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Are children attaining the minimum dietary diversity criteria in India? Evidence from National Family Health Survey-5

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Abstract

The feeding practices of infants and young children in the first two years of their lives are essential for their nutritional status. The lack of dietary variety poses a significant threat to children's growth and development. Therefore, it is vital to study the dietary diversity among infants and young children in India to identify nutritional gaps, health risks, and factors that influence their diets. We analyzed data collected from 64,084 children in India through the National Family Health Survey-5, based on a 24-hour recall. This study focused on the consumption patterns of food groups and their critical factors among infants and young children in India. We found that only 22.46 percent of children met the minimum dietary diversity requirement. From logistic regression analysis, we identified that age, gender, birth order, religion, nutrition access, and health conditions significantly affect children's food intake. This study highlighted the significance of maternal education and female leadership in improving health and nutrition outcomes for children. Moreover, the study identified that the socio-economic, cultural, and regional determinants influencing dietary diversity enable the development of tailored strategies. These strategies can ensure equitable access to diverse and nutritious foods, irrespective of socioeconomic background or geographic location in India.

JEL Codes: Q180, Q000, and O130

INTRODUCTION

Insufficient dietary intake and illnesses are the leading causes of micronutrient deficiency, undernutrition, and overnutrition (Chopra et al., 2023). In 2018, globally, 22% or 149 million children under the age of five were chronically undernourished (United Nations Children's Fund, 2021). The lack of dietary diversity poses a significant threat to children's growth and development, as they are missing out on essential nutrients necessary for their physical and mental well-being (Chopra et al., 2023; Patel et al., 2010). In many low-income countries, children do not receive the recommended feeding practices (Lutter et al., 2011). India has the highest number of malnourished children, approximately 3.3 million, in the world (Rai et al., 2022; Saha et al., 2022; Seth & Jain, 2023). Undernutrition not only increases childhood mortality but also impedes cognitive development (Chopra et al., 2023; Dewey & Begum, 2011).

Child malnutrition is a serious issue, and dietary diversity is an essential indicator of it (Jain et al., 2022; Saha et al., 2022). In the first two years of a child's life, insufficient dietary intake can cause irreversible harm to their growing body and brain (United Nations Children's Fund, 2021). According to the NFHS-5 report, 35.5% of children in India are stunted, 19.3% are wasted, and 32.1% are underweight (IIPS, 2021). A child who receives an acceptable diet is expected to reach optimal anthropometric measures (Selvaraj et al., 2021). Minimum Dietary Diversity (MDD) is an indicator used to measure whether young children's diets are diverse enough in terms of micronutrient density. However, many children in India who meet MDD criteria have low consumption of protein-rich foods (Beckerman-Hsu et al., 2020). MDD failure is associated with several factors, such as increased child age, being a second or third-born child, higher maternal age and education, and more than four antenatal care visits (Rai et al., 2022).

In India, improper feeding practices during early childhood contribute to malnutrition and infant and child mortality (Patel et al., 2010). The first 1000 days of a child's life are crucial in determining their health and nutritional status. It is essential to study the dietary diversity among infants and young children in India to identify nutritional gaps, health risks, and factors that influence their diets. By understanding these patterns, policymakers can design targeted interventions to promote healthy eating habits and ensure equitable access to nutritious foods. This will lead to a healthier future generation and improve the overall well-being of the nation. Therefore, our analysis focuses on the consumption patterns of food groups and their critical factors among infants and young children in India.

MATERIALS & METHODS

Data & Sampling Procedure

The National Family Health Survey-5 is a comprehensive survey that covers a representative sample of households across India. The survey provides reliable estimates for measuring the dietary diversity of children in India. The period of the study is from 2019-2021. In line with WHO's guidelines for assessing infant and young child feeding practices, our study primarily focused on children aged between 6 and 23 months. This data was collected based on a 24-hour recall in the NFHS surveys. The unit-level data for the survey is obtained from Demographic and Health Surveys, and we have received permission to download the data in STATA format from the DHS website (www.dhsprogram.com). The present study focused on analyzing the dietary intake of 64,084 children in 707 districts, 28 states, and eight union territories across India (Figure 1).

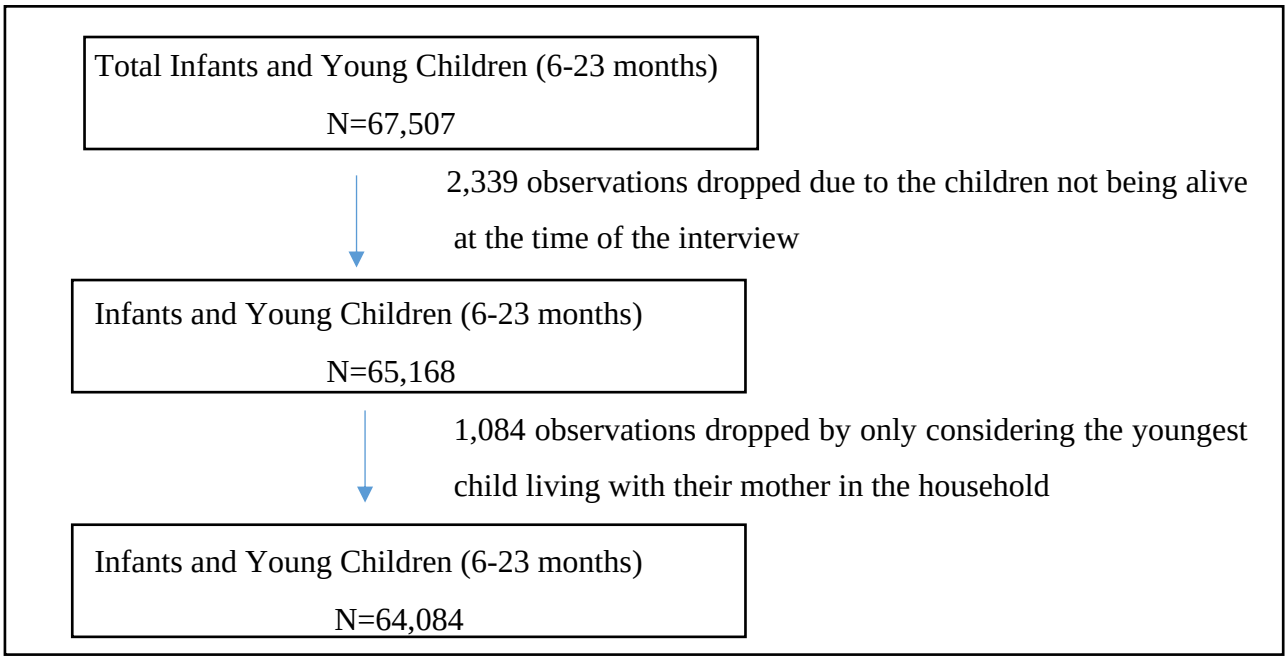


Fig. 1: Flow of sampling procedure

Measure of Minimum Dietary Diversity (MDD)

It is recognized that infant and young child feeding practices play an essential role in the nutritional status of children under the age of 2. The MDD measure required for children aged 6-23 months was developed by WHO's Global Nutrition Monitoring Framework (Rai et al., 2022).

In 2017, the WHO-UNICEF Technical Expert Advisory Group on Nutrition Monitoring revised the MDD by including breastmilk as one of the food groups (World Health Organization, n.d.). The classification of food items into different food groups by WHO to meet MDD is presented in Table 1. Children's dietary intake of a total of 17 food items was classified into eight food groups. Thus, when a child's diet contains five or more food groups out of eight, it is considered to have met the MDD.

