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EFFECTIVENESS OF CENTRALIZED MID DAY MEAL PROGRAMME ON THE NUTRITIONAL STATUS OF CHILDREN OF EKALBARA VILLAGE, RURAL VADODARA

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ABSTRACT

Background: Akshay Patra served mid day meal is implemented in both urban and rural Vadodara since November, 2009 to improve the acceptability of the programme as well as its health and nutritional impact.

Aim: To conduct a situational analysis of MDM served through Akshay Patra and its impact on the nutritional status of children in rural area of Vadodara district.

Methodology: Using a cross sectional study design, two primary schools were selected from the Padra Taluka of rural Vadodara district, Gujarat. Qualitative and quantitative research methodologies were used to collect data on the quality of MDM implementation, teachers and students perceptions as well as nutritional status of the students using anthropometric measurements and blood estimations.

Result: Infrastructural facilities such as serving area, water facility and cleanliness were observed; fixed weekly menu was served regularly and the serving frequency varied as per the demand. Nearly 80% of the students were undernourished; 58% suffered from mild anemia and Hs-CRP values were moderately high indicating prevalence of infections.

Conclusion: Thus poor nutritional status and increased prevalence of infection emphasizes the need to integrate approaches such as school health program (IFA, de-worming and calcium), nutrition health education, sanitation and hygiene, clean school premises, safe drinking water and toilet facilities in school as well as at home.

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INTRODUCTION

School based feeding programmes have taken many forms since past until in 1995, when the Mid Day Meal Program (MDMP) was accepted and acknowledged by the Supreme court of India (https://en.wikipedia.org/wiki/Akshaya_Patra_Foundation). It has been one of the earliest supplementary nutrition programs in the country (Awate, 1997). After its inception, the MDMP was implemented in customized manner across the states of India. Decentralized kitchens, distribution of raw ration, take home meals etc. were some of the different strategies (Awate et al., 1997) followed in order to meet the 1/3rd daily nutritional requirements of the school children. However, "Akshay Patra" an initiative by Nandi Foundation – a private sector; has extended uniformity

in MDM implementation in 23 regions of 10 states of India catering to 1.4 million children (Bose et al., 2008). "Akshaya Patra" mid day meal program started in Vadodara on 5th November, 2009. It is certified with ISO – 22000 and facilitates feeding in about 616 urban and rural government schools covering 1,31,093 children of Vadodara district. Prior to Akshay Patra issues such as irregularity, poor quality of ration, improperly cooked meal, lack of variety, non-compliance with the fixed meals, poor sanitation and hygiene, lack of infrastructure, etc. were the common implementation hurdles; especially in the rural areas of Vadodara. However, the use of advance technology under Akshay Patra has upgraded the MDMP. Adequate staff members ensure efficient management and quality workforce. Its infrastructure has well planned kitchen area, cleaning, washing, storing and dispatch area (Bose and 2008). It has adapted nutrient conserving cooking technology such as steaming and boiling (Dhaundiya et al., 2010) The sterile and insulated vans and containers guarantee safe and timely delivery of the cooked meal. Akshay

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Patra is indeed a boon (Djokic *et al.*, 2010) in the rural areas of Vadodara. According to the report on state food security (<https://idl-bnc.idrc.ca/dspace/bitstream/10625/12999/1/108409.pdf>) no country in the world comes close to India in terms of absolute hunger. RSOC, 2014 data (PEO, 2010) (0 – 5 years of children) of rural area have reported 42% prevalence of stunting, 15% wasting and 32% prevalence of underweight. Poor beginning early in life affects the nutritional status at school age that causes negative impact on the quality of life and learning (Dhaundiyal *et al.*, 2010). Malnutrition coupled with nutritional anemia as well as infections has been the major culprit in developing countries, especially in the rural areas and India is no exception (Hall *et al.*, 2007 and Hioui, *et al.*, 2010). The prevalence of anemia among Indian school children continues to be high in spite of numerous efforts to tackle it (Jood *et al.*, 2001). In distant areas and difficult terrains, scheme like the MDMP has shown marvelous impact on health, nutrition and educational outcomes. Thereby, intervention by Akshay Patra, would definitely improve service delivery under MDM thus reducing the prevalence of undernutrition among school children. The Akshay Patra served MDM holds immense potential (Kantawala *et al.*, 2013 and Karbhari and 2010) to improve health and education for school children in rural areas.

