Original Research Article

Impact study of institutional food supplementation on nutritional status of pre-school children

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ABSTRACT

Aims: To assess the Nutritional status of urban and semi-urban pre-school children of Dharwad**,** at baseline and after institutional supplementation.

Study design: Nutritional status of the pre-school children was assessed based on anthropometry and clinical examination. Urban pre-school children were treated as control and semi-urban pre-school children were supplemented with institutional food for three months (experimental). Nutritional status were measured before and after institutional food supplementation.

Place and Duration of Study: Department of Food Science and Nutrition, College of Community Science, University of Agricultural Science, Dharwad, Karnataka, India. The experiment was conducted between July 2017 and July 2018.

Methodology: A sample size of 100 pre-school children (3-6 years) were selected, out of which, 50 children from urban and another 50 children from semi-urban school were randomly selected from Dharwad district. Nutritional status of the pre-school children was assessed based on anthropometry and clinical examination. Nutritional status were measured before and after institutional food supplementation, in both schools.

Results: Results revealed that, at baseline nutritional status were higher in urban pre-school children compare to semi-urban pre-school children, but after supplementing with the institutional food, significant improvement in anthropometric measurements were observed in semi-urban group and they were on par with the urban children in terms of nutritional status.

Conclusion: The weight for age is an indicator of current nutritional status, whereas height for age is an indicator of past nutritional status, so height improvement was observed in urban group and weight improvement was observed in semi-urban group. Finally concluded that food intervention can go long way in changing the current malnutrition scenario.

Keywords: Pre-school children; Nutritional status; Anthropometric measurements; clinical symptoms; morbidity pattern and institutional food supplementation.

1. INTRODUCTION

In India, as per the National Family Health Survey (NFHS-4) in 2015-16, 35.7 per cent children below five years were underweight, 38.4 per cent were stunted and 21 per cent were wasted. They constitute about 36% of the total population of India. The world health organization reports that half of the malnourished children in the world live in Asia and Africa, including children in India.

Nutrition problems are not usually given attention until a severe stage or obvious clinical symptoms appear. The nutrition of pre-school children (3-5 years) needs much attention,

since they are in a formative stage of life where growth is rapid and the nutrient requirements are relatively high (Bose, et al, 2008). Proper growth and development of children are determined by the quality of food they eat. Balanced and adequate diets are required for proper cell functioning, development of good immunity system and normal brain functioning in children (Preschulek et al, 1999).

The various anthropometric indices that can be used to assess child growth was height-for-age portrays performance in terms of linear growth and essentially measures long term growth faltering, weight-for-height reflects body proportion or the harmony of growth and it is particularly sensitive to acute growth disturbance and weight-for-age represents a convenient synthesis of both linear growth and body proportion (WHO, 1986), mid-upper arm circumference has been proposed as an alternative index of nutritional status. Hence, necessary efforts was given to assess the nutritional status of pre-school children of Dharwad District in Karnataka. The present investigation was undertaken with the objectives to assess the Nutritional status of urban and semi-urban pre-school children of Dharwad, at baseline and after institutional supplementation.

2. MATERIAL AND METHODS

A sample size of 100 pre-school children (3-6 years) were selected for the study (50 children from urban and 50 children from semi-urban school), where 60 children from the age group of 3-4 years (30 children from urban and 30 children from semi-urban school), 20 children from 4-5 years (10 children from urban and 10 children from semi-urban school), 20 children from 5-6 years (10 children from urban and 10 children from semi-urban school) were randomly selected from urban and semi-urban pre-schools of Dharwad. Consent of school authorities and parents of selected children were obtained prior to inclusion of children in the investigation.

Nutritional status of pre-school children was assessed based on anthropometry, clinical examination and morbidity pattern. Anthropometric measurements viz. Weight (kg), height (cm), mid upper arm circumference (MUAC) (cm) and head circumference (cm) and chest circumference (cm) were recorded as per the guidelines suggested by Jelliffe (1966). Clinical examination was done by using rapid clinical survey given by Indian council of medical research (ICMR), (Anon., 2010). Morbidity refers to the level of sickness and disability characterizing a population by Thomas (2016). The morbidity viz. suffering from any kind of illness such as cold, cough, fever, vomiting, diarrhea, respiratory infections, ear infections and skin infection etc. was recorded for one month.

