ASSOCIATION OF TIMING, FREQUENCY AND COMBINATION OF NUTRIENTS WITH UNDERWEIGHT OF CHILDREN IN GUJARAT

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ABSTRACT:

Underweight is a persistent worldwide public health concern, especially in South-East Asia and Sub-Saharan Africa. Factors affecting undernutrition are many. However, feeding with appropriate, adequate and safe complementary foods from the age of six months onwards leads to better health and growth outcomes in children. In this paper, we have examined the level of underweight in Gujarat and explored the impact of child feeding practices after adjusting socio-economic variables among children under five years of age. The paper is based on the Comprehensive Nutrition Survey (CNS) undertaken in Gujarat in the year 2014. As per the survey, the prevalence of underweight is 10.6% among children below five years of age. The multivariate analysis attributed the mother's BMI status to be significantly related to undernutrition among children. The prevalence of undernutrition was higher amongst children who do not consume a combination of cereals, pulses, milk and vegetables. The results indicate that the prevalence of undernutrition in Gujarat can be addressed by increasing the frequency, quantity and quality of complementary foods served through the ICDS programme.

Keywords: Timing, frequency, combination, nutrients, pulses, underweight

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INTRODUCTION

Globally, the number of children dying before reaching five years age has dropped from 12.6 million in 1990 to 5.6 million in 2016[1]. However, disparities in child mortality exist among the countries and in the regions[2-4]. In developing countries, most deaths are due to preventable causes and treatable diseases[5]. Malnutrition remains one of the vital underlying causes of child mortality, especially in developing countries[5, 6]. India contributes around 18% of the global under-five mortality rate, and about half of these were due to malnutrition[5, 7]. Malnutrition is defined as deficiencies, excesses or imbalances in a person's intake of energy and/or nutrients. The term malnutrition categorized as undernutrition, which includes stunting (low height for age), wasting (low weight for height), underweight (low weight for age) and micronutrient deficiencies or insufficiencies (a lack of vital vitamins and minerals) and overnutrition or obesity, indicated by Body Mass Index (BMI) >25. Worldwide, 165 million children below five years of age are affected with undernutrition[8, 9].

Underweight is a persisting worldwide public health concern, especially in South-East Asia and Sub-Saharan Africa. The prevalence is 33% per cent in South Asia, followed by 21% in Sub-Saharan Africa[10, 11]. Underweight is defined as the percentage of children aged 0 to 59 months whose weight for age is below minus two standard deviations (moderate and severe underweight) and minus three standard deviations (severe underweight) from the median of the WHO child growth standards.

In India, according to National Family Health Survey (NFHS)-4 (2015-16) more than one-third of the total children below five years of age were underweight[12]. Studies have shown that malnutrition at a younger age is associated with child mortality and morbidity. Malnutrition/ undernutrition has a debilitating effect on child growth as often leads to poor cognition skills and lower physical and mental growth among children[13, 14]. Moreover, undernutrition at a younger age has an impact on acquiring chronic diseases in the future[15].

Although the factors affecting undernutrition are many, the appropriate feeding practice and food security remain to be the prime reason for decline in underweight among children. Feeding with appropriate, adequate and safe complementary foods from the age of six months onwards leads to better health and growth outcomes in children. Globally, only 60% of children aged six to eight months receive solid, semi-solid or soft foods highlighting deficiencies in the timely introduction of complementary foods[16-20]. Dietary pattern, dietary intake and dietary quality distinguish the burden of malnutrition and disease burden among the various groups and regions[21-24]. A short duration of breastfeeding and mothers' utilization of bottle and hand for the feeding of additional foods were strong predictors of chronic undernutrition in children [25]. Pre-lacteal feeding was also one of the risk factors for undernutrition of children. Furthermore, the age of initiation of complementary feed is also significantly associated with being undernourished. Besides, socio-economic demographic factors such as mother's literacy, education, nutrition status and household wealth group are significantly associated with the undernutrition[26-28]

A study from Nepal indicates that poor socio-economic status were the risk factors for both stunting and being underweight [28]. Similar research from Ethiopia indicates that the problem of underweight Ethiopian children was rooted in socio-economic factors. The percentage of underweight amongst rural children was almost double to that of urban children[29, 30] reported that education played an important role as

educated mothers were more autonomous to make decisions on resource allocation to nourish their children. Male children were more underweight than female children. Clinical and public health studies showed that exclusive breastfeeding up to six months is associated with better health outcomes[31]. The benefits of exclusive breastfeeding include prevention of disease and infection during childhood, and it also improved the cognitive and motor skills among children[32, 33]. In a study from Ethiopia the main predictors of nutritional status of children were maternal education, mother's occupation, age of mothers, preceding birth interval, age of the child, sex of the child, source of drinking water and place of residence[34].

