ASSESSING MATERNAL AND CHILD DIETARY DIVERSITY IN SELECTED VILLAGES OF KALOL TALUKA OF PANCHMAHAL DISTRICT, GUJARAT

APRIL, 2023

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B.Sc. (Hons.) Community Science

ASSESSING MATERNAL AND CHILD DIETARY DIVERSITY IN SELECTED VILLAGES OF KALOL TALUKA OF PANCHMAHAL DISTRICT, GUJARAT

A Dissertation submitted in partial fulfilment of the requirement for the degree of
Master of Science
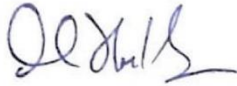(Family and Community Sciences)
(Public Health Nutrition)

BY

ANUSHKA PATHAK

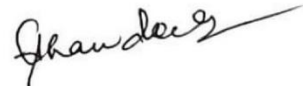B.Sc. (Hons.) Community Science

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April, 2023

CERTIFICATE

This is to certify that the research work presented in this thesis has been carried out independently by Ms. Anushka Pathak under the guidance of Dr. Suneeta Chandorkar in pursuit of Degree of Master of Science (Family and Community Sciences) with major in Foods and Nutrition (Public Health Nutrition) and this is her original work.

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ACKNOWLEDGEMENT

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ABBREVIATIONS

ADDI	Adequately Diversified Dietary Index
APL	Above Poverty Line
AWC	Anganwadi Centre
BMI	Body Mass Index
BPL	Below Poverty Line
CED	Chronic Energy Deficiency
DDS	Dietary Diversity Score
DQQ	Diet Quality Questionnaire
FAO	Food and Agriculture Organization
FHI	Family Health International
FNS	Food and Nutrition Security
HAZ	Height-for-Age Z score
ICDS	Integrated Child Development Scheme
IF	Indigenous Foods
IFA	Iron and Folic Acid tablets
IYCF	Infant and Young Child Feeding
LBW	Low Birth Weight
LMIC	Low-Middle Income Countries
MAD	Minimum Acceptable Diet
MDD	Minimum Dietary Diversity
MMF	Minimum Meal Frequency
MUAC	Mid Upper Arm Circumference
NCD	Non-Communicable Disease
NFE	Neighboring Food Environment
NFHS	National Family Health Survey
NFSA	National Food Security Act
NREGA	Mahatma Gandhi National Rural Employment Guarantee Act
OBC	Other Backward Classes
PDS	Public Distribution System
SBCC	Social and Behavior Change Communication
SES	Socio-Economic Status
THR	Take-Home Ration
UNICEF	United Nations Children's Fund
WASH	Water, Sanitation and Hygiene
WAZ	Weight-for-Age Z score
WHZ	Weight-for-Height Z score
WHO	World Health Organization
WRA	Women of Reproductive Age

ABSTRACT

ABSTRACT

Dietary diversity is a measure of food consumption that reflects household access to a variety of food items, and is a proxy for nutrient adequacy of the diet of an individual. Poor dietary diversity often results in macronutrient deficiencies and undernutrition in the priority group of women and children.

Objective: To assess the dietary diversity of mothers and their children (6-23 months) from selected villages of Kalol taluka of Panchmahal District, Gujarat.

Design: A cross-sectional study was carried out in 13 villages purposively selected from Kalol taluka of Panchmahal district, Gujarat. All the households (385) with mothers and children 6-23 months of age from the 13 villages were enrolled in the study after obtaining their consent.

Methods: The dietary diversity of women was assessed using the Diet Quality Questionnaire, which is designed to capture both nutrient adequacy and diet patterns related to NCD risk (consumption of processed and ultra-processed foods), as well as aspects of diets related to the nutrition transition, and to sustainability. It contains 29 food groups from which several indicators can be derived, including MDD-W. The dietary diversity in children was assessed through UNICEF guidelines of Minimum Dietary Diversity (MDD), which is defined as the percentage of children 6–23 months of age who consumed foods and beverages from at least five out of eight defined food groups during the previous day, and Minimum Acceptable Diet (MAD), which is defined as percentage of children 6–23 months of age who consumed a minimum acceptable diet during the previous day. Anthropometry for children was assessed by calculation of height, weight and MUAC with indices of stunting, wasting and underweight. Anthropometry of women was assessed using the Body Mass Index. The data was collected using EpiCollect5 software and analysed in Microsoft Excel and SPSS software.

Results: The mean age of mothers was 27.2± 3.78 years and that of the children was 14.1± 4.47 months. Sixty nine percent of the families spent three-fourth of their monthly income on food which indicates poor/low food and nutrition security as well as diminished resources for education, health and other amenities. The study population belonged to lower-middle class with a maximum number of household heads employed in the service industry and majority of mothers being housewives. The study population consisted of OBC (34.3 %), Tribals (30.9 %) and Scheduled Caste population (22.9 %). Only 20.1 percent of the women consumed five food

groups that were advised namely, starchy grains, vegetables, fruits, pulses, nuts and seeds, and animal-based meals (mainly fluid milk and yogurt) for an adequate dietary diversity. The major food groups consumed were grains and white roots, tubers, and plantains, whole grains, legumes, and sweet tea/coffee/coca that contributed simple and complex carbohydrates and small amount of protein to their diet. The least consumed food groups were eggs, meat, poultry and fish, and nuts and seeds. 90% of the mothers started complementary foods for their child at 7 months of age. Only 2.3% of the children (N=9) met the criteria for a Minimum Acceptable Diet, while 41% of the children met the Minimum Dietary Diversity (MDD) standard. The older age group, between 9 and 17 months, was found to have a better outcome for MDD. The least consumed food groups while assessing MAD and MDD were found to be flesh foods, eggs and other fruits and vegetables. Data on utilization of Public Distribution System revealed that 61.1% participants purchased food from the PDS, out of which 53% (N=204) government card holders were BPL and 34 % (N=131) were APL. Thirteen percent (N=50) participants had no government card in their possession. On assessing the nutritional status of women, a total of 49.9 percent women had Normal Body Mass Index (BMI), followed by 44.7 percent women being Mild underweight, 4.9 percent women being Moderate underweight and 0.5 percent women being Severe underweight. Prevalence of undernutrition was found to highest by wasting in 6-11 months age group (8.3%)). Stunting was found to be highest in –12-17 months age group (17.9%). Highest prevalence of underweight was seen in 18-23 months age group (21.6%). Dietary quality had a significant effect on the nutritional status of both women and their children with those not fulfilling the criteria of a Minimum Diverse Diet having poor nutritional status. When processed food consumption was examined, biscuits came out as the most preferred item for consumption. The primary motivators behind these purchases were found to be similar tastes, reasonable prices, shopkeeper trust, and time convenience. The main sources of information for these things were friends, family, radio and television ads, and product packaging and labelling.

INTRODUCTION

1. INTRODUCTION

Mothers and children are a priority group in any community. They account for approximately 71.14 percent of the population in developing countries. Women of childbearing age (15 to 44 years) account for 22.2% of the total population in India.

Women living in resource-poor settings face micronutrient malnutrition, which is a widespread challenge affecting the health of not only women but also their children. Consumption of poor-quality diets, lacking in dietary diversity, is the main cause of micronutrient malnutrition (Custodio et al.,2018). Diet diversity is a reliable indicator of dietary quality and nutrient adequacy. It is defined as the number of different food groups consumed by an individual or a household over a given reference period. Dietary diversity is an important approach in improving micronutrient nutrition for Women of Reproductive Age (WRA). It is a component of diet quality. The higher is the consumption of food items and food groups, the more there is a scope of improved nutritional status (Vellaichamy et al., 2018).

In order to meet average caloric needs, Indian agriculture, which was stimulated by the Green Revolution in the mid-1960s, primarily concentrates on the production of wheat and rice (Dwivedi et al., 2017). Additionally, the National Food Security Act, a significant government project, includes food staples such wheat, rice, sugar, and millets (in selected states) as part of its targeted public distribution system. In particular among vulnerable populations, this method has promoted low-quality, monotonous, and low-diversity diets (Welthungerlife, 2016).

A useful indicator for reflecting micronutrient adequacy is the Minimum Dietary Diversity for women of reproductive age (WRA). Consumption from at least five of the ten food groups indicates higher micronutrient adequacy (FAO & FHI 360, 2016). Evidence suggests that less diverse diets are consumed by women in comparison to other household members. Women lack non-staple food groups like green leafy vegetables, vitamin A rich fruits and vegetables, eggs and dairy, in their diets (Gupta et al.,2020). Women's dietary diversity is also associated with their educational status, sex of the household head, number of members in the household and household wealth index (Adubra et al., 2019).

It has been long acknowledged that women's diets and nutrition are lacking, and there are gaps in their intake of some micronutrients. Diet quality is multifaceted, and one

strategy used to increase micronutrient nutrition for WRA and support sustainable, healthy diets is the promotion of diversified diets. Consuming food from various food groups, as well as raising the corresponding availability and accessibility of nutrient dense food groups, can be safely and universally advised regardless of whether other techniques for enhancing nutrition are in place (Arimond & Deitchler, 2019).

The term 'food insecurity' is often understood to mean 'insufficient access to food' or 'hunger'. However, it is also possible to consume sufficient, or even excess energy and yet be unable to consume a diverse, high-quality diet due to lack of availability, access to, or affordability of healthier foods, as well as a lack of time and resources to prepare them. This lack of access to a healthy, diverse diet is sometimes termed as 'nutrition insecurity' and is characterised by a double burden of over-nutrition (overweight and obesity) alongside persisting micronutrient deficiencies such as anaemia (Perez-Escamilla et al.,2018). The likelihood that food insecurity will lead to obesity, rather than undernutrition, is influenced by factors like the quantity and diversity of food consumed, as well as the affordability of high energy, processed foods and the level of access to nutritious food (Farrell et al., 2018).

Like women, children also continue to be a vulnerable section of the society. As per the recent report of NFHS-5 (2019-21), the nutrition indicators for children under 5 years have improved as compared with NFHS-4 (2015-16) in India. Stunting has reduced from 38.4% to 35.5%, Wasting has reduced from 21.0% to 19.3% and Underweight prevalence has reduced from 35.8% to 32.1%. The infant mortality rate in Gujarat in NFHS-5 is estimated at 31 deaths before the age of one year per 1,000 live births, down from the NFHS-4 estimate of 34. The under-five mortality rate (U5MR) is estimated to be 38 deaths before five years of age per 1,000 live births, which is lower than U5MR in NFHS-4 (44 per 1,000).

Progress continues on increasing exclusive breastfeeding for the first 6 months of life, to prevent incidents of Low Birth Weight (LBW) and stunting. The main cause of child undernutrition is poor Infant and Young Child Feeding (IYCF) practices (FAO, IFAD, UNICEF, WEP & WHO, 2020. The State of Food Security & Nutrition in the World 2020).