Thus, the following study was planned with the objective of accessing the impact of Akshay Patra served MDM on the nutritional status of school children in the rural areas of Vadodara; since there is a dearth of such data.

MATERIALS AND METHODS

Study type: Cross sectional study design

Study site: Primary schools (n=2) from Padra taluka of Vadodara district, Gujarat were randomly selected for the study.

Study sample: School teachers (n=6) and students from standard 1st – 5th of both the primary schools who gave consent for both anthropometry and biochemical testing were enrolled in the study (n=77).

Tools and techniques: The school infrastructure was assessed using non-participatory semi-structured observation checklist (post permission from the school management). The school teachers were subjected to semi structured interview to assess their Knowledge Attitude and Practices (KAP) regarding Akshay Patra served MDM and its health implications.

Table 1. Infrastructure supporting MDM at the schools

Infrastructural facilities	Hynapura	Walipura
Easy road accessibility	Yes	Partially
Covered and well floored serving area	Yes	Yes
Hand washing facilities available and practiced	Yes	Partially
Well maintained serving utensils	Partially	Yes
Well arranged food disposal system	Yes	Yes

Table 2. Menu planned Vs. served under MDM in both the schools

Week Days	Akshay Patra Decided Menu	Hynapura	Walipura
Monday	Matar Pulav + Thepla + Dal	Thepla + Rice	
Tuesday	Dal + Roti + Sabji	Rice + Roti + Sabji	
Wednesday	Jeera Rice + Dal + Dhokali	Dal + Dhokali	
Thursday	Veg Khichadi + Aloo Chana Dal + Thepla	Thepla + Rice + Chana Dal	
Friday	Rice + Roti + Mixed Sabji	Khicadi + Roti + Mixed Sabji	
Saturday	Veg Pulav + Mixed Dal + Lapsi (at times)	Veg Pulav + Mixed Dal (Lapsi / Sukhadi at times)	

Table 3. Perceptions of the staff and students on MDM in both the schools

Respondents	Area	Perceptions	Hynapura	Walipura
Teachers (n=6)	Regularity	The meal is served regularly on all working days	73%	85%
		Even during odd climatic conditions, we receive the meal	69%	80%
		Attendance of students is more when rice based recipe is served	84%	90%
	Sanitation and Hygiene	We encourage our students to wash hands before and after meal	77%	79%
		We ensure that the left over is disposed off in dustbin	86%	80%
		The serving area is cleaned before the meal is served	91%	92%
		The utensils are washed and rinsed before using	92%	92%
	Health effect	Many children have gained weight	59%	62%
		Absenteeism due to illness has reduced	56%	58%
		Academic performance of students have improved	57%	55%
Quality of the Meal	The food is clean, well cooked and provides variety	78%	76%	
	Quantity of the Meal	Adequate quantity of meal is served on demand	85%	91%
Students (n=77)	Regularity	Every-day the meal is delivered in the school	79%	83%
		We consume the food more when sweet is served	89%	94%
	Sanitation and Hygiene	We wash hands with soap before the meal	93%	94%
		We sweep the varanda before serving the food	53%	58%
		We throw the leftover food in dustbins provided in our school	66%	75%
	Health effect	We feel more energetic than before	62%	67%
		We enjoy studies and attending school	58%	66%
	Quality of the Meal	The food served is clean and well cooked	73%	72%
		We get fresh and hot food everyday	81%	85%
		All recipes are tasty	65%	75%
	Quantity of the Meal	We get as many servings as needed	91%	94%

Anthropometric measurements such as height and weight were measured through standard techniques and BMI for age (BAZ) was computed using WHO's Anthroplus software. Using Z-score, the children were categorized as normal, mild, moderate and severely undernourished as per WHO cut offs, 2010. For biochemical estimations, a lab technician drew venous sample. Haemoglobin and Hs-CRP was tested for all the students using set standard lab techniques.

Statistical analysis: The collected data was cleaned, coded and entered in to an excel sheet and imported to SPSS software for analysis. Descriptive statistics such as frequency, cross-tabulation, ANOVA and chi-square were applied to arrive on the said result.