CONCERN OF THE PAPER

Although undernutrition continues to be high in India, there are inter-state and intra-state variations. It is a paradox that Gujarat, one of the economically developed states of India, has a higher prevalence of undernutrition compared to national estimate as well as compared to many other high focused Indian states[12]. In this paper, we have examined the status of underweight children below five years of age in Gujarat. The paper explored whether feeding practices and socio-economic situation of households were correlated to the prevalence of underweight in Gujarat.

DATA AND METHODS

The present paper is based on data collected by the Comprehensive Nutrition Survey in Gujarat (CNSG) during 2014. The survey was implemented by the International Institute for Population Sciences, Mumbai. The survey collected data on maternal and child health utilization, feeding practice, food insecurity and nutritional status of mother and children from the six administrative regions in Gujarat. The survey used the two-stage probability sampling method to sample 4,828 children below five years from 3,788 households.[35]

For this paper, the children whose weight-for-age was less than -2 Standard Deviation was defined as underweight. The data on the dietary pattern was collected on 24-hour recall period (the different time of the day), i.e. food intake of the children a day prior to the survey. All possible times of food intake were collected such as early breakfast, breakfast, late breakfast, lunch, evening snacks, dinner, late night dinner and others. For this paper, we have grouped the meals into three major categories - breakfast, lunch, and dinner. Hence, early breakfast and breakfast was grouped as breakfast, while late breakfast and lunch were combined as lunch and dinner include the evening snacks, dinner and late-night dinner. For each type of food, we have grouped the frequency of intake of cereals, milk, pulses, fruits and vegetables into three categories - - none, once and more than once.

The socio-economic and demographic predictors taken into consideration for the paper were childhood characteristics such as sex of the child (male and female) and status of birth (single and multiple); characteristics of mother - educational level (no education, primary, secondary and the higher), work status (working and not working), Body Mass Index (<18.5, 18.5-25 and 25+). While, the household predictors include caste (scheduled caste, scheduled tribe, other backward class and others), religion (Hindu, Muslim and others), wealth index (poor, middle and rich), place of residence (urban and rural) and administrative division (Ahmedabad, Bhavnagar, Gandhinagar, Rajkot, Surat, Vadodara).

The paper used bivariate and multivariate analysis to illustrate the relationship between a set of predictor

variables on underweight, which is dichotomous (underweight - yes or no). The predictor variables may be either categorical or in ratio scale.

FINDINGS:

Prevalence of underweight among children in Gujarat

Table 1 provides the level of underweight among children in three broad age groups, < 6 months, 6-23 months and 24-59 months by selected socio-economic and demographic characteristics. The data indicates the proportion of underweight children declines with the age of the child. The proportion of underweight among children in the 0-6 month age group was higher (40 percent) compared to rest of the two age groups (13 percent and 6 percent in 6-23 month and 24-59 month old children respectively).

There were around 11% underweight children in Gujarat, and the percentage varied by socio-demographic characteristics. Regardless of the age of the child, the proportion of underweight children was least among mothers with higher BMI. There was a marginal difference in underweight among children with respect to residence, mothers' education and wealth status. Interestingly, Ahmadabad and Vadodara regions of Gujarat showed a higher prevalence of underweight than other regions of the State (Map 1).