A number of strategies have also been developed to improve the nutritional status of children under the age of 2. More than two-thirds of malnutrition-related deaths occur

due to inappropriate feeding practices during the first 1000 days of life (Melaku et al., 2003). Globally, only 29% of children 6–23 months consume the minimum dietary diversity (defined by WHO as ≥4 of 7 food groups; UNICEF, 2016) and an estimated 23% of children under 5 are stunted (UNICEF, 2017). According to NFHS 4 and 5 data, the state of Gujarat experienced rise in rates of stunting in children aged 6-23 months (from 38.5% to 39%), and underweight (from 39.3% to 39.7%). The percentage of wasting in children however decreased from 26.4% to 25.1%. Only 5.2% children consumed an adequate diet in the survey for year 2015-2016, and this showed a positive increase to 5.9% in the year 2019-2020. However, Panchmahal continues to remain a poor performing district in the state with only 3% of children aged 6-23 months receiving an adequate diet in the year 2019-2020, with percentages of stunting, wasting and underweight being 47.1, 35.7 and 51.9 respectively (NFHS-5).

Complementary feeding is defined as the process starting when breast milk alone is no longer sufficient to meet the nutritional requirements of infants, therefore other foods and liquids are needed in addition to breast milk. A lack of healthy complementary feeding practices is the main cause of undernutrition, which is a direct cause of mortality. Food must come from a variety of food groups to ensure that children receive all the vitamins, minerals, and nutrients they need to grow, develop, stay healthy, and reach their full potential. According to UNICEF 2021 guidelines on Infant and Young Child feeding, The MDD (Minimum Dietary Diversity) is defined as the percentage of children aged 6–23 months who consumed foods and beverages from at least five out of eight defined food groups during the previous day. Minimum Meal Frequency is defined as the percentage of children, 6–23 months of age who consumed solid, semi-solid or soft foods (but also including milk feeds for non-breastfed children) at least the minimum number of times during the previous day. The MAD (Minimum Acceptable Diet) is defined as the percentage of children, 6–23 months of age who consumed a minimum acceptable diet during the previous day. Complementary foods that do not meet caloric and protein requirements are a major contributor to poor growth and development. Inadequate dietary diversity with poor consumption of nutrient-rich foods can cause micronutrient deficiencies. Foods that are energy-dense and high in unhealthy types of fat, refined starches, free sugars and salt are poor sources of protein, dietary fibre and micronutrients. Excessive consumption of these energy-dense but nutrient-poor foods

increases the risk of overweight and micronutrient deficiencies in children (UNICEF, 2020).

Comparison studies of the rural-urban context of dietary practices show that the level of food security was higher in rural areas where women with high MDD-W consumed green leafy vegetables and fruits. Research also shows that dietary diversity was related to socioeconomic status. Women in urban slums were more food insecure due to high levels of poverty, with a high percentage of the population living in extreme poverty in urban areas. Households living in poverty consume unhealthy food and change their consumption patterns to suit their income. Additionally, urban households have limited access to land which can cause them to be more vulnerable to food insecurity compared to rural households with land access (Savy et al.,2008).

What people eat depends not only on individual and cultural factors but also on their surrounding food environment. The food environment is one of the major domains in which policies can intervene to improve the availability, affordability, and acceptability of healthier food. By improving nutrition labelling, offering healthier foods, setting standards in public institutions, using economic tools to address food affordability, restricting food advertising, improving the quality of the food supply, and setting incentives and rules to create a healthy retail environment, the food environment can better support consumers to make healthier food choices (Hawkes et al., 2016).

A situational analysis is required to understand the status, trends and drivers of poor diets in young children. This can be done through a review of the quantitative and qualitative data (eg. from national and local surveys and studies), existing programme service delivery, and interviews with government stakeholders. Barriers to nutritious diets can be assessed through market analysis of locally-available foods, including their availability and promotion, and public perceptions of commercially produced complementary foods. Food consumption patterns, cost of diets and nutritional gap analysis for children aged 6-23 months, can help understand the levels of dietary limitations. It is also important to study the social and cultural norms hindering young child feeding practices and address them through Social and Behaviour Change Communication (SBCC) (UNICEF, 2021).

Dietary diversity and micronutrient deficits may be improved by using food-based techniques like including traditional and indigenous foods (IFs) harvested locally from

the wild or grown on farms (Dwivedi et al., 2017; Sethi et al., 2017). A better access to diverse and improved diets through home gardening and consumption of indigenous varieties of fruits and vegetables from forests and other nearby areas could probably improve micronutrient status, according to studies that have shown a positive impact of production diversity on child anthropometric outcomes (Jones, 2017).

Rationale-

- Poor diet diversity in mothers and children is a cause of concern and needs to be addressed.

- Tribal households have poor dietary diversity and high food insecurity.

- Maternal and child nutrition need to be reviewed with respect to poor dietary diversity associated with socio-cultural and environmental factors.

- Food consumption patterns and nutritional gap analysis for mothers and their children aged 6-23 months, can help understand the levels of dietary limitations. (UNICEF, 2021).

Broad objective-

- To assess Maternal and Child Dietary Diversity in selected villages of Kalol taluka of Panch Mahal District, Gujarat.

Specific objectives-

- To assess the socio-demographic profile of households with mothers and children 6-23 months in selected villages of Kalol taluka, Panch Mahal district, Gujarat.

- To assess the dietary diversity in mothers and their children 6-23 months in selected villages of Kalol taluka, Panch Mahal district, Gujarat, India.

- To assess the complementary feeding practices of children aged 6-23 months in selected villages of Kalol taluka, Panch Mahal district, Gujarat.

- To assess the Socio-Cultural Factors and the Food Environment and their association with dietary diversity in women and children aged 6-23 months in selected villages of Kalol taluka, Panch Mahal district, Gujarat.

REVIEW

OF

LITERATURE

2. REVIEW OF LITERATURE

The present chapter includes literature review under the following headings

2.1   Dietary Diversity

      2.1.1   Dietary Diversity in Women

      2.1.2   Social and economic status of women

      2.1.3   Dietary Diversity in Children

2.2   Complementary Feeding

2.3   Dietary Diversity and Food and Nutrition Security

2.4   Dietary Diversity in Tribal Populations

2.5   Food Environment and its association with Dietary Diversity

2.6   Food Safety Net Programs

      2.6.1   Integrated Child Development Scheme

      2.6.2   Public Distribution System

2.1 Dietary diversity

Through the provision of a wholesome and safe food, dietary diversity guarantees that each individual has simple access to enough macro and micronutrients. In terms of bioavailability, nutritional accessibility, and economics, dietary diversity can be employed as an effective strategy for addressing hidden hunger. (Nair et al.,2016).

Changes in eating habits can affect the quality of a diet in both positive and bad ways. A balanced diet must include both increases and decreases in the consumption of cereals, pulses, and calories. Using dietary diversity indicators is the best technique to assess the quality of the diet. Malnutrition and food insecurity are top issues for Indian policy. There is little data for India and other low- and middle-income countries on how children experience food insecurity in the home and how it affects the quality of their nutrition. Even less research has been done on middle childhood and adolescence. According to analysis, children in households with food insecurity had less variety in their diets and were less likely to consume foods high in protein and micronutrients, both of which are essential for their healthy development. Preschool age was when dietary disparities between households' food security status were the most evident (Aurino et al., 2018).

In order to support sustainable diets and combat the worldwide epidemic of obesity, undernutrition, and climate change, interventions must be implemented in the food environment, which contains the full range of options from which consumers choose which foods to purchase and consume (Downs et al., 2020).

In underdeveloped nations, micronutrient malnutrition is a significant public health issue. The poorest households most frequently suffer from micronutrient malnutrition as a result of monotonous diets based on cereal and lacking in nutritional variety. A study carried out in Sri Lanka found that different regions had poor dietary practises, with an alarmingly low intake of micronutrients and an imbalance of macronutrients. In comparison to metropolitan areas, rural communities had a greater variety of food. Most urban women did not fulfil the basic dietary diversification requirements (MDD-W). The study also supported the notion that poor dietary diversity affects one's health and nutritional status. The findings show that a lack of adequate cultivable areas, agro-commercialization, a reduction in reliance on homegrown food, an increase in market purchases, and a lack of understanding about nutrition are the main causes of poor diet diversity (Weerasekara et al., 2020).

It was discovered that (Socio-Economic Status) SES, as determined by household wealth and maternal education, was associated with ADDI among children in a study examining food consumption patterns and (Adequately Diversified Dietary Intake) ADDI among children aged 6-23 months in India. While household financial status was significantly connected with intake of the dairy group only, maternal education was more strongly associated with consumption of all food categories and critical food items. Studies from LMICs (Lower Middle-Income Countries) and India generally indicated a favourable correlation between dietary diversity and particular food item/food category consumption and individual-level socioeconomic status metrics.

While maternal education and household affluence generally increased along with dietary diversity scores, higher SES groups also consumed more packaged food items (Agrawal et al., 2019).

There are various connections between eating habits and health outcomes that point to possible dietary effects on health. The strongest supporting data pointed to a connection between eating habits and body mass. Snacks were frequently present as a significant dietary component in many of the dietary patterns connected to risk factor profiles with lower favourable outcomes. In India, snacks are typically fried dishes that are heavy in trans fats, salt, and fat content (Waghmare et al, 2021).

2.1.1 Dietary diversity in women

The lack of variety in diet is a serious issue that most poor households worldwide face. Women of reproductive age (WRA) are especially at risk for poor micronutrient intake due to diets high in starchy staples. A study that examined the dietary diversity and food security of women between the ages of 15 and 49 in three South African towns along the rural-urban continuum found that peri-urban populations had low dietary intake and were more food insecure due to high rates of poverty, unemployment, and a lack of land. Because they lack safety nets to withstand shocks to income or price as they buy more rather than growing their own food, peri-urban residents are more susceptible to fluctuations in income and food prices. As a result, dietary diversity is compromised (Chakona et al., 2017).

During pregnancy, poor maternal nutrition is linked to poor consequences for the health of the baby. In the developing world, India has the highest percentage of low birth weight (LBW) infants. Results from a study that examined the socioeconomic factors that influence pregnant women's dietary diversity and the relationship between maternal dietary diversity and low birth weight in their offspring showed that participants' poor dietary diversity was significantly correlated with low maternal education and economic status. When compared to women in the medium to high dietary diversity categories, LBW new-borns were considerably more common among women with low mother dietary diversity (Rammohan et al., 2018).

2.1.2 Social and Economic status of women

Women are frequently treated unfairly when producing food, working for pay, and engaging in self-employment in non-farming activities. Even in the informal forms of solidarity promoted by government initiatives or at the family or community levels, discrimination is frequently present. Even if women create food, the intra-household distribution of food may still be biased against them due to attitudes of women's worth in comparison to men. Women typically consume the least amount of food or leftovers in many South Asian regions, which is frequently the result of internalising gender roles.

Power to produce, power to buy, and power to access food in intra-household allocation mechanisms—is a prerequisite for having access to food. Women's access to food is directly impacted when they have less power than males. Thus, it is crucial to improve women's status both inside and outside of the home in order to assure better nutritional outcomes in general and to lower child malnutrition in particular.

Pregnant women's diets are characterised by low energy, an unbalanced macronutrient intake, and insufficient vitamin intake. The lack of food, a bad economy, little exposure to nutrition counselling, taboos and prohibitions surrounding certain foods, negative familial influences, gender stereotypes, and knowledge gaps are all supply- and demand-side barriers to a balanced diet. Food-based programmes, behaviour change communication, and nutrition-sensitive agricultural interventions are intervention strategies that have the potential to enhance maternal diets (Nguyen et al., 2021).