Table 1. Classification of food groups by WHO's minimum dietary diversity

Food groups considered by the WHO
Food Group I ***Breastfeeding*** (Currently breastfeeding)
Food Group II ***Grains, roots, and tubers*** (Any commercially fortified baby food, Any Bread, rice, noodles, or foods made from grains, Any potatoes, white yams, manioc, cassava, or any other foods made from roots)
Food Group III ***Legumes & nuts*** (Beans, lentils, peas or nuts)
Food Group IV ***Dairy products*** (Powdered, tinned, or fresh animal milk, Commercially produced infant formula, Cheese, yogurt, or other milk products)
Food Group V ***Eggs*** (Eggs)
Food Group VI ***Flesh foods*** (Chicken, duck, or other birds, Liver, kidney, heart, or another organ meat, Fresh or dried fish or shellfish, Other meat products)
Food Group VII ***Vit A rich fruits and vegetables*** (Carrots, pumpkin, or sweet potatoes (yellow or orange inside), Dark green, leafy vegetable, Papayas, ripe mangoes, cantaloupe or jackfruit)
Food Group VIII ***Other fruits and vegetables*** (Any other fruits and vegetables)

Source: Author’s compilation using DHS Program

Statistical Analysis

We analyzed the consumption rates of eight food groups and dietary diversity scores by MDD status using descriptive statistics and a box-plot graph. Our study showed the diversity in consumption levels of food groups and MDD status across the states in India. Additionally, we identified the determinants of different food group consumption patterns and MDD failure (receiving less than five food groups) using binary logistic regression analysis. Our independent variables included child characteristics (age, gender, and birth order), maternal characteristics (age and education), household characteristics (household head, family size, religion, social status, wealth index, and residence), whether supplementary nutrition was received from Anganwadi Centres or not, and the health status of children (having cough, diarrhea, and anaemia). We used binary logistic regression analysis to find the determinants of food group consumption and MDD failure among infants and young children. We checked for multicollinearity by estimating the variance inflation factor and used appropriate sampling weights for descriptive and multivariable analysis. We presented the odds ratio of food group consumption patterns obtained from multivariable regression with $P < 0.05$ in the form of forest plots. Our analysis was conducted using Stata 14.2 and ArcGIS 10.8.

RESULTS

Figure 2 shows the prevalence of dietary diversity among children aged 6–23 months by eight food groups. The consumption levels for eight different food groups were recorded as follows: breastmilk (82.47%), grains, roots and tubers (65.81%), dairy products (52.37%), vitamin A-rich fruits and vegetables (40.87%), other fruits and vegetables (28%), legumes and nuts (17.57%), eggs (17.48%), and flesh foods (9.03%). It was found that a large share of children in India (77.54%) consumed less than five food groups during the previous day and night of the interview, which highlights the fact that there is insufficient dietary variety in their diets.

77.54 percent of children in India did not meet the minimum dietary diversity (MDD) requirement. Out of these children, 54 percent consumed two or fewer food groups. Only 22.46% of children meet the MDD status. Among children who met the MDD status, 72.71 percent consumed five or six food groups. It is observed that younger children tend to consume fewer food groups, regardless of whether they meet the MDD status or not (Table 2).

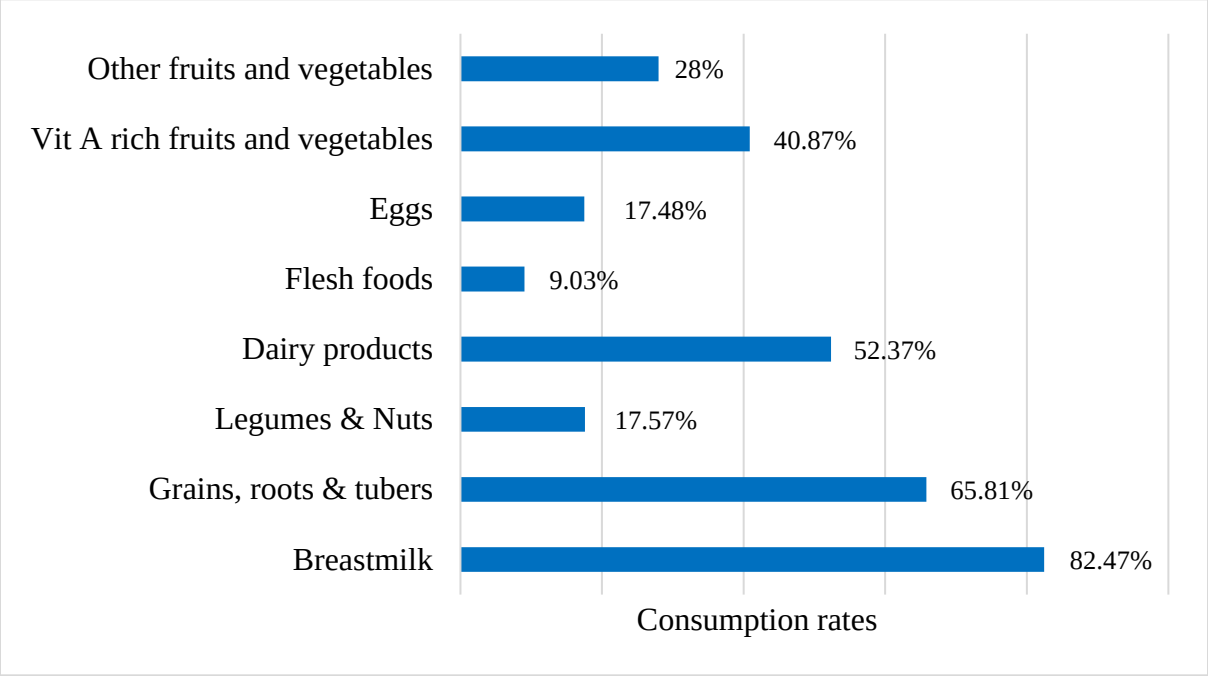


Fig. 2: Consumption levels of food groups among children aged 6-23 months in India

Source: Author's computation using NFHS-5, 2019-21

Table 2. Dietary diversity score by minimum dietary diversity status among children aged 6-23 months in India, 2019-21 NFHS

Dietary Diversity Score	n	%
Not meeting MDD		
0	2188	4.41
1	12258	24.73
2	12211	24.64
3	12922	26.07
4	9981	20.14
Total	49560	77.54
Meeting MDD		
5	6688	46.59
6	3749	26.12
7	2202	15.35
8	1713	11.94
Total	14354	22.46

Source: Author's computation using NFHS-5, 2019-21

Note: All percentages are weighted to be nationally representative. Percentages for each dietary diversity score are out of all children with that Minimum Dietary Diversity (MDD) status. Percentages for totals are out of the entire country.

Across various states in India, there exist significant disparities in the average consumption of different types of foods among children. For example, in Odisha, a whopping 94.16% of

children consumed breast milk, while in Tamil Nadu, only 67.67% of children did so. A significant difference of 22.55 percentage points was observed in the consumption of grains, roots, and tubers between Andhra Pradesh (60.08%) and Odisha (82.63%). Similarly, there was a vast difference of 25.48 percentage points in the consumption of legumes and nuts between Gujarat (10.55%) and Meghalaya (36.03%). When it comes to dairy products, Himachal Pradesh (72.79%) had a much higher consumption rate than Jharkhand (36.45%), resulting in a 36.34 percentage point difference. In terms of flesh foods, Meghalaya (36.53%) had a much higher rate than Rajasthan (1.36%), with a difference of 35.17 percentage points.

