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## Anthropometry and food distribution pattern among below poverty line families living in a slum

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### Abstract

There are millions of food insecure and undernourished people in India. The limitation is not food supply, but food distribution. This study was conducted to assess the anthropometry and food distribution pattern among the families Below Poverty Line (BPL) living in a slum of Delhi. The data was collected from 40 BPL families living in the slum of Seemapuri, Delhi using the standardized procedures and equipment. In comparison, food and nutrient composition of the diets of older children (7-18 years) was better than younger ones (7months - 6years) and poorer than adults in the family. Unequal distribution of food items was seen among the family members living in an urban slum.

**Keywords:** Anthropometry, dietary pattern, malnutrition, nutrient intake, urbanization

### Introduction

The world is generally food secure to feed everyone, yet 805 million are food insecure due to uncertainties from growing resource scarcity and climate change. Nearly 43.5% children under the age of five are being under weight, therefore there is need to address the nutritional security in the children and women (FAO, 2014) <sup>[1]</sup>. The prevalence of underweight (56.6%), stunting (59.9%) and wasting (25%) were highest among children belonging to lowest quantile of wealth index (NFHS-3, 2005–06) <sup>[2]</sup>

There are millions of food insecure and undernourished people in India. The limitation is not food supply, but food distribution. Household food security means access to adequate food, which is one of the fore-most basic needs of life, is the fundamental right of every single human being on this earth.

One in every nine people in the world still had insufficient food for living healthy life. South Asia had shown remarkable change in the prevalence of under-nutrition from 23.7% in 1990-92 to 12.7% in 2012-14 and met their target of MDG. Latin America and the Caribbean have made the greatest overall progress in increasing food security with modest progress in Sub-Saharan Africa and Western Asia, which have been afflicted by natural disasters and conflict. South Asia and Sub-Saharan Africa have the highest global hunger index scores at 18.1 and 18.2, respectively <sup>[3]</sup>.

### Methods and Material

The selection of the slum was done using purposive sampling method. Seemapuri is located in the east of Delhi, where people had been living without the basic amenities of life. A list of all BPL families was obtained from the fair price shop of the area and all BPL families living in the slum of Seemapuri were identified. The present study was undertaken on a sample of 40 households. Forty BPL families were selected using systematic random sampling method for data collection. First household was selected using random sampling method and thereafter the data is collected from every fifth house until the data was available for 40 BPL families. A written consent was obtained from the head of the household before data collection. Data collection was initiated after obtaining ethical clearance.

The data were collected through structured questionnaire from primary caregiver (mother/father/grandmother) of the household. Data were collected on anthropometry of every individual in the family and data on dietary intake were collected through 24-hour recall questionnaire about the total raw and cooked amount of the food in the last 24 hours for the family and amount consumed by all the family members.

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Both qualitative and quantitative data were organized and analyzed statistically. All data were consolidated and systematically coded in Microsoft excel 2007. Frequencies and percentages of each parameter of Socio-demographic information were calculated. Mean adequacies of nutrient intake were computed as compared with balanced diet (ICMR, 2011) [4] and RDA (ICMR, 2010) [5]. Mean intake of food groups for each subject will be calculated using NSI CALCULATOR (www.nutritionocietyindia.org). The values obtained were assessed by comparing with respective RDA (ICMR, 2010) and percent adequacies for all nutrients were calculated. Mean adequacies for intake of food groups were analyzed for assessing differences in consumption pattern by

various age groups using ANOVA, test of significance. All the results were tested at 5% significance level.

## Results and Discussion

### Anthropometric profile of the families

Anthropometry is used to assess the nutritional status of the families (n=40) among Below Poverty Line (BPL) living in slum of Delhi. The weight and height of the mothers and children were taken using standard procedures and standardized equipments. The weight and height of the fathers were not taken due to their unavailability at the time of data collection. The values of mean age, weight, height, BMI and MUAC of children were presented in Table 1.

