

Dietary Diversity among Children Below 6 Years During the Midst of COVID-19 Pandemic

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ABSTRACT Under-nutrition among children is the biggest concern for the global community. The current pandemic of Covid-19 further exacerbated this condition. Due to the lockdown, food supply chains were disrupted which impacted millions of livelihoods globally and further suspension of the nutrition based interventions in many parts of the world, put children of unprivileged regions into a never ending cycle of malnutrition. Fortunately, India has an extensive system of social safety net for ensuring the nutrition security of the poorest of the poor. This study was carried out during the COVID-19 pandemic. It was observed that the nutrient consumption of children was below the RDA level. Analyzing the subjects groups, it was revealed that children were not receiving the nutrients according to their bodily requirements. Almost all the children were deficient in one or more nutrients. It was observed that compared to RDA, nutrient difference for energy was (-55.14%), protein (-3.45%), Carbohydrate (-16.02%), Fat (-4.26%), Total folate (-64.57%), vitamin-C (-61.44%), Retinol (-73.60%) and iron (-71.52%) among 1-3 years of age while children among 4-6 years the difference in energy was -62.31%, carbohydrate (-20.83%), fat (5.99%), protein (-16.51%), total folate (-65.63%), vitamin-C (-62.06%), Iron (-79.28%), and retinol (-77.93%) at 95 CI. Similarly, the consumption of fortified food staples was very low among the household.

Keywords: Malnutrition, RDA, COVID-19, Children, Dietary diversity

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INTRODUCTION

The current pandemic exaggerated this condition by influencing the social, economic and moral aspect of people. Due to the current pandemic of the COVID-19, several countries were exposed to a state of high food and nutrition insecurity, which led to a vicious cycle of malnutrition (IFPRI, 2020). According to World Health Organization people living in the developing countries, especially people working in the informal sector were affected the most as they lost their livelihood during the pandemic (WHO, 2020). India a country with world's 17% of the total population faced various challenges in terms of ensuring nutritional security during the pandemic time. It brought a big challenge for the policy makers in ensuring nutritional security during this tough time (Economic Survey, 2021). Malnutrition among preschool aged children has always been a great concern among the global community. Elementary years of human life cycle are very

crucial for the growth and development where only adequate supply of nutrients can ensure the optimum growth and development. Children below six year of age are the most sensitive age group where surprisingly, the likelihood of micronutrient malnutrition is highest (CNNS, 2018-19). Fortunately, addressing the persisting problem of malnutrition or *Bhukbhari*, India has extensive social safety nets of Mahatma Gandhi National Rural Employment Guarantee Act, Mid day meal, Integrated Child Development Services & Public Distribution System in place. The Integrated child development scheme is one of the social safety net which is currently the largest multi-sectoral supplementary nutrition program for the mothers and young children and adolescent girls in India (Kapil, 2002). According to Global Nutrition

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Report (2020). India is also going to miss its global nutrition targets, i.e. (Stunting among under-5 children, anemia among women of reproductive age, Childhood overweight and Exclusive breastfeeding) by 2025. The current study was designed to assess the status of delivery of ICDS services during the pandemic time. Angan-wadi centers (AWCs) and primary health care centers (PHCs) are the major platform for delivering the six ICDS services i.e. supplementary nutrition, referral services, immunization, non formal preschool education, health check up for the beneficiaries (i.e., children up to 6 years), adolescent girls, pregnant and lactating mothers (NFHS-4, 2014-15). Delivery pattern of the given services is implemented and monitored through a coordinated effort of front-line health workers popularly known as 3As, i.e., ASHAs, AWWs, and ANMs. During this pandemic, they provided door-to-door services to the beneficiaries following the strict social distancing measures (MoWCD, 2021).