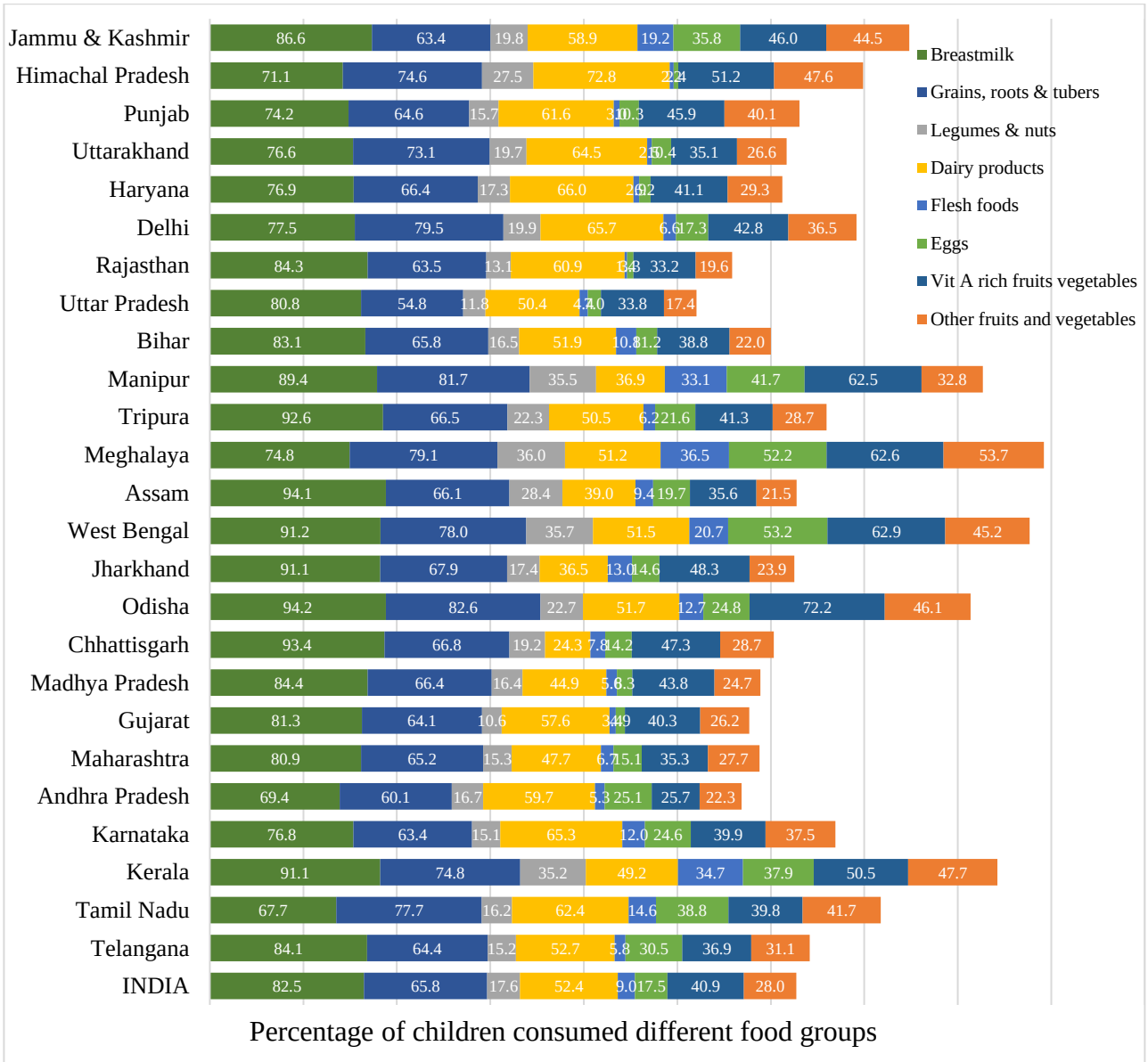


Fig. 3: Consumption levels of eight food groups for WHO's MDD indicator (%)

Source: Author's computation using NFHS-5, 2019-21

Likewise, there was a significant gap in the consumption of eggs between West Bengal (53.17%) and Himachal Pradesh (2.41%), with a difference of 50.76 percentage points. The consumption of vitamin A-rich fruits and vegetables also varied greatly, with Odisha (72.18%) consuming much more than Andhra Pradesh (25.72%), a difference of 46.46 percentage points. Finally, there was a substantial difference of 35.75 percentage points in the consumption of other fruits and vegetables between Meghalaya and Uttar Pradesh (Figure 3).

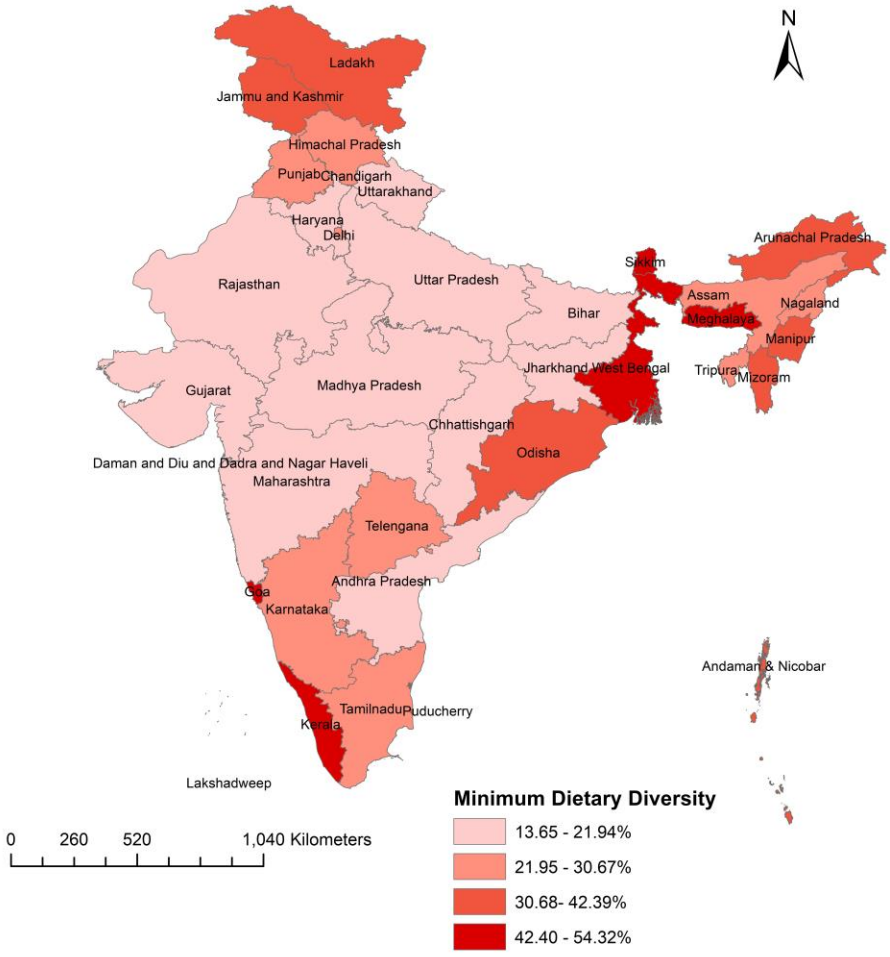


Fig. 4: State-wise meeting of minimum dietary diversity of children in India

Source: Author's computation using NFHS-5, 2019-21

The present study indicated that the prevalence of MDD among children was found to be higher in Sikkim, Meghalaya, West Bengal, Kerala, and Goa. In contrast, it was comparatively lower in Uttar Pradesh, Rajasthan, Gujarat, Maharashtra, Madhya Pradesh, Uttarakhand, Bihar,

and Andhra Pradesh. (Figure 4). Interstate variation in food consumption was high, particularly for eggs (food group V), and low for legumes and nuts (Figure 5).