**Table 1:** Mean and Standard Deviation of weight, height, MUAC, BMI for children (6months-18 years) combined by sex

Age Group	n			Mean $\pm$ SD				
	Total	Boys	Girls	Age(yr.)	Weight (kg)	Height (cm)	BMI (kg/m <sup>2</sup> )	*MUAC (cm)
Mothers	40			24.3 $\pm$ 3.71	48.9 $\pm$ 7.93	152.9 $\pm$ 4.18	21.3 $\pm$ 4.03	—
#6-12 months	15	6	9	8.5 $\pm$ 1.80	7.4 $\pm$ 1.43	69.6 $\pm$ 4.02	14.7 $\pm$ 0.98	10.6 $\pm$ 0.98
1-5 years	33	16	17	2.8 $\pm$ 1.39	11.6 $\pm$ 2.22	84.8 $\pm$ 7.67	16.0 $\pm$ 1.93	12.3 $\pm$ 1.62
6-18 years	35	20	15	9.2 $\pm$ 3.52	20.8 $\pm$ 6.33	118.7 $\pm$ 13.69	14.6 $\pm$ 1.24	—
*MUAC was measured for the Children age 6months – 5years. #Age was measured in months.								

**Weight:** The mean weight of the mothers was 48.9 $\pm$ 7.93kg. The mean weight for children age 6-12 months, 1-5 years and 6-18 years was 7.4 $\pm$ 1.43, 11.6 $\pm$ 2.22 and 20.8 $\pm$ 6.33, respectively.

**Height:** The mean height of the mothers was 152.9 $\pm$ 4.18cm. The mean height for children age 6-12 months, 1-5 years and 6-18 years was 69.6 $\pm$ 4.02cm, 84.8 $\pm$ 7.67 and 118.7 $\pm$ 13.69, respectively.

**MUAC:** MUAC was measured for the children age 6 months-5 years. The mean MUAC for the children 6-12 months and 1-5 years was 10.6 $\pm$ 0.98 and 12.3 $\pm$ 1.62, respectively

**BMI:** The mean BMI of the mothers was 21.3 $\pm$ 4.03kg/m<sup>2</sup>. The mean BMI for children age 6-12 months, 1-5 years and 6-18 years was 14.7 $\pm$ 0.98 kg/m<sup>2</sup>, 16.0 $\pm$ 1.93 kg/m<sup>2</sup> and 14.6 $\pm$ 1.24 kg/m<sup>2</sup> respectively.

**Table 2:** Nutritional status of mothers as assessed by BMI using WHO cut-offs for South Asians (n=40)

Categories	BMI cutoffs	n (%)
Underweight	<18.5	9(22.5)
Normal	18.5-24.9	25(62.5)
Pre-obese	25 -29.9	6(15)
Obese class I	30-34.9	0
Obese class II	$\geq$ 35-39.9	1(2.5)
Obese class III	$\geq$ 40	0

It was observed that 62.5% of mothers were normal, nearly one fourth of mothers were underweight (22.5%) and one sixth of mothers were Pre-obese and 2.5% of mothers were obese class II category (Table 2). National Family Health Survey (NFHS)-3, 2005-06 had shown that 33% of the women had low BMI which is higher than present study data indicating that there is improvement in nutritional status of mothers in the last decade [2].

A recent study conducted by Chabra and Bhardwaj, 2013 on women of reproductive age group studying in slums of West Delhi reported that mothers had mean BMI of 21.5 $\pm$ 1.5 kg/m<sup>2</sup>

and 13.9% of mothers were underweight [6]

A recent study conducted by Mamulwar *et al.* (2014) in the slum of Pune reported prevalence of underweight 34.3%, stunting 58.7% and wasting was 16.9% among under-five children (using WHO 2006 standards) [7].

### Food distribution pattern among families

The aim of the present study was to gather information on household food distribution pattern among BPL families. A one day 24-hour recall was conducted for the entire family to assess actual dietary intake by all the family members.

Data on dietary intake were collected from the primary caregivers of the families (n=40). Investigator asked about the total raw and cooked amount of the food in the last 24 hours for the family and amount consumed by all the family members, taking care of leftovers and food eaten outside the family pot by each member. Raw amounts were calculated using standardized measures and recipes. In the present study, families were divided into four groups viz.

- Fathers (n=40),
- Mothers (n=40),
- Infants and preschoolers (6months-6 years, n=61) and
- Children and adolescents (7-18 years, n=22)

Data for food and nutrient intake by each family member was compared with Dietary Guidelines for Balanced Diet (ICMR, 2011) and Recommended Dietary Allowances (ICMR, 2010), respectively to assess and compare the adequacy of dietary intake among family members.