METHODOLOGY

It was a cross sectional study which was carried out to observe the status of delivery system of Anganwadi units with a special focus on the nutritional status of preschool-aged children (<6 Years) during the pandemic time. This study was carried out among the twelve Angan-wadi centers of Rural (Sawad) and Urban (Karelibough) area of Vadodara district of Gujarat from November 2020-March 2021. Due to the pandemic situation convenience sampling method was

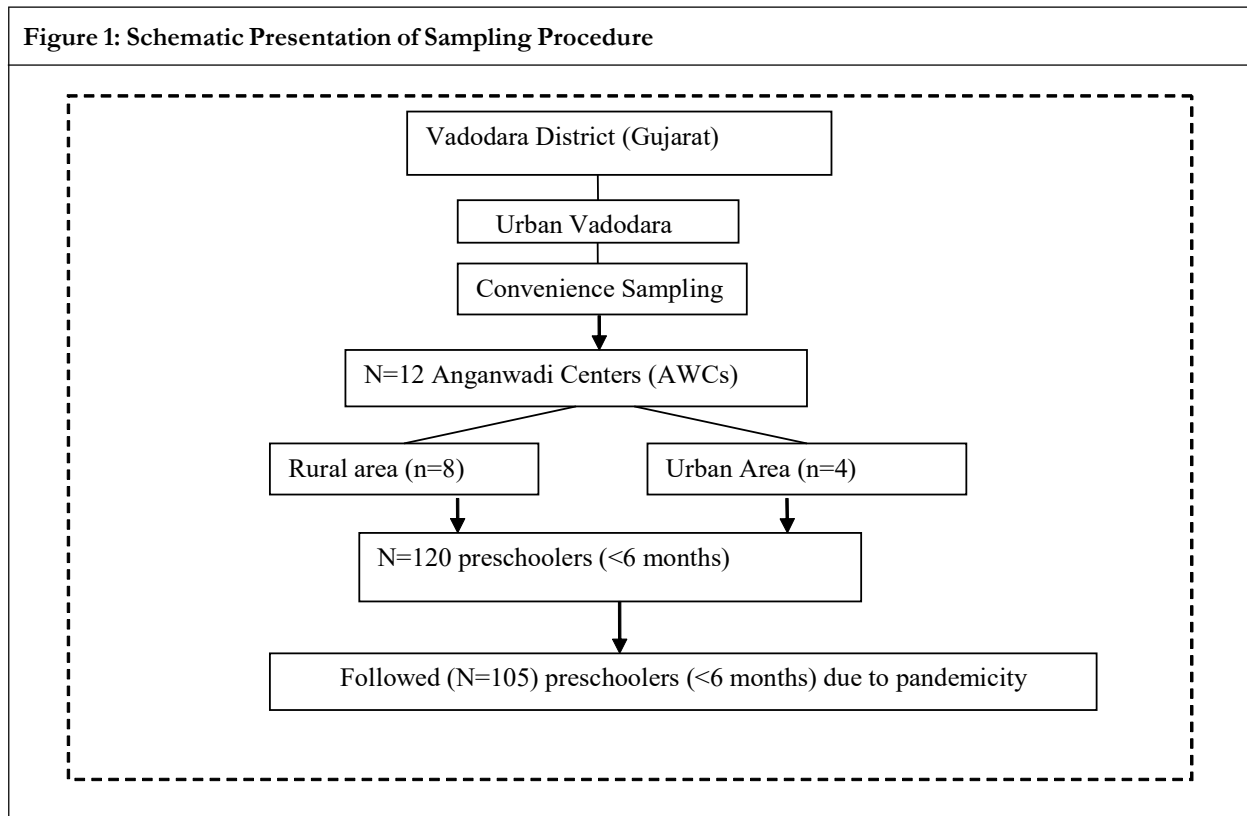
used for selecting the ICDS units of Sawad and Karelibaough area.