Figure 6 shows the food consumption of children who meet and do not meet the Minimum Dietary Diversity (MDD) criteria. Children who did not meet the MDD criteria mostly consumed breastmilk (80.74%), followed by grains, roots, and tubers (56.79%), dairy products (43.36%), vitamin A-rich fruits and vegetables (25.92%), other fruits and vegetables (12.21%), eggs (6.42%), legumes and nuts (5.92%), and flesh foods (1.42%). On the other hand, children who met the MDD criteria consumed mostly grains, roots, and tubers (96.95%), followed by vitamin A-rich fruits and vegetables (92.46%), breastmilk (88.45%), dairy products (83.49%), other fruits and vegetables (82.51%), legumes (57.78%), eggs (55.66%), and flesh foods (35.41%).

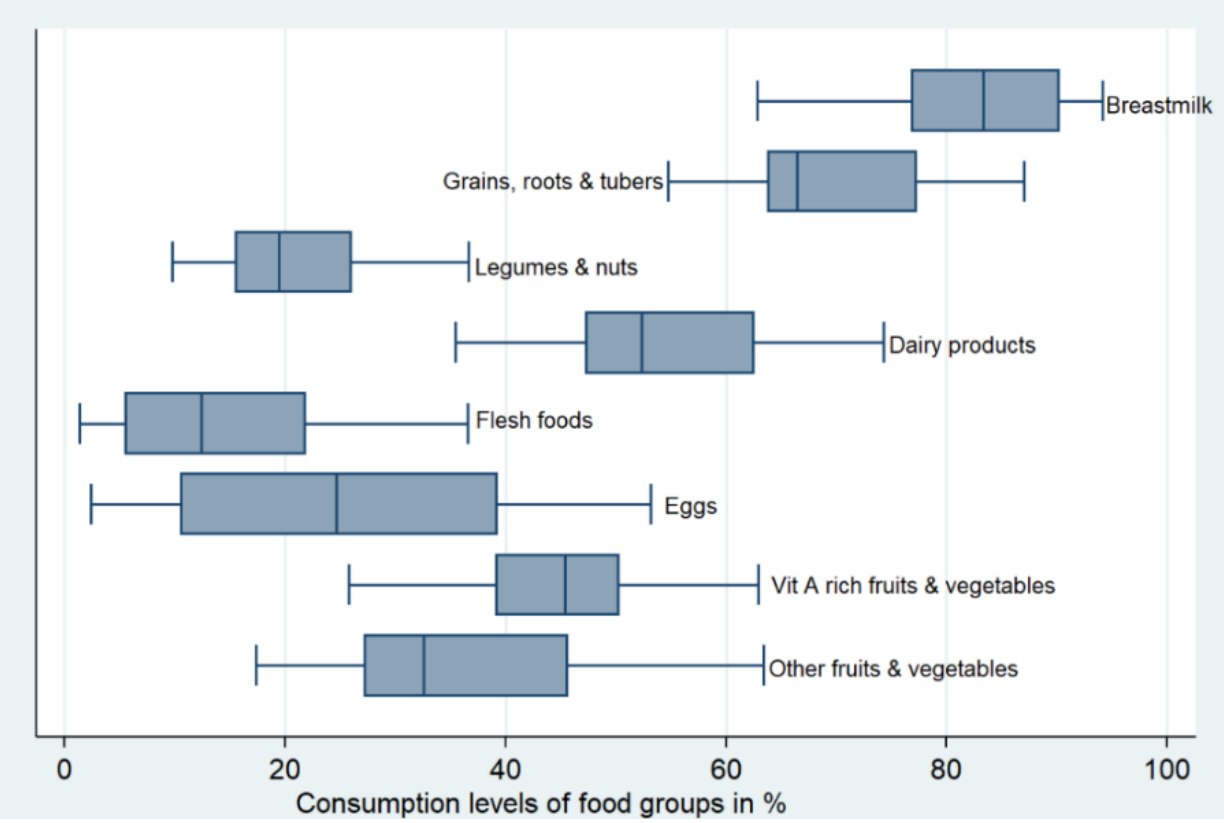


Fig. 5: State-wise consumption rates of eight food groups in India

Source: Author's computation using NFHS-5, 2019-21

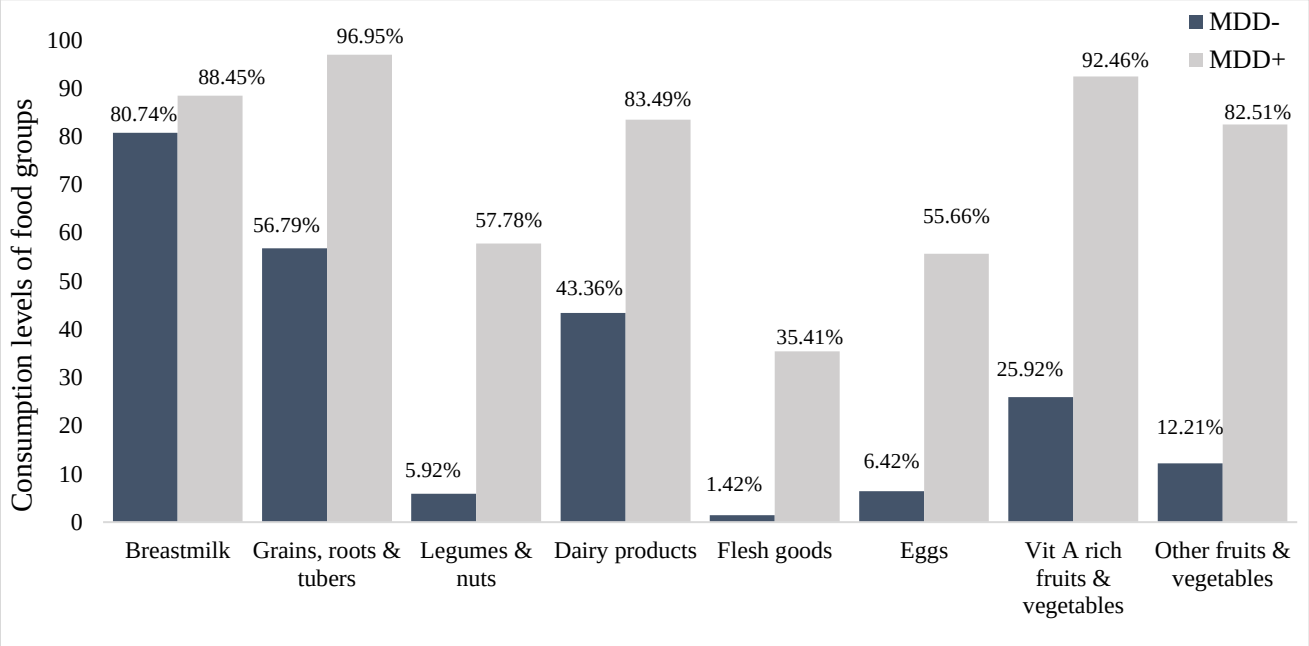


Fig. 6: Consumption levels by status of reaching minimal dietary diversity for food items

Source: Author's computation using NFHS-5, 2019-21

The consumption of food items varied among children of different age groups. Children aged 6-11 months mostly consumed breastmilk, which accounts for 92.94% of their diet. Grains, roots, and tubers were the next most commonly consumed food group (52.42%), followed by dairy products (42.82%), vitamin A-rich fruits and vegetables (25.43%), other fruits and vegetables (17.33%), legumes and nuts (10.89%), eggs (9.93%), and flesh foods (4.32%). For children aged 12-17 months, breastmilk was still the most commonly consumed food, accounting for 83.18% of their diet. Grains, roots, and tubers were also a significant portion of their diet (71.13%), followed by dairy products (56.01%), vitamin A-rich fruits and vegetables (45.54%), other fruits and vegetables (30.80%), eggs (19.03%), legumes and nuts (18.85%), and flesh foods (9.81%). Children aged 18-23 months consumed primarily grains, roots, and tubers (74.31%), followed by breastmilk (70.57%), dairy products (58.62%), vitamin A-rich fruits and vegetables (52.25%), other fruits and vegetables (36.33%), eggs (23.84%), legumes and nuts (23.30%), and flesh foods (13.19%). It is worth mentioning that the consumption of food items varies with different age groups of children, as shown in Figure 7.