### Food Intake

The mean daily intake of different food groups by the families were tabulated (Table 1) and compared with the Balanced Diet for different age groups as recommended by the ICMR, 2011. The consumption pattern of various food groups is discussed below:

**Cereal:** Cereal contributes to the major portion of the Indian diets. The mean cereal consumption of the fathers, mothers, infants & preschoolers and children and adolescents were

317.5±74.00g/d, 238±41.08g/d, 37.7±26.08g/d and 184.9±66.4 g/d respectively. All the family members had inadequate intake of cereals (Table 1 and Figure 1) as compared with the dietary guidelines for balanced diet (ICMR, 2011). Fathers and mothers were consuming significantly higher amounts of cereals than infants and children ( $t=7.111$ ,  $p<0.05$ ). Both fathers and mothers were consuming more than 80% of the recommended intake (ICMR, 2011). All families reported daily consumption of wheat and rice preparations like chappati, parantha, boiled

rice, and bread. Some family members had consumed biscuits, rusk, fan etc with morning and evening tea. Majority of the infants (70%) and preschoolers (55%) had consumed supplementary food like *sweet dalia*, *halwa* and *khichri* on the day of recall from the AWC. Some of the children and adolescents (70%) had also consumed Mid-day meal from their school on the day for which the recall was obtained. However, mothers also reported that they did not packed school lunch as the quality and quantity of supplementary food was adequate for their children.

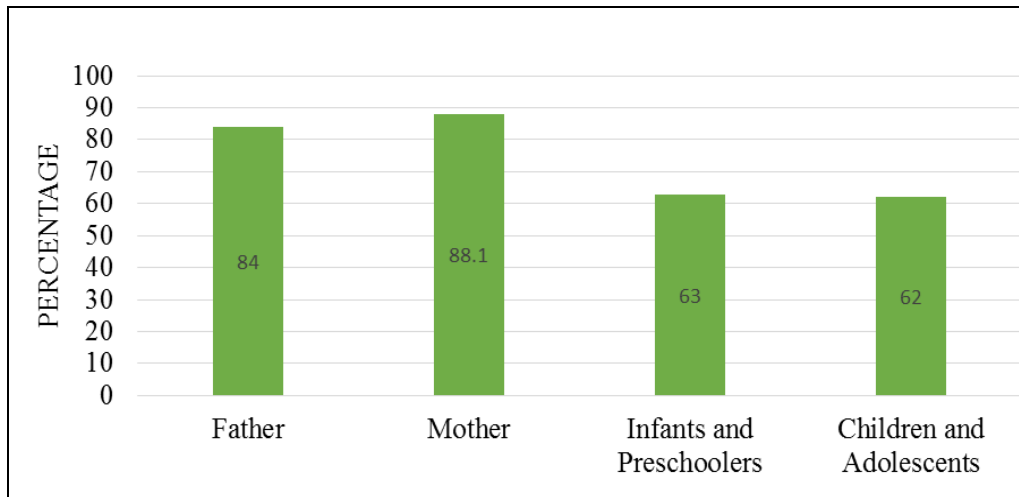


Fig 1: Mean% adequacy of CEREALS by families as compared with dietary guidelines for balanced diet (ICMR, 2011)

**Pulses:** Figure 2 clearly indicated that the consumption of pulses was least by the infants and preschoolers (30±9.8%), followed by children and adolescents (58.2±82.7%). The consumption of pulses was more than 80% by fathers and

mothers when compared with balanced diet (ICMR, 2011). The commonly consumed pulses were *moong*, *masoor* and *arhar dal* in their daily diet.