2.1.3 Dietary diversity in children

In the first two years of life, eating meals from various dietary categories is linked to better growth. Contrarily, diets deficient in variety, especially those rich in nutrient-dense foods like eggs, fish, dairy, fruits, and vegetables, can raise the risk of vitamin deficiencies, stunted growth, and impaired physical and cognitive development.

Millions of families around the world struggle to give their children the nourishing meals they require for growth, development, and learning. As the world struggles with a crippling global food and nutrition crisis, that is disproportionately impacting the most vulnerable children and families, the situation is only expected to get worse.

Children under the age of five who consumed no more than four of the eight food categories the day before are considered to be living in food poverty, according to UNICEF. There are two categories:

1. **Severe child food poverty**, which is measured by the proportion of children under 5 who consumed no food or drink from any of the eight food groups the day before.

2. **Moderate child food poverty** is the proportion of children under 5 who consumed items from three or four of the eight designated food groups the day before (UNICEF, 2022).

These are the eight food groups that were tabulated for this indicator:

1. Breast milk

2. Grains, roots, tubers and plantains

3. Fibres (beans, peas, lentils), nuts and seeds

4. Dairy products (milk, infant formula, yogurt, cheese)

5. Flesh foods (meat, fish, poultry, organ meats)

6. Eggs

7. Vitamin A rich fruits and vegetables

8. Other fruits and vegetables

To support their rapid growth and development, infants and young children need diets rich in a variety of nutrients. According to a study, children who consume four or more food groups had a greater length-for-age z-score (LAZ) than children who don't consume any complementary meals. Increased child dietary diversity and LAZ were both linked

to household production of fruits and vegetables. Age in months, socioeconomic level, maternal education, women's empowerment and dietary diversity, father childcare assistance, household food security, fruit and vegetable cultivation, and land ownership were additional characteristics that were positively connected with children's dietary diversity. Age, socioeconomic position, maternal education, the production of fruits and vegetables, and land ownership were all positively correlated with LAZ (Kuche et al.,2019).

Figure 2.1: National prevalence of undernutrition in children under 5
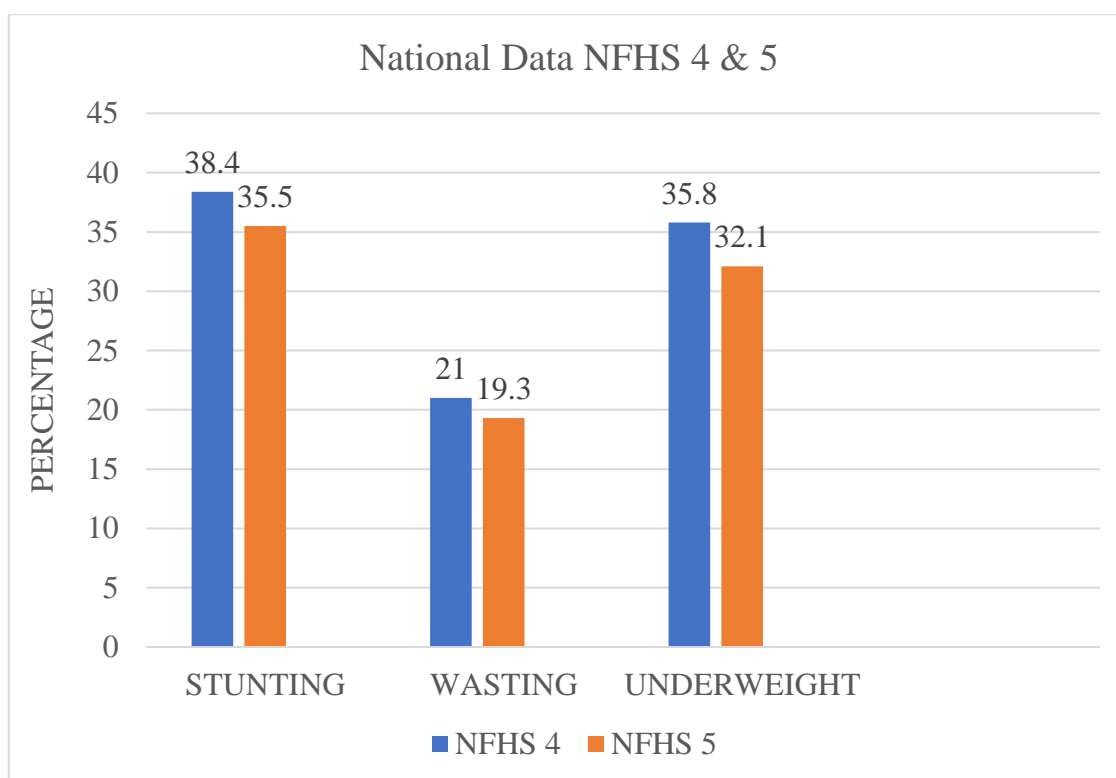
Data on the three indicators that assess undernutrition in children i.e stunting, wasting and underweight, show a decrease in prevalence in NFHS 5 data at national level.

Figure 2.2: State prevalence of undernutrition in children under 5, Gujarat

State Data NFHS 4 & 5
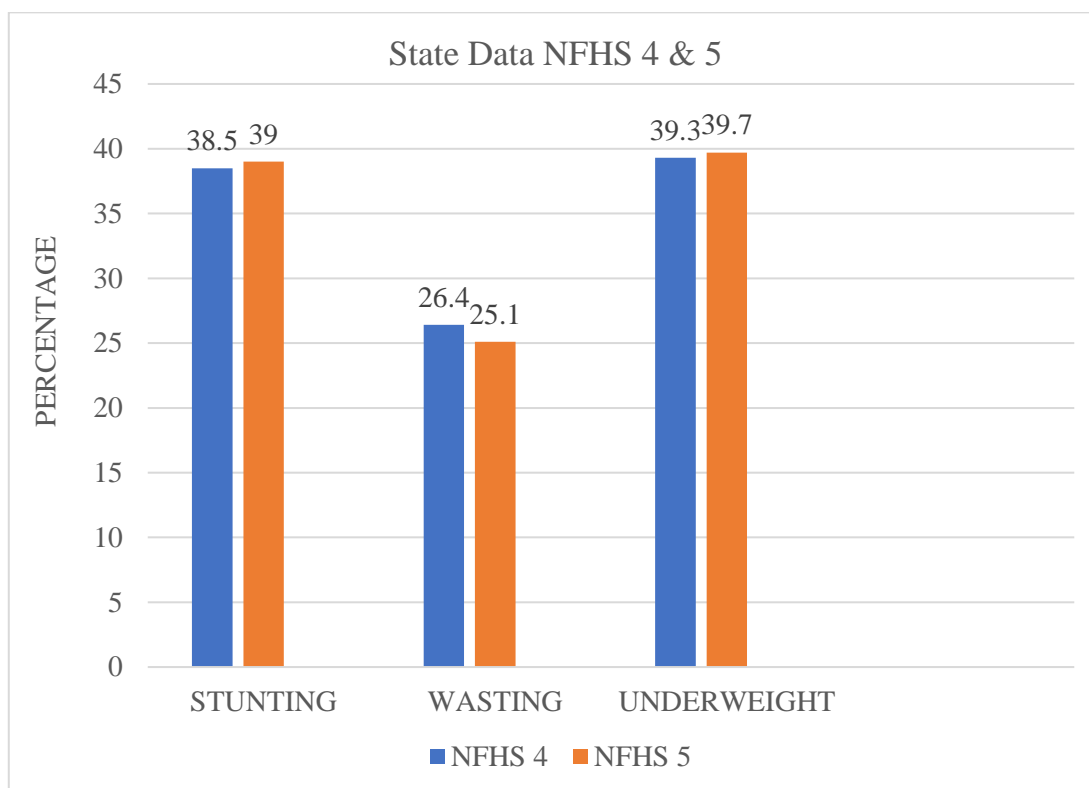
Gujarat data on stunting, wasting and underweight shows an increase in prevalence of stunting and underweight in children under 5. Wasting prevalence however shows a slight decrease from 26.4 to 25.1%.

Figure 2.3: District wise prevalence of undernutrition in children under 5, Panchmahal
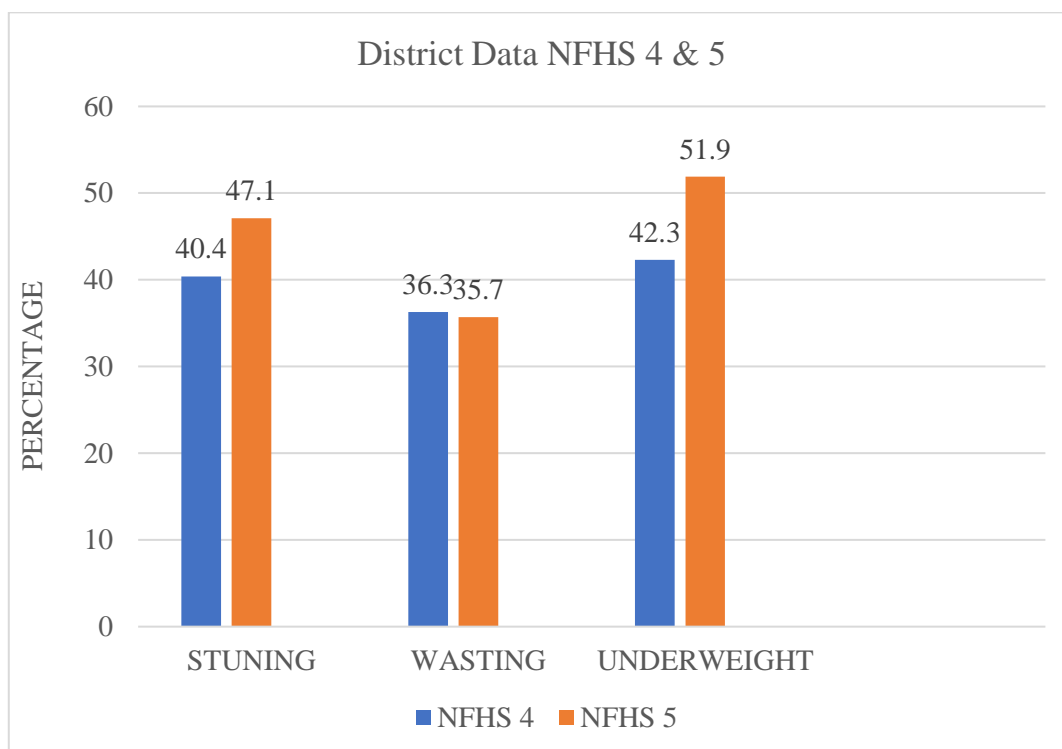
Panchmahal district data by NFHS 4&5 shows a similar pattern, where rates of stunting and underweight have increased according to NFHS 5 data whereas rates of wasting have shown a decrease as compared to data obtained from NFHS 4.