MAP 1: Percentage of children (6-59months) underweight by Administrative Division, Gujarat
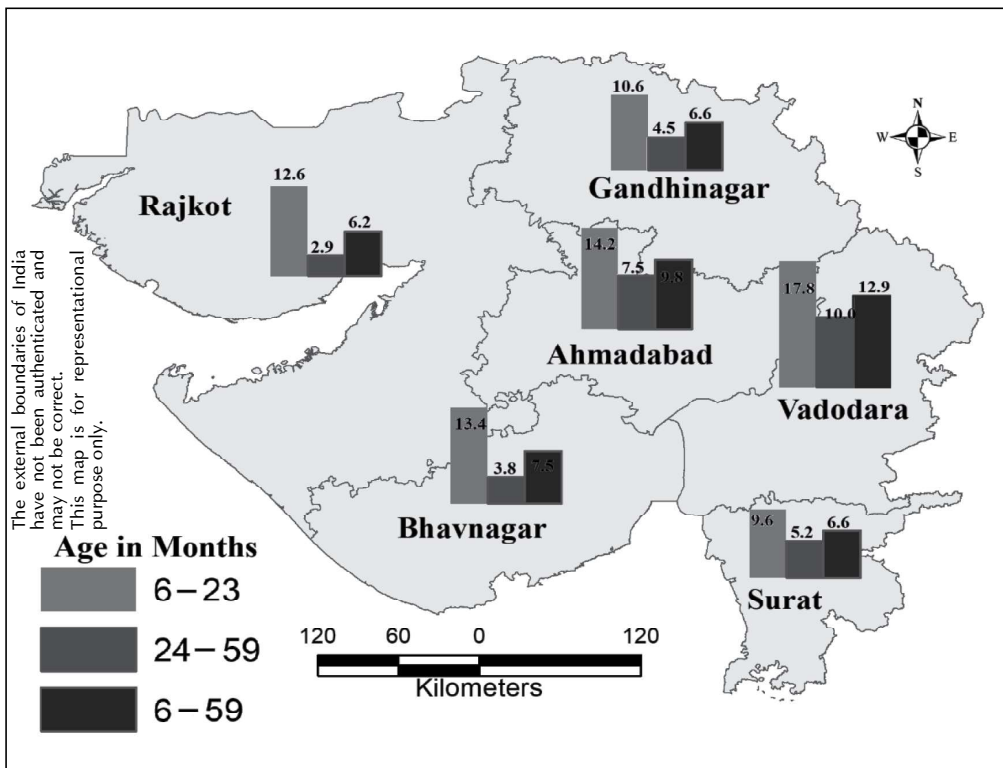
Feeding practices of children: Timing, frequency and combinations

Table 2 presents the consumption of meals at different times in a day. Among children aged 6-23 months, almost all were given early breakfast and breakfast. The percentage of children who had late breakfast and lunch was 91.2%. However, only 40% of children were given evening snacks, dinner and late dinner. Same was the trend in case of children aged 24-59 months and 6-59 months.

Table 3 presents the top five food items consumed by children aged 6-59 months at a different time of the day. The data showed that children aged 6-23 months during early breakfast were largely given milk (49.4%), tea (48%) and at times given biscuit (35%) and Roti* (15%). However, during breakfast, the food items consumed by children was roti (28%), khichdi** (21%), and rice (21%) along with green vegetables (26%). In the late breakfast, roti (29%) was the most common item consumed along with a green vegetable and pulses. About one-fifth of children were given roti (26%) and khichdi (23%) with a green vegetable (23%). Milk was largely consumed during dinner (50%) and late dinner (81%).

For children aged 24-59 months, early breakfast consisted of tea (72 %), biscuit (36%) and milk (35%) and roti (19%). During late breakfast (43.9%), lunch (31%), evening snacks (44.8%) and dinner (41%) the most common food item consumed with roti or rice was green vegetable curry. A sizeable proportion of children were given milk at dinner (37%) and late dinner (88 %). When we pooled the consumption data for children aged 0-59 months, tea emerged to be the most common food item consumed by children during early morning breakfast (64.2%), followed by milk and biscuits (35%). Whereas, green vegetables and roti or rice were the most common food items consumed during breakfast, lunch, evening snacks and dinner for the majority of children. Nevertheless, among those who had taken late dinner, 86% of children consumed milk.

Consumption of food items such as pulses, cereals, milk and milk products, vegetable and non-vegetable during different meal period is presented in **Table 4**. For the children aged 6-23 months, cereals consumption was highest during all meals, such as breakfast (89.6%), lunch (94.5%) and dinner (93.7%). Milk and milk products were consumed anytime by 93% of the children. However, it was largely consumed during the breakfast (91%) than during lunch (46%) or dinner (45%). Vegetables were largely consumed during lunch (42%) and dinner (43%) than in breakfast (24%). Consumption of fruit and non-vegetarian products such as poultry and meat was considerably low. Among children aged 24-59 months, the most common food item consumed during was cereals and milk and milk products. Nonetheless, milk and milk product were largely consumed during breakfast (96%) than in lunch (38%) or dinner (37%). Almost 90% of children consumed vegetables, and it was largely consumed during lunch or dinner (64%) rather than in breakfast (40%). Only 12% of children reported having consumed fruits at any time of the day. In contrast, intake of poultry and meat was considerably low (1%). When we pooled the consumption data for all children aged 6-59 months, the most frequent item consumed during breakfast was milk and milk product (95.3%) of children in breakfast, and only 3.5% of children consume fruits in breakfast. In lunch, most commonly food item consumed was cereals (97.8%), followed by green vegetables (57.6%), pulses (33%) and fruits

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* Roti means flat and rounded bread made of wheat flour
** Khichdi, is a dish from the Indian subcontinent, made from rice and lentils.