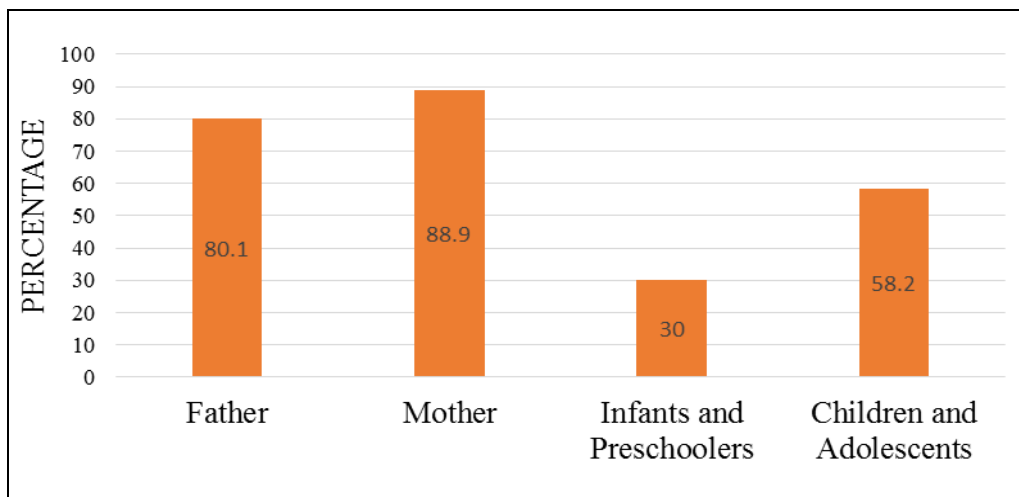


Fig 2: Mean% adequacy of Pulses by families as compared with dietary guidelines for balanced diet (ICMR, 2011)

**Egg/Meat:** Mostly families were non-vegetarian and consumption of *mutton*, *chicken*, *fish (rohu and katla)* and egg was common among the families in their daily diet (Table 1 and Figure 3). Fathers (402.1±11.2%) and mothers (363.5±90.2%) were consuming significantly higher amount

of egg/meat than infants (20.4±28.9%) and children (107.9±19.3%) ( $t=4.126$ ,  $p<0.05$ ), as compared with the balanced diet (ICMR, 2011). The consumption of egg/meat was adequate among children and adolescents (107.9±19.3) as compared with balanced diet.

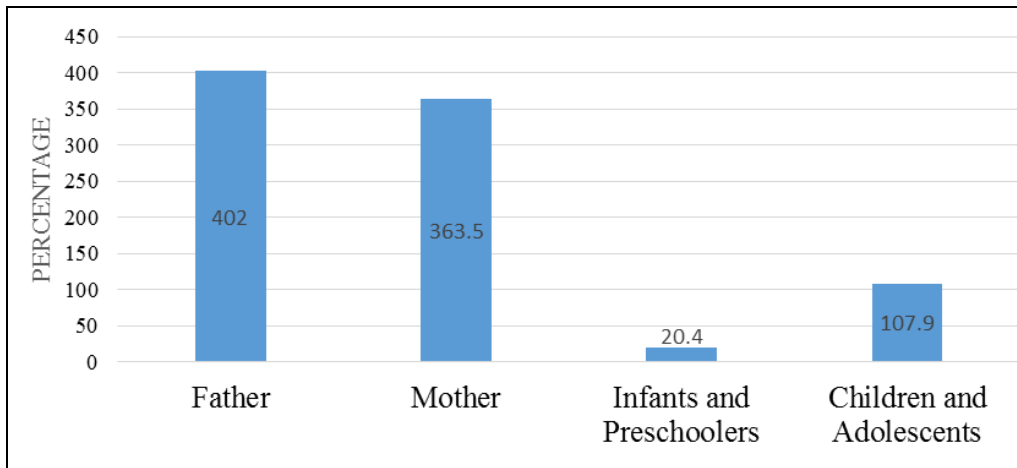


Fig 3: Mean% adequacy of Meat/Poultry by families as compared with dietary guidelines for balanced diet (ICMR, 2011)

**Milk:** The consumption of milk and milk products was inadequate among all the family members as compared to the balanced diet (ICMR, 2011). Figure 4 showed that intake of milk and milk products was significantly higher by fathers and mothers as compared to infants and preschoolers ( $104.2 \pm 33.57\text{g/d}$ ) and children and adolescents

( $115.7 \pm 10.2\text{g/d}$ ) in the BPL families ( $f=23.488, p<0.05$ ). The adults in the family generally consumed milk in the form of *tea*. None of the family reported consumption of milk products like *curd, panner, lassi* on the day for which recall was obtained. Families bought milk from the nearby dairy shops.

