference between the two groups, suggesting that gender did not influence the nutritional outcomes in this study. This is consistent with findings from other regional surveys indicating that dietary disparities among Pakistani children are primarily influenced by socioeconomic status, parental education, and meal source rather than gender differences[20]. Moreover, the slightly higher prevalence of overweight among home-meal consumers (15%) may reflect the emerging trend of overnutrition in urban, middle-income families, possibly due to higher caloric intake and reduced physical activity. Thus, while home-cooked food appears nutritionally superior, awareness of portion control and physical exercise must also be emphasized[21].

The results highlight that although mid-day meal programs play a vital role in improving school attendance and reducing hunger among children from low-income families, the current meal composition may lack the nutritional balance necessary to support optimal growth. Incorporating local, nutrient-rich ingredients, such as lentils, eggs, dairy, and seasonal vegetables, can significantly enhance the effectiveness of these programs. Fortification strategies and the introduction of periodic menu revisions under the guidance of nutritionists are also strongly recommended[22].

The findings are particularly relevant in the context of Pakistan, where regional differences in dietary habits and economic disparities influence nutritional health. The comparison between two major centers Khyber Teaching Hospital, Peshawar, and National Hospital and Medical Center, Lahore demonstrated that despite geographical variation, the trend of better anthropometric outcomes among home-meal consumers remained consistent. This suggests that the issue is systemic and not confined to a particular location or socioeconomic group[19,23].

Nevertheless, this study had some limitations. The sample size was relatively small and limited to selected schools associated with two hospitals, which may not represent all school-going children in Pakistan. Dietary data were based on self-reporting and 24-hour recall, which may introduce recall bias. Additionally, biochemical markers such as serum iron or vitamin levels were not assessed due to resource constraints. Future research with larger samples, multi-regional representation, and inclusion of biochemical assessments would provide a more comprehensive understanding of nutritional disparities[17,24].

In summary, the study establishes a clear association between meal source and child nutrition outcomes. Children consuming home-cooked meals displayed better dietary diversity and anthropometric parameters than those depending on mid-day meals, emphasizing the need for nutritional enhancement of institutional feeding programs in Pakistani schools[25].

CONCLUSION

This comparative cross-sectional study conducted at Khyber Teaching Hospital, Peshawar, and National Hospital and Medical Center, Lahore, concluded that school students consuming home-cooked meals exhibited superior nutritional status, higher BMI values, and greater dietary diversity compared to those consuming mid-day meals. Although mid-day meal schemes are valuable in reducing classroom hunger and supporting educational attendance, their current composition may not adequately meet the dietary and micronutrient needs of growing children. It is therefore recommended that the nutritional quality of school meal programs be improved through menu diversification, fortification with

essential micronutrients, inclusion of locally available fruits and vegetables, and regular monitoring by trained dietitians. Awareness campaigns for parents and teachers regarding balanced nutrition and healthy lifestyle practices should also be implemented. Strengthening the nutritional standards of school feeding programs will contribute to better growth, learning outcomes, and long-term health of children in Pakistan.

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Ethical Approval: The study was approved by the Institutional Review Boards of Khyber Teaching Hospital, Peshawar, and National Hospital and Medical Center, Lahore. Written informed consent was obtained from parents or guardians of all participants.

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