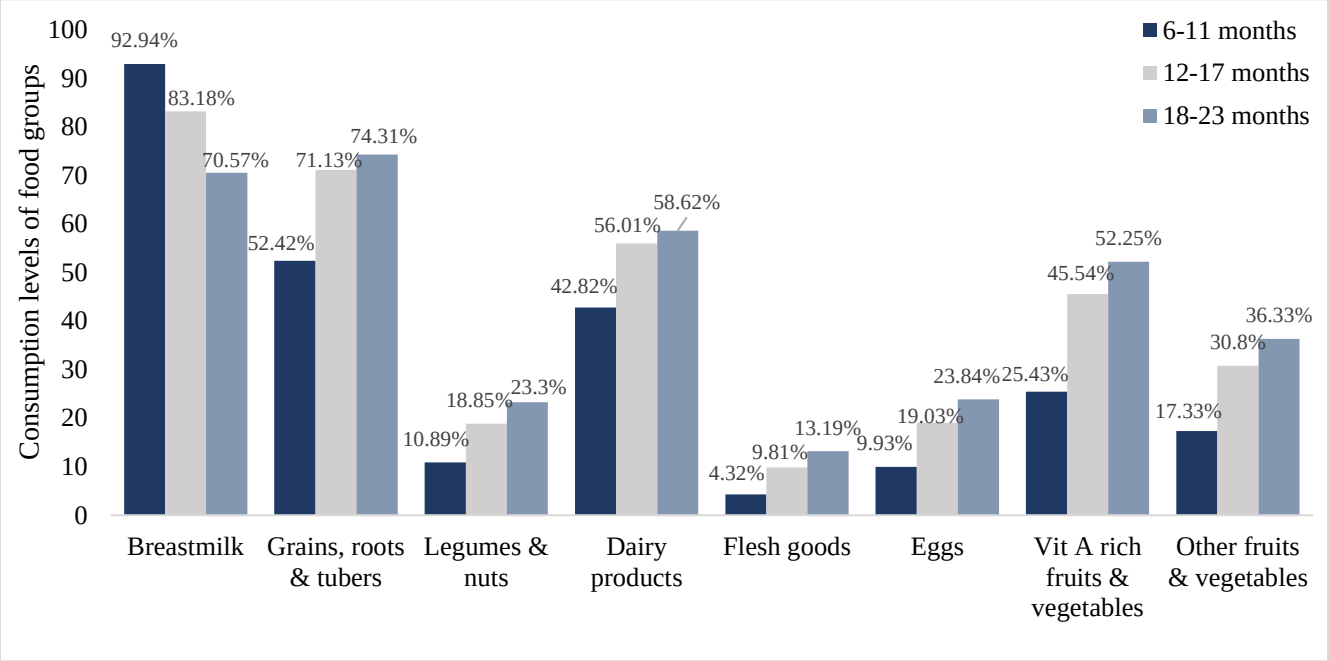


Fig. 7: Consumption levels of food groups for separate age groups

Source: Author's computation using NFHS-5, 2019-21

Children from households headed by females consume more eggs, flesh foods, Vitamin A-rich fruits and vegetables, legumes, nuts, and other fruits and vegetables compared to households headed by males (Figure 8).

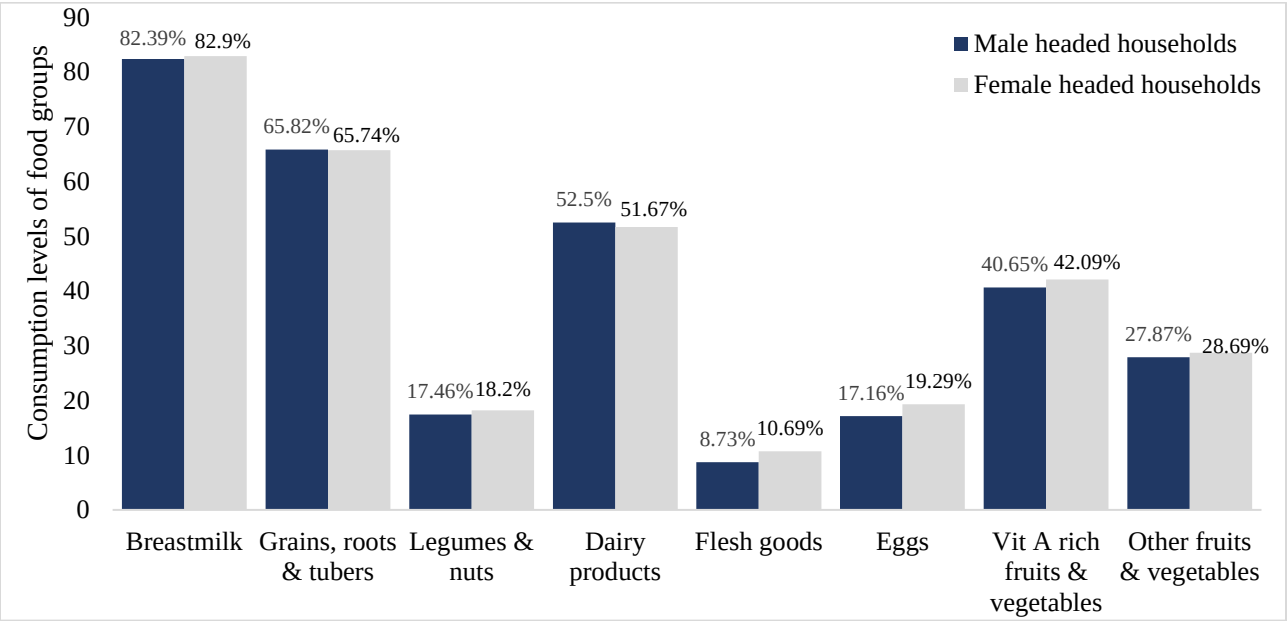


Fig. 8: Consumption levels of food groups for separate-headed households

Source: Author's computation using NFHS-5, 2019-21

Determinants of consumption pattern of food groups in India

Currently breastfeeding: Breastfeeding is less commonly practiced among older and female children aged between 12 and 23 months. Children with older siblings were more likely to be breastfed. Children belonging to Muslim and Christian families were less likely to be breastfed compared to those belonging to Hindu families. Children from OBC and other caste categories were less likely to be breastfed compared to those belonging to the SC category. Children born to mothers with lower education levels, from lower socio-economic households, and residing in rural areas are more likely to be breastfed. Furthermore, children who received their nutrition from Anganwadi Centres were also more likely to be breastfed. It was observed that children with cough tend to be breastfed more often than those with anaemia (Figure 9a).

Consumption of grains, roots, and tubers: Children between the ages of 12 and 23 months tend to consume a larger number of grains, roots, and tubers compared to those aged between 6 and 11 months. Second-born children and those who followed Christianity were more likely to consume these foods as compared to their peers. Children belonging to the SC community consumed more of these foods as compared to those in the OBC community. Families with fewer members tend to consume more of these foods than those with larger families. The level of education of the mothers also had an impact on their children's consumption habits. Children who suffer from coughs, diarrhea, and anaemia tend to consume more grains, roots, and tubers (Figure 9b).