(7.2%). However, 40.5% children consume milk and milk product during lunchtime. Dinner mostly consisted of Cereals (94.8%) followed by vegetables (57.7%), milk and milk product (39.9%).

The frequency of nutrient intake in a day is presented in **Table 5**. Most of the children consume cereals thrice in a day across the age groups, and only 3% children aged 6-59 months had not consumed cereals in a day. In all the age cohorts, consumption of pulses was non-existent in the majority of children (52% and 44% among children aged 6-23 months and 24-59 months respectively). Very few children aged 6-23 months and 24-59 months consumed pulses twice or more than two in a day. Around 4% of children aged 6-59 months did not consume milk and milk products in a day. Among children aged 6-23, 38.2% consumed milk and related products only once in a day. While it was higher among children aged 24-59 months (46.1%). Consumption of milk and milk products thrice in a day was relatively higher among children aged 6-23 months (25%) than children 24-59 months (18%). Vegetables were not consumed by almost 40% and 12% of children in the ages 6-23 months and 24-59 months respectively. Nonetheless, green vegetables were consumed more than once by the older cohort of 24-59 months (45%) than the younger ones, aged 6-23 months (23%). Few children consumed fruits (11-12%) and fewer (1%) had poultry or meat products on the previous day.

We looked at the combination of food items consumed by the children by age as it provided an insight into the staple diet, which, to a large extent is a combination of household economic and cultural practices. **Table 6** illustrates the diversity of diet; however, a pattern did emerge from the data. A little more than one-third of children in the age group 6-59 months had meals that were a combination of cereals,

pulses, milk and vegetables and this was more pronounced among older than younger children (27 % younger cohort; 41% older cohort). There was another group of children (31%), whose diet was devoid of pulses and consisted of cereals, vegetables, milk and milk products, which was more common among 24-59 months (34%) than 6-23 months. About 7% of 6-59 months children's diet was a combination of milk and cereals, which was common among younger cohorts (14%) than the older cohorts (4%). Likewise, around 8% of the meals consisted of a combination of cereals, pulses and milk, which was common in younger (12%) than the older cohort (5%). Only 6% of the meals comprised of fruits in addition to cereals, pulses, milk/milk products, and this was slightly higher among older (7%) than the younger cohorts (4%). As evident from the previous tables, the consumption of pulses was limited, and is attributed to the purchasing power of the households.

Association of feeding practices with underweight children

We have tried to examine the association between feeding practices and underweight. **Table 7** provides the percentage of children underweight by the feeding practices. For understanding the nutritive value of food item on underweight, we have classified the frequency at these items were individually consumed and in combination. The results showed that the children who had taken cereals, pulses, vegetables, milk/milk products more frequently were found to be less underweight than those who took once or did not take at all. This pattern was the same for each age cohort. Similarly, we found that children who consumed non-vegetarian food or fruits were less underweight compared to their counterparts.

It is evident from **Table 8** that underweight in 6-23 months children were

least among those who had a combination of cereals, vegetables, pulses and milk/milk products as their diet than with the different type of food combination. On the contrary, in 24-59 months, underweight was least among those who had a mix of cereals, pulses, milk, vegetable and fruits in a day (4.9%) than those who had just cereals and milk (11%) or other combinations. We may conclude that meals comprising of milk, pulses and vegetables do contribute to reducing underweight among children.

Table 9 shows the contextual correlates of underweight among children in Gujarat. We have taken into consideration the socio-economic variables, timing and adequacy of food pattern and contents of food to understand the correlates of underweight among children below five years of age. The two models have been used to understand the specific role of different variables that affect the underweight status. Model 1 shows the role of timing of feeding on underweight after adjusting for socio-economic factors. Model 2 illustrates the role of combination of food intake in a day on underweight after adjusting socio-economic factors. The result showed that mother's BMI status, sex of the child and administrative region in which the household resided significantly determined the underweight status of the children in all the models in 6-59 age groups. The results indicate that a higher frequency of consuming vegetable reduces the risk of underweight among 6-59 months old (Model 1) At the same time, a combination of cereals, pulses, vegetables and milk/milk products reduces the risk of underweight status in children (Model 2).

