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Food Consumption Pattern of Adolescents in Delhi-NCR Born Full-term with Low Birth Weight with Reference to the New Estimated Average Requirement

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ABSTRACT

Introduction: Nutrition and lifestyle transition in India have attributed to the burden of malnutrition in early life. Evidence suggests that children born Low Birth Weight (LBW) are at increased risk of later life diseases.

Aim: The study aims to describe the nutrient intake of term LBW children with reference to the new estimated average requirement.

Materials and Methods: This questionnaire based cross-sectional study was conducted in the premises of Institute of Home Economics, Delhi, India. Dietary intake data for 139 full-term LBW children (9-12 years) was collected using 24-hour recall. Nutrient and food group intake was analysed using DietCal software (version 10). Gender differences in dietary intake were assessed using Mann-Whitney U test. Proportion of children with micronutrient intake below Estimated Average Requirement (EAR) was also estimated. Data was analysed using Mann-Whitney U test and Chi-square test.

Results: The protein intake of more than 50% children provided 10-15% of energy. Carbohydrate contributed to less than 55% of day's energy while energy from fat was more than 30% for majority of children. Percentage of children with inadequate micronutrient intake ranged from 44.6% for Vitamin C to 100% for Vitamin B12 and Vitamin D. A high proportion of children had low consumption of green leafy vegetables, nuts, oilseeds, and fleshy foods. The intake of milk and milk products were significantly higher in boys as compared to girls (p=0.02).

Conclusion: There is a transition from carbohydrate dense foods to high fat processed foods that are inadequate in micronutrients. Findings highlight the need for an intensive public health approach to improve the diet quality of the Indian population.

Keywords: Childhood, Diet, Macronutrients, Micronutrients, National capital region

INTRODUCTION

India has been facing a problem of dual burden of malnutrition [1]. Industrialisation, economic development and market globalisation has led to socio-demographic changes [2]. With accelerated migration from rural areas for economic reasons and improving standards of living, incomes have improved and access to food availability and dietary practices resulting in a transition from traditional staples to more 'westernised' diets. Consequently, children are being overfed with high calorie but micronutrient deficient foods [3]. Food intake without proper selection coupled with a decrease in energy expenditure due to lack of physical activity [3] have resulted in a 'triple burden of malnutrition' [4] and Indian children are not only at an increased risk of under and overnutrition but also micronutrient deficiencies [5]. This is exacerbated with a high burden of children being born with LBW (<2.5 kg) [6].

According to foetal origin of disease theory, children born LBW when exposed to lifestyle and nutrition transition are likely to become overweight and obese increasing their risk of metabolic diseases in later life [7]. With one third of country's children being born low birth, this study is relevant in the Indian context [6].

To the best of our knowledge, there is no data on the nutritional intake of Indian children born LBW at term. Earlier, Recommended Dietary Allowances (RDA) was used as a single value for all nutrients. With RDA there is a risk of excessive intake of nutrients. As nutrient requirements have changed, over the years specifically for individuals and populations, EAR of Indians have been brought out for the first time in India by Indian Council of Medical Research (ICMR) in 2020. The EAR is used for the assessment of nutrient intake of the population, while RDA evaluates nutrient intake of individuals [8].

This study attempts to assess the nutritional intake of these children with reference to the EAR, average daily nutrient intake level estimated to meet the requirements of half of the healthy individual in a particular life stage and gender group for Indian children [8]. Based on this assessment, strategies and policies can be devised with a three-pronged approach to prevent the vicious cycle of undernutrition, overnutrition and micronutrient deficiency that may have been initiated in childhood.

MATERIALS AND METHODS

The questionnaire based cross-sectional study was conducted in the premises of Institute of Home Economics, New Delhi, India. during the period of April 2019 to September 2019. All the participants of the Delhi Infant Vitamin D Supplementation Study (DIVIDS-2 study) [9] residing in the underprivileged areas of Delhi-NCR, now aged 9-12 years were invited to join the DIVIDS-3 study which is the third follow-up of the original DIVIDS birth cohort.

The study was approved by the Institutional Ethics Committee of Institute of Home Economics (University of Delhi) (Ethical Clearance Number-IHE/2018/1146). Written/thumb print informed consent and assent was obtained from the parents and the children respectively, before the commencement of the study.

Inclusion criteria: Only those children who were accompanied by their primary caregivers, residing in the same household having knowledge of their child's dietary intake were selected for the study.

Exclusion criteria: Children who were not accompanied by a household member and without a record of foods eaten in the previous day were excluded from the study.

Sample size calculation: Sample size calculations were based on mean usual intakes of children in India [10-12] [Annexure-1].

Since micronutrient intakes are poor in this population, sample size requirement for key micronutrient intakes were calculated using the formula

$$n=\frac{e^2}{s^2}$$

where s is the standard deviation of the nutrient intake of interest, and e is the standard error, based on mean intakes with 95% confidence interval and accounting for an attrition rate of 20% [13]. One hundred thirty-nine interactive 24-hour recalls were adequate for the study.

Demographic characteristics: The socio-demographic information of the children was collected from the parents/caregivers of the study participants. Details pertaining to the child's age and education, contact details, parental education and occupation and house ownership were obtained through an interviewer administered structured questionnaire

Dietary Assessment

The 24 hours recall was chosen to collect dietary data due to its feasibility, non invasive property, low cost as well as comprehensive and real time interaction with the participants [14]. Dietary recall was collected by professional nutritionists to assess the type and amount of food consumed by the child. The 24-hours recall consisted of two days of dietary recall of which one was a working day and the other a weekend. Data was not collected at the time of illness or festivities. A standardised validated questionnaire frequently used by nutritionists was used to collect dietary data [Annexure-1,2] [15]. The parent/guardian of the child was given prior instructions to keep a food record of all the foods consumed by the child on the two designated days to reduce recall bias.

The parent or the guardian responsible for cooking in the household was interviewed in the presence of the child, to recall, identify and quantify the food or beverage consumed in the past 24 hours, i.e., from the first food/beverage consumed from the moment they woke up until the last food/beverage consumed at bedtime. Details pertaining to the time of meal, type of dish with quantity, ingredients and the techniques of food preparation were also gathered. For quantification of portion sizes, standard household measuring cups, spoons, glass, and photographic models were used. In case of any packaged food, the details including the brand name, quantity consumed, Maximum Retail Price (MRP) [Annexure-3]. A market survey was carried out to list the commonly consumed packaged foods available to the sample population. The respondent and the child were continuously probed to reduce recall bias. The raw ingredients used in the recipes were standardised at the Food and Nutrition Laboratory, Institute of Home Economics, New Delhi, India. Salter (Model no. 1017), electronic kitchen scale with a sensitivity of 0.001kg was used for weighting of food samples and the beverages. The macro and micronutrient content of the composite foods was determined using DietCal software (version 10), a software developed to estimate the nutrient content of foods consumed using extended Indian Food Composition Table 2017 [16].

Data entry and processing: The Indian food composition database covers all the primary foods sampled from across the country. For any packaged food item consumed by the child but not included in the software, the nutritive information per 100 grams on the label was added to the database. Once the database was completed, details of the food consumed, and quantities as specified by the participants were entered. For each child, the nutritive values from the two days of dietary recall were averaged and used for analysis.

STATISTICAL ANALYSIS

Data processing and statistical analysis was conducted using STATA 13.0 for PC windows. Since the data was not normally distributed, the median, 25th and 75th percentiles of food groups and nutrient intakes were determined and comparisons for the same were made using the Mann-Whitney U test. The macronutrient intakes as percentages of energy were compared with the recommendations. For micronutrient intakes, the proportions of children having intakes below the corresponding EAR threshold were assessed. The Chi-square test was used for comparison of micronutrient inadequacy among boys and girls (p-value <0.05).

RESULTS

[Table/Fig-1] presents the socio-demographic details of the participants. Of a total of 139 children enrolled in the study, 51% were girls with mean age of 11.0 (0.8) years. A large proportion of families of these children lived in self-owned houses consisting of 1-2 rooms in the underprivileged areas of Delhi. While 78.4% mothers were homemakers, 53.2% fathers were salaried employees and 32.4% self-employed.

Characteristics	Boys (n=68, %)	Girls (n=71, %)	Total (n=139, %)
Age (years) mean (SD)	10.8 (0.8)	11.0 (0.8)	10.9 (0.8)
School type†			
Private	24 (35.3)	34 (48.6)	58 (42.0)
Government	44 (64.7)	36 (51.4)	80 (58.0)
Father's education			
None or pre-primary	6 (8.8)	11 (15.5)	17 (12.2)
Primary or middle	34 (50)	36 (50.7)	70 (50.4)
Secondary or senior secondary	13 (19.1)	23 (32.4)	36 (25.9)
University	14 (20.6)	1 (1.4)	15 (10.8)
Not applicable	1 (1.4)	0 (0)	1 (0.7)
Mother's education			
None or pre-primary	7 (10.3)	19 (26.8)	26 (18.7)
Primary or middle	23 (33.8)	26 (36.6)	49 (35.2)
Secondary or senior secondary	29 (42.6)	24 (33.8)	53 (38.1)
University	9 (13.2)	2 (2.8)	11 (7.9)
Father's occupation			
Self employed	21 (30.9)	24 (33.8)	45 (32.4)
Daily wager	5 (7.4)	6 (8.5)	11 (7.9)
Salaried employment	35 (51.4)	39 (54.9)	74 (53.2)
Unemployed	4 (5.9)	1 (1.4)	5 (3.6)
Not applicable	3 (4.4)	1 (1.4)	4 (2.9)
Mother's occupation			
Housewife	48 (70.6)	61 (85.9)	109 (78.4)
Self employed	6 (8.8)	2 (2.8)	8 (5.8)
Salaried employment	14 (20.6)	8 (11.3)	22 (15.8)
House ownership			
Own house	55 (80.9)	41 (57.7)	96 (69.1)
Rented accommodation or living with relatives	13 (19.1)	30 (42.3)	43 (30.9)
Number of rooms			
1-2	47 (69.1)	55 (77.5)	102 (73.4)
3-4	17 (25.0)	15 (21.1)	32 (23.2)
>4	4 (5.9)	1 (1.4)	5 (3.5)

[Table/Fig-1]: Baseline characteristics of participants of the study; n (%) *Mean (SD), †n=138, 1 missing

Half of the fathers were educated till primary or middle school and 38% mothers completed secondary or senior secondary school. All the children in the study went to school with more than 50% of the children studying in government schools.

Nutrient Intake of children: Median nutrient intakes of children are presented in [Table/Fig-2]. The median intake of energy in this population was 1467 (1216, 1796) Kcal, with boys consuming significantly higher calories than girls (p-value=0.0012). Boys also showed a significantly higher intake of protein (p-value=0.0064), carbohydrates (p-value=0.0012) and fat (p-value=0.0069). Consumption of micronutrients like calcium (p-value=0.0018), iron (p-value=0.0171), vitamin B6 (p-value=0.0191), magnesium (p-value=0.0440), was also significantly higher amongst boys. Intakes of vitamin B12 however, were negligible, amongst boys and girls (p-value=0.2970). The micronutrient intakes of zinc (p-value=0.0620), thiamine (p-value=0.0516), riboflavin (p-value=0.1426), niacin (p-value=0.1392), folate (p-value=0.869) and vitamins A (p-value=0.5997), and D3 (p-value=0.9278) were not significantly different amongst boys and girls.

Nutrients	Boys (68) (Median and interquartile range unless specified)	Girls (71) (Median and interquartile range unless specified)	Average total	p-value
Energy (Kcal)	1586 (1347.4, 1922.9)	1350.8 (1038.5, 1653.7)	1467 (1216, 1796)	0.0012*
Protein (mg)	41.3 (34.6, 49.8)	36.3 (26.6, 44.6)	38.8 (32.04, 48.11)	0.0064*
Carbohydrate (g)	196.4 (175.5, 236.4)	169.2 (137.8, 206.6)	187.1 (152.6, 228.2)	0.0012*
Fat (g)	63.4 (50.7, 73.4)	52.7 (38.2, 67.9)	56.7 (44.9, 70.986)	0.0069*
Calcium (mg)	528.6 (337.5, 693.7)	368.7 (253.0, 528.1)	447.4 (290.2,653.7)	0.0018*
Iron (mg)	7.9 (6.23, 10.8)	7.0 (5.3, 8.1)	7.2 (5.8, 9.2)	0.0171*
Ascorbic acid (mg)	43.1 (25.7, 64.5)	52.8 (27.8, 78.8)	48.6 (27.3, 72.7)	0.1200
Zinc (mg)	4.7 (3.7, 6.2)	4.2 (3.4, 5.3)	4.4 (3.5, 5.9)	0.0620
Thiamine (mg)	0.61 (0.47, 0.82)	0.5 (0.4, 0.6)	0.58 (0.44, 0.58)	0.0516
Riboflavin (mg)	0.34 (0.25, 0.47)	0.3 (0.2, 0.3)	0.33 (0.25, 0.43)	0.1426
Niacin (mg)	5.77 (4.2, 7.4)	5.3 (4.0, 6.4)	5.54 (4.14, 6.6)	0.1392
Folate (ug)	147.8 (110.3, 191)	155.8 (98.2, 217.3)	154.7 (108.5,198.4)	0.869
Vitamin B6 (mg)	0.77 (0.57, 1.01)	0.6 (0.5, 0.8)	0.69 (0.54, 0.92)	0.0191*
Vitamin B12 (µg)	0 (0, 0.04)	0 (0, 0.4)	0 (0, 0.75)	0.2970
Vitamin A (µg RE)	73.7 (13.7, 139.9)	79.9 (33.8, 122.9)	77.9 (28.1, 131)	0.5997
Vitamin D3 (IU)	7.4 (0, 28.74)	10.8 (0, 20.1)	8.4 (0, 25.32)	0.9278
Magnesium (mg)	196.4 (152.6, 268.2)	184.2 (136.3, 221.4)	191.8 (141.3, 244.2)	0.0440*

[Table/Fig-2]: Median intake of nutrients of boys and girls aged 9-12 years from underprivileged areas of Delhi.
Kcal: Kilocalories; g: Grams; mg: Milligrams; µg: Micrograms; RE: Retinol equivalent; IU: International unit; Median and Interquartile range unless specified; p-values were calculated using Mann-Whitney U test; *p-values <0.05

Macronutrient intakes compared with the nutritional recommendation (ICMR, 2020) [Table/Fig-3] depicts the proportion of children based on contribution of various macronutrients as percent of energy. The acceptable range of dietary protein and carbohydrate intake has been set between 10-15% and 55-60% of energy, respectively for children [8]. According to the recommendation, fat should contribute to 25-30% energy in the diet. However, in the present study, most of the children were consuming diets with fat providing >30% energy putting them at a high risk of obesity and chronic disease.

Micronutrient Intake compared with the reference Estimated Average Requirement (EAR) (ICMR, 2020): Distribution of children with micronutrient intake below EAR is summarised in [Table/Fig-4]. Intake of key micronutrients was poor amongst all children in the study. Proportion of children with inadequate intakes ranged from 61.2% for magnesium to almost 100% for vitamin D, vitamin B12, riboflavin, niacin, vitamin B6 and Vitamin A. No significant difference in micronutrient intakes was observed between boys and girls.

Macronutrients	Boys (n=68)	Girls (n=71)	Total (n=139)
Percent energy from fat			
<25%	2 (3.0)	2 (2.9)	4 (2.9)
>25% to <30%	9 (13.2)	12 (16.9)	21 (15.1)
>30%	57 (83.8)	57 (80.2)	114 (82)
Percent energy from protein			
<10%	24 (35.3)	30 (42.3)	54 (38.8)
>10% to <15%	43 (63.2)	38 (53.5)	81 (58.3)
>15%	1 (1.5)	3 (4.3)	4 (2.9)
Percent energy from carbohydrate			
<55%	52 (76.5)	51 (71.8)	103 (74.1)
>55% to <60%	13 (19.1)	13 (18.3)	26 (18.7)
>60%	3 (4.4)	7 (9.9)	10 (7.2)

[Table/Fig-3]: Distribution of children (%) based on proportion of energy intake from fat, carbohydrates, and protein; n (%)

Nutrients	Boys (n=68, percentage)	Girls (n=71, percentage)	Total (n=139)	p-value
Iron (mg)	58 (85.3)	71 (100)	129 (92.8)	0.5
Vitamin A (µg RE)	66 (97.1)	71 (100)	137 (98.6)	0.9
Zinc (mg)	53 (77.9)	63 (88.7)	116 (83.5)	0.6
Vitamin D3 (IU)	68 (100)	71 (100)	139 (100)	1.0
Calcium (mg)	41 (60.3)	60 (84.5)	101 (72.7)	0.2
Vitamin B12 (µg)	68 (100)	71 (100)	139 (100)	1.0
Folate (µg)	47 (69.1)	42 (59.2)	89 (64)	0.5
Vitamin C (mg)	35 (51.5)	27 (38)	62 (44.6)	0.3
Thiamine (mg)	65 (95.6)	71 (100)	136 (97.8)	0.8
Riboflavin (mg)	67 (98.5)	71 (100)	138 (99.3)	0.9
Niacin (mg)	68 (100)	70 (98.6)	138 (99.3)	0.9
Vitamin B6 (mg)	66 (97.1)	70 (98.6)	136 (97.8)	0.9
Magnesium (mg)	38 (55.9)	47 (66.2)	85 (61.2)	0.5

[Table/Fig-4]: Distribution of children with micronutrient intake below Estimated Average Requirement (EAR).
g: Grams; mg: Milligrams; µg: Micrograms; RE: Retinol equivalent; IU: International unit; n (%); p-values were calculated using Chi-square test

Food consumption data: [Table/Fig-5] summarises the dietary consumption pattern of the children according to food groups.

Nutrients	Boys (68), (Median and interquartile range unless specified)	Girls (71), (Median and interquartile range unless specified)	Average total	p-value
Cereals and millets (g)	143 (108.1, 177.5)	132.5 (95,152.5)	135.75 (105, 167.5)	0.06
Pulses (g)	20 (10, 33.9)	17.5 (7.5, 26)	17.5 (9.99, 30)	0.24
Green leafy vegetables (g)	0 (0, 3.1)	0 (0,0)	0 (0, 1.875)	0.77
Other vegetables (g)	66.3 (41.9, 115)	67.5 (43.75,125.75)	67.5 (42.5,121.25)	0.38
Fruits (g)	28.75 (0, 120)	35 (0, 125)	35 (0, 120)	0.69
Roots and tubers (g)	35 (17.5, 50)	40 (12.5, 70)	37.5 (15, 63.5)	0.58
Nuts and oilseeds (g)	0 (0,0)	0 (0,0)	0 (0,0)	0.31
Sugars (g)	11 (5, 18.8)	8.35 (5, 15)	10 (5, 17.5)	0.18
Milk and milk products (mL)	250 (140, 365)	163.75 (97.5,250)	197.75 (115, 325)	0.02*
Egg and egg products (g)	0 (0, 3.1)	0 (0, 75)	0 (0, 12.5)	0.34
Flesh foods (g)	0 (0,15)	0 (0,35)	0 (0,25)	0.40
Edible oils and fats (g)	28.7 (20, 41.9)	25.2 (25.3, 37.3)	26.25 (20, 38.8)	0.27

[Table/Fig-5]: Dietary consumption pattern of the children according to food groups; Median and Interquartile range unless specified; p-values were calculated using Mann-Whitney U test; *p<0.05

For foods such as green leafy vegetables, nuts and oilseeds and fleshy foods the median value of zero indicates that at least 50% of the children did not consume these foods. The intake of milk and milk products was significantly higher in boys as compared to girls (p-value=0.02).

DISCUSSION

Adolescence is a vulnerable physiological state where children are at a greater risk of malnutrition [1] and thus, understanding their nutrient intake is important. The present study attempts to describe the nutrient intake of children living in underprivileged areas of Delhi who were born LBW at term and who could potentially be at a higher risk of chronic disease during later life. Although Indian dietary recommendations suggest the proportion of energy from protein, fat, and carbohydrate as 10-15%, 25-30% and 55-60%, respectively [8], fat intake contributed to more than the recommended energy consumed in 80% of the children and not carbohydrates. Though cereal based 'carbohydrate diets' constitute a bulk of Indian diet, the current trend demonstrates a paradigm shift in the consumption pattern from a carbohydrate rich diet to a diet high in fat from fried foods such as pooris, bhaturas, samosa and processed foods including chips, biscuits and namkeens [17,18].

Large scale surveys like National Sample Survey Office [17] survey and Food and Nutrition Security Analysis, India [18] have also reported a decline in the cereal intake over the last decade and an increase in the consumption of fat. This transition in food consumption pattern is attributed to increased urbanisation, changing lifestyle, easy availability of high fat foods as a result of market exposure, advertisement and peer pressure in schools. Moreover, processed, and ready to eat street foods are also considered as a time saving, tastier and cheaper option to fulfil hunger. The inclusion of such foods can, however, impose adverse health implications [19]. While most of the participants consumed protein as per the EAR for Indian children [8] the quality of protein remains a concern. Most of the children consumed vegetarian sources of protein like pulses and animal protein came from milk and an occasional egg. Dietary protein was consumed as pulses in combination with cereals such as 'dal-chawal' or 'dal-roti'. Though milk, pulses and cereals were consumed in small quantities sufficient to meet the protein requirement, they were not enough to fulfil micronutrient intakes of these children.

The study also demonstrated inadequacy in micronutrient intake. All the children in the study consumed very small quantities of vitamin B12 and D and at levels below the EAR for these vitamins. While dairy was the main source of vitamin B12 and vitamin D in these children, consumption of small quantities and adherence to a vegetarian dietary pattern could explain the insufficient consumption of these vitamins. These findings are consistent with other studies that have reported diets of Indian children as insufficient in vitamin D and vitamin B12 [1,20,21]. Despite India being a tropical country, there is evidence of high prevalence of vitamin D deficiency in children and adolescents, highlighting the importance of inclusion of vitamin D in the diet [22-25]. Since vitamin D rich foods do not form a part of Indian diets, a public health approach should be directed towards tackling the deficiency of Vitamin D as was done in the case of vitamin A in Indian children [26].

The shift from consumption of staple complex carbohydrates such as millets, in rural areas to fibre deficient refined carbohydrates like polished rice, refined flour, sugar in the urban areas as well as low and irregular consumption of fruits and vegetables, resulted in the vast majority of children consuming insufficient amounts of B complex vitamins, vitamin A and iron. It is unfortunate that despite originating from rural areas, people have lost contact with their micronutrient rich staple diets. Previous literature has also reported higher deficiency in intake of vitamin A and iron [20,27]. Therefore, a combination of food groups is required for meeting the dietary recommendations for all micronutrients.

The findings also highlight sex specific differences, with higher proportion of girls eating diets below the EAR for majority of the micronutrients than boys. The median intakes of micronutrients, especially calcium and iron were lower in girls than boys. Boys reported a greater carbohydrate and protein intake than girls. This finding is consistent with the higher intake of cereals, pulses, dairy and its products among boys than girls, which has likewise been observed in other child populations in India [28], possibly indicating a neglect of girl child.

Limitation(s)

The study had some limitation. The collection of dietary data by using 24-hour recall is a challenging task for nutritionists. Due to its extensive reliance on the participant's memory and capacity of interviewer in comprehending the portion sizes, the method has its limitations. However, introduction of food diary and having extremely well-trained nutritionists doing dietary assessment have minimised errors. Secondly, the study population being small may not be representative of the population at large. Despite of the above limitations, the study does provide an extent of nutrient intake in the study population.

CONCLUSION(S)

Results from the present study indicate a significantly higher intake by boys, of energy, protein, carbohydrates, fats and micronutrients-iron, calcium, magnesium, vitamin B6 when compared to the girls. Of the micronutrients, a marked deficiency is seen in the intake of B complex vitamins, vitamins A and D and iron in both boys and girls. Most of the children were consuming diets with fat providing >30% energy putting them at a high risk of obesity and chronic disease in later life. Therefore, future research should stress upon increasing awareness regarding a balanced diet, inclusion of Indian indigenous staple foods and cooking methods. Public health initiatives should be taken to support such a population in achieving the EAR.

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ANNEXURE 1

Sample size calculation based on mean intake of nutrient.

S. No.	Nutrient	Sample size calculated for the present study (accounting for 20% attrition rate)
	Iron (mg) [10]	134
		134
	Calcium (mg) [10]	122
	Vitamin C [10]	139
	Vitamin D (μg) [11]	43
	Vitamin B12 (μg) [12]	32

ANNEXURE 2

Sociodemographic questionnaire.

Child's name	
Date of interview (dd/mmm/yy)	☐☐/☐☐/☐☐
Child's date of birth (dd/mmm/yy)	☐☐/☐☐/☐☐
Child's birth weight (kg)	☐.☐☐
Source of birth weight data	DIVIDS Road to Health card other
Child sex (circle)	M F

Name of the mother	
Name of the father	
Relationship of respondent to child	Mother Father Paternal grandmother Maternal grandmother Paternal grandfather Maternal grandfather Other
	Specify other respondent
Address of the family	
Address landmark	
Contact number	☐☐☐☐☐☐☐☐☐☐☐ ☐☐☐☐☐☐☐☐☐☐☐

Education level (completed) of the mother	1. None 2. Pre primary 3. Primary 4. Middle school 5. Secondary school 6. Senior Secondary 7. Technical /Polytechnic/ITI 8. University (Bachelor/Masters/ Engineering/MBBS/PhD)
Occupation of the mother	1. Housewife 2. Self-employed 3. Daily wager 4. Salaried employed 5. Student 6. Other

Education level (completed) of the father	1. None 2. Pre primary 3. Primary 4. Middle school 5. Secondary school 6. Senior secondary 7. Technical/Polytechnic/ITI 8. University (Bachelor/Masters/ Engineering/ MBBS/Phd) 9. Not applicable (no father or partner)
Occupation of the father	1. Self-employed 2. Daily wager 3. Salaried employed 4. Student 5. Unemployed 6. Other 7. Not applicable
Does the child go to school?	1. Yes 2. No
What type of school does the child attend?	1. Government 2. Private 3. Charitable 4. Not applicable (doesn't go to school)
Name of the school?	
House ownership	1. Own own house 2. Rented accommodation 3. Live with relatives 4. Live with friends
Total number of rooms in the house	|___|___|

ANNEXURE-3

24-hour recall questionnaire.

Name: ID: Date:					
Place eaten	Time	Description of food or drink. Give brand name if applicable	Amount in household measures	Ingredients	Amount of raw ingredient (g/ mL)