Sampling: Sample size was calculated using the MEDCALC software. Considering the prevalence of anemia in Vadodara (Gujarat) as 55.6% (NFHS-4, 2015-16) among children 36-59 months, with an alpha of 0.05%, beta 0.10% with a 20% attrition rate, a total of N = 120 children were enrolled for the study. The age of children during the study period was 36-47 months [n = 37 (22 male and 15 female)], 48-59 months [n = 47 (26 male and 21 female)], 60-70 months [n = 13 (5 male and 5 female)], 71-80 months [n = 8 (3 male and 5 female)].

DATA COLLECTION

A semi-structured survey schedule was developed to collect data on key parameters like socioeconomic status (SES), anthropometric indices, dietary history and supplementary nutritional services provided by the Angan-wadi centers and availability and consumption of fortified foods by the target population. To validate the survey schedule, questionnaire was pretested on 20 individuals. Due to the strict protocols of physical distancing mandated by the Govt. of India during the month of November and December 2020, data on anthropometry (Height and weight) was collected from the Angan-wadi workers (AWWs). However, the data on dietary practices and service delivery was collected using the mother and child pair along with the AWWs during the months of January to March 2021 following the social distancing

Figure 1: Schematic Presentation of Sampling Procedure



measures. Data on Dietary practices were collected using semi structured Food frequency questionnaire and three days 24 hr dietary recall method.

Data Processing and Analysis

Data was processed and analyzed through Microsoft excel (2016) and SPSS version 21. The nutrient consumption data was recorded through 24-hour dietary recall and Food frequency questionnaire. The nutrient analysis of the dietary data was computed using a validated software “DietCal” version 10.0 (Profound Tech Solutions) which is based on values from Indian Food composition tables 2017, National Institute of Nutrition, ICMR (IFCT, 2017). For calculating the difference between RDA and the mean intake of a nutrient, a one-sample t-test (equality of two population means) was used to analyze the data while for assessing the difference in nutrient intake among male and female child, independent sample t-test (homogeneity of equal variance) was used.

RESULTS

Due to the existing COVID-19 conditions only 105 parents were agreed and gave their written consent for participation in the study. Nearly 15 subjects dropped out from the study due to pandemic situation. Finally a total of 105 children’s data was collected out of which 56 were male and 49 were female children. The analysis of the data was done under the following subheadings.

Socioeconomic Status of the Household

The Kuppaswami scale was used for assessing the socioeconomic status of the household. Out of 105 households, approximately 46.51% and 44.18% households in the Karelibaugh and 54.83% and 45.16% in Sawad area were BPL and APL ration card holders respectively whereas 9.3% households were not aware of an APL or BPL ration card. In the Karelibaugh area, nearly 46.51%, 32.87%, and 20.93%, while in Sawad, almost 33.87%, 27.41%, and 38.7% belonged to joint, nuclear, and extended families respectively. The proportion of extended families was more in Sawad compared to the Karelibaugh area. Approximately, 58.1% families were belonged to Hindu in Karelibaugh and 98.38% in Sawad whereas 41.86% were belonged to other category (Muslims) in Karelibaugh and only 1.61% in Sawad. Most of the mothers in the Sawad and Karelibaugh area were unemployed, i.e., 74.19% and 86.04% respectively, whereas 9.30% in Karelibaugh and 14.51% were engaged in either the Skilled Workers Shop or Market Sales Workers.

Anthropometric Indices

In the present study it was observed that among children below 6 years the prevalence of wasting among male child

was (37.5%), severe wasting (6.25%), stunting (59.73%), underweight (76.79%), thinness (41.08%) and overweight (16.37%) while among female child, the prevalence of wasting (38.39%), severe wasting (13.89%), stunting (63.17%), underweight (71.35%), thinness (46.92%) and overweight (22.62%) respectively. It was observed that the prevalence of stunting, wasting, thinness, and overweight was more among females than males at 5% level of significance.