DISCUSSION AND CONCLUSION:

The uniqueness of the present study is that it has examined timing, frequency, type of food and nutrients consumed by children in Gujarat. Food consumption by children is very skewed. Around one-fourth children do not having lunch and more than 50% dinner. This is a huge gap in meals, and hampers the growth of the children. As it is expected, all children are fed breakfast. However, the type of items for early breakfast, namely tea, biscuits, and roti are not very nutritious. All other meals consist of roti, shaak, rice, dal, khichdi and milk. We did not find much diversity in the food item given to children.

Data revealed that the consumption of milk was highest, followed by cereals and pulses. This may be attributed to the fact that under Gujarat's Doodh Sanjeevani Yojana, ICDS provides milk to children. The main cereal was roti, which happens to be the staple cereal of Gujarat and it is made from whole-wheat flour, jowar, bajra or maize depending upon the geographical location. The consumption of green vegetables and fruits was considerably low. This is in line with the data available from RSOC, which also indicates less intake of fruits and vegetables among children

The multivariate analysis does not illustrate any significant difference in the prevalence of undernutrition by social class and religious groups. These results are in line with studies carried out in Ethiopia and Zambia[36, 37]. Studies have confirmed that maternal nutritional status during pregnancy have a long term effect on its offspring. The results showed that the prevalence of undernutrition was higher amongst children whose mothers were short stature, having a BMI of less than 18.5 kg/m^2 than those with higher BMI levels. Non-availability of adequate food in the household may have prevented mothers to feed their children. The other reason could be an intergenerational flow of mothers' health on her offspring. The multivariate analysis showed that after controlling for all other variables, vegetable consumption is reducing the

underweight among children. Moreover, undernutrition was least among children consuming cereals, pulses, milk and vegetables than other combinations. Similar results were reported in other global studies[37, 38].

In the CNSG survey, the prevalence of underweight among children below five years of age was 11% and highest in the age group of 0-6 months (39.2%) which declined with increase in the age of the child. CNSG showed a lower prevalence of underweight (11 %) when compared to RSOC and NFHS 4 data (38.5%). The decline of prevalence can be attributed to newer initiatives started by the Gujarat government, such as Mothers Absolute Affection (MAA) program, which was meant to promote Infant and Young Child Feeding (IYCF) practices. In Gujarat, ICDS provides meals three times a day to the children. Revising the duration of Integrated Management of Neonatal and Childhood Illness (IMNCI) training from seven to nine days may have

had a bearing on IYCF practices in the community. The training of Accredited Social Health Activists (ASHAs), health and ICDS functionary and celebration of Village Health Nutrition Day (VHND), may have also contributed in reducing underweight status in the state.

The findings of this study are highly relevant for a communication strategy for improving the nutrition of children by emphasizing the timing and frequency of meals of children with a better combination of nutrients. This strategy will help to achieve the desired results in the POSHAN Abhiyan.

Nonetheless, there is a need to reduce the regional imbalances in undernutrition. We suggest that strengthening of ongoing ICDS programme should be geared towards increasing frequency, quantity and quality of complementary feeding and thereby lead to a further reduction in undernutrition in Gujarat.

TABLE 1

Percentage of children (6-59months) underweight by background characteristics, Gujarat

Background Characteristics	6-23		24-59		6-59	
	Percent	N	Percent	N	Percent	N
Caste						
SC	13.1	314	6.2	603	8.5	917
ST	13.7	270	7.2	523	9.4	793
OBC	14.1	676	5.9	1201	8.9	1877
Others	11.0	282	3.9	479	6.4	761
Religion						
Hindu	13.4	1391	6.0	2516	8.7	3907
Muslim	10.4	137	4.7	274	6.6	411
Others	17.6	14	0.0	16	8.6	30
Mother's education						
No education	13.1	426	7.8	940	9.4	1366
Primary	14.4	199	4.6	401	7.8	600
Secondary	13.3	745	4.9	1256	8.0	2001
Higher	11.9	172	5.7	209	8.4	381
Mother's work status						
Not working	13.8	1382	5.4	2478	8.4	3860
Working	7.3	160	9.0	328	8.7	488