2.2 Complementary feeding

To promote excellent health, growth, and development in young children, appropriate complementary feeding practises are necessary. The World Health Organization (WHO) recommends exclusive breastfeeding for the first six months of a child's life, after which all children should be introduced to complementary foods. Yet, many nations still have a long way to go before meeting crucial complementary feeding indicators including the minimum meal frequency (MMF), minimum dietary diversity (MDD), and minimum acceptable diet (MAD) (MAD). According to studies, one of the key factors that must be taken into account at the individual level when evaluating complementary feeding strategies is the child's health situation. Early complementary feeding practises that are adequate have a positive impact on food preferences and health outcomes over the course of a person's life (Black et al.,2013).

Rural areas have a higher prevalence of malnutrition and inadequate complementary feeding than metropolitan areas. However, the application of a validated composite measure to investigate the determinants of complementary feeding habits has received little attention (Ariyo et al., 2021).

When it comes to feeding their children, mothers may feel more confident and independent if they receive health education, see the recommended complementary diet in action, and learn that homemade meals are equally as nutritious as commercial ones. The results indicate that four themes—caregivers' knowledge of complementary feeding, caregivers' knowledge of breastfeeding, the influence of culture custodians on the caregivers, and patterns and the burden of other household responsibilities—are the main obstacles to the use of appropriate infant and young child feeding practises (Goswami et al., 2022).

To enhance nutritional diversity and meal frequency, it is strongly advised that mothers' education be increased. Home gardening, media promotion, and empowering women in decision-making are all advisable practises (Beyene et al.,2015).

Studies also suggest that it is crucial to raise community understanding of the dietary groups utilised for child growth and development by giving them the right information and educating local representatives and caregivers (Keno et al., 2021).

Table 2.1: Complementary Feeding Guidelines given by UNICEF, 2021

Sr. no.	Indicator	Short name	Age group	Definition
1	Introduction of solid, semisolid or soft foods 6–8 months	ISSSF	Infants 6–8 months of age	Percentage of infants 6–8 months of age who consumed solid, semi-solid or soft foods during the previous day
2	Minimum dietary diversity 6–23 months	MDD	Children 6–23 months of age	Percentage of children 6–23 months of age who consumed foods and beverages from at least five out of eight defined food groups during the previous day
3	Minimum meal frequency 6–23 months	MMF	Children 6–23 months of age	Percentage of children 6–23 months of age who consumed solid, semi-solid or soft foods (but also including milk feeds for non-breastfed children) the minimum number of times or more during the previous day
4	Minimum milk feeding frequency for non-breastfed children 6-23 months	MMFF	Children 6–23 months of age	Percentage of non-breastfed children 6–23 months of age who consumed at least two milk feeds during the previous day
5	Minimum acceptable diet 6-23 months	MAD	Children 6–23 months of age	Percentage of children 6–23 months of age who consumed a minimum acceptable diet during the previous day
6	Egg and/or flesh food consumption 6-23 months	EFF	Children 6–23 months of age	Percentage of children 6–23 months of age who consumed egg and/or flesh food during the previous day
7	Sweet beverage consumption 6-23 months	SwB	Children 6–23 months of age	Percentage of children 6–23 months of age who consumeda sweet beverage during the previous day
8	Unhealthy food consumption 6-23 months	UFC	Children 6–23 months of age	Percentage of children 6–23 months of age who consumed selected sentinel unhealthy foods during the previous day
9	Zero vegetable or fruit consumption 6-23 months	ZVF	Children 6–23 months of age	Percentage of children 6–23 months of age who did not consume any vegetables or fruits during the previous day

2.3 Diet diversity and Food and nutrition security

"Food and nutrition security (FNS) exists when all people at all times have physical, social and economic access to food, which is consumed in sufficient quantity and quality to meet their dietary needs and food preferences, and is supported by an environment of adequate sanitation, health services and care, allowing for a healthy and active life". (UNSCN, 2013)

Food availability is only one aspect of food security. It also considers a number of additional criteria, such as whether families and individuals have access to enough and nutritious food, how well food is absorbed and used by the body, and if people are drinking safe water, have access to toilets and other hygienic requirements.

Studies have revealed that the impact of different income sources on food security varies. For instance, dietary diversification, spending on non-cereals, and goods containing animal protein are all more influenced by income from regular job and entrepreneurship (Rahman et al., 2020).

Food security and the prevalence of anaemia were shown to be related in a study that looked at the relationships between anthropometric measurements, body composition, diet diversity, and quality among women of reproductive age in the urban township of Soweto, South Africa. Women with the least access to food had the least varied diets. Lower diet quality was also linked to food insecurity. Regardless of BMI, about one-third of the women participants experienced anaemia and food insecurity.

There is evidence that both adults and children in less affluent environments eat monotonous meals that are primarily made up of processed cereals and deficient in fruit, vegetables, and other nutrient-rich foods. These diets, which were frequently heavy in calories, refined carbs, and sugar, may contribute to obesity, pregnancy illnesses such gestational diabetes, and long-term cardiometabolic risk in both women and their offspring. Additionally, there were problems with intra-household food distribution in some contexts, limiting the access of women and girls to whatever nutrient-rich foods that were available (Kehoe et al.,2020).

The minimum dietary diversity score for women reported the lowest score of two and one in rural and urban India respectively. Only six to seven states were able to achieve minimum score of five food groups in rural & urban India (2011-12). Regional disparities were seen in association between maternal, child care, socio-economic

indicators and prevalence of underweight and anaemia in under-five children (6-59 months) in a study conducted in Gujarat (Chandorkar and Meghani, 2021).

Another study conducted in rural Vadodara, Gujarat, found low maternal dietary diversity. The diet consisted of cereals (majorly bajra, rice and wheat), pulses and some common vegetables (tomato, potato), and was deficient in consumption of milk products and green leafy vegetables (Nambiar and Saha, 2019).

2.4 Diet diversity in tribal populations

A study conducted to describe the dietary intake and nutritional status, with emphasis on indigenous food consumption in a representative group of the Oraon tribal community in Jharkhand, India, observed a paradox regarding poor consumption of resources despite awareness and seasonal availability. Many of the indigenous foods remained underutilized in this tribal community with a comparatively low level of consumption (Ghosh-Jerath et al., 2018).

Poor dietary diversity among women of reproductive age, a high prevalence of Chronic Energy Deficiency (CED), and inadequate consumption of nearly all macronutrients and micronutrients examined were discovered in a study exploring the agroforestry diversity and dietary intake in the context of Indigenous Food (IF) consumption in the Sauria Paharias of Jharkhand. Intakes of calories, protein, fat, iron, calcium, zinc, B vitamins, vitamin A, and vitamin C were greater in women with higher dietary diversity scores (MDD-W), whereas calcium and vitamin A intakes were higher among IF consumers (Ghosh-Jerath et al., 2021).

Indigenous/tribal populations are frequently shut off from mainstream culture and may not be aware of the various programmes offered. Special consideration needs to be given to them through more inclusive policies and actions. Additionally, caste-based discrepancies must be addressed right away if they exist so that this demographic group's health and developmental condition can also improve. (Padmanabhan et al., 2016).

2.5 Food environment and its association with dietary diversity

Food environment study is becoming more and more popular in low- and middle-income nations (LMICs). Food availability was linked to dietary outcomes at the community

and school scales across several LMICs, according to a study that examined the food environment at the national, community, school, and home levels, although relationships differed by vendor type (Turner et al., 2022).

According to studies examining the relationships between crop and income diversity and dietary diversity in farmer households across Gujarat and Haryana, India, crop diversity appears to have a favourable relationship with dietary diversity among adults (both men and women) in both states as well as among adolescents and children in Haryana. In Gujarat, better family education and higher yearly income were the two most significant characteristics linked to higher dietary diversity scores (DDS), whereas in Haryana, higher family education, more diverse crops, and longer travel distances to markets were linked to higher individual DDS.

In both states, crop diversity was found to be one of the most significant determinants influencing children's dietary diversity. It's interesting to note that the pathways to dietary diversity vary between sites and within households, even in these two highly affluent states. This suggests that programmes to promote nutritional diversity should be customised to a particular area and context (Singh et al., 2020).

Economic analysis of food preferences and diet quality is typically limited to household purchases rather than individual consumption, especially with regard to infants between the ages of 6 and 24 months, when growth faltering most frequently happens (Choudhary et al., 2021).

Unimproved water access was also linked to lower odds of achieving dietary diversity in children aged 6 to 23 months, which was primarily reflected by lower odds of consuming breast milk, vegetables, and fruits, according to a study looking at the relationship between household water access and children's nutrition-related outcomes in China. Additionally, the findings showed that in children aged 6 to 59 months, inadequate water access was linked to low haemoglobin concentration and HAZ, as well as a higher risk of stunting and anaemia, respectively. Lack of access to home water was not linked to wasting or WHZ (Gao et al., 2022).

Obesity development is a complex process, but there is evidence that it starts in childhood and persists throughout adulthood, becoming more severe the younger the person is when it does. One possible factor in the early onset of obesity is food insecurity, which is described as having restricted access to appropriate food due to a lack of money

or other resources. Obesity and food insecurity are both linked to lower socioeconomic position.

Parental feeding habits and beliefs are one of the potential mediators of the relationship between food insecurity and obesity. There is evidence that parental feeding habits can affect children's weight status later in adolescence and adulthood, and that food insecurity might affect parents' feeding habits and views.

In two Latinx populations—one in Oregon and one in Texas—a study looked at the relationship between feeding behaviours and food insecurity. It was discovered that, compared to caregivers who reported food security, those who reported food insecurity were significantly less likely to watch over their children's consumption of unhealthy foods and significantly more likely to report controlling feeding behaviours in these samples of Latinx families from low socioeconomic backgrounds. Parents who face food insecurity and have poorer self-efficacy did report more inappropriate feeding habits. Food insecurity was not linked to variations in feeding behaviours in these samples in parents with higher self-efficacy (Foster et al., 2022).

Beyond those immediately connected to new-born food patterns (such as manner of infant feeding and early introduction of solids), parental feeding behaviours also affect the risk of obesity during the early years of life. For instance, when worried about a kid being underweight or overweight, caregivers frequently exert extra control over the child's diet. The choices parents make about their children's nutrition, however, have both immediate and long-term effects on the development of their offspring.

Comparatively to non-Hispanic White mothers, racial/ethnic minority mothers at 6 months postpartum reported feeding practises and beliefs that showed greater concern about their infant's hunger, as well as the amount of food their infant consumed (i.e. concern about under- and overeating) and his or her weight status (i.e. concern about the infant becoming underweight or overweight). In addition, compared to White mothers, women of racial or ethnic minorities were more likely to feed their infants on a schedule and less likely to engage in social interaction with them while doing so. The observed disparities were not affected by the mother's age, marital status, parity, level of education, household income, or whether she was nursing.

Interventions must take into account the environmental elements that influence the habits and beliefs of mothers while they are focusing on infant feeding. Maternal baby

feeding practises are determined by cultural influences in addition to socioeconomic position and family structure-related factors (Von et al., 2021).

A study defined NFE (Neighbouring Food Environment) as the distribution of food sources in the area surrounding a person's house, taking into account both the types and location of food retail and service outlets. By examining the relationships between neighbourhood food environment, household food insecurity, and child weight-related outcomes using a rich data set of racially and ethnically diverse families with multiple measures (objective and subjective) of food environment, this study aimed to add to the body of prior literature.

