Original Research Article

Comprehensive nutrient gap analysis of children (6-23 months) of selected villages of jambusar block in Bharuch district

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ABSTRACT

Background: The "First 1000 Days" are a period of rapid physical growth and enhanced mental development that provides a once-in-a-lifetime opportunity to create lifelong health and intelligence. These first 1000 days of life prepare a child for good health for the rest of their life. Quality of Complementary food plays very important role in maintaining growth and development of young children.

Materials and Methods: It was a University-NGO collaborative study so the study was conducted in the villages which comes under working of aatapi seva foundation in Jambusar block. In this study Jambusar block was purposively selected and the study was conducted in anganwadi centers of 5 villages where aatapi seva foundation is currently working. Total 232 children were enrolled in the study and data on Socio- economic status (HHs), Practices about Complementary feeding and three day 24 hour Dietary Recall. Nutrient gap analysis for 11 nutrients were carried out using RDA for children given by ICMR 2020

Results: The results of the study showed the all of the children had a percent nutritional deficit for all micronutrients. The energy deficit in 1-2 year old children was 48.8%, compared to 13.4% in the 6-12 month age group. Minimum meal frequency, dietary diversity, and acceptable diets were found to be 51 %, 71%, and 34%, respectively.

Conclusion: It can be concluded that breast feeding practices and complementary feeding practices needs to be strengthen among young mothers. Energy deficit was seen in all the children. Nutrient gap was found for all the micronutrients in all the children.

1. Introduction

Every child has the fundamental right to adequate nutrition. Children who are fed enough of the right foods, in the right amounts, and at the right time in their development have a better chance of surviving, growing, developing, and learning. They are better prepared to thrive in the face of disease, disaster, or crisis. Breastfeeding and access to a wide variety of healthy foods provide children with the necessary nutrients, vitamins, and minerals they need to grow to their maximum physical and cognitive potential between the ages of 6 and 23 months – the complementary feeding period – with benefits that last long into adulthood. The complementary feeding cycle is also an important opportunity to avoid all types of childhood malnutrition, such as stunting, wasting, micronutrient deficiencies, overweight, obesity, and diet-related non-communicable diseases. (UNICEF 2020)[1]

Globally, only 19% of children (6-23 months) are getting a minimum acceptable diet. We can see that 69% children (6-8 months) were introduced of solid, semi-solid or soft foods. Whereas, only 29% of children (6-

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23 months) receive minimum diet diversity (UNICEF, 2019).The NFHS-5 data shows that only 5.9% and 7.7% of children receive minimum adequate diet for Gujarat and Bharuch respectively. Whereas, NFHS-4 data of India shows that only 9.6% children has received minimum acceptable diet.

GAIN and UNICEF 2020 has come up with Comprehensive Nutrient Gap Analysis report. As per the report, nutrient requirements for an infant after the first six months exceed what breastmilk alone can supply. Along with breastfeeding, babies should be exposed to nutrient-dense firm, semi-solid, or soft foods at six months of age to satisfy growing nutrient requirements and ensure proper growth and development. Despite this, only 21% of infants and young children aged 6–23 months in India eat a diet that includes the required number of food groups, rising their risk of micronutrient deficiency and growth halting.

Findings from nationally representative and high-quality sub-national studies, grey literature, and journal papers on infant and young child feeding habits, micronutrient shortages, dietary intake, household use and spending, and food availability were analysed and summarised. The literature was reviewed to assess the burden of gap and the certainty of available evidence for 11 micronutrients typically deficient in the diets of young children. (Table 1)[2–6]

2. Objective

Comprehensive Nutrient Gap Analysis of children (6-23 months) and capacity building of frontline workers of selected villages of Jambusar block in Bharuch district

2.1. Specific objectives

1. To assess socio- demographic profile of households of children (6-23 months)
2. To document complementary feeding practices of children (6-23 months)
3. To document the utilization of services of Annaprasan diwas under ICDS programme by the mothers of children (6-23 months) To document the compliance of Balshakti supplied under ICDS programme.
4. To calculate the CONGA for selected macro and micro nutrients based on ICMR RDA 2020.

3. Materials and Methods

To fulfill the above objectives a University-NGO collaborative study was conducted in the villages which comes under working of aatapi seva foundation in Jambusar block. Aatapi Seva Foundation is a social developmental institute, incorporated under the companies act, 2013 (section 8) working towards holistic and sustainable community development through promotion and strengthening of community based organizations.

3.1. Location of the Study

Jambusar block was purposively selected and the study was conducted in anganwadi centers of 5 villages where aatapi seva foundation is currently working. These 5 villages are Daabha, Kareli, Kahanva, Piludra, Vedach.

3.2. Sample size

In this study, 13 Anganwadi centers of 5 villages where Aatapi seva foundation is working were enrolled. All the children aged between 6 months to 23 months who were registered in the anganwadi centers were included for the study.

3.3. Data collection tools

A pre-tested semi structured questionnaire in vernacular language was prepared. Data on socio demographic profile, anthropometric measurements and ANC information, utilization of Annaprasann diwas and compliance of Bal Shakti, complementary feeding practices was collected. Data on both quantity and quality of food given to the child was elicited through 3 day 24 hour dietary recall to assess CONGA (comprehensive nutrient gap analysis) and complementary feeding indicators.