Ethical clearance: The following study was present and approved by the board of ethical committee of the Department of Foods and Nutrition, Faculty of Family and Community Science, The Maharaja Sayajirao University of Baroda.

RESULT AND DISCUSSION

School level infrastructure: Both the evaluated schools had fairly good infrastructural facilities (Table 1). The villages were not at isolated location and were near to the Vadodara city. Thereby the road accessibility was quiet good thus facilitating timely delivery of MDM. Both the schools had concrete and elevated serving areas which could be cleaned easily and thus ensured hygienic ambience during meal consumption. Both the schools had liquid soap solutions and hand pumps that encouraged the students to practice thorough hand washing regularly. However, students of Walipura village followed the hand washing practice averagely due to poor water supply. Both the schools had a distinctly arranged food waste disposal system which were well maintained and kept at a distant corner in the school premise. Centralized cooking under Akshay Patra has dramatically improved the nutritional quality and quantity of the food prepared. However, in the rural areas the accessibility of schools is a major influencing factor towards delivery of services. Unlike in the decentralized served MDM, where facilities of storing and transportation is primarily depended on allocation of funds (Lal, 2013 and Mid Day Meal Program in Karnataka, 1990). As per an evaluation report by the Government of India (Mid-Day Meal Annual Work Plan and Budget, 2013) 80% schools had pucca buildings, 72% had toilets but less than 75% schools have poor facility for drinking water and inadequate plates and tumblers. However, other studies have reported poor infrastructural facilities such as improper cleaning of dining area, utensils, lack of provision for dishwashing, safe drinking water as a problem (Mishra *et al.*, 2013; Nambiar *et al.*, 2012 and Nambiar, *et al.*, 2016).

Menu under MDM

The result on MDM menu (Table 2) revealed modifications in the combinations. Students of 1st to 5th standard were given dal and rice 4 times a week and different vegetables in form of veg pulav, thepla and mixed sabji. They were given sweet in form of lapsi and sukhadi once a week. The quantity and frequency of serving varied based on the demand by the students. The menu observed during the study was followed regularly throughout the week. Thus with centralization both

urban and rural areas are served uniformly. Similar findings were reported (Dhaundiyal G. and Dhruv, 2010 and Hioui *et al.*, 2010), with respect to the menu served and the frequency of servings made. Partnership with a non-profitable agency has helped to maintain equal distribution especially when in many parts of the county, the guidelines of Government of India to deliver the food grain at the school point by PDS is not followed (Mid-Day Meal Annual Work Plan and Budget, 2013 and Nambiar and Desai, 2013).

Perception of staff and students: Views and perception of teachers and students were also elicited regarding quality of services, meal provided and its effect on health (Table 3). Regularity of MDM was reported by more than 70% of the respondents. Unlike previous years, reasons such as absentees of cook, lack of resources, inadequate infrastructure, etc. did not appear to affect the delivery of services (Nambiar and Desai, 2012 and 2013). Due to increased inclination towards availing the freshly cooked hot food under MDM more attention was given on cleanliness of hand, serving area as well as utensils (53% - 92%). An appreciable practice of collecting the plate waste in a separate container was observed in both the schools. Nearly 72% - 92% teachers and children were satisfied with the quality and quantity of MDM served. Similar improvement have been reported in terms of health and nutritional status of children (76.9%), school attendance (67.7%), scholastic performance (37.4%). The school teachers have shown satisfaction with the quantity (96.4%) and quality (88.7%) of the MDM provided by Akshay Patra (Mishra *et al.*, 2013). Nearly 13% teachers had good perception for the MDM provided by the Akshay Patra Foundation (Mishra *et al.*, 2013).