Institutional food was assessed in semi-urban pre-school, Dharwad and they followed the cyclic menu (fixed meals that rotated on weekly base). Name of the item prepared, major ingredients used and weight of major ingredients were noted for 30 days excluding holidays. Nutritional status were assessed at the time of admission and after three months of admission. Where urban pre-school children were treated as control and semi-urban pre-school children were supplemented with institutional food for three months (experimental).

2.1 Institutional food supplementation for semi-urban pre-school children are as follows

Sl. No.	Days	Institutional food supplementation with composition
1	Monday	Milk, Upma (cooked rava + vegetables) and Fruits
2	Tuesday	Milk, Curd rice (cooked white rice +curd) and

		Snacks rich in pulse
3	Wednesday	Milk, *Bisibelebath* (spicy rice based Indian dish composed from cooked rice+vegetables+ spices) and Fruits
4	Thursday	Milk, Kichidi (cooked cereals +pulses) and Boiled egg
5	Friday	Milk, Idli samber (cooked cereals+ pulses+ vegetables) and Dry fruits

2.2 STATISTICAL ANALYSIS

The data were processed, scored, tabulated and analyzed using simple tools like, frequency, percentage, mean, standard deviation, as well as advance tools like t-test, z-test, paired t-test and statistical analysis was carried out using SPSS (Statistical Packages For Social Sciences) software version 16.0.

2.2.1 Frequencies and percentages. The clinical and morbidity examination results were expressed in frequency and percentages.

2.2.2 Mean and standard deviation for anthropometry was used to interpret the data.

2.2.3 The independent 't' test (sample ≤ 30) was used to test the significance of mean difference between two nursery schools with regard to anthropometric measurements

2.2.4 The Z test:(sample ≥ 30) was used to test the significance of mean difference between two nursery schools with regard to anthropometric measurements

2.2.5 Paired t test : Was used to test the significance between before and after with regard to anthropometric measurements

3. RESULTS AND DISCUSSION

3.1 Anthropometric measurements of pre-school children based on locality at the time of admission

Anthropometric measurements of pre-school children enrolled in the investigation at the time of admission to school, based on locality are presented in the Table 1. It was observed that, the weight of the children did not vary significantly among the urban and semi-urban group. The mean weight of the children belonging to urban group was 13.87 kg and semi-urban group recorded 13.07 kg.

Table 1. Anthropometric measurements of pre-school children based on locality at the time of admission (n=100)

Anthropometric measurements	Urban (n=50)	Semi-urban (n=50)	Urban v/s semi-urban 'Z' value
Weight(kg)	13.87 ± 2.73	13.07 ± 2.31	1.58NS
Height (cm)	96.75 ± 7.28	96.93 ± 7.41	0.12NS
MUAC(cm)	14.92 ± 1.44	14.50 ± 1.08	1.65NS
HC (cm)	47.82 ± 1.48	46.88 ± 1.45	3.20**

CC (cm)	50.75 ± 3.44	49.20 ± 2.42	2.60**
HC:CC	0.94 ± 0.05	0.95 ± 0.04	1.89*

** MUAC- Mid Upper Arm Circumference * Significant at 0.05 level*
*HC- Head Circumference ** Significant at 0.01 level*
CC- Chest Circumference
HC: CC - Head to Chest circumference ratio.

It was observed that, the difference in the height of urban and semi-urban children was not significant. The mean height of the children belonging to urban group was recorded to be 96.75 cm and the children belonging to semi-urban group recorded the mean height of 96.93 cm. It was observed that mid upper arm circumference (MUAC) of children was not statistically significant between the groups. The mean MUAC of the children in the urban group was 14.92 cm and semi-urban group recorded 14.50 cm.