Weight for Age (WAZ)

According to WHO growth reference median, a WAZ score value of $<-2SD$ denotes under weight. In this study it was observed that all the enrolled children were underweight as per their age. Prevalence of *mild underweight* was highest among 36-47 months old children (15.24%), followed by 48-59 months (14.29%), 60-70 months (5.71%), and 71-80 months (3.81%) respectively. While moderately underweight children were highest among 48-59 months (14.29%) followed by 36-47 months (4.76%), 60-70 months (1.90%) and 71-80 months (0.90%). Prevalence of severely underweight children was highest among 48-59 months (5.71%), followed by 36-47 months (3.81%).

Height for Age Z Score (HAZ)

Stunting is a reflection of chronic under-nutrition. According to the NFHS-5 report of Gujarat prevalence of stunting under-five years of age was 39.0%, while CNNS report presented that in India HAZ for 36-47 months children were 14.9% (below-3SD), 41.2% (below-2SD), while among 48-59 months age group it was 10.3% (below-3SD), 30.9% (below-2SD). In the current study prevalence of mildly stunted children was high among 48-59 months (11.43%) followed by 36-47 months (10.48%), 60-70 months (3.81%), and 71-80 (2.86%). The prevalence of moderately stunted children was high among 48-59 months old children (5.71%). A similar score was observed among 36-47 months old and 71-80 months old. However, the lowest prevalence of moderately stunted children was observed among 60-70 months. Prevalence of severely stunted children was approximately 12.38%, 4.76%, 0.95%, and 0.95% among 48-59 months, 36-47 months, 60-70 months, and 71-80 months old, respectively.

Weight for Height Z-Score (WHZ)

In the current study, it was found that among 60-70 months and 71-80 months old children, none of them were wasted, while among 36-47 months and 48-59 months old children, the prevalence of severe wasting was 3.57% and 5.95% respectively. Prevalence of mild wasting was 8.33% and 15.48%. Prevalence of moderate wasting was 7.14% and 4.76%, respectively.

BMIZ/Prevalence of Thinness

It was found that none of the children was severely thin among the 71-80 months age group. However, the prevalence of mild thinness among the four age groups was 4.76%, 11.43%, 5.71%, and 0.95% in 36-47 months, 48-59 months, 60-71 months and 71-80 month, respectively whereas, the prevalence of severe thinness among the first three age groups was 2.86%, 3.81%, and 0.95% respectively.

Dietary Practices of the Households

Among all the selected households in Karelibaugh area majority of the population was non-vegetarian, i.e., 62.79%, while in Sawad proportion of vegetarian and non-vegetarian households was similar, i.e., 45.16% with nearly 9.67% population was ovo-vegetarian. As per the Comprehensive National Nutrition Data 2016-18, it was revealed that in India, approximately 54.4% population is purely vegetarian; while 39.4% was non-vegetarian and 6.2% population consume a vegetarian diet along with eggs. In Gujarat, the percentage of population groups with vegetarian, non-vegetarian and ovo-vegetarian are was 54.4%, 39.4%, 6.2% respectively. It was observed that in Sawad, approximately 83.8% of children consumed at least three meals in a day, while in Karelibaugh; nearly 67.44% of children consumed at least four meals in a day. However, nearly 16.12% children in Sawad and 2.32% children in Karelibaugh consumed only two meals in a day.

Mean Nutrient Intake

Using the 24 hour dietary recall method it was observed that the mean energy consumption among children between 1-3 years and 4-6 years was 497.96 ± 174.44 Kcal and 512.54 ± 169.57 Kcal, respectively. Comparing the values with the RDA

2020, a mean difference of 612.03 Kcal among 1-3 years and 847.45 Kcal among 4-6 years below the RDA level was observed. As per the RDA (2020), the average consumption of carbohydrates should range between 100-130 grams per day. However, in the current study mean carbohydrate intake of subjects in both the age group was only 52.20 ± 19.05g and 54.38 ± 19.64g, respectively. Thus a mean difference of 47.79 g and 45.62 g was observed. The mean protein intake of children in both groups was 12.93 ± 5.38 Kcal and 13.35 ± 5.91 Kcal. In both, the group consumption of protein was found below the RDA level with a mean difference of 0.43 in 1-3 years and 2.64 g in 4-6 years. The average consumption of fat among the subjects was 26.06 ± 9.63 g and 26.5 ± 9.07 g, respectively. Comparing the values with the reference RDA level, it was found that the mean difference was 5.72 g, while among 4-6 years; it was 1.49 g.

