

DEVELOPMENT AND IMPLEMENTATION FEASIBILITY OF COST-EFFECTIVE SCHOOL LUNCH PROGRAM

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ABSTRACT

School plays an important role in determining the food choices of the students besides mental and cognitive development. Snacks available at the school premises effect the nutritional status of the children; consumption of fast food is increasing these days in the urban areas due to availability at the school premises that is also posing severe effects on the health of students. The aim of this study was to provide cost effective school lunch to the students within their limited resources. The study also helped them in determining healthy food choices virtually by providing them the school lunch that meet their 1/3rd of the macro-nutrient requirements. The study focused on development of sustainable business model that can be easily implemented in any of the school. Healthy lunch was developed on the basis of their daily money consumed at school; on an average Rs. 75/- to Rs. 100/- were spent on snacking weekly by the students and the lunch was developed within this range. In the second phase the regular lunch available at school was converted to a cyclic menu and its acceptance was checked to further modify the lunch to make it healthy. Students were not very satisfied with the lunch, almost 48% students liked the lunch but there were complaints for diarrhea and abdominal pain. The lunch was than modified and was standardized by the expert panel for sensory evaluation. Students were contented with the healthy lunch and they readily accepted the change; 88% of the students liked the cyclic menu of lunch, only 1% of the students were not happy with the lunch. The female staff in the school started delivering the same lunch thus making this model sustainable. In future, this should be implemented at national level; government should also supply this lunch free of cost to low socioeconomic schools thus securing the future of the children belonging to low and middle socioeconomic status.

KEYWORDS: School Lunch Program, Cost Effective, Implementation Plan.

INTRODUCTION

Early childhood nutrition has an impact on education, growth and health of individuals. School going children require optimum nutrition as this is phase of rapid growth and development of the body (Wooldridge). In developing countries approximately 183 million pre-school children were underweight, muscle wasting was reported in 67 million children, and 226 million had stunted growth (Neumann, Gewa and Bwibo). An important contributor of malnutrition is socioeconomic status as in Karachi an urban city of Pakistan; obesity was observed in high socioeconomic status (SES) and undernutrition in lower socioeconomic status (Warraich, *et al.*, 2009). Other reasons for compromised nutritional status in Pakistan are: illiteracy of mothers and the larger family size; intergenerational poverty among low socioeconomic families due to lack of education, high fertility rate and thus unable to provide adequate

nutrition to the children (Grantham-McGregor *et al.*, 2007; Baig-Ansari *et al.*, 2006). Food inadequacy has a positive relationship with the cognitive development; academic and psychosocial consequences (Alaimo, Olson and Frongillo).

One of the interventions to overcome the problem of malnutrition is "School Lunch Programs" that aims to provide adequate nutrition, improve their cognitive abilities and to provide adequate health. A federal assisted program "National School Lunch Program (NSLP)" is providing assistance in 100,000 schools in both sectors; even in the residential institutions in the US (US Department of Agriculture). School lunch programs offer school meals according to Dietary Guidelines for Americans. Almost 31 million school children are getting sponsored lunch under National School Lunch Program that covers nearly 92% of the U.S. schools

including both public sector and private sector (Baidal and Taveras). European schools usually offer school meals in basis of food standards as well as nutrient standards. These schools focus on almost 14 different nutrients with restriction of salt & sugar. Similarly, Sweden uses Plate-model as guideline for developing school lunch (The European Food Information Council).

The guidelines stated to increase the consumption of fruits and vegetables, include whole grains in diet, limit trans-fats and sodium intake along with the caloric ranges for the students of different age groups. USDA recommended that school lunch program must meet the 1/3rd of the recommended daily allowances (RDA) of the children and breakfast must provide 1/4th of the nutrient needs of the school going children. Other nutrients whose level were controlled due to rise in the prevalence of chronic diseases were sodium (<2300 mg) and saturated fatty acids (<7%) (Baidal & Taveras, 2014; Wooldridge, 2011).

Efficacy of nutrition programs has been shown through different researches conducted in schools and has concluded a positive effect on nutritional status. Studies showed that students who participate in School Breakfast Program (SBP) and School Lunch Program (SLP) had a nutritious diet throughout the day. Their diet contains less fats and more nutrients like magnesium. Their serum levels for folate and vitamin C tends to show more normal values and their snacks also include healthy choices (Losasso et al., 2015; Bhattacharya et al., 2004).