The head circumference of children between urban and semi-urban group was statistically significant ($P \leq 0.01$). The mean head circumference of children belonging to urban group was 47.82 cm and semi-urban group recorded 46.88 cm. It was observed that the chest circumference of the children between urban and semi-urban group was statistically significant ($p \leq 0.01$), the mean chest circumference of children in the urban group was 50.75 cm and semi-urban group recorded 49.20 cm.

Significant difference ($p \leq 0.05$) was observed among the urban and semi-urban groups for head to chest circumference ratio. The mean head to chest circumference of children in urban group was 0.94 and semi-urban group recorded 0.95. This results due to, a newborn's head circumference is usually about 2 cm larger than the chest circumference. Between 6 months and 2 years, both measurements are about equal. After 3 years, the chest circumference becomes larger than the head circumference. The ratio of head and chest circumference can be used as a rough guide to assess the amount of growth failure from malnutrition. So, here in both urban and semi-urban children chest and head circumference ratio is normal and urban children have good growth norms than semi-urban children.

Anthropometric measurements of semi-urban pre-school children was lower than the urban children, at the time of admission. Similar results were reported by Wadakappanavar et al. (2015). They stated that regional differences was found in anthropometric measurements between rural and urban children.

3.2 Comparison of anthropometric measurements of pre-school children with NCHS standards

The mean height and weight of pre-school children were calculated and compared with National Center for Health Statistics (NCHS) standards (50th percentile) were presented in Table 2. The mean weight of urban girls and boys were 14.08 kg and 13.66 kg, respectively. Similarly the mean weight of semi-urban girls and boys were 12.75 kg and 13.39 kg, respectively and the mean weight was found less than the NCHS standards in both girls and boys of both urban and semi-urban groups. Highly significant difference ($p \leq 0.01$) was observed between NCHS standards and actual values of both urban and semi-urban girls and boys.

The mean height of urban children was almost similar in both girls and boys (96.75 cm and 96.74 cm, respectively). Similarly the mean height of semi-urban girls and boys were 97.74 cm and 98.11 cm, respectively. The mean height of children was found lower than the NCHS standards in both girls and boys of both urban and semi-urban groups. Highly significant

difference ($p \leq 0.01$) was observed between NCHS standards and actual values of urban and semi-urban girls and boys.

Semi-urban girls weight and height was lesser than semi-urban boys and urban girls. This results might be due to Gender differentials like discriminatory Breastfeeding and supplementation practices. Gender inequalities in quantity and quality of food intake may contribute to under-nutrition of girl child. In rural area, still girl child is considered less important than the boy child.

All the children from urban and semi-urban areas were shorter and lighter than NCHS standards at 50th per centile. The lower values of anthropometric measurements could be attributed to reduced intake of energy and other body building nutrients. Similar results were reported by Amosu et al. (2011), Wadakappannavar et al. (2015).

Table 2. Comparison of anthropometric measurements of pre-school children with NCHS standards (n=100)

	Urban (n=50)				Semi-urban (n=50)			
	Weight (kg)	NCHS Standard	Difference	't'-value	Weight (kg)	NCHS Standard	Difference	't'-value
Girls (n=25)	14.08 ± 3.33	16.12 ± 1.60	-2.04	2.76**	12.75 ± 2.58	15.78 ± 1.53	-3.04	5.07**
Boys (n=25)	13.66 ± 1.10	16.62 ± 1.48	-2.96	5.97**	13.39 ± 2.00	16.59 ± 1.78	-3.204	5.98**
	Urban (n=50)				Semi-urban (n=50)			
	Height (cm)	NCHS Standard	Difference	't'-value	Height (cm)	NCHS Standard	Difference	't'-value
Girls (n=25)	96.75 ± 8.32	102.06 ± 6.28	-5.31	2.55**	95.74 ± 6.57	100.71 ± 6.05	-4.964	2.78**
Boys (n=25)	96.74 ± 6.24	102.47 ± 5.37	-5.73	3.48**	98.11 ± 8.12	102.71 ± 6.42	-4.60	2.22**