Neighbourhood food environments (NFE) can influence outcomes for public health, such as optimal child weight and food security. Lack of affordable, nutrient-rich food options in the neighbourhood may affect children's weight by limiting energy intake, which could result in weight loss, or lowering dietary quality, which could result in weight gain. Additionally, connections between NFE and child weight may be stronger for children in families with food insecurity. Poor NFE were discovered to be linked to negative outcomes for children's weight, and the link between weight and NFE was stronger for children living in food-insecure households. The food environment in the neighbourhood should be taken into consideration when developing policies and interventions aimed at reducing food insecurity and child obesity-related consequences. To reduce inequities in child obesity, food establishments that serve wholesome, culturally appropriate food in a safe and welcoming environment should be made more widely available and easier to access (Agarwal et al., 2022).

2.6 Food Safety Net Program

Food safety net programs are a basis to improve diet diversity and its associated factors among the population. The essential idea behind these interventions is to enhance individual capabilities and welfare through more equitable access to food and income.

2.6.1 Integrated Child Development Scheme (ICDS)

ICDS was founded in 1975 with the intention of helping children under the age of six and pregnant and nursing mothers with their dietary needs. Due to lobbying efforts to put nutrition at the top of the national agenda, the performance of ICDS has significantly

improved over the past ten years. However, there are still challenges with ICDS implementation, including lack of political will, poor infrastructure, and issues with untrained and underpaid workers (Pingali et al., 2019).

According to NFHS-4, India has a significant problem with maternal and child undernutrition. According to an analysis of the ICDS by NFHS survey, mothers in rural regions were more likely to use services during pregnancy than mothers in urban areas, and they were less likely to use services for prenatal and early childhood health and nutrition education. In India's metropolitan areas, one in every two mother-child pairs did not use any ICDS benefits (Rajpal et al., 2020).

In urban Rishikesh, the reasons why adolescent girls did not participate in the ICDS scheme and the gaps in KAP practises were investigated using the sequential explanatory mixed approach. Only 13 (3.25%) of the 400 adolescent girls visited the AWC for IFA supplementation, compared to roughly 15 (3.75%) for supplemental nutrition. The lack of awareness, the inadequate supply of IFA/THR, the poor monitoring, and the insufficient health education sessions were determined to be the barriers to poor utilisation (Chowdhury & Chakraborty, 2017).

In rural regions of the Bareilly district, breastfeeding mothers used the supplemental nutrition services the most (85%), followed by pregnant women (83.6%) and adolescent girls (78.8%). Children older than 3 years old had the largest service gap. The beneficiaries' main justification for not consuming the complementary food was disliking its flavour (Khan et al., 2016). While in Odisha, more than 85% of AWCs lacked a defined building for daily operations, which led to poor programme implementation due to insufficient logistical support and infrastructure (Sahoo et al., 2016).

2.6.2 Public Distribution System

India still has a sizable population of hungry and malnourished individuals, despite the fact that PDS is a pillar of the national food and nutrition policy. In India, there is still a lack of published literature in the fields of PDS and food poverty. If significant legislative reforms are made to address the operational inefficiencies and environmental footprints, the PDS can be a successful strategy for reducing hunger and malnutrition. With massive food waste, roadblocks including the use of illegal cards, and vast volumes

of food not reaching the intended receivers, the PDS has not been functioning efficiently (George & McKay, 2019).

Studies indicate that enhancing the delivery of care quality in food safety net programmes could result in a more rapid progress towards achieving household food security. On analysing the impact of PDS on household gains in calorie intake in the poorly performing state of Bihar, the findings suggested that PDS might significantly contribute to reducing malnutrition and hunger at the household level with improved governance and targeted extension to vulnerable areas (Kumar et al., 2016).

Food and nutrition security in rural Vadodara was mapped together with its relationship to vulnerable populations' nutritional condition, which revealed that safety net services were not being used to their full potential. Because of the village's inadequate accessibility, utilisation, and stability of other dimensions, it was discovered to be moderately to severely insecure (Chandorkar & Shah, 2017).

A study conducted in India revealed that beyond what was grown at home, PDS was the primary source of cereals in the majority of the sample villages of Odisha, Jharkhand and Bihar. Odisha had the highest level of household reliance on PDS for cereals, followed by Jharkhand, and Bihar had the lowest level. irrespective of where they lived, those with smaller land categories relied more on PDS to get their grains than did other households. Estimates of dietary variety compared across villages revealed the degree of dietary heterogeneity in the research area (Parappurathu et al., 2015).

METHODS

AND

MATERIALS

3. METHODS AND MATERIALS

Overview of the chapter-

3.1 General introduction

3.2 Ethical approval

3.3 Study Design

      3.3.1   Study Area

      3.3.2   Sample size and selection

      3.3.3   Inclusion criteria

      3.3.4   Exclusion criteria

      3.3.5   Questionnaire designing and pre testing

      3.3.6   Data collection

      3.3.7   Data entry and analysis

3.4 Measures through which dietary diversity and its associated factors were measured

3.4.1   Diet Quality Questionnaire

3.4.2   Minimum Dietary Diversity (6-23 months)

3.4.3   Minimum Acceptable Diet (6-23 months)

3.5   Anthropometric Measurements

3.6   Anthropometric Indices

3.7   Focus group discussion

3.1 General introduction- A cross sectional study was undertaken to map the prevalence of dietary diversity and its associated factors at household level and its association with the nutritional status of vulnerable groups namely, mothers and children aged 6-23 months in Kalol taluka, Panchmahal district, Gujarat.

3.2 Ethical approval- The study was approved by the Institutional Ethics Committee for Human Research (IECHR), of the Department of Foods and Nutrition, Faculty of Family and Community Sciences, The Maharaja Sayajirao University of Baroda. The ethical approval number of the study is IECHR/FCSc/MSc/2022/29.

3.3 Study Design- The study was carried out in three phases:

- Data collection
- Data analysis
- Thesis writing

3.3.1 Study Area- Out of the 11 talukas of Panchmahal district, Kalol taluka was purposively selected. Under the Kalol taluka, 13 villages with tribal and non-tribal populations were selected. These villages were- Katol, Alindra, Barol, Tarvda, Jetpur, Medapur, Namra faliya, Madhwas, Alawa, Devchotiya, Fatehpuri, Dongripura, Jilia

3.3.2 Sample size and selection- After an approximate calculation of number of children aged 6-23 months in both these set ups, the sample size was 385.

3.3.3 Inclusion criteria-

- Households with Mother-child dyads, in the age group of 15-49 and 6-23 months respectively, were selected.
- They should be permanent residents of the area and should be willing to participate.
- Only mothers with one child in the age group of 6-23 months were selected.

3.3.4 Exclusion criteria-

- Migratory households were not selected for the study.

3.3.5 Questionnaire designing and pre-testing- A semi-structured, pre-tested questionnaire was used to cover the following aspects of the study population- socio-demographic characteristics, hygiene and sanitation, infant and young child feeding, food environment, and utilisation of food safety net programs. Indicators which are well supported by the literature to measure each aspect

was used. Pre-testing was done on 10 households before arriving at the final questionnaire.

3.3.6 Data Collection- Data was collected by the investigator, going door to door in each house until a household which fits into the selection, inclusion and exclusion criteria is found. The mothers were interviewed to obtain the information.

3.3.7 Data Entry and Analysis- Collected data was entered through EpiCollect5 and analysed in Excel and SPSS software.

3.4 Measures through which dietary diversity and its associated factors were measured-

3.4.1 Diet Quality Questionnaire- The DQ-Q is designed to capture both nutrient adequacy and diet patterns related to NCD risk (consumption of processed and ultra-processed foods), as well as aspects of diets related to the nutrition transition, and to sustainability. It contains 29 food groups from which several indicators can be derived, including MDD-W.

It is a set of yes/no questions about consumption of 29 food groups in the previous day or night. Respondents are asked whether they consumed any of up to 7 sentinel foods per question, which are the most commonly-consumed food items in each food group in each country setting. The DQ-Q tool and indicators provide accurate, reliable, comparable food group consumption data for assessing diet diversity in women and children in India. The food groups are purposefully selected to reflect diet quality holistically.

3.4.2 Minimum Dietary Diversity (6-23 months)- It is defined as the percentage of children 6–23 months of age who consumed foods and beverages from at least five out of eight defined food groups during the previous day. Food group diversity is associated with improved linear growth in young children. A diet lacking in diversity can increase the risk of micronutrient deficiencies, which may have a damaging effect on children's physical and cognitive development.

3.4.3 Minimum Acceptable Diet (6-23 months)- It is defined as percentage of children 6–23 months of age who consumed a minimum acceptable diet during the previous day. The minimum acceptable diet is defined as:

- for breastfed children: receiving at least the minimum dietary diversity and minimum meal frequency for their age during the previous day;

- for non-breastfed children: receiving at least the minimum dietary diversity and minimum meal frequency for their age during the previous day as well as at least two milk feeds.

3.5 Anthropometric measurements-

1. **Weight-** Weight is one of the most simple and reproducible measurements of growth and nutritional status. It indicates the body mass and is a composite of all body constituents like water, minerals, fat, proteins, bones, etc. In children, it is a more sensitive measure of nutritional adequacy than height and it reflects recent nutritional intake. It is sensitive even to small changes in nutritional status due to childhood morbidities like diarrhoea etc.

Instruments used for assessing weight:

Adult Platform Weighing Scale- These are used for weighing older children and adults. It is can weigh up to 100 kg to the nearest 250 g or 500 g.

Procedure: The scale was placed on a flat and uniform surface and the respondent (with minimal clothing possible) was asked to stand on it. The readings were then recorded. To measure the weight of the child, mother was asked to hold the child and stand on the scale, then weight of the mother with child is subtracted from weight of the mother without child (Gibbson 1992).

2. **Height-** The height of an individual is made up the sum of four components – legs, pelvis, spine and skull. Height gain is an indicator of long- term nutrition status

Instruments used for measuring height:

Measuring tape: It is a non – elastic, non – stretchable tape.

Procedure: The respondent was asked to stand erect against a smooth wall, perpendicular to the floor after removing the footwear. The respondent was asked to stand in a way so that the heels, buttocks, shoulders and back of the head of the respondent touched the wall. With the help of a scale crushing the hair, the readings were marked. The mark was then measured by measuring tape and the readings were recorded (Gibbson 1992).

3.6 Anthropometric indices

1. Stunting: According to WHO, a child is defined as "stunted", if the Height-for-Age is below –2 SD from the median WHO Child Growth Standards. It is also known as

chronic malnutrition. Stunting reflects a process of failure to reach linear growth potential of suboptimal health and/or nutritional conditions. It starts from pre – conception. The condition worsens when the child's diet and hygiene and sanitation conditions are poor. By the age of 2 years, it is irreversible. (WHO, 2014).

2. Wasting: According to WHO, a child is defined as "wasted", when the Weight-for-Height is below – 2 SD from the median WHO Child Growth Standards. It is also known as acute malnutrition. A wasted child is 5 – 20 times more prone to dying from illnesses like diarrhoea, pneumonia etc. than a normal child. In most cases, it indicates a recent and severe process of weight loss, which is often associated with acute starvation and/or severe disease. (WHO, 2014).