MATERIAL AND METHODS

Sequential research design using both quantitative & qualitative data as the study was conducted in four phases from assessing the needs of the community to developing the school lunch, then modifying it and finally implementing the program. The universe of the study was public and government schools of Lahore.

Phase I Need Assessment: Need assessment was done to determine the socioeconomic status, daily lunch money and demographics of the students. A self-developed questionnaire was used for this purpose along with a checklist to determine other factors like time for lunch, facilities available for hygiene in school and to determine the choices of students. The anthropometric measurements were assessed using the standard equipment.

Phase II Development of School Lunch: Need assessment provided the base for the development of school lunch program. The routine school lunch snacks used by students were converted into a cyclic menu for a week with slight modification considering convenience and ease of handling and then acceptability of school lunch program was determined using 3-point Likert scale.

Phase III Modification of School Lunch: The school lunch was modified as per the guidelines of national school lunch program i.e. 1/3rd of the recommended dietary allowance (US Department of Agriculture, 2012). The recipes of school lunch were standardized in the laboratory of Food Science and Human Nutrition department of Kinnaird College for Women, Lahore. A five point hedonic scale was used for formal evaluation of recipes (Muhimbula, Issa-Zacharia, & Kinabo, 2011) and then macronutrients were analyzed in the standard servings using USDA Food Composition tables (Shridhar, Dhillon and Bowen). Finally, the cost was analyzed using the following formula:

$$\begin{aligned} \text{Cost of a week lunch} &= \text{cost spend on lunch} \times \text{total days} \\ \text{Cost of one day} &= \text{Total cost of a week lunch} / 5 \text{ (days} \\ &\text{ school lunch served)} \end{aligned}$$

Results were presented as Mean \pm SD in the tabular form and Paired Comparison T test was used to compare the results of standardization tests.

Phase IV Implementation Feasibility: A sustainable business plan was used for implementation of cost effective school lunch program. After the consent of the Principal of the school an introductory session was held with the female teaching staff to let them know about the importance of the school lunch program. A training workshop was arranged for the individuals in which complete execution plan was demonstrated to them from cooking till packaging and distributing; food safety and hygiene training was also given to them. Ingredients from the local market were supplied to the school premises to the selected participants by the researcher to ensure quality of the food and the lunch was prepared in the school premises. Students were given enough time to have their lunch and then sensory attributes were assessed using three-point facial hedonic scale as students were able to understand this more easily (Brown et al., 2012). Acceptability of cyclic menu was determined using a three-point Likert scale. The results were presented in Mean \pm SD and in percentages form.

RESULTS AND DISCUSSION

Healthy breakfast & lunch keeps the children active whole day and also, they have a positive effect on cognitive health. Pakistan being an underdeveloped country had paid little attention towards empowering the health sector; currently food fortification and awareness programs have been initiated so far (Niazi, Niazi and Baber). The study proposed to develop a cost-effective healthy school lunch program for students according to the requirements of children assessed during the first phase using a self-developed questionnaire. A total of 280 students participated in the first phase out of which 129 (46%) were male and 151 (54%) were female. Students mostly belong to the middle socioeconomic status (55%) and then low socioeconomic status (40.7%); only 4.3% belongs to upper socioeconomic status as shown in figure 1 below.