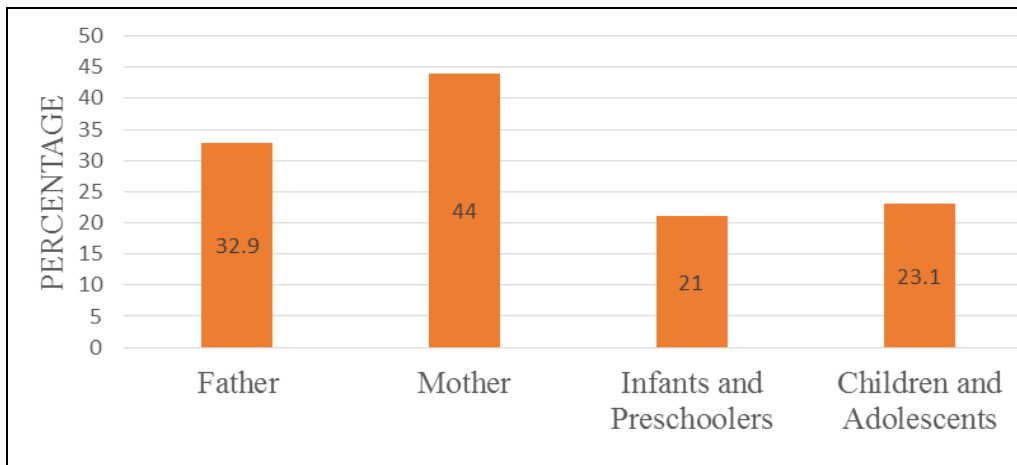


Fig 4: Mean% adequacy of Milk & Milk Products by families as compared with dietary guidelines for balanced diet (ICMR, 2011)

**Roots and tubers:** Average intake of roots and tubers was significantly higher in fathers and mothers than their children ( $f=22.534, p<0.05$ ). Figure 5. showed mean% adequacy of roots and tubers among family members when compared with recommended balanced diet (ICMR, 2011). The consumption of roots and tubers like *potatoes, onion, carrot and raddish*

etc. was higher by the family members. The mean intake of roots and tubers was negligible by the infants and preschoolers ( $9.30 \pm 12.18\text{g/d}$ ). Even the consumption of roots and tubers by children and adolescents was only 60% of the recommended balanced diet (ICMR, 2011).

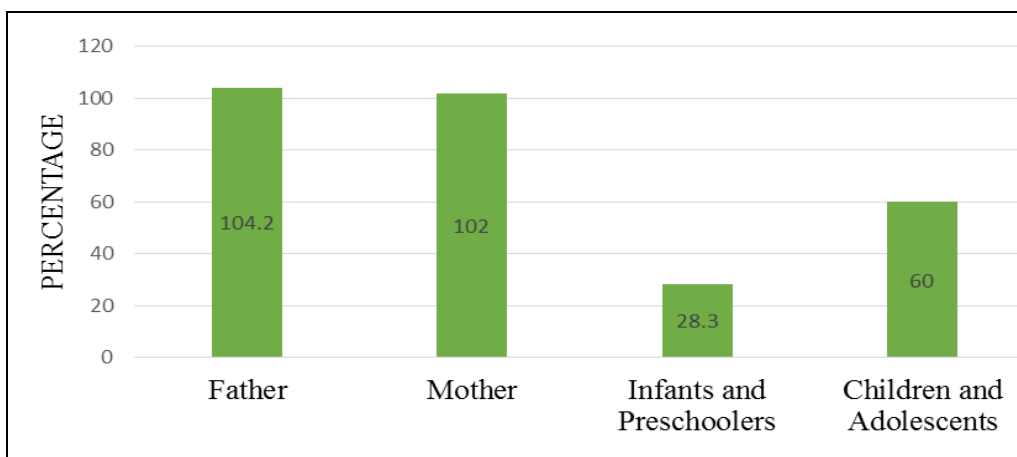
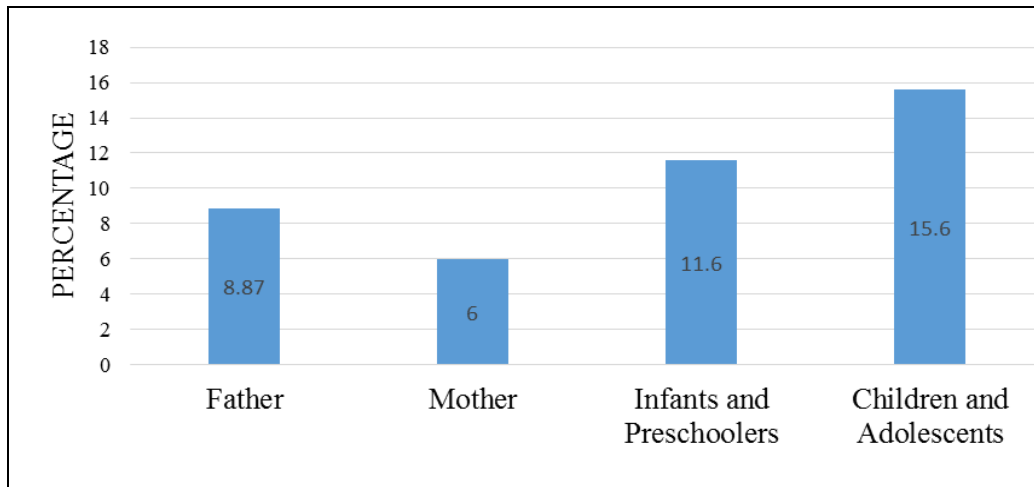