NCHS-National Center for Health Statistics
** Significant at 0.05 level*
*** Significant at 0.01 level*

3.3 Clinical symptoms of urban and semi-urban pre-school children at the time of admission

Table 3 Provides data on clinical symptoms of pre-school children, irrespective of gender and locality, higher proportion of children from urban and semi-urban group suffered from tooth carries (64 % and 68 %, respectively). In urban group very few clinical symptoms were observed, four per cent of children suffered from discoloured hair and 2 per cent from conjunctival xerosis. In semi-urban group slightly higher per cent of children suffered from clinical symptoms like sparse hair (4 %), discolored hair (4 %), conjunctival xerosis (2 %), angular stomatitis (2 %) and cheilosis (6 %). Symptoms like easily pluckable hair, moon face, nasolabial dyssebacea, bitot's spot, corneal opacity, night blindness, photophobia, red and raw tongue, papillae atropy, papillae hytropy, spongy bleeding of gums, parotid

enlargement, follicular hyperkeratosis, pellagra dermatitis, koilonychia, oedema, marasmus were not observed.

Nutritional status of children was directly correlated with the clinical symptoms, the children from urban group, who were having good nutritional status showed fewer clinical symptoms, where in semi-urban group, more number of children were there in malnourished group and also they were having more clinical symptoms. Similar type of results were reported by Geetha et al. (2009). Where they stated that, nutritional deficiency and clinical symptoms were correlated with each other.

Table 3. Clinical symptoms of urban and semi-urban pre-school children at the time of admission (n=100)

Clinical symptoms	Urban (n=50)		Semi-urban (n=50)	
	n	%	n	%
Sparse hair	-	-	2	4
Discoloured hair	2	4	2	4
Conjunctival xerosis	1	2	1	2
Angular stomatitis	-	-	1	2
Cheilosis	-	-	3	6
carries	32	64	34	68

*Symptoms like easily pluckable hair, moon face, nasolabial dyssebacea,, bitot's spot, corneal opacity, night blindness, photophobia, red and raw tongue, papillae atropy, papillae hytropy, spongy bleeding of gums, parotid enlargement, follicular hyperkeratosis, pellagra dermatitis, koilonychia, oedema, marasmus were not observed.

3.4 Morbidity pattern of urban and semi-urban pre-school children at the time of admission

Table 4 provides data on morbidity pattern of pre-school children. It was noticed that higher proportion of children from both urban and semi-urban group suffered from fever (6 % and 10 %, respectively) for the past one month. In the urban group few children (2 %) suffered from cold, vomiting, stomach ache and constipation than semi-urban group (8 %, 4 %, 2 % and 2 %, respectively). From urban group 4 % and 2 % of children suffered from cough and skin allergy, none of the child from semi-urban group had these symptoms, from semi-urban group 6 % of children suffered from Diarrhoea, none of the child from urban group suffered from Diarrhoea.

Clinical symptoms and morbidity pattern was related with each other, more number of children from semi-urban group suffered from higher episodes of fever, cold, vomiting, diarrhea, stomach ache and constipation, so morbidity pattern was high in semi-urban group (32%) compared to urban group (20%). Similar type of results were reported by Devi and Geervani (1994). Where they stated, children who were more vulnerable to infections had higher morbidity and became malnourished.

Table 4. Morbidity pattern of urban and semi-urban pre-school children at the time of admission (n=100)

Sl. No.	Morbidity	Urban (n=50)		Semi-Urban (n=50)	
		n	%	n	%
1	Fever	3	6	5	10
2	Cough	2	4	-	-
3	Cold	1	2	4	8
4	Vomiting	1	2	2	4
5	Stomach ache	1	2	1	2
6	Constipation	1	2	1	2
7	Diarrhoea	-	-	3	6
8	Skin allergy	1	2	-	-

Note: One month morbidity pattern was observed

3.5 Anthropometric measurements of pre-school children based on locality after 3 months of admission

Anthropometric measurements of urban and semi-urban group at the time of admission and after 3 months of admission was presented in Table 5. It was observed that the mean weight of children in urban group was increased from 13.87 kg to 14.84 kg. The children belonging to semi-urban group recorded a mean weight of 13.07 kg at baseline and it increased significantly ($p \leq 0.01$) to 14.30 kg after 3 months.