3. Underweight: According to WHO, an underweight child is defined as one who has Weight-for-Age below – 2 SD from the median WHO Child Growth Standards. It reflects body mass relative to chronological age. It is a combination of acute and chronic malnutrition (WHO, 2014).

4. Mid Upper Arm Circumference: Mid-Upper Arm Circumference (MUAC) is the circumference of the left upper arm, measured at the mid-point between the tip of the shoulder and the tip of the elbow (olecranon process and the acromion).

5. Body Mass Index: Body Mass Index is a person's weight in kilograms divided by his or her height in meter square. Asia Pacific out offs were used for classifying subjects as underweight, normal, overweight or obese. BMI was calculated by using formula:

BMI = Weight (kg) / Height (m 2)

Table 3.1: Asia Pacific Classification for BMI (Source: WHO, 2017)

Sr. no.	BMI range (in kg/m2)	Category
1.	<16.5	Severe Underweight
2.	16.5 – 16.9	Moderate Underweight
3.	17 – 18.5	Mild Underweight
4.	>=18.5 – 24.9	Normal
5.	>=30	Pre – obese
6.	30– 34.9	Obese I
7.	35 – 39.9	Obese II
8.	>=40	Obese III

Table 3.2: Classification of Nutritional status

Weight-for-Age Z score (WAZ)	
-1 SD to +1 SD	Normal
<=-1 SD to <-2 SD	Mild underweight
<=-2 SD to <-3 SD	Moderately underweight
<=-3 SD	Severely underweight
Height-for-Age Z score (HAZ)	
-1 SD to +1 SD	Normal
<=-1 SD to <-2 SD	Mild stunted
<=-2 SD to <-3 SD	Moderately stunted
<=-3 SD	Severely stunted
Weight-for-Height Z score (WHZ)	
-1 SD to +1 SD	Normal
<=-1 SD to <-2 SD	Mild wasted
<=-2 SD to <-3 SD	Moderately wasted
<=- 3 SD	Severely wasted
MUAC-for- Age Z score (MUACZ)	
-1 SD to +1 SD	Normal
<=-1 SD to <-2 SD	Mild undernourished
<=-2 SD to <-3 SD	Moderately undernourished
<=-3 SD	Severely undernourished

3.7 Focus group discussion

Focus group discussion is a type of qualitative research which is used to gather information about participants' perceptions, opinions, beliefs, and attitudes about particular topics or concerns. It comprises of a small group of carefully selected participants who contribute to open discussions for research.

The focus group discussion (FGD) was conducted with the study participants (mothers of children aged 6-23 months) from selected villages of Kalol taluka. From among the study participants 10 participants were selected and two groups of 5 women each were formed. The two groups were homogenous in composition with respect to the socio-cultural background of the participants. Participants in the first group belonged to a lower socio-economic background with majority of household heads being employed in agriculture labour, land owner farmers and livestock rearing, and elicited poor knowledge regarding dietary diversity practices. Participants in the second group belonged to a comparatively better socio-economic background with a majority of household heads being employed under the service industry. They were also found to have better knowledge regarding the different aspects of dietary diversity like young child feeding practices and inclusion of a diverse diet. The participants also had a higher level of education as compared to the participants in the first group.

Table 3.3: Tools and techniques used in the study

Contextual information	Indicator	Methods used
Socio demographic characteristics	• Literacy • Occupation • Household expenditure indicator • Socio economic status	Pre tested semi-structured questionnaire Kuppuswamy Scale
Dietary diversity of women	Diet data	Diet Quality Questionnaire (Global Diet Quality Project, 2019)
Dietary diversity of children under 5 years of age	Diet data	MAD (UNICEF, 2021) MDD (UNICEF, 2021)
Nutritional status of women	Undernutrition	BMI
Nutritional status of children	• Children (6-23 months) who are stunted • Children (6-23 months) who are wasted • Children (6-23 months) who are underweight	• WHO Height-for-Age Z-score <-2 SD • WHO Weight-for-Height Z-score <-2 SD • WHO Weight-for-Age Z-score <-2 SD • MUAC
Sanitation and hygiene	• Handwashing • Access to safe drinking water • Food handling practices • Households having toilets in their premises	Pre tested semi-structured questionnaire
Food Environment	Utilisation of food safety net programs Observation of food produced Observation of food available in the market	Pre tested semi-structured questionnaire
Socio cultural factors associated with diet diversity		Focus Group Discussion

RESULTS

AND

DISCUSSION

4. RESULTS AND DISCUSSIONS

The results and discussion have been discussed in this chapter under the following heads:

4.1 Socio-Demographic characteristics of the study population.

4.2 Dietary Diversity in Women

4.3 Dietary Diversity in Children

4.4 Nutritional status of women

4.5 Nutritional status of children

4.6 Sanitation and Hygiene

4.7 Food environment

    4.7.1   Food Safety Net programs

    4.7.2   Consumption of Processed Foods

4.8 Observation of food produced and food available

4.1 Socio-demographic characteristics

The data on socio-demographic profile of the study population comprising of 385 women and children aged 6 to 23 months from selected villages of Kalol taluka, are presented below in table 4.1

Table 4.1: Socio-demographic characteristics of the study population

Variables (n=385 households)	Mean ± SD
1. Age of the mother	27.2 ± 3.78
2. Age of the child (months)	14.1± 4.47
3. Monthly income	11203.6 ± 8313.2
4. Religion	**Frequency (%) (n=385 HHs)**
Hindu	383 (99.5)
Muslim	2 (0.5)
5. Caste	**Frequency (%) (n=385 HHs)**
OBC	132 (34.3)
ST	119 (30.9)
a) Nayak	52 (43.7)
b) Damor	27 (22.7)
c) Bharwad	23 (19.3)
d) Rathva	17 (14.3)
SC	88 (22.9)
General	46 (11.9)
6. Head of the family	**Frequency (%) (n=385 HHs)**
Husband	172 (44.7)
Father-in-law	138 (35.8)
Mother-in-law	65 (16.9)
Others	10 (2.6)
7. Education of the head	**Frequency (%) (n=385 HHs)**
Intermediate or post HSC	155 (40.3)
High school certificate	141 (36.6)
Middle school certificate	42 (11)
Illiterate	24 (6.2)
Graduate or post graduate	14 (3.6)
Primary school certificate	9 (2.3)
8. Education of the mother	**Frequency (%) (n=385 HHs)**
High school certificate	162 (42.1)
Middle school certificate	100 (26)
Intermediate or post HSC	61 (15.7)
Primary school certificate	48 (12.5)
Graduate or post graduate	11 (2.9)
Illiterate	3 (0.8)

It can be observed from the data presented in table 4.1 that the mean age of the mothers interviewed was 27.2 ± 3.78 years and the mean age of the children was 14.1

± 4.47 months. The mean monthly income was INR 11203.6 ± 8313.2. It can be also seen that average families spend almost third quartile of their incomes on food leaving little money to procure other amenities. Majority of the population, about 99.6 percent, were Hindus followed by 0.5 percent belonging to the Muslim community. Majority of the population belong to the ethnicity of OBC (Other Backward Classes), about 34.3 percent of the households, followed by ST (Scheduled Tribe) (30.9%). The tribes were further classified into Nayak (43.7 %), Damor (22.7%), Bharwad (19.3%), and Rathva (14.3%).

Rathvas are a tribal community mainly inhabiting Chhotaudepur, Panchmahal and Dahod districts. They are primarily involved in farming, animal husbandry, poultry farming, and agriculture labour. Nayaks are a tribal community mostly found in Panchmahal, Dahod, Kheda, Tapi districts. They have sub-castes like Patel-Nayak, Mota-Nayak, Nana-Nayak. Bharwads are a tribal community mainly involved in livestock rearing. Study findings showed good consumption of milk and milk products by the members of this community. Damors are a tribal community primarily involved in agricultural labour and reside in Panchmahal district of Gujarat.

The head of the family in most cases was the Husband, about 44.7 percent of the households and the highest level of education of the head was Intermediate or post High School Certificate (HSC), which were about 40.3 percent of the households. The highest level of education of the mother was High School Certificate, about 42.1 percent of the households.

Table 4.2 presents data on primary occupation of the study population. The primary occupation of the household head was found to be Service in about 29.6 percent of the households, followed by Land owning farmers (28.1 %) percent, Agricultural labourers (15.1 %), and so on.

Of the total land-owning farmers, 55.6% were following irrigated agriculture using tube wells (36.7%) and 44.4% were following rainfed agriculture. Rain-fed agriculture is used by approximately 61% of India's farmers, and it accounts for 55% of gross planted area. Almost 40% of the nation's food is produced by rainfed agriculture, which takes up around 51% of the net sown area. Agriculture that relies on rain is intricate, diversified, and risky. Low levels of productivity and input consumption, combined with the erratic monsoon caused by climate change, are its defining

characteristics. As a result, crop yields are very variable and unstable. It is necessary to develop and increase the productivity of rainfed lands due to the rising demand for food grains in the nation. If correctly managed, these areas have a much greater potential to increase agricultural growth and food production relative to irrigated areas, which have hit a plateau (Department of Agriculture and Farmer's Welfare, 2022).

As irrigation allows for greater production intensification and crop diversification, it is more productive per unit of land than rainfed agriculture, hence promoting food security (The World Bank, 2022).

Table 4.2: Occupation of the study population

1. Occupation of the household head	Frequency (%) (n=385 HHs)
1.1 Service	114 (29.6)
1.2 Land owning farmer	108 (28.1)
1.2.1 Type of ownership of land (n=108)	
a) Single	73 (67.6)
b) Partnership	35 (32.4)
1.2.2 Type of crops grown (multiple responses)	
a) Rabi	50 (46.3)
b) Kharif	46 (42.6)
c) Cash crops	34 (31.5)
1.2.3 Tools and machinery used (multiple responses)	
a) Tractor	80 (74.1)
b) Chopper	72 (66.6)
c) Plough	65 (60.2)
d) Axe	62 (57.4)
e) Leveller	48 (44.4)
f) Threshing machine	45 (41.6)
1.2.4 Source of water for farming (n=108)	
a) Irrigation	60 (55.6)
b) Rainfed	48 (44.4)
1.3 Agricultural labourer	58 (15.1)
1.3.1 Type of agricultural labour involved in (multiple responses)	
a) Harvesting	25 (43.1)
b) Sowing	23 (39.7)
c) Ploughing	20 (34.5)
1.4 Livestock rearing	45 (11.7)
1.5 Skilled worker	25 (6.5)
1.6 Own business	23 (5.9)
1.7 Employed under NREGA	12 (3.1)
2. Occupation of the mother	**Frequency (%) (n=385 HHs)**
Housewife	123 (31.9)
Livestock rearing	89 (23.1)
Agricultural labourer	73 (19)
Landless farmer	48 (12.5)
Employed under NREGA	22 (5.7)
Own business	20 (5.2)
Skilled worker	10 (2.6)
3. Animals reared	**Frequency (%) (n=385 HHs)**
Cattle	285 (74)
Poultry	58 (15.1)
Goat	42 (10.9)
4. Expenditure on food	**Frequency (%) (n=385 HHs)**
Three-fourth	266 (69.1)
Half	119 (30.9)

Most reared animals were cattle, about 74 percent, followed by poultry (15.1 %) and goat rearing (10.9%). About 180 days a year, there are no jobs in agriculture, therefore households with low means depend on animals for additional income. Cattle rearing helps to provide food security by giving livestock farmers a reliable source of revenue from milk sales (Herrero et al., 2013).