Fig 5: Mean% adequacy of Roots & Tubers by families as compared with dietary guidelines for balanced diet (ICMR, 2011)

**Green Leafy vegetables:** The consumption of green leafy vegetables was highly inadequate by all the family members when compared with balanced diet (ICMR, 2011). Figure 6. indicated that consumption of green leafy vegetables was highest among children and adolescents (11.6±15.0) and

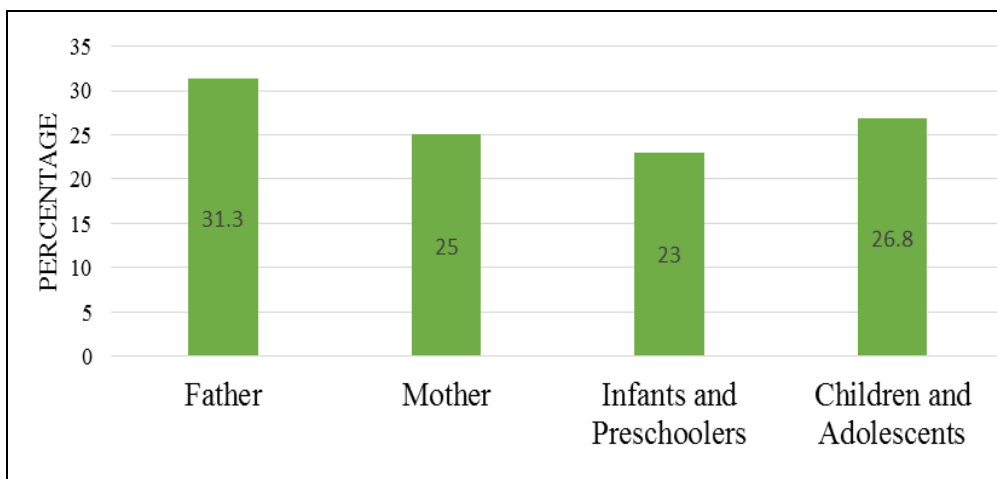
infants and preschoolers (15.6±2.32) as compared to fathers (8.8±1.13) and mothers (6.0±2.13). Majority of the families reported that they did not like vegetables like *bathua*, *spinach*, *methi* etc.



**Fig 6:** Mean% adequacy of Green Leafy Vegetables by families (n=40) as compared with dietary guidelines for balanced diet (ICMR, 2011)

**Other vegetables:** It was observed that consumption of other vegetables like *peas*, *tomatoes*, *ladyfinger*, *bottle-gourd* was