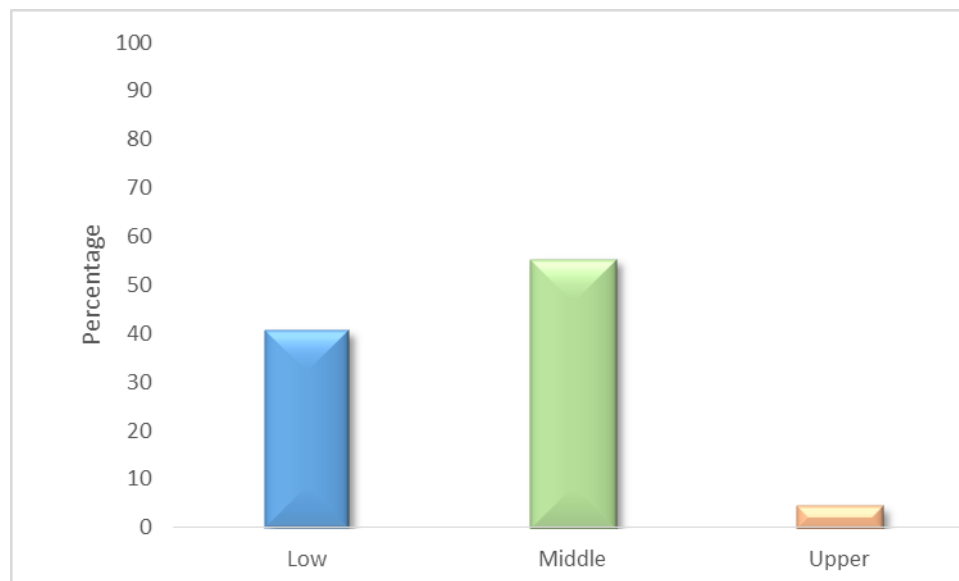


Figure 1 Socioeconomic Status of the Participants

The mean school lunch money of students was Rs. 16/- that was spent on the snacks during lunch times which makes approximately Rs. 100/- for a week. On the basis of the food choices determined in this phase and total money that they spend per week; a regular school lunch was prepared and served to the students. The lunch developed in the second phase only focused towards the choices and likeness of the children. Based on the results of this phase school lunch was modified and portion size adjusted to the determined cost and choices of the children yet meeting the nutrient requirements (table 1 below). The recipes were then subjected to

standardization in which modifications were made according to the suggestions by expert panel to achieve the desired taste of each recipe and then final recipe was prepared for three times and they produce similar results to produce standardized recipe. The scale used for this purpose was five point-hedonic scale the most widely used scale and produce more accurate results (Muhimbula, Issa-Zacharia, & Kinabo, 2011). Macronutrients were estimated in the standardized recipes using USDA nutrient databases as evidence suggested no difference in the table values and proximate analysis (Shridhar, Dhillon and Bowen).

Table 1: Comparison of Macronutrient Estimation.

Recipe Name	Standard	Vegetable& Chicken Burritos	Potatoes on Bread	Egg Sandwiches	Potato Wraps	Potato and Chicken Sandwiches
Energy (kcal)	550-650	299	380	322	397	313
Protein (g)	10.00	11.25	10.12	11.44	10.28	11.25
Fats (%)	25-35	35.00	28.97	34.04	21.50	34.33
Saturated Fats (%)	<10	1.43	7.58	07.24	05.21	05.49
Carbohydrates (%)	45-60	49.22	46.56	41.70	60.26	49.10
Fiber (g)	05.70	05.20	03.10	04.00	08.55	05.30

The macronutrient content of the school lunch illustrated that mostly the recipes provide around 300 calories and 10 grams of protein. The difference in the energy values was due to the cost effectiveness that limit the total budget and thus use of most ingredients. Also, if energy was increased the portion size of the food was increased. So, to balance the protein and saturated fat requirements a slight compromise was made at the end of energy. A survey report conducted in Slovenia showed a similar result that evaluate the school lunches in different schools and determine that school lunches fail to meet the energy requirements although they were meeting the protein, fats and saturated fats requirements. The

research also indicated positive effect on health of the children concluding that it's more important to meet the macronutrient needs (Gregoric et al., 2015). The last phase of the study was implementation and acceptability test of the school lunch and to maintain the quality of food. The school lunch was popular among the children except for the potato wraps which were graded slightly low (2.80 ± 0.38). School lunch was fulfilling and satisfied the appetite of the children. Similar results had been shown by a research conducted in Chicago 70% of the students showed acceptance towards the lunch. Study also revealed that students from low socioeconomic

status were more willing to buy the lunch (Turner and Chaloupka).

CONCLUSION

School lunches are known to play a positive role in improving nutritional status of the children thus the present study will help the nation in improving health status. The study concludes that cost-effective healthy school lunch can be implemented with the optimistic participation of parents and school. The study provides standardized recipes for school lunch along with their nutrient and cost analysis. This study thus provides a virtual tool for children that help them to make healthier selections for the lunch. Sustainability of this system further ease the implementation procedure and make it possible to expand this program at national level. The public schools and government authorities should join hands to promote the healthy eating among school aged children by providing the school lunch snacks.

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Competing Interests

The authors have declared that no competing interests exist.

Authors' Contributions

This work was carried out in collaboration among all authors. All authors contributed equally in various roles including formulation research goals, development of methodology, performing the experiments and analyzing data and writing the initial draft. The corresponding author coordinated the research activity as agreed by all authors. All authors read and approved the final manuscript.

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