3.4. Dietary information

Data on dietary practices of children was taken through a 24-hour dietary recall method. A three day dietary recall of quality and quantity of food consumed by all the children were collected. Standard cups and spoons were used to elicit information about the quantity of food consumed by children.

3.5. Breastfeeding information

The main focus was to assess nutrient gap among children of 6-23 months age, it is necessary to calculate breastmilk consumption by the child. Information on frequency of breastmilk given to child was taken in 24-hour dietary recall data to calculate nutrient contributed by breastmilk. The nutritive values of breastmilk was calculated according to Nutrition composition of human milk by Gopalan et al. 1989 (Table 2). We allocated breast milk volumes based on the child's age in months using the available literature. Information available through research paper by Butte et al.[3] 2010 was considered (Table 3).

3.6. Data collection

Six Arogya Sathis of Aatapi seva foundation who are from the same villages where the study area was who are supposed to carry out interpersonal counselling to vulnerable groups was trained to elicit required information using pretested semi structured questionnaire in

Table 1: Nutrient gaps and evidence ratings for children 6–23 months in India

	Iron	Vit A	Zinc	Vit $_{12}$	Folate	Ca	Niacin	Iodine	Vit B$_1$	Vit C	Vit B$_6$
Gap burden	High	Mod	Mod	Mod	Mod	Mod	Mod	Low	Low	Low	None
Evidence certainty	High	High	High	High	High	Mod	Low	High	Low	Low	Low

Table 2: Nutrient composition of Human milk (per 100g)

S.No.	Nutrients	Human Milk Composition
1.	Water (g)	88
2.	Energy (kcal)	65
3.	Protein (g)	1.1
4.	Carbohydrate (g)	7.4
5.	Fat (g)	3.4
6.	Calcium (mg)	28
7.	Phosphorus (mg)	11
8.	Vitamin-A (μg)	41
9.	Thiamine (mg)	0.02
10.	Riboflavin (mg)	0.02
11.	Caseinogen	1.2
12.	Vitamin-C (mg)	3

Table 3: Calculation for nutrient contribution by Breastmilk consumption.

S.No.	Category of Breastfeeding	Age	Average human milk consumption
1	Exclusively breastfed	6-11.9 months	600 ml/day
2	Partially breastfed	6-11.9 months	600ml/day – amount of other milk ingested
3	Partially breastfed	12-17.9 months	89ml/feed
4	Partially breastfed	>17.9 months	59ml/feed

Macronutrients	Micronutrients
Energy, Protein, Fat	Iron, Vitamin-A, Zinc, Vitamin-B12, Folate, Calcium, Niacin, Iodine, Vitamin-B1, Vitamin-B6, Vitamin-C

vernacular language to avoid unnecessary exposure due to COVID19 pandemic. Research Investigator had monitored and accompanied each ArogyaSathi during data collection phase.

3.7. Nutrient calculation

All the data of 24-hour dietary recall and breastfeeding was entered and analysed using DietCal software to arrive at per day and average nutrient intake by children. CONGA will be calculated for selected macro and micro nutrients based on recent RDA given by ICMR (2020).

Nutrients calculated using DietCal software

3.8. Statistical analysis

1. The data collected were entered and cleaned using Microsoft Excel version 15.

2. Data were analyzed using Excel.
3. Frequency distribution and the percentage was calculated for all quantitative parameters.

3.9. Highlights of findings

3.9.1. Findings about IYCN practices and utilisation of ICDS services are depicted in Table 4 below

1. According to the findings of 232 surveyed household s' socioeconomic data, 48.3 % of them fall into the general category. Nearly 68.5 % of households have a below poverty line card that allows them to receive public distribution services. 64.2 % of mothers had completed at least ten years of schooling.

2. Data on service utilization of ICDS (Integrated Child Development Scheme) showed that only 41.4% mothers are having knowledge about annaprashan diwas and 96.6% children received supply of balshakti packets regularly.

3. Breastfeeding was started early for 67.2 % of the children, which implies that they were put on the breast within one hour of birth. In contrast, 54.3 % of children were exclusively breastfed until they were six months old. At the completion of six months age, around 47% of children were introduced to complementary foods. (Table 4)

3.10. Nutrient Gap analysis

Median intake of nutrients such as protein, energy, niacin, vitamin-B6, folate, calcium, iron, and iodine shows a decrease as compared to mean intake of nutrients by children. (Table 5)

1. After comparing average intake of children with the RDA, percent nutrient gap was derived for all the children.

2. Percent energy gap was 13.4% among 6-12 months old children and 48.8% among 1-2 years old children. For 6-12 month old children, a high percent nutrient gap of nutrients such as Niacin, Vitamin-B6, Folate, zinc and iodine is seen. For 1-2 year old children, nutrients