Consumption of legumes and nuts: Children between the ages of 12-23 months consumed more legumes and nuts than those between 6-11 months. Females tended to consume more legumes and nuts than males, and second-born children consumed more than first-borns. Large families, as well as Muslim and Christian families, tended to consume more legumes and nuts. However, children whose mothers had no formal education tended to consume less. Urban children tended to consume more legumes and nuts than rural children. Children who received supplementary nutrition and those who were unwell tended to consume more legumes and nuts (Figure 9c).

Consumption of dairy products: Children aged 12-23 months, male children, second-born children, Hindu children, OBC and other caste categories, children born to highly educated mothers, children from wealthier households, rural children, and those experiencing cough and diarrhea were more likely to consume dairy products. However, children from urban areas and

those who received their nutrition from Anganwadi Centres were less likely to consume dairy products (Figure 9d).

Consumption of eggs: Infants aged 12-23 months, second-born children, and children from Muslim or Christian families were more likely to consume eggs. Families led by females and children from Scheduled Tribe families also had higher odds of egg consumption. Additionally, maternal education and household wealth played a role in egg intake. Rural children, those who received nutrition from Anganwadi Centres, and children with anaemia had lower odds of consuming eggs. Children with cough or diarrhea had a higher probability of egg consumption (Figure 9e).

Consumption of flesh foods: Children aged 12-23 months and females were more likely to consume flesh foods. Second and third-born children, Muslim/Christian children, and children receiving nutrition from Anganwadi Centres had higher odds of flesh food consumption. In India, cultural differences contribute to variations in meat consumption. The prevalence of non-violence in Hinduism is the main reason for the lower meat consumption of Hindus (Devi et al., 2014). Rural children and children of mothers with lower education had lower odds of consuming flesh foods. Lastly, children with a cough had higher odds of consuming flesh foods, while those with anaemia had lower odds (Figure 9f).