Status of Micronutrient Consumption

Consumption of iron-rich foods of children revealed that the mean iron intake of the study subjects was very low, i.e., only 2.27 ± 0.93 mg (1-3Y) and 2.27 ± 1.13 mg (4-6 Y). A mean difference of 5.72 mg and 8.72 mg below the RDA level was observed in both the age group. The mean consumption of total folate in both the groups was 42.52 ± 14.43 µg and 46.39 ± 23.29 µg, respectively. Comparing the observed values with the RDA level, it was found that both the values were lower than the RDA with a mean difference of 84.56 µg and 88.60 µg at 95% CI. While, mean consumption of vitamin A and C among 1-3 years was only 102.94 ± 88.27 µg and 11.56 ± 5.75 mg, whereas among 4-6 years it was 114.05 ± 91.2 µg and 13.27 ± 7.15 mg respectively. Comparing the values with the reference RDA (2020), it was

Table 1: Average Nutrient Intake of Children Below 6 Years

| Nutrients | 1-3 Years | | 4-5 Years | |
|--------------------------|---------------|---------------------|---------------|---------------------|
| | Mean ± SD | Difference with RDA | Mean ± SD | Difference with RDA |
| Energy (Kcal) | 497.96±174.44 | 55.14%*** | 512.54±169.57 | -62.31%*** |
| Carbohydrate (g) | 52.20±19.05 | -16.02%** | 54.38±19.64 | -20.83%*** |
| Protein (g) | 12.93±5.38 | -3.45%* | 13.35±5.91 | -16.51%** |
| Total fat (g) | 26.06±9.63 | -4.26%* | 26.5±9.07 | -5.99%* |
| Total folate B9 (µg) | 42.52±14.43 | -64.57%*** | 46.39±23.29 | -65.63%*** |
| Total ascorbic acid (mg) | 11.57±5.75 | 61.44%*** | 13.27±7.15 | -62.06%*** |
| Retinol (µg) | 102.94±88.27 | 73.60%*** | 114.05±91.2 | -77.93%*** |
| Iron (mg) | 2.27±0.93 | 71.52%*** | 2.27±1.13 | -79.28%*** |
| Iodine (µg) | 39.72±6.16 | 55.86%*** | 39.33±10.77 | -67.22%*** |

Note: *NS, **(0.05%), ***0.001% (N = 105 children <6 Years).

found that the consumption of micronutrient was significantly lower at 5% level of significance. In the current study, the mean iodine intake of the subject was 39.72 ± 6.16 (1-3 Y) and 39.33 ± 10.77 μg (4-6 Y). Comparing it with the RDA, it was found that there was a mean difference of 52.66 μg and 80.66 μg was observed. According to a report published by GAIN, India (2021), whole Foods (chicken liver, ruminant liver, eggs, ruminant meat, and dark green leafy vegetables, milk, fresh frozen fish, groundnuts, pulses and eggs, etc.) which are rich in major micronutrients are lacking in children's plate.