Health implication of MDM: Table 4 shows the nutritional status assessment of enrolled students using hemoglobin, C-Reactive Protein and BMI for age (BAZ). Average hemoglobin was 10.9 while CRP was recorded to be 2.5 ± 1.8 , indicating poor iron stores and prevalence of infections; while another study reported 33% prevalence of morbidity among students (Dhaundiyal G. and Dhruv, 2010). The BMI for age indicated high prevalence of mild to moderate undernutrition among the enrolled children. In a study in West Bengal, 35% prevalence of undernutrition was seen (Nambiar, V. and Desai, 2013) with higher prevalence among boys (Nutan, *et al.*, 2014). In the rural area of Nepal, 61% students were found to be malnourished (22% stunted and 10% wasted) (PEO, 2013) while another study in rural Vadodara reported 58% underweight, 46% stunting and 42% thinness (Nambiar, V. and Desai, 2013). On comparing these parameters across village blocks, gender and age group; hemoglobin was not significantly associated with age and gender. CRP was significantly different between age groups and the two blocks at $p < 0.5$, while among boys and girls the difference was significant at $p < 0.01$. BMI for Age showed maximum significant difference the two blocks ($p < 0.001$), gender ($p < 0.01$) and age group ($p < 0.5$). As shown in Figure 1, 58% of the subjects were suffering from mild and 14% were suffering from moderate anemia, which has reduced since year 2003 (which was reported to be as high as 66% and 33% respectively) (Nambiar, V. and Desai, 2013 and http://mdm.nic.in/Files/Review/Fifth_Review/Andhra/JRM_MDM_Report_AP.pdf) [19, 24]. Under nutrition was

prevalent among 84% subjects (23% mild, 26% moderate and 36% severely undernourished). Association of BMI for age and hemoglobin was evaluated to understand the impact of centralized MDM.

Under nourished girls of 8 – 11 years residing in the Walipura block of Ekalbara village had mild anemia with was significantly associated at $p < 0.5$ (Table 5). Prevalence of infection was seen more among under nourished females of 8 – 11 years residing in Hynapura village (Table 6).

Table 4. Comparing the overall nutritional status of enrolled children across both the village blocks, age and gender (n=77)

Village	Parameters	Mean \pm SD	Minimum	Maximum	ANOVA F Value
Hynapura	CRP	2.72 \pm 2.1	2	15	CRP: 0.2*
	Hb	11.02 \pm 0.92	9	13	
	BAZ	-2.87 \pm 1.5	-6	1	Hb: 0.2*
Walipura	CRP	2.20 \pm 1.3	1	9	
	Hb	10.8 \pm 0.84	9	12	BAZ: 0.003***
	BAZ	-1.87 \pm 1.1	-1	0	
Females	CRP	2.89 \pm 2.5	1	15	CRP: 0.09**
	Hb	10.8 \pm 1	9	13	
	BAZ	-2.24 \pm 1.5	-6	1	Hb: 0.68 ^{NS}
Males	CRP	2.18 \pm 0.7	1	5	
	Hb	10.9 \pm 0.7	9	12	BAZ: 0.1**
	BAZ	-2.7 \pm 1.38	-6	0	
Junior (5-7 yr)	CRP	2.22 \pm 0.6	1	5	CRP: 0.5*
	Hb	10.8 \pm 0.8	9	12	
	BAZ	-2.7 \pm 1.3	-5	0	Hb: 0.83 ^{NS}
Senior (8-11 yr)	CRP	2.78 \pm 2.4	1	15	
	Hb	11 \pm 0.8	9	13	BAZ: 0.4*
	BAZ	-2.27 \pm 1.5	-6	1	
Total	CRP	2.5 \pm 1.8	1	15	-
	Hb	10.9 \pm 0.8	9	13	
	BAZ	-2.48 \pm 1.4	-6	1	

Note: $p < 0.1^*$, 0.05^{**} and 0.01^{***}

Table 5. Assessing the relation between nutritional status and anemia (n=77)

Area	Sections	Haemoglobin	Nutritional Status				Chi-Square Value
			Mild UN	Moderate UN	Normal	Sever UN	
Village	Hynapura	Mild Anemic	3	8	2	14	0.8 ^{NS}
		Moderate Anemic	1	1	1	3	
		Normal	3	2	2	7	
	Walipura	Mild Anemic	7	5	4	2	0.5*
		Moderate Anemic	1	3	1	0	
		Normal	3	1	1	2	
Gender	Females	Mild Anemic	5	6	3	4	0.2*
		Moderate Anemic	1	4	2	1	
		Normal	4	0	2	5	
	Males	Mild Anemic	5	7	3	12	0.9 ^{NS}
		Moderate Anemic	1	0	0	2	
		Normal	2	3	1	4	
Age	Junior (5-7 yr)	Mild Anemic	4	6	2	9	0.8 ^{NS}
		Moderate Anemic	2	1	0	2	
		Normal	1	3	1	5	
	Senior (8-11 yr)	Mild Anemic	6	7	4	7	0.1**
		Moderate Anemic	0	3	2	1	
		Normal	5	0	2	4	