Background Characteristics	6-23		24-59		6-59	
	Percent	N	Percent	N	Percent	N
Wealth Index						
Poor	11.8	648	6.2	1212	8.1	1860
Middle	14.8	322	5.2	578	8.7	900
Rich	13.8	572	5.7	1011	8.7	1583
Mother's BMI#						
<18.5	18.0	415	8.3	703	11.8	1118
18.5-24.9	12.0	930	5.0	1717	7.5	2647
>=25.0	8.4	176	4.1	336	5.6	512
Sex of the child						
Male	19.0	844	6.3	1457	10.9	2301
Female	6.4	698	5.3	1349	5.7	2047
Status of Birth						
Single	13.0	1525	5.7	2743	8.3	4268
Multiple	29.4	17	9.7	63	13.9	80
Place of Residence						
Urban	13.6	956	6.9	1818	9.2	2774
Rural	12.7	586	4.5	988	7.5	1574
Total	13.1	1542	5.9	2806	8.4	4348

Note: # Excludes mothers who were pregnant at the time of survey

TABLE 2

Percentage of children aged 6-59 months have consumed food in different time of the day

Time	6-23	24-59	6-59
Taken Food	88.5	97.9	94.6
Early breakfast	95.9	99.6	98.4
Breakfast	92.9	97.6	96.0
Late breakfast	88.9	96.8	94.1
Lunch	68.7	76.8	74.1
Evening snacks	39.6	44.9	43.1
Dinner	11.8	14.8	13.8
Late Dinner	2.7	4.1	3.6
Early Breakfast and Breakfast	99.7	100	99.9
Late breakfast and Lunch	91.2	96.9	95.0
Evening Snacks, Dinner and late dinner	40.1	45.1	43.4
N	1393	2797	4190

Table 3

TABLE 3

Top five food items among children aged 6-59 months who have taken food in different time of the day

Time	Top 1		Top 2		Top 3		Top 4		Top 5	
	Item	Percent	Item	Percent	Item	Percent	Item	Percent	Item	Percent
Children aged 6-23 months										
Early breakfast	Milk	49.4	Tea	48.1	Biscuit	34.9	Roti	15.2	Khichdi	2.2
Breakfast	Roti	28.3	Shaak*	24.5	Khichdi	20.5	Rice	20.5	Biscuit	11.6
Late breakfast	Roti	29.4	Shaak	28.8	Dal	22.0	Batata/potato	21.4	Khichdi	19.3
Lunch	Milk	27.1	Roti	25.8	Khichdi	23.3	Shaak	22.8	Rice	12.1
Evening snacks	Shaak	34.9	Roti	32.4	Khichdi	30.4	Milk	24.6	Rice	17.7
Dinner	Milk	50.3	Roti	30.3	Shaak	27.9	Khichdi	10.3	Rice	9.7
Late dinner	Milk	81.1	Shaak	10.8	Fruit	8.1	Roti	5.4	Khichdi	2.7
Children aged 24-59 months										
Early breakfast	Tea	71.9	Biscuit	36.0	Milk	28.6	Roti	21.2	Shaak	2.3
Breakfast	Roti	40.0	Shaak	37.9	Dal	21.8	Rice	21.5	Khichdi	12.7
Late breakfast	Shaak	43.9	Roti	40.2	Rice	24.8	Dal	24.4	Khichdi	15.3
Lunch	Shaak	34.7	Roti	30.7	Khichdi	22.4	Tea	17.0	Milk	13.5
Evening snacks	Shaak	49.2	Roti	41.8	Khichdi	27.0	Rice	15.1	Dal	14.9
Dinner	Shaak	46.3	Roti	44.1	Milk	32.0	Khichdi	11.1	Fruit	6.7
Late dinner	Milk	87.8	Fruit	5.2	Shaak	2.6	Dal	1.7	Chips/wafer	1.7
Children aged 6-59 months										
Early breakfast	Tea	64.2	Biscuit	35.7	Milk	35.3	Roti	19.3	Shaak	2.0
Breakfast	Roti	36.2	Shaak	33.6	Dal	21.3	Rice	21.1	Khichdi	15.2
Late breakfast	Shaak	39.2	Roti	36.8	Rice	24.0	Dal	23.6	Khichdi	16.5
Lunch	Shaak	31.1	Roti	29.2	Khichdi	22.8	Milk	17.6	Tea	15.2
Evening snacks	Shaak	44.8	Roti	39.0	Khichdi	28.0	Milk	17.6	Rice	15.9
Dinner	Shaak	40.9	Roti	40.0	Milk	37.2	Khichdi	10.9	Rice	6.9
Late dinner	Milk	86.2	Fruit	5.3	Shaak	4.6	Roti	2.0	Rice	2.0

* Gujarati dish prepared from potato as base and spices. Some time it is also mixed with other vegetables. People also name it as vegetable curry.