It was observed that the mean height of children belonging to the urban group was 96.75 cm at baseline it increased significantly ($p \leq 0.01$) to 100.80 cm after 3 months. The children belonging to semi-urban group recorded mean height of 96.93 cm at baseline and it increased to 99.53 cm, no significant difference was observed between urban and semi-urban group both at baseline and after 3 months.

The children belonging to urban groups recorded a mean mid upper arm circumference (MUAC) of 14.92 cm at baseline and no changes was observed after 3 months. In the semi-urban group a mean MUAC of 14.50 cm at base was increased to 14.85 cm. There was no significant difference was observed between the urban and semi-urban groups both at baseline and after 3 months.

The mean head circumference of urban children was 47.82 cm at baseline and increased to 47.83. The children belonged to semi-urban group recorded a mean head circumference of 46.88 cm and increased to 47.10 cm. Statistically significant increment was observed between urban and semi-urban groups both at baseline ($p \leq 0.01$) and after 3 months ($p \leq 0.01$).

Mean chest circumference of urban children was 50.75 cm at baseline and it decreased to 50.17 cm. The mean chest circumference of semi-urban children at baseline was 49.20 cm and it increased to 49.71 cm. Statistically significant difference ($p \leq 0.01$) was observed between urban and semi-urban at baseline but there was no significant difference was observed between urban and semi-urban group after 3 months.

The ratio of head to chest circumference was increased from 0.94 to 0.95 in urban group and the semi-urban group measured 0.95 at baseline which not differ even after 3 months.

Statistically significant difference ($p \leq 0.01$) was observed between before and after 3 months in urban group with regard to height and statistically significant difference ($p \leq 0.01$) was observed between before and after 3 months in semi-urban group with regard to weight. Results was supported by Devi and Geervani (1994). Where they, stated that weight for age is an indicator of current nutritional status, whereas height for age is an indicator of past nutritional status, so height improvement was observed in urban group and weight improvement was observed in semi-urban group.

Table 5. Anthropometric measurements of pre-school children based on locality after 3 months of admission (n=100)

Anthropometric measurements	Urban (n=50)		't' value	Semi-urban (n=50)		't' value	Urban v/s Semi-urban t-value	
	Before (n=50)	After (n=50)		Before (n=50)	After (n=50)		Before	After
Weight (kg)	13.87 ± 2.73	14.84 ± 3.00	1.70NS	13.07 ± 2.31	14.30 ± 2.52	2.55**	1.58NS	0.98NS
Height (cm)	96.75 ± 7.28	100.80 ± 6.39	2.96**	96.93 ± 7.41	99.53 ± 6.90	1.82NS	0.12NS	0.96NS
MUAC(cm)	14.92 ± 1.44	14.92 ± 1.44	0.13NS	14.50 ± 1.08	14.85 ± 1.26	1.48NS	1.65NS	0.13NS
HC (cm)	47.82 ± 1.48	47.83 ± 1.44	0.04NS	46.88 ± 1.46	47.10 ± 1.55	0.74NS	3.20**	2.45**
CC (cm)	50.75 ± 3.44	50.17 ± 3.60	0.83NS	49.20 ± 2.42	49.71 ± 2.62	1.01NS	2.60**	0.73NS
HC:CC	0.94 ± 0.05	0.95 ± 0.05	1.37NS	0.95 ± 0.04	0.95 ± 0.04	0.75NS	1.89*	0.27NS

MUAC- Mid Upper Arm Circumference ** Significant at 0.05 level*
HC- Head Circumference *** Significant at 0.01 level*
CC- Chest Circumferenc

3.6 Increment in anthropometric measurements of urban and semi-urban pre-school children after 3 months

Increment (shift) in anthropometric measurements of urban and semi-urban pre-school children after 3 months of admission to school was presented in Figure 1. It was observed that the increment in weight was more (9.41 %) in semi-urban group compared to urban group (6.99 %). The increment in height was more in urban group (4.19 %) compared to semi-urban group (2.68 %).