4.2 Dietary Diversity in Women

Data on dietary diversity in women was calculated using the Diet Quality Questionnaire. To facilitate food quality monitoring at the population level, the Diet Quality Questionnaire (DQ-Q) was created. Nationwide quantitative dietary intake surveys are expensive to conduct and are not done frequently or recently in the majority of nations. The DQ-Q tool and indicators offer a practical, low-burden way to gather precise, trustworthy, comparable data on food group consumption at the population level. The food groupings are specifically chosen to reflect a holistic diet quality.

The DQ-Q is intended to capture characteristics of diets linked to sustainability, the nutrition transition, and NCD risk, as well as nutrient adequacy and diet patterns. It consists of 29 food groups.

Table 4.3: Dietary Diversity in Women assessed using Diet Quality Questionnaire categorised on the basis of food groups

Sr. no.	Food Groups	Frequency	Percentage
1.	Grains, white roots and tubers, and plantains	**384**	**100**
2.	Pulses (beans, peas and lentils)	**370**	**96.4**
3.	other vitamin A rich fruits and vegetables	55	14.3
4.	dark green leafy vegetables	142	36.9
5.	other vegetables	**308**	**80.2**
6.	other fruits	143	37.2
7.	Baked / grain-based sweets	**249**	**64.8**
8.	other sweets	5	1.3
9.	eggs	0	0
10.	dairy	161	41.9
11.	meat, poultry and fish	0	0
12.	nuts and seeds	1	0.3
13.	Packaged ultra-processed salty snacks	31	8.07
14.	fast food and instant noodles	9	2.3
15.	deep fried food	20	5.2
16.	sweetened tea/coffee/milk drinks	**357**	**92.9**
17.	fruit juices	4	1.04
18.	soft drinks (sodas)	6	1.5

Data on dietary diversity collected using DQQ is presented in table 4.3. The most consumed food groups were Grains, white roots and tubers, and plantains (99.7%), followed by Pulses (96.1%), Sweetened tea/coffee/milk drinks (92.9%), Other vegetables (80.2%), and Baked/ grain-based sweets (64.8%).

The data on food consumption was further categorised on the basis of food items consumed from each food group and presented in table 4.4. The top five most consumed food items were Whole grains (chapati, roti, dalia etc.) (98.9%), followed by Staple foods made from grains (97.9%), Legumes (96.1%), White roots/ tubers (94.8%), and Sweetened tea/coffee/milk drinks (92.7%).

On analysing data from the DQQ, percentage of women who consumed all five recommended food groups i.e starchy staples, vegetables, fruits, pulses, nuts and seeds, and animal-based foods (mainly yogurt and fluid milk), were found to be 20.1 percent. Data demonstrated that the NCD-Protect Score was found to be 3.6. The NCD- Protect score is an indicator used to capture consumption of a diversity of fruits, pulses, vegetables, nuts and seeds and whole grains associated with meeting the required recommendations. The higher the NCD- Protect score (0-9), the more

recommendations have been met. The NCD- Risk score is additionally a proxy indicator of ultra-processed food consumption. The lower the NCD-Risk score, the lower the percentage of dietary energy from ultra processed food. The NCD- Risk score is an indicator that reflects dietary risk factors for NCDs. The NCD-Risk Score was found to be 0.8. The consumption of sweet beverages, sweet foods, salty packaged snacks, instant noodles, fried foods, fast food and processed and red meat is negatively associated with meeting the recommendations. The lower the NCD- Risk score (0-9), the more recommendations have been met.

A study shows significant evidence that women's diets are less diversified than those of their homes. In the previous 24 hours, women ingested an average of 4 food groups, whereas other household members consumed 6 food groups. women's dietary habits were discovered to be deficient in non-staple dietary groups like fruits and vegetables high in vitamin A, green leafy vegetables, dairy, and eggs (Gupta et al., 2020).

According to a study carried out in Sri Lanka, women in rural regions ate a limited amount of dairy, meat, poultry, fish, and eggs, as well as pulses and beans, nuts and seeds, and other vegetables. A high mean intake of carbohydrates and a low mean intake of fat and protein were among the imbalanced macronutrient intakes seen in the study sample with WRA. Increased risk of heart disease and type 2 diabetes can result from consuming too many carbohydrates, along with weight gain and poor metabolic health (Weerasekara et al.,2020).

Table 4.4: Dietary Diversity in Women assessed using Diet Quality Questionnaire categorised on the basis of food items

Sr. no.	food items	Frequency	Percentage
1.	staple foods made from grains	**377**	**97.9**
2.	whole grains (chapati, roti etc)	**381**	**98.9**
3.	whole grains (pearl millet, finger millet)	321	83.3
4.	white roots/tubers	**365**	**94.8**
5.	legumes	**370**	**96.1**
6.	vit A rich orange veg	39	10.1
7.	vit A rich fruits	17	4.4
8.	dark green leafy vegetables	142	36.8
9.	other vegetables (tomato, eggplant etc)	286	74.2
10.	other vegetables (bitter gourd, bottle gourd etc)	85	22.07
11.	other vegetables (cucumber, raddish etc)	23	5.9
12.	citrus	5	1.2
13.	other fruits (ripe banana, apple etc)	129	33.5
14.	other fruits (grapes, kiwi etc)	0	0
15.	other fruits (papaya, mango etc)	17	4.4
16.	grain sweets	249	64.6
17.	other sweets	5	1.2
18.	eggs	0	0
19.	cheese	9	2.3
20.	yogurt	92	23.8
21.	fluid milk	108	28.05
22.	processed meat	0	0
23.	unprocessed red meat NR	0	0
24.	unprocessed red meat R	0	0
25.	poultry	0	0
26.	fish and sea food	0	0
27.	nuts and seeds	1	0.2
28.	ultra processed packaged salty snacks	31	8.0
29.	instant noodles	9	2.3
30.	fast food	0	0
31.	deep fried foods	20	5.1
32.	sweetened tea/coffee/milk drinks	**357**	**92.7**
33.	fruit juices	4	1.03
34.	SSBs (sodas)	6	1.5

Diet diversity in women using Diet Quality Questionnaire was also categorised by castes of the study population where the data is presented in table 4.5. The most consumed food group by the General population was Grains, white roots and tubers, and plantains, and Sweetened tea/ coffee/ milk drinks. The most consumed food group by the Scheduled Caste population, the Scheduled Tribe population and population

belonging to Other Backward Classes was also found to be Grains, white roots and tubers, and plantains. The least consumed food groups of the population belonging to all the castes were other sweets, eggs, meat, poultry and fish, fruit juices, and soft drinks.

Table 4.5: Diet Quality Questionnaire analysis on the basis of caste

Variable	Frequency (%) (n=385)			
Food groups	**General**	**SC**	**ST**	**OBC**
Grains, white roots and tubers, and plantains	**46 (11.9)**	**88 (22.9)**	**119 (30.9)**	**132 (34.3)**
Pulses (beans, peas and lentils)	43 (11.2)	83 (21.6)	115 (29.9)	129 (33.5)
other vitamin A rich fruits and vegetables	1 (0.3)	15 (3.9)	17 (4.4)	22 (5.7)
dark green leafy vegetables	11 (2.9)	36 (9.4)	37 (9.6)	58 (15.1)
other vegetables	43 (11.2)	86 (22.3)	16 (4.2)	129 (33.5)
other fruits	13 (3.4)	32 (8.3)	35 (9.1)	52 (13.5)
Baked / grain-based sweets	26 (6.8)	61 (15.8)	71 (18.4)	91 (23.6)
other sweets	1 (0.3)	3 (0.8)	0 (0)	1 (0.3)
eggs	0 (0)	0 (0)	0 (0)	0 (0)
dairy	16 (4.2)	40 (10.4)	47 (12.2)	58 (15.1)
meat, poultry and fish	0 (0)	0 (0)	0 (0)	0 (0)
nuts and seeds	0 (0)	0 (0)	0 (0)	1 (0.3)
Packaged ultra-processed salty snacks	3 (0.8)	9 (2.3)	8 (2.1)	11 (2.9)
fast food and instant noodles	2 (0.5)	0 (0)	2 (0.5)	5 (1.3)
deep fried food	1 (0.3)	5 (1.3)	2 (0.5)	12 (3.1)
sweetened tea/coffee/milk drinks	**46 (11.9)**	83 (21.6)	107 (27.8)	121 (31.4)
fruit juices	0 (0)	2 (0.5)	2 (0.5)	0 (0)
soft drinks (sodas)	1 (0.3)	1 (0.3)	3 (0.8)	1 (0.3)

Data in table 4.6 represents data on dietary diversity of women assessed by DQQ categorised on the basis of tribes. The most consumed food groups for the population belonging to the Nayak tribe were Grains, white roots and tubers, and plantains, and Other vegetables. The most consumed food groups for the population belonging to the Damor tribe were Grains, white roots and tubers, and plantains, Pulses (beans, peas and lentils), and Other vegetables. The most consumed food groups for the population belonging to the Rathva tribe and the Bharwad tribe was Grains, white roots and tubers, and plantains. The Bharwad tribe also consumed significant amount of food items belonging to the food group Dairy. This is because the tribe's population is primarily involved in Livestock rearing and they rear animals like cows and buffalos and use them for milk. Some amount of milk fetched everyday is used for consumption by the family while the remaining is sold to a local dairy in the village area for an amount of INR 30 per litre.

Table 4.6: Diet Quality Questionnaire analysis on the basis of tribes

Variable	Frequency (%) (n= 119)			
Food groups	Nayak	Damor	Rathva	Bharwad
Grains, white roots and tubers, and plantains	52 (43.7)	26 (21.8)	4 (3.4)	24 (20.2)
Pulses (beans, peas and lentils)	51 (42.9)	26 (21.8)	3 (2.5)	22 (18.5)
other vitamin A rich fruits and vegetables	7 (5.9)	4 (3.4)	0 (0)	3 (2.5)
dark green leafy vegetables	17 (14.3)	6 (5.04)	2 (1.7)	6 (5.04)
other vegetables	52 (43.7)	26 (21.8)	3 (2.5)	22 (18.5)
other fruits	15 (12.6)	9 (7.6)	1 (0.8)	9 (7.6)
Baked / grain-based sweets	30 (25.2)	16 (13.4)	1 (0.8)	17 (14.3)
other sweets	0 (0)	0 (0)	0 (0)	0 (0)
eggs	0 (0)	0 (0)	0 (0)	0 (0)
dairy	14 (11.8)	12 (10.1)	0 (0)	18 (15.1)
meat, poultry and fish	0 (0)	0 (0)	0 (0)	0 (0)
nuts and seeds	0 (0)	0 (0)	0 (0)	0 (0)
Packaged ultra-processed salty snacks	3 (2.5)	1 (0.8)	0 (0)	3 (2.5)
fast food and instant noodles	1 (0.8)	1 (0.8)	0 (0)	0 (0)
deep fried food	1 (0.8)	0 (0)	0 (0)	1 (0.8)
sweetened tea/coffee/milk drinks	49 (41.2)	24 (20.2)	2 (1.7)	20 (16.8)
fruit juices	0 (0)	0 (0)	1 (0.8)	1 (0.8)
soft drinks (sodas)	0 (0)	1 (0.8)	0 (0)	1 (0.8)

4.3 Dietary Diversity in children

1. Complementary feeding

The World Health Organization (WHO) recommends that at about seven months, an infant's energy and nutrient requirements begin to outstrip those of breastmilk and can be satisfied through complementary feeding. With both breastfed and non-breastfed children in NFHS, the frequency of meals and the sufficiency of nutritional diversity are assessed as essential IYCF markers. For non-breastfed children, an appropriate diet should include at least 3 Infant and Young Child Feeding practices as well as additional milk or milk products at least twice a day. For breastfed children, an adequate diet should include at least 4 food groups and a minimum meal frequency. A minimum meal frequency is defined as receiving solid or semi-solid food from at least four food categories (excluding milk or milk products) at least twice daily for breastfed infants 6 to 8 months old and at least three times daily for breastfed infants 9 to 23 months old. Complementary feeding was started in the 7th month of the child's life cycle by a majority of women interviewed.

Minimum Dietary Diversity (MDD) (6-23 months)- It is defined as the percentage of children 6–23 months of age who consumed foods and beverages from at least five out of eight defined food groups during the previous day.

Minimum Acceptable Diet (MAD) (6-23 months)- It is defined as percentage of children 6–23 months of age who consumed a minimum acceptable diet during the previous day. The minimum acceptable diet is defined as:

- for breastfed children: receiving at least the minimum dietary diversity and minimum meal frequency for their age during the previous day;
- for non-breastfed children: receiving at least the minimum dietary diversity and minimum meal frequency for their age during the previous day as well as at least two milk feeds.

The data on minimum dietary diversity met and minimum acceptable diet of children 6-23 months from selected villages of Kalol taluka are presented in table 4.7.

Fourty-one percent (N=158) of all children fulfilled the criteria of MDD. Flesh foods and eggs were the two food groups that were not consumed at all by the children in the 4 age ranges i.e. 6 to 8, 9 to 11, 12 to 17 and 18 to 23 months.

Only 2.3 % (N=9) of all children fulfilled the criteria of having a Minimum Acceptable Diet. The Minimum Dietary Diversity met and Minimum Acceptable Diet was found to be influenced by the age of the child.

The minimum requirement for dietary diversity was met by 4.9% of children in the age range of 6 to 8 months, it increased to 7.5% in children 9 to 11 months and to 16.6 % in children in the 12 to 17 month range and dropped to 11.9% in children in the age range of 18 to 23 months, as seen in Figure 4.1.

As for children with a MAD, the age range of 6 to 8 months had 0.5% of children, which dropped down to 0.3% children in age range of 9-11 months. It further increased to 0.8% in the age ranges of 12 to 17 and 18 to 23 months, as seen in Figure 4.2.

Table 4.7: Children with adequate MDD segregated in age groups.

Age range (N)	Children with adequate MDD (N=158)
6-8 months (19)	4.9%
9 to 11 months (29)	7.5%
12 to 17 months (64)	16.6%
18 to 23 months (46)	11.9%
Total (385)	41.03%

Figure 4.1: Children with adequate Minimum Dietary Diversity
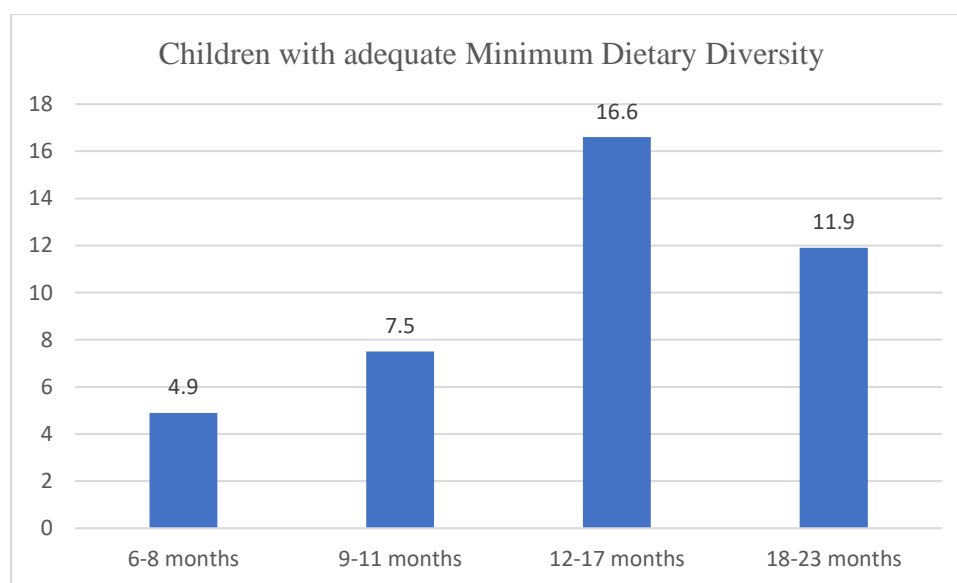
Table 4.8: Children having a MAD segregated in age groups.

Age range (N)	Children having a MAD (N=9)
6-8 months (2)	0.5%
9-11 months (1)	0.3%
12 to 17 months (3)	0.8%
18 to 23 months (3)	0.8%
Total (385)	2.3%

Figure 4.2: Children having a Minimum Acceptable Diet
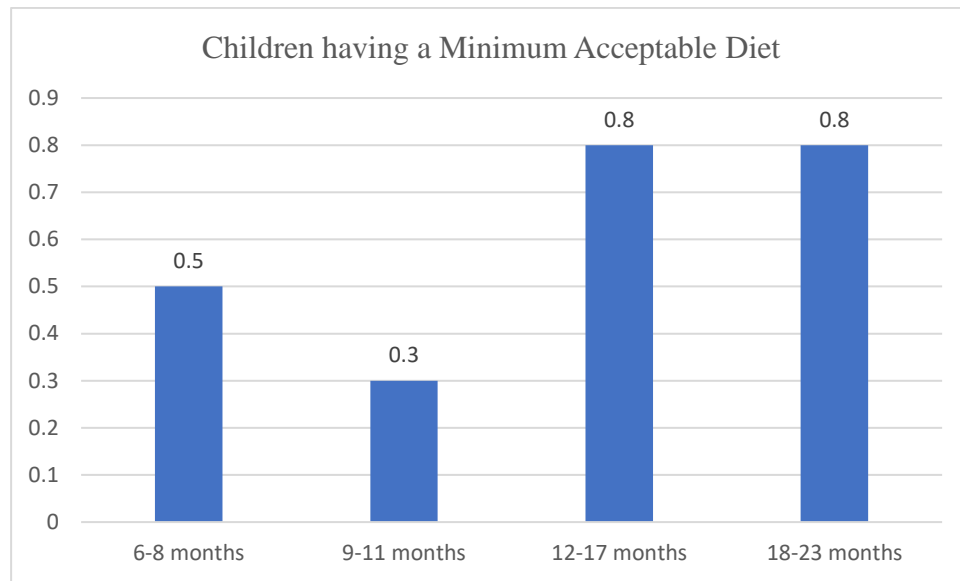
The Minimum Dietary Diversity was found to be lower among children 6-8 and 9-11 months than children aged 12-17 and 18-23 months, thus reflecting worsening dietary diversity among younger children. This outcome might be explained by cultural customs that call for introducing a variety of family foods gradually after starting complementary feeding with a thin cereal sheera or porridge that is frequently nutrient-poor but high in energy (Ariyo et al., 2021).

It can also be seen that the primary complementary foods in the study environment were home-cooked meals. This suggests that efforts to improve dietary diversity should be concentrated during the period between the start of complementary feeding and the end of exclusive breastfeeding. In this study's population's complementary diet, certain food groups, such as eggs, dairy products, and other fruits and vegetables, are especially underrepresented. It can also be concluded that increased awareness about complementary feeding techniques and demonstrations of complementary diets using locally sourced homemade items may benefit caregivers (Goswami et al., 2022).

Worsening dietary diversity among younger children is also a sign of food poverty-a state where young children are not fed the minimum number of food groups they require during early childhood. A study on food poverty suggests the prevalence of severe food poverty to be much higher in children from rural backgrounds as compared to their urban counterparts. Designing and leveraging health and protection

systems and strengthening nutrition governance can be a possible solution to fight food poverty in children (UNICEF,2021).

A study found factors like higher household wealth status, higher maternal education, and birth order to be associated with MAD and MDD in children aged 6-23 months. The study also discusses the relationship between higher maternal education and appropriate complementary feeding practices, which could be a result of promotion of optimal child and maternal nutrition, and subsequent uptake of health-seeking behaviour of educated mothers (Dhami et al., 2019).

Another study discussing the determinants of MDD and MAD in children aged 6-23 months reveals that a lack of knowledge can be evidently seen in mothers and primary caregivers regarding the minimum number of meals and food groups that children of a certain age should be consuming. It also demonstrates a lack of counselling on all facets of complementary feeding to the community (Goswami et al., 2022).

Data on MDD and MAD was further analysed through multiple logistic regression and chi-square value analysis. The results are presented in table 4.9.

Table 4.9: A multivariate logistic regression output showing factors associated with minimum dietary diversity practices among 6 to 23 months children

Variables	Categories	MDD Met(n=158)	MDD Unmet(n=227)	AOR (95% CI)
Age of the child	6-8 months	22 (13.9)	30 (13.2)	1
	9-11 months	26 (16.5)	45 (19.8)	0.9 (0.4-2.1)
	12-17 months	64 (40.5)	84 (37)	1.1 (0.6-2.4)
	18-23 months	46 (29.1)	68 (30)	1.1 (0.5-2.4)
Sex of the child	Female	62 (39.2)	93 (41)	1
	Male	96 (60.8)	134 (59.03)	0.8 (0.5-1.2)
Age of the mother	15-24 years	30 (19)	29 (12.8)	1
	25-29 years	95 (60.1)	163 (71.8)	1.3 (0.8-2.4)
	30-49 years	33 (20.9)	35 (15.4)	1.1 (0.5-2.1)
Education of the mother	High school certificate	52 (32.9)	57 (25.1)	1***
	Middle school certificate	16 (10.1)	10 (4.4)	1.3 (0.6-2.6)
	Intermediate or post HSC	90 (57)	160 (70.5)	2.6 (1.5-4.4) ***
Occupation of the mother	Housewife	72 (45.6)	160 (70.5)	1
	Livestock rearing	53 (33.5)	47 (20.7)	1.9 (1 -3.9)
	Agricultural labourer	22 (13.9)	15 (6.6)	1.3 (0.7-2.2)
	Landless farmer	8 (5.06)	4 (1.8)	1.3 (0.4-3.7)
	Employed under NREGA	3 (1.9)	1 (0.4)	0.4 (0.03-3.9)
Total monthly expenditure on food	75%	53 (46.5)	61 (53.5)	1
	50%	105 (38.7)	166 (61.3)	0.9 (0.5-1.7)
Type of government card	APL	67 