Note: $p < 0.1^*$, 0.05^{**} and 0.01^{***}

Table 6. Assessing the relation between nutritional status and infections (n=77)

Area	Sections	CRP Values based Infection	Nutritional Status				Chi-Square Value
			Mild UN	Moderate UN	Normal	Sever UN	
Village	Hynapura	Infection	1	1	2	3	0.4*
		Non-Infection	6	10	3	21	
	Walipura	Infection	1	1	0	0	0.7 ^{NS}
		Non-Infection	10	8	6	4	
Gender	Females	Infection	2	2	2	1	0.8 ^{NS}
		Non-Infection	8	8	5	9	
	Males	Infection	0	0	0	2	0.4*
		Non-Infection	8	10	4	16	
Age	Junior (5-7 yr)	Infection	0	0	0	2	0.4*
		Non-Infection	7	10	3	14	
	Senior (8-11 yr)	Infection	2	2	2	1	0.7 ^{NS}
		Non-Infection	9	8	6	11	

Note: $p < 0.1^*$, 0.05^{**} and 0.01^{***}

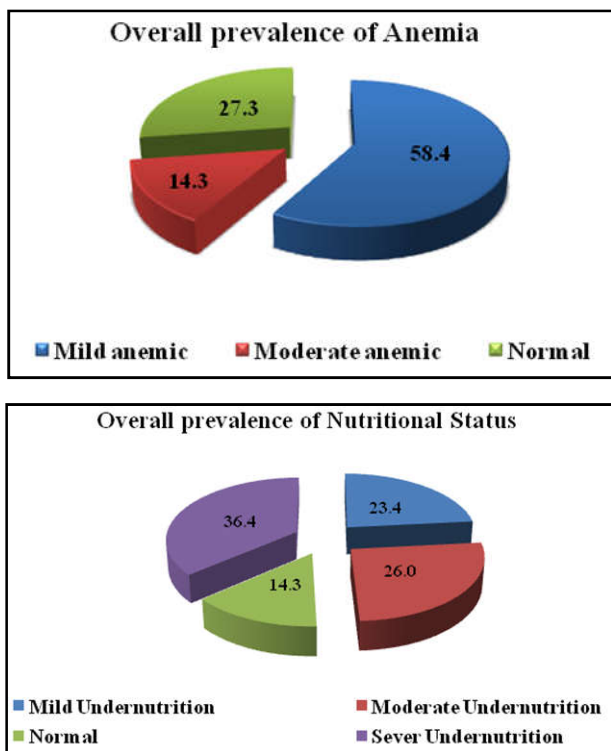


Figure 1. State of anemia and nutritional status among MDM consuming students (n=77)

Co-existence of nutritional deficiencies, anemia and undernutrition was seen among rural school children [25, 26], more so among girls and therefore it is important to periodically screen the children (Shakya *et al.*, 2004). Also there is a need to impart nutrition health education to the mothers and enable them to know about low cost and nutritious sources of food in their diet (Sudhagandhi *et al.*, 2011).

Conclusion

Both the surveyed schools had well developed infrastructure with respect to food serving area, cleaning area, utensil storage space and road accessibility. There is a consistency in the weekly menu and nutritional quality and quantity abides to the NP-NSPE norms. Teachers and students have reported health and academic improvement due to MDM. More so there is an improvement in sanitary practices, nutritional quality and quantity of the MDM served in the rural areas. However, the nutritional status assessment reveals high prevalence of undernutrition, anemia and infection especially among the girls of 8 – 11 years. This indicates the need to integrate other approaches such as school health program (IFA, deworming and calcium), nutrition health education, sanitation and hygiene, clean school premises, safe drinking water and toilet facilities in school as well as at home. Overall quality of life has to be enhanced among these children with the help of private and public partnerships.

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