Table 4: Coverage particulars and findings of various indicators

S.No.	Indicators	Total No.
1.	No. of Villages surveyed	5
2.	No. of Anganwadicenters Surveyed	13
3.	No. of Households surveyed	232
4.	No. of 6-8 months old children	32
5.	No. of 9-11 months old children	41
6.	No. of 12-24 months old children	159
	Demographic & Socio-economic Profile	**Percentage (%)**
7.	Community: Scheduled Tribe	9.1
8.	Community: Scheduled Caste	25
9.	Community: Other backward classes	17.7
10.	Community: General	48.3
11.	Economic status: APL	31.5
12.	Economic status: BPL	68.5
13.	Literacy among Mothers	64.2
	Utilization of ICDS services	
14.	Mothers who visits Anganwadicenters	88.8
15.	Mothers having knowledge about annaprashan divas	41.4
16.	Children getting Balshakti packets regularly	96.6
	Infant and Young Child Feeding (IYCF) Practices	
17.	Mothers who initiates breastfeeding within one hour of delivery	67.2
18.	Mothers who fed pre-lacteals to their child	32.8
19.	Mothers who have exclusively breastfed their child till 6 months of age	54.3
20	Mothers who initiates complementary food to their children at the completion of 6 months of age	47

**Table 5:** Mean and Median intake of Nutrients among all the children.

Nutrients	Mean Nutrient Intake		Median nutrient intake	
	6-12 months children	**1-2 years children**	**6-12 months children**	**1-2 years children**
Protein (g)	11.3	12.6	10.7	12.0
Energy (Kcal)	580	568.3	573.5	567.5
Thiamin (mg)	0.2	0.2	0.2	0.2
Niacin (mg)	0.5	1	0.4	0.9
B6 (mg)	0.1	0.1	0.0	0.1
Folate (μg)	11.6	24.9	7.3	20.9
Vitamin-C (mg)	17.7	11.2	18.2	10.6
Vitamin-A (μg)	242.8	142.2	249.4	141.2
Calcium (mg)	205.7	173.9	184.8	143.4
Iron (mg)	0.7	1.6	0.6	1.5
Zinc (mg)	0.4	1	0.4	0.9
Iodine (μg)	10.1	20.9	9.0	19.5

of concern were Niacin, Vitamin-B6, folate, iron, showing high nutrient gap. Whereas other nutrients also show more than 50% nutrient gap.

3. From the data nutrient gap of only 2 micronutrients Niacin and Folate showed significant difference in both the age groups.(p-value>0.05) (Table 6) (Figure 1)

4. Discussion

In the present study, we calculated the nutrient intake of young children based on average of food quantity consumed by children in 3 days including breast milk. The results showed the nutrient gap of Nutrients such as Niacin,
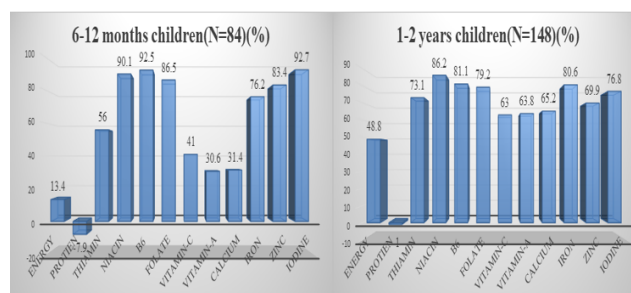
Fig. 1: Nutrient gap among 6 months to 2 years old children

Table 6: Average of percent Nutrient gap among 6-23 months old children

Nutrients	6-12 months children	1-2 years children
Energy	13.4	48.8
Protein	-7.9	-1
Thiamin	56	73.1
Niacin	90.1	86.2
B6	92.5	81.1
Folate	86.5	79.2
Vitamin-C	41.0	63.0
Vitamin-A	30.6	63.8
Calcium	31.4	65.2
Iron	76.2	80.6
Zinc	83.4	69.9
Iodine	92.7	76.8

Vitamin-B6, Folate, Iron, Zinc and Iodine are found in the diets of 6-12 months old children. Whereas, for 1-2 years old children almost all the nutrients are having more than 50% gap.

A study by Beal et al. 2021 showed high burden of nutrient gap for nutrients such as Iron, Zinc and Folate. A comprehensive nutrient gap analysis by GAIN-UNICEF 2020 showed the high nutrient gap burden of Iron and Moderate nutrient gap burden of Vitamin-A, Zinc, Folate, Calcium and Niacin. NIN report 2021 showed that the deficit intake reported to be high with respect to vitamin C (87%) followed by riboflavin (83%), calcium (77.5%), niacin (73.8%),vitamin A (71.8%) folic acid (62.9%) and iron (61.1%). [7–11]

5. Conclusion

It can be concluded that breastfeeding practices and complementary feeding practices needs to be strengthen more among young mothers as Infant and Young Child Feeding (IYCF) Practices was suboptimal. Nutrient gap was found for all the micronutrients among young children. Nearly half of energy deficit was seen in older 1-2 years old children. To achieve targets of POSHAN Abhiyan and SDG goal 3, we need to prioritised optimal practices of IYCN through multipronged strategies.

6. Conflict of Interest

None.

7. Source of Funding

None.

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