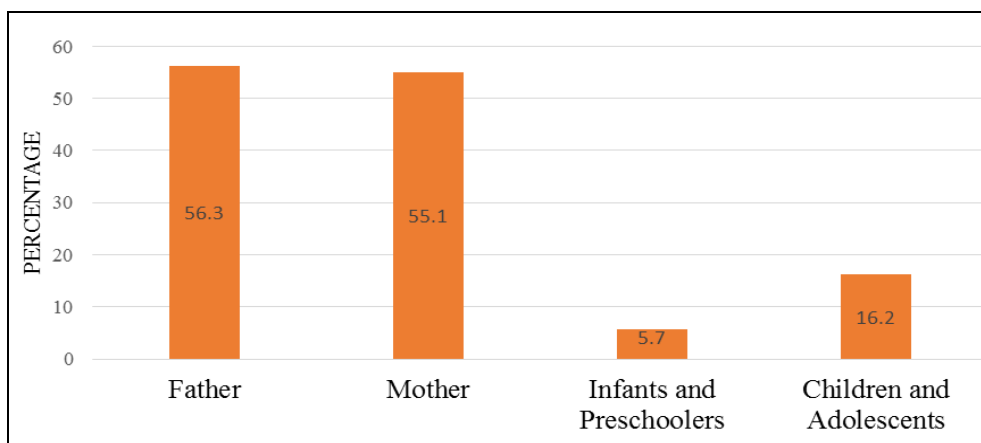
nearly one third of the recommended balanced diet (ICMR, 2011) by all the age groups (Figure 7).



**Fig 7:** Mean% adequacy of Other Vegetables by families as compared with dietary guidelines for balanced diet (ICMR, 2011)

**Fruits:** The intake of fruits was negligible among all the members of the family. The intake of fathers (56.3±49.34g/d) and mothers (55.1±49.24g/d) was significantly higher than

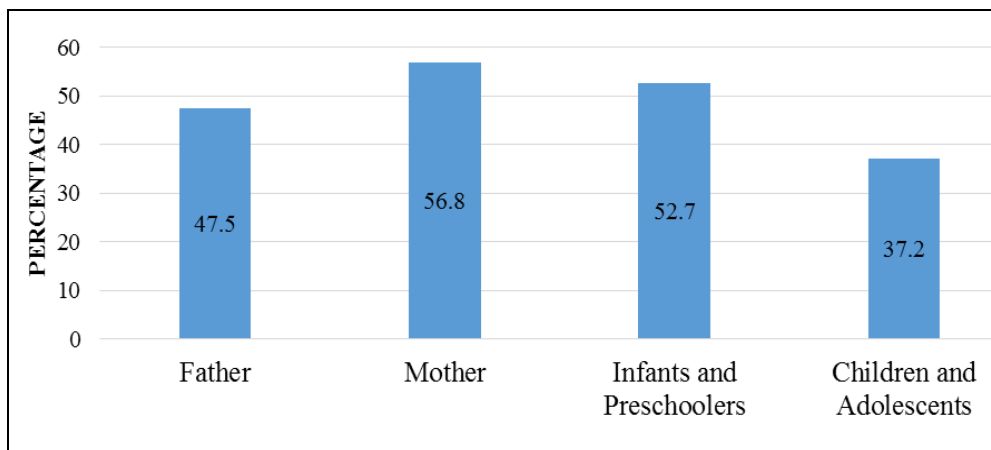
their children (‘f’-89.974, p<0.05). The most commonly consumed fruits included banana, oranges and apple as these were cheaper fruits.



**Fig 8:** Mean% adequacy of Fruits by families as compared with dietary guidelines for balanced diet (ICMR, 2011)

**Sugar:** The average intake of sugar per day was observed to be  $9.5 \pm 7.32$ g/d (fathers),  $15 \pm 6.19$ g/d (mothers),  $8.0 \pm 3.71$ g/d (infants and preschoolers) and  $10.5 \pm 0.77$  (children and adolescents). The mean% adequacies for consumption of

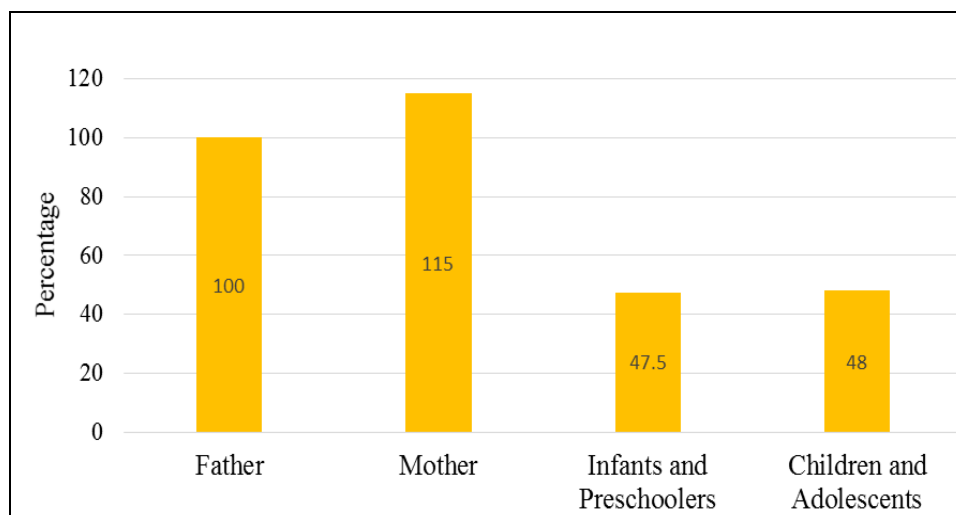
sugar was significantly higher by mothers and infants and preschoolers than fathers and older children (\* $f=2.970$ ,  $p < 0.05$ ) as compared with balanced diet (ICMR, 2011).