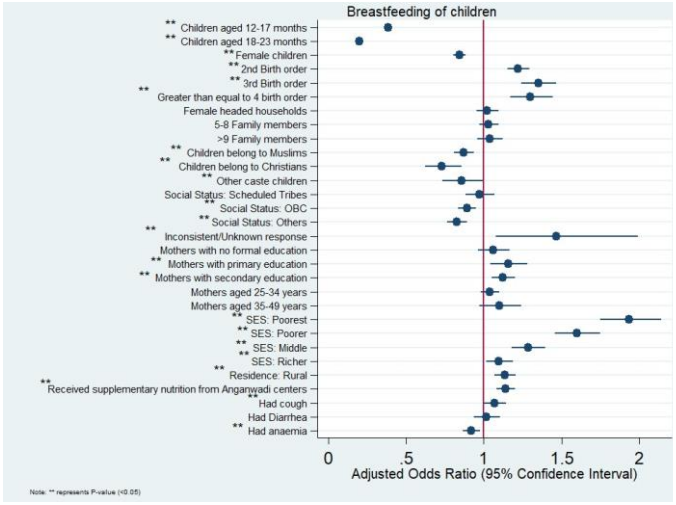


Fig. 9a: Children currently breastfeeding in India

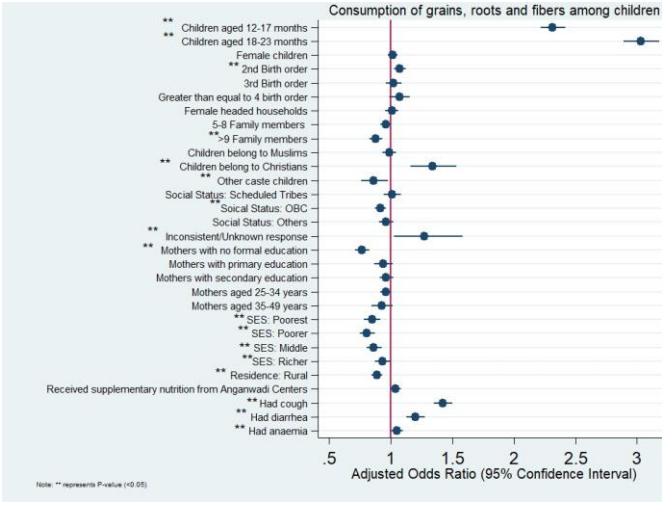


Fig. 9b: Children fed with grains, roots, and tubers in India

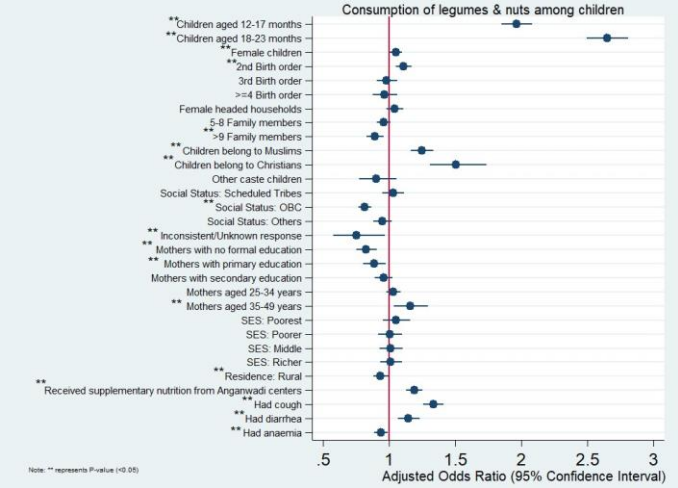


Fig. 9c: Consumption levels of legume nuts among children in India

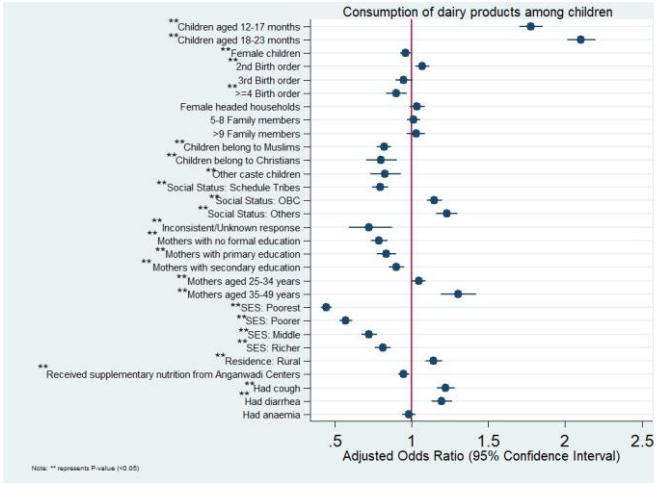


Fig. 9d: Consumption levels of dairy products among children in India

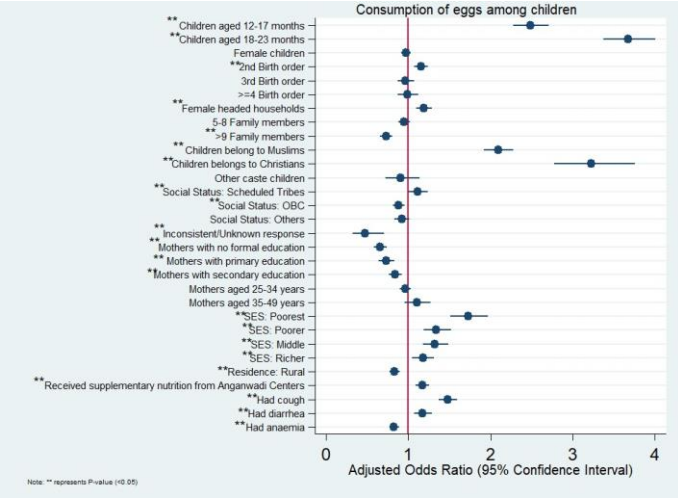


Fig. 9e: Consumption levels of eggs among children in India

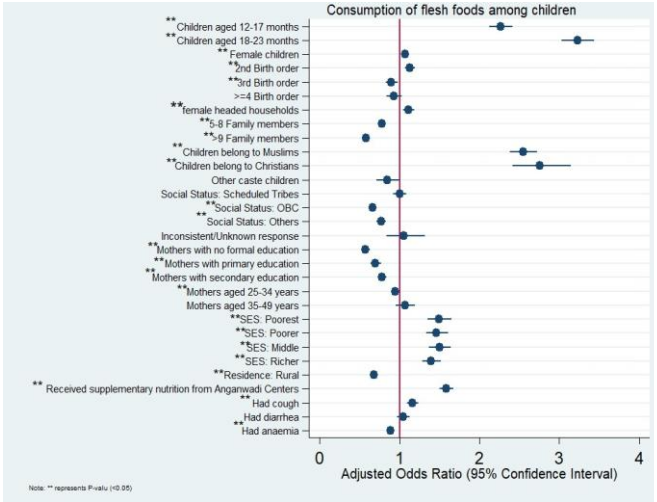
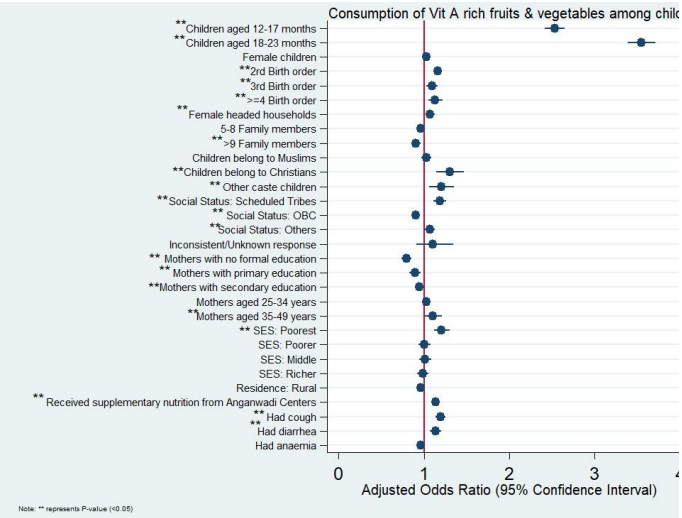


Fig. 9f: Consumption levels of flesh foods among children in India



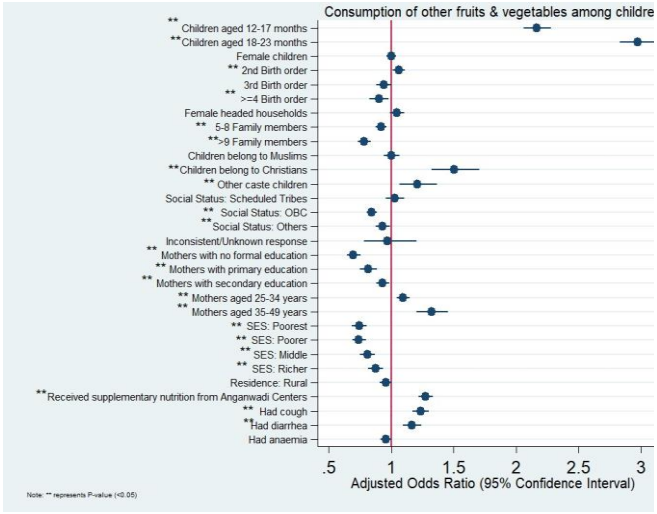


Fig. 9g: Consumption levels of Vit A rich fruits and vegetables among children in India

Fig. 9h: Consumption levels of other fruits and vegetables among children in India

Source: Author's computation using NFHS-5, 2019-21

Consumption of Vit A-rich fruits and vegetables: Children aged 12-23 months and from female-headed households were more likely to consume vitamin A-rich fruits and vegetables. Children from Christian and other religious backgrounds, born to mothers aged 35-49 years, and those receiving nutrition from Anganwadi Centres also had higher odds of consuming such foods. Children experiencing cough and diarrhea had higher odds of consuming these foods. Lower maternal education and larger households decreased the likelihood of consuming these foods (Figure 9g).

Consumption of other fruits and vegetables: Children aged 12-23 months and second-born were more likely to eat non-vitamin A-rich fruits and veggies. Families with over five members had a lower chance of their children consuming these foods. Christian children and those with mothers aged 25-49 years were more likely to eat these foods. However, children from OBC and poorer households, and those of mothers with no formal education had a lower chance of consuming these foods. Children who received nutrition from Anganwadi Centres and those with cough and diarrhea had a higher chance of eating these foods (Figure 9h).

Determinants of Minimum Dietary Diversity Failure

Children between the ages of 12 and 23 months were less likely to experience MDD failure compared to children aged 6-11 months. Children who were of birth order three or greater were more likely to have MDD failure than children of birth order 1. Children born to mothers aged between 25-34 years were found to be less likely to experience MDD failure (aOR: 0.94; 95% CI: 0.89, 0.99) compared to those born to mothers aged 15-24 years. Similarly, children born to mothers aged between 35-49 years were also less likely to experience MDD failure (aOR: 0.73; 95%CI: 0.66, 0.80) compared to those born to mothers aged 15-24 years. Children born to mothers with lower levels of education (primary and secondary) were more significantly prone to MDD failure compared to those born to highly educated mothers. The odds ratio was 1.46, with a 95% confidence interval of 1.35 to 1.59. Additionally, children from households headed by females were less likely to face MDD failure (odds ratio of 0.91; 95%CI: 0.86 to 0.96) when compared to those from male-headed households. Children from families with 5-8 members (aOR: 1.05;

95%CI: 1.00, 1.11) are more likely to experience MDD failure than those from families with 1-4 members. Moreover, children from families with a larger family size of >9 members (aOR: 1.23; 95%CI: 1.15, 1.32) were even more likely to experience MDD failure than those from families with a size of 1-4 members. The study found that children belonging to the Muslim community (aOR: 0.71; 95%CI: 0.67, 0.76) were less likely to experience MDD failure compared to those belonging to the Hindu community. Similarly, children belonging to the Christian community (aOR: 0.56; 95%CI: 0.49, 0.64) were also less likely to face MDD failure compared to those belonging to the Hindu community. On the other hand, children from the OBC community (aOR: 1.21; 95%CI: 1.15, 1.27) were found to be more likely to experience MDD failure than those belonging to the Schedule Caste community. Children living in rural areas (aOR: 1.06; 95% CI: 1.00, 1.12) were more likely to experience MDD failure than those in urban areas. However, children who received supplementary nutrition from the Anganwadi Centres (aOR: 0.75; 95% CI: 0.72, 0.79) were less prone to MDD failure compared to those who did not receive such nutrition. Similarly, children who had a cough (aOR: 0.75; 95% CI: 0.71, 0.79) or diarrhea (aOR: 0.87; 95% CI: 0.81, 0.93) were less likely to face MDD failure. On the other hand, children with anaemia (aOR: 1.08; 95% CI: 1.03, 1.14) had a higher likelihood of experiencing MDD failure than those without anaemia (Table 3).