In case of MUAC, no changes was observed in urban group, which remains constant even after 3 months of admission. In semi-urban group slight increment in MUAC was observed (2.41 %) after 3 months of admission. It was observed that 0.02 per cent and 0.46 per cent increment in head circumference and 1.14 per cent and 1.04 per cent increment in chest circumference was observed in urban and semi-urban group, respectively. The ratio of head to chest circumference was increased in urban group (1.06 %) and no increment was observed in semi-urban group, even after 3 months of admission.

With respect to weight, MUAC, head circumference faster increment was observed in semi-urban group compared to urban group. This results might be due to supplementing the institutional food in semi-urban group. In case of malnutrition, the body's ability to absorb

nutrients from the digestive system into the bloodstream was increased so, increment was observed in semi-urban group. Height increment were observed in urban group because height for age is an indicator of past nutritional status, urban group children past nutritional status was good so, height improvement was observed in urban group.

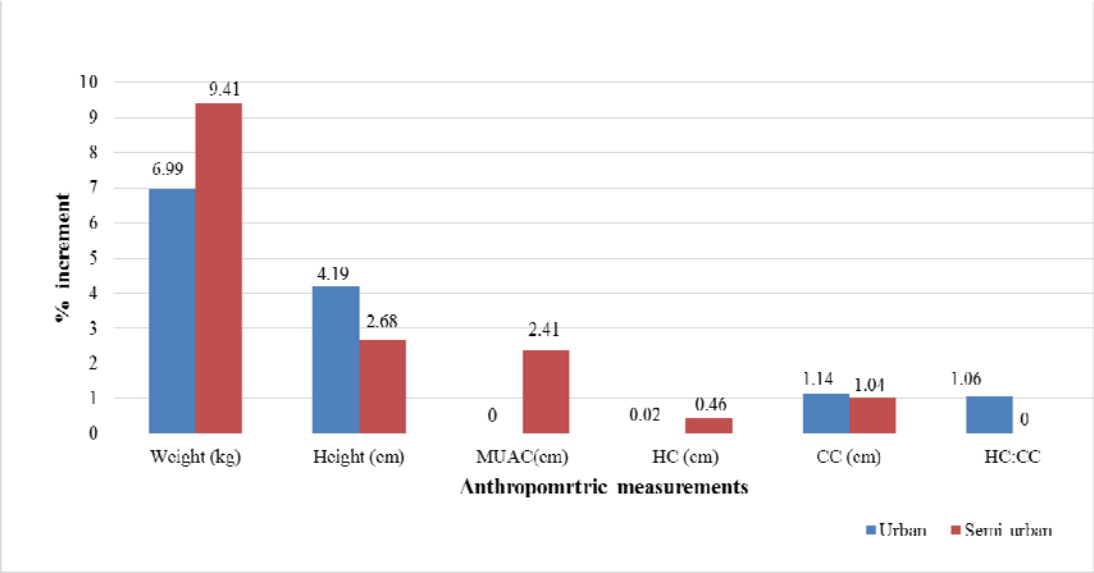

Fig. 1. Increment in anthropometric measurements of urban and semi-urban pre-school children after 3 months

3.7 Shift in the clinical symptoms of urban and semi-urban pre-school children after 3 months of admission

Clinical symptom of pre-school children, irrespective of gender and locality at the time of admission and after 3 months of admission was given in Table 6. Majority of urban and semi-urban children had tooth carries (64 % and 68 %, respectively) at baseline, which did not show any change even after 3 months. In urban group, few children were having discolored hair (4 %) at baseline and it was decreased after 3 months to 2 per cent and Conjunctival xerosis (2 %) remained unchanged even after 3 months. In semi-urban group at baseline, 4 per cent children had sparse hair, another 4 per cent children had discoloured hair, 2 per cent children had conjunctival xerosis. At baseline 2 per cent children suffered from angular stomatitis and 6 per cent from cheilosis, after 3 months it decreased by 100 per cent.