**Fig 9:** Mean% adequacy of SUGAR by families as compared with dietary guidelines for balanced diet (ICMR, 2011)

**Fats/oils:** In the present study, the average intake of fats and oils by the fathers ( $25.0 \pm 11.04$ g/d) and mothers ( $27.3 \pm 10.69$ g/d) was significantly higher than their children.

The consumption of fat was adequate in fathers and mothers. Most of the families were using mustard oil for cooking.



**Fig 10:** Mean% adequacy of Fats/Oils by families as compared with dietary guidelines for balanced diet (ICMR, 2011)

**Table 3:** Mean daily intake and mean percent adequacies of various food groups by families (n=40), as compared with Dietary Guidelines for Balanced Diet (ICMR, 2011)

Food group	Fathers (n=40)		Mothers (n=40)		Infants and Pre-schoolers (n=61)		Children and adolescents (n=22)		F-value
	Mean intake (g/d)	Mean% adequacy	Mean intake (g/d)	Mean% adequacy	Mean intake (g/d)	Mean% adequacy	Mean intake (g/d)	Mean% adequacy	
Cereals	317.5±74.0	84.5±34.45	238.0±41.08	88.1±54.05	37.7±26.05	16.0±7.83	184.9±66.45	62.4±16.3	7.111*
Pulses	60.6±61.95	80.1±56.32	57.7±58.01	88.9±80.54	6.5±4.92	30.0±9.81	38.4±7.79	58.2±8.07	14.429*
Milk	97.2±64.78	32.4±13.46	132.2±59.65	44.0±23.50	104.2±33.57	21.9±3.9	115.7±100.8	23.1±2.04	23.488*
Roots & tubers	208.2±117.18	104.2±83.45	204.0±112.48	102.0±67.44	19.3±12.18	28.3±11.4	73.8±20.3	60.5±13.0	22.534*
Green leafy vegetables	8.87±15.92	8.8±1.13	6.0±25.01	6.0±2.13	58.3±5.06	11.6±15.06	15.6±2.3	15.6±2.32	5.862*
Other vegetables	62.6±84.01	31.3±11.98	50.5±72.5	25.25±24.56	15.20±13.76	23.0±5.78	46.3±4.32	26.8±8.80	2.808*
Fruits	56.3±49.34	56.3±20.82	55.1±49.24	55.1±30.44	5.7±5.42	5.7±4.42	26.8±8.80	16.2±4.08	89.974*
Sugar	9.5±7.32	47.6±38.02	15.0±6.19	56.6±48.33	8.0±3.71	57.7±10.4	10.5±0.77	37.2±16.3	2.790*
Fat	25.0±11.04	100.0±0.00	27.3±10.69	115.5±102.32	17.5±4.33	47.1±8.2	17.1±4.56	48.0±16.6	19.455*
Meat/poultry	120.7±160.41	402.1±112.34	109.1±159.5	363.5±90.21	10.2±17.7	20.4±28.9	52.4±9.6	107.9±19.3	4.126*

\*, ANOVA test, F-value significant at  $p < 0.05$

### Conclusion

This study revealed that the prevalence of underweight was highest among children under five year due to poor food intake. However, the data from dietary intake clearly indicated that diets of adults in the family, both fathers and mothers, were nutritionally much better than children. The diets of younger children (7 months -5 years) were inadequate in most of the nutrients making them most vulnerable group followed by older children (children and adolescents). In the present study nearly one third of under five children and one fourth of mothers were underweight (low BMI).

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