Table 3. Determinants of minimum dietary diversity failure among children

Variables	**n**	**%**	**aOR (95% CI)**	**P-value**
Children age (in months)				
6-11	21,640	86.71	1 (ref)	
12-17	21,918	75.14	0.44 (0.42, 0.46)	0.000
18-23	20355	70.38	0.33 (0.31, 0.35)	0.000
Sex of the child				
Male	33082	77.41	1 (ref)	
Female	30832	77.68	0.99 (0.95, 1.03)	0.656
Birth Order				
1	25395	77.92	1 (ref)	
2	21932	75.29	0.89 (0.85, 0.94)	0.000
3	9501	79.49	1.09 (1.01, 1.17)	0.019
≥4	7085	80.55	1.13 (1.03, 1.23)	0.008
Mother's age				
15-24	27437	78.45	1 (ref)	
25-34	32979	77.14	0.94 (0.89, 0.99)	0.024
35-49	3498	74.27	0.73 (0.66, 0.80)	0.000
Mother's education				
No education	12006	81.81	1.46 (1.35, 1.59)	0.000

Primary	7125	79.18	1.26 (1.15, 1.37)	0.000
Secondary	33529	76.48	1.08 (1.02, 1.15)	0.009
Higher	11254	75.12	1 (ref)	
Sex of household head				
Male	54232	77.76	1 (ref)	
Female	9682	76.32	0.91 (0.86, 0.96)	0.002
Family size				
1-4	16263	75.47	1 (ref)	
5-8	36720	77.51	1.05 (1.00, 1.11)	0.038
>9	10931	80.72	1.23 (1.15, 1.32)	0.000
Religion				
Hindu	50800	78.47	1 (ref)	
Muslim	10387	74.64	0.71 (0.67, 0.76)	0.000
Christian	1304	65.34	0.56 (0.49, 0.64)	0.000
Others	1411	76.98	0.96 (0.84, 1.11)	0.619
Social status				
Scheduled Caste	14743	77.58	1 (ref)	
Scheduled Tribes	6475	76.89	0.97 (0.90, 1.05)	0.457
OBC	27807	79.34	1.21 (1.15, 1.27)	0.000
Others	11391	75.98	1.05 (0.98, 1.13)	0.118
Unknown response	555	83.22	1.53 (1.19, 1.96)	0.001
Wealth Index				
Poorest	15256	78.76	1.02 (0.94, 1.12)	0.590
Poorer	13642	78.74	1.06 (0.97, 1.15)	0.165
Middle	12770	76.97	1.01 (0.94, 1.09)	0.745
Richer	11924	76.39	1.01 (0.94, 1.09)	0.731
Richest	10323	76.20	1 (ref)	
Residence				
Urban	16890	76.10	1 (ref)	
Rural	47023	78.06	1.06 (1.00, 1.12)	0.032
Received supplementary nutrition through Anganwadi Centres				
No	18656	80.32	1 (ref)	
Yes	43998	75.82	0.75 (0.72, 0.79)	0.000
Had Cough				
No	53448	78.26	1 (ref)	
Yes	10411	73.84	0.75 (0.71, 0.79)	0.000
Had Diarrhea				
No	56778	77.72	1 (ref)	
Yes	7066	76.06	0.87 (0.81, 0.93)	0.000
Had Anaemia				
No	12072	76.07	1 (ref)	
Yes	45333	77.49	1.08 (1.03, 1.14)	0.001

Source: Author's computed using NFHS-5, 2019-21

DISCUSSION

The study found that 77.54 percent of children in India need to consume the minimum required variety of foods for a healthy and balanced diet. A diverse diet is crucial to ensure that they get all the vital nutrients for optimal growth and development. This highlights the fact that there is insufficient dietary variety in their diets, which can lead to nutritional deficiencies and health problems (Chopra et al., 2023; Patel et al., 2010). The study found that only 22.46 percent of children in India meet the minimum dietary diversity requirement. Younger children tend to consume fewer types of food regardless of whether they fulfil the minimum nutritional diversity requirement. Consumption of food items varies with different age groups of children and the gender of household heads. Children belonging to households led by female heads tend to have a more nutritious diet. They consume a higher quantity of eggs, flesh foods, Vitamin A-rich fruits and vegetables, legumes, nuts, and other fruits and vegetables compared to households headed by males. This highlights the importance of female leadership in ensuring better health and nutrition outcomes for children.

This study also highlights the disparities in the average consumption of different types of foods among children across various states in India, the same as given in the study (Parappurathu et al., 2015). The findings revealed that the states of Sikkim, Meghalaya, West Bengal, Kerala, and Goa have a significantly higher prevalence of MDD among children. In contrast, the states of Uttar Pradesh, Rajasthan, Gujarat, Maharashtra, Madhya Pradesh, Uttarakhand, Bihar, and Andhra Pradesh have a comparatively lower prevalence. Some previous studies also reported the regional differences existing in household dietary diversity in India and across countries (Heemann et al., 2022; Singh et al., 2020). The reason behind the variation in dietary diversity between states can be attributed to multiple factors such as regional differences in household socioeconomic status, female literacy, religion and caste, and agricultural productivity. These factors play a crucial role in shaping the food habits and preferences of the local population, hence resulting in dietary diversity (Gausman et al., 2018; Jain et al., 2022; Singh et al., 2020).

Breastfeeding rates are influenced by various factors such as religion, caste, maternal education, socio-economic status, location, and health conditions. Older children tend to consume more grains and tubers. Consumption of nuts, dairy, flesh foods, vitamin A-rich fruits and vegetables, and other fruits and vegetables is also influenced by factors such as age, birth order, family size, religion, maternal education, wealth status, and health conditions. Various factors, which are diverse and interconnected, collectively shape the dietary patterns and consumption

habits of different food groups among children in India. This has been reported by previous studies (Agrawal et al., 2019; Harris-Fry et al., 2015). Agricultural policies and programs in India should aim to diversify agricultural production to promote dietary diversity and improve nutritional outcomes of children (Kumar et al., 2016; Venkatesh et al., 2016).

The study found that children aged between 12-23 months are less likely to experience MDD failure than those aged between 6-11 months. Children who are third-born or later, born to mothers with lower levels of education, and living in larger families have a higher chance of experiencing MDD failure. Children from households headed by females, belonging to the Muslim or Christian community, and receiving supplementary nutrition are less likely to face MDD failure. Additionally, children with cough or diarrhea are less likely to experience MDD failure, while those with anaemia have a higher likelihood of facing it. Encouraging maternal education could play a vital role in developing context-specific interventions to mitigate MDD failure, as per the study by (Rai et al., 2022).

CONCLUSION AND POLICY IMPLICATIONS

The study revealed that 77.54 percent of Indian children consumed less than the minimum required food groups for a healthy diet, posing a significant threat to their growth and development. Only 22.46 percent met the dietary diversity requirement. Hence, urgent action is required to improve health and nutrition outcomes for children across the country. Factors such as age, gender, birth order, religion, nutrition access, and health conditions significantly impacted the food consumption of infant children. The study highlighted that maternal education and female leadership were crucial for better health and nutrition outcomes. A higher risk of MDD failure was associated with lower maternal education, larger families, higher birth order, and anaemia. Our study provided valuable information that is necessary to design targeted interventions by comprehensively studying different food group consumption patterns of infant children. These interventions could address nutritional deficiencies, promote healthier eating habits, and mitigate health risks associated with inadequate diets among this vulnerable population. Moreover, the study identified that the socio-economic, cultural, and regional determinants influencing dietary diversity enable the development of tailored strategies. These strategies can ensure equitable access to diverse and nutritious foods, irrespective of socioeconomic background or geographic location in India.

Ethical Standards: The study utilizes data from the NFHS-5 survey, which is available for free on the National Family Health Survey Website. Ethical approval was granted by the review board of IIPS and approved by ICF International.

No ethical approval or participant consent was required for this study as it used freely accessible survey data from the DHS program. However, we did receive permission from the DHS program to download and use the data. The data files do not contain any information regarding individual names or household addresses.

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