In both urban and semi-urban group tooth carries was major clinical symptom and unaltered even after 3 months. The reason might be due to poor oral hygiene, false dietary habits and less dental visit habits.

Table 6. Shift in the Clinical symptoms of urban and semi-urban pre-school children after 3 months of admission (n=100)

Clinical symptoms	Urban (n=50)		Semi-urban (n=50)	
	Before (n=50)	After (n=50)	Before (n=50)	After (n=50)

	n	%	n	%	n	%	n	%
Sparse hair	-	-	-	-	2	4	2	4
Discoloured hair	2	4	1	2	2	4	2	4
Conjunctival xerosis	1	2	1	2	1	2	1	2
Angular stomatitis	-	-	-	-	1	2	-	-
Cheilosis	-	-	-	-	3	6	-	-
Caries	32	64	32	64	34	68	34	68

Symptoms like easily pluckable hair, moon face, nasolabial dyssebacea, , bitot's spot, corneal opacity, night blindness, photophobia, red and raw tongue, papillae atropy, papillae hytropy, spongy bleeding of gums, parotid enlargement, follicular hyperkeratosis, pellagra dermatitis, koilonychia, oedema, marasmus were not observed.

3.8 Shift in morbidity pattern of urban and semi-urban pre-school children after 3 months of admission

Table 7 provides data on morbidity pattern of pre-school children, irrespective of gender and locality both at the time of admission and after 3 months of admission. In urban group 6 per cent children suffered from fever at baseline and it decreased to 4 per cent after 3 months. Four per cent children suffered from cough at baseline and it decreased to 2 per cent after 3 months. Two per cent children suffered from cold and another 2 per cent children suffered from constipation at baseline, morbidity per cent was not decreased even after 3 months. At baseline, equal per cent (2 %) of children suffered from vomiting, stomach ache and skin allergy, which totally disappear after 3 months. The morbidity like diarrhea was not found in urban group both at baseline and after 3 months.

In semi-urban group 8 per cent children suffered from cold at baseline and it decreased to 6 per cent after 3 months. Four per cent children suffered from vomiting at baseline and it decreased to 2 per cent after 3 months. Ten per cent children suffered from fever at baseline, morbidity per cent remained same even after 3 months. At baseline, 2 per cent children suffered from stomach ache, another 2 per cent children suffered from constipation and 6 per cent children suffered from diarrhea, which totally disappear after 3 months. The morbidity like cough and skin allergy was not found in semi-urban group both at baseline and after 3 months

Table 7. Shift in morbidity pattern of urban and semi-urban pre-school children after 3 months of admission (n=100)

Sl. No.	Morbidity	Urban (n=50)				Semi-Urban (n=50)			
		Before (n=50)		After (n=50)		Before (n=50)		After (n=50)	
		n	%	n	%	n	%	n	%
1	Fever	3	6	2	4	5	10	5	10
2	Cough	2	4	1	2	-	-	-	-
3	Cold	1	2	1	2	4	8	3	6
4	Vomiting	1	2	-	-	2	4	1	2
5	Stomach ache	1	2	-	-	1	2	-	-

6	Constipation	1	2	1	2	1	2	-	-
7	Diarrhoea	-	-	-	-	3	6	-	-
8	Skin allergy	1	2	-	-	-	-	-	-

4. CONCLUSION

At baseline, nutritional status were higher in urban pre-school children compared to semi-urban pre-school children because they belonged to low socio-economic status, less nutritional knowledge of mothers and less parental education than urban group. The semi-urban children past dietary habits was poor than institutional diet. After supplementing with the institutional food, significant improvement in anthropometric measurements were observed in semi-urban group after 3 months of admission and they were on par with the urban children in terms of nutritional status. The weight for age is an indicator of current nutritional status, whereas height for age is an indicator of past nutritional status, so height improvement was observed in urban group and weight improvement was observed in semi-urban group. Finally concluded that food intervention can go long way in changing the current malnutrition scenario.

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