TABLE 4

Percentage of children aged 6-59 months who have consumed nutrients in different time of the day

Nutrients	6-23				24-59				6-59			
	Breakfast	Lunch	Dinner	Anytime	Breakfast	Lunch	Dinner	Anytime	Breakfast	Lunch	Dinner	Anytime
Cereals	89.6	94.5	93.7	94.2	95.4	99.3	95.3	98.7	93.5	97.8	94.8	97.2
Pulses	21.6	29.6	18.5	48.0	24.9	34.6	17.8	55.8	23.8	33.0	18.0	53.2
Milk and Milk products	91.0	46.3	44.9	92.9	95.9	37.7	36.9	97.0	95.3	40.5	39.3	95.7
Vegetables	24.7	42.4	43.2	59.7	40.0	64.7	63.8	88.3	34.9	57.6	57.7	78.8
Fruits	4.0	7.6	2.9	10.9	3.2	7.0	5.5	11.6	3.5	7.2	4.7	11.4
Non-Veg	0.4	0.7	0.2	1.1	0.6	0.5	0.9	1.1	0.5	0.5	0.7	1.1
N	1389	1267	554	1393	2797	2706	1255	2797	4186	3973	1809	4190

TABLE 5
Percentage distribution of children aged 6-59 months by the frequency of nutrients intake in a day

Food consumption	6-23	24-59	6-59
Cereals			
No	5.8	1.3	2.8
Once in a day	4.9	1.7	2.8
Twice in a day	15.8	10.1	12.0
Thrice and more	73.6	86.9	82.4
Pulses			
No	52.0	44.2	46.8
Once in a day	39.1	43.1	41.7
Twice or more	9.0	12.7	11.4
Milk and Milk products			
No	7.1	3.0	4.3
Once in a day	38.2	46.1	43.4
Twice in a day	30.2	32.5	31.7
3+	24.6	18.4	20.5
Vegetables			
No	40.3	11.7	21.2
Once in a day	37.3	42.8	40.9
Twice or more	22.5	45.5	37.8
Fruits			
No	89.1	88.4	88.6
Once and more	10.9	11.6	11.4
Non-Veg			
No	98.9	98.9	98.9
Yes	1.1	1.1	1.1
N	1393	2797	4190

TABLE 6

Percentage distribution of children aged 6-59 months by the consumption of combination of nutrients in a day

Food consumption	6-23	24-59	6-59
Cereals Only	3.4	0.1	1.2
Milk and Milk products Only	5.5	1.2	2.7
Cereals and Pulses	0.7	0.3	0.4
Cereals, Milk and Milk products	13.7	3.5	6.9
Cereals and Vegetables	1.5	1.3	1.4
Cereals and Fruits	0.2	0.0	0.1
Cereals, Pulses, and Milk	12.2	5.1	7.5
Cereals, Pulses, and Vegetables	1.1	1.1	1.1
Cereals, Pulses, and Fruits	0.1	0.0	0.0
Cereals, Pulses, Milk, and Vegetables	27.3	40.9	36.4
Cereals, Pulses, Milk and Fruits	2.3	0.8	1.3
Cereals, Pulses, Milk and Non-veg	0.0	0.1	0.1
Pulses and Milk	0.2	0.0	0.1
Cereals, Milk and Milk products, Vegetables	22.8	34.3	30.5
Cereals , Milk and Milk products, Fruits	1.8	0.3	0.8
Cereals, Pulses, Milk and Milk products, Vegetables, Fruits	4.0	7.4	6.2
Cereals, Milk and Milk products, Vegetables, Non-veg	0.5	0.4	0.5
Cereals, Pulses, Milk and Milk products, Vegetables, Non-veg	0.2	0.1	0.1
Cereals, Milk and Milk products, Vegetables, Fruits	2.3	2.8	2.6
Cereals, Milk and Milk products, Vegetables, Fruits, Non-veg	0.0	0.1	0.1

TABLE 7

Percentage of children (aged 6-59 months) underweight by the frequency of nutrients intake in a day

Frequency of Food consumption	6-23	24-59	6-59
Cereals			
No	20.3	8.8	16.1
Once in a day	16.7	4.2	11.4
Twice in a day	11.1	5.8	8.1
Thrice and more	10.9	6.0	7.4
Pulses			
No	12.8	5.4	8.1
Once in a day	10.4	5.5	7.1
Twice or more	10.1	9.2	9.4
Milk and Milk products			
No	14.1	5.3	10.3
Once in a day	12.8	6.5	8.3
Twice in a day	9.2	6.1	7.1
3+	12.2	4.5	7.5
Vegetables			
No	14.1	8.1	11.9
Once in a day	11.1	5.5	7.2
Twice or more	8.4	5.8	6.3
Fruits			
No	11.5	6.0	7.9
Once and more	12.2	5.3	7.5
Non-Veg			
No	11.7	6.0	7.9
Yes	7.1	3.1	6.4
Total	**11.6**	**5.9**	**7.8**

TABLE 8

Percentage of children (aged 6-59 months) underweight by the consumption of combination of nutrients in a day

Combination of Food consumption	6-23	24-59	6-59
Cereals, Pulses, Milk, Vegetables	8.1	6.1	6.6
Cereals, Milk and Milk products, Vegetable	9.8	5.2	6.3
Cereals, Pulses, Milk	12.0	11.4	11.8
Cereals, Milk and Milk products	15.8	7.2	12.8
Cereals, Pulses, Milk and Milk products, Vegetables, Fruits	13.0	4.9	6.6
All other combinations	15.1	5.7	10.7
Total	**11.6**	**5.9**	**7.8**

TABLE 9

Odds ratio showing the effect of feeding practices on the underweight among children aged 6-59 months, Gujarat

Feeding Practices	6-23		24-59		6-59	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
Mother's BMI#						
<18.5®						
18.5-24.9	0.666**	0.650**	0.631**	0.623***	0.627***	0.626***
>=25.0	0.585	0.565*	0.603	0.595*	0.563**	0.551***
Sex of the child						
Male®						
Female	0.220***	0.217	0.813	0.818	0.459***	0.458***
Administrative Division						
Ahmadabad®						
Bhavnagar	0.688	0.628	0.306***	0.311***	0.549***	0.516***
Gandhinagar	0.620	0.573*	0.396***	0.405***	0.525***	0.501***
Rajkot	0.725	0.686	0.331***	0.337***	0.529***	0.504***
Surat	0.613	0.567*	0.649	0.695	0.654*	0.639**
Vadodara	1.267	1.217	1.399	1.375	1.299	1.284
Food consumption						
Cereals						
No®						
Once in a day	1.029		0.653		0.888	
Twice in a day	0.751		1.198		0.795	
Thrice and more	0.900		1.231		0.869	
Pulses						
No®						
Once in a day	0.844		1.085		0.898	
Twice or more	0.839		1.505		1.051	
Milk and Milk products						
No®						
Once in a day	1.235		1.051		0.977	
Twice in a day	0.895		0.936		0.787	
3+	0.975		0.876		0.834	
Vegetables						
No®						
Once in a day	0.754		0.645		0.577***	
Twice or more	0.535**		0.913		0.544***	
Fruits						
No®						
Once and more	1.350		1.179		1.239	
Non-Veg						
No®						
Yes	0.712		0.664		0.624	
Combination of Food Consumption						
Cereals, Pulses, Milk, Veg®						
Cereals, Milk and Milk Products, Veg		1.136		0.966		1.013
Cereals, Pulses, Milk		1.638		1.691*		1.849***
Cereals, Milk and Milk products		2.094**		1.147		2.183***
Cereals, Pulses, Milk and Milk products, Veg, Fruits		2.248*		1.088		1.285
All other combinations		1.812**		1.120		1.774***
Constant	0.400	0.213***	0.177**	0.178***	0.447*	0.187***

Note: ®: Reference group; ***, **, *: <1%, 5% and 10% level of significance respectively. Model 1 shows odd of food frequency after adjusting for maternal education, work status, wealth quintile, social group, religion, and place of residence. Model 2 shows combination of items after adjusting for maternal education, work status, wealth quintile, social group, religion, and place of residence.

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