Frequency of Consumption of Iron-Rich Foods

It is a well-known fact that Anemia is a multifactorial concern in India and our dietary combinations are one of the biggest exacerbating factors. Hence, all the subjects were asked about the frequency of consumption of some locally available iron-rich foods. Food items included in the questionnaire were Dates, pulses (green gram whole, green gram dal, Bengal gram dal, Bengal gram whole, Bajra and eggs, green leafy vegetables. As per the responses of the subjects of the Karelibaugh area, it was observed that the frequency of consumption of green gram dal and green gram whole on weekly basis was nearly 67.44% and 76.74%, respectively. Dates are a concentrated source of iron and other vital nutrients; it was surprising that approximately 81.40% of children never consumed dates or only 18.60% of children consumed dates seasonally while in the Sawad area, 61.29% of children never consumed dates. On the other hand it was also noticed that consumption of Bajra on weekly basis was (16.27%), twice a month (13.9%), occasionally (13.95%), and never (41.86%). It was noticed that except Bajra (11.29%), Bengal gram dal (3.23%) and green gram dal (1.61%), none of the iron-rich food items was consumed by the children on a daily basis.

Frequency of Intake of Vitamin-C

Vitamin C acts as antioxidants, due to the lack of the *gluconolactone-oxidase* enzyme, human beings cannot synthesize vitamin C; hence it became a dietary essential. Presence of vitamin C in adequate amount results in better absorbency of iron. This study observed that consumption of vitamin C-rich food was seasonal among the selected population group. Frequency of consumption of Vitamin C-rich food on seasonal basis like guava (93.02%), Sweet-lime (97.62%), and orange (93.02%) was observed while lemon was the only food item which was consumed every week. None of the vitamin C food was consumed daily. In the Sawad, it was observed that the consumption pattern of lemon on a daily, twice in a week, weekly, occasionally was 3.23%, 38.71%, 37.10%, and 8.060%, respectively. The frequency of

consumption of guava, sweet-lime, and orange was very low. Approximately, 67.74% (never consumed guava), 72.58% (never consumed sweet lime) and 51.42% (never consumed orange). However, only 19.35% consumed guava occasionally, 4.84% consumed sweet-lime, and 3.8% of children consumed orange on an occasional basis. Only 3.23% of children consumed lemon daily. In a nut shell it can be stated that consumption of vitamin C rich food on a daily basis was very low.

Awareness of Fortified Staples

Since fortified commodities like DFS and fortified oil were available at the Angan-wadi centers. A separate questionnaire was developed for assessing the knowledge of fortified commodities. It was observed that none of the mothers were aware of the *+F logo*. It was also noticed that most of the mothers were not even aware of fortified wheat flour, double fortified salt and fortified oil. In Karelibaugh, none of the respondents was aware of the term *fortification*. In Sawad, only 1.61% of respondents were aware of the term fortification.

Awareness among Mothers

It was found that most of the mothers in both Karelibaugh (97.67%) and Sawad (98.38%) area was aware of the term 'malnutrition' while only 2.32% in Karelibaugh and 1.61% in the Sawad area was unaware. It was also observed that in the Karelibaugh area, none of the mothers were aware of micronutrient deficiencies whereas in the Sawad area, only 1.61% of mothers were aware. However, it was surprising that in the Karelibaugh area, approximately 2.32%, and in Sawad, nearly 4.83% of mothers were aware of the term 'anemia,' which is locally known as '*Pandurog*'

DISCUSSION

Despite the existence of three broad food based safety nets, India still did not achieve remarkable progress in terms of maternal and child nutrition targets. Some of the confounding factors are, over emphasis on the production of starchy staples, cultural believes of people, food combinations, food taboos, lack of adequate nutrition knowledge of mothers and low purchasing power. All these factors are responsible for the existence of the micronutrient deficiencies in India. As per the research evidences it is clearly evident that if fortified staples are provided through the Govt. safety nets it will definitely reduce the likelihood of micronutrient deficiencies in a long run. Secondly it is very essential to monitor the nutrient and dietary gaps of children. There is a need to focus on the alternative sources of plant based low cost protein sources, so that under privileged children can be protected from the vicious cycle of malnutrition.

CONCLUSION

This study highlighted that under nutrition is an existing problem in the study area. Nutrient consumption of children was lower than the current RDA level. Hence, strategies like food fortification, nutrition education should be promoted at the grass root level. Secondly, the compliance rate of IFA supplementation and deworming should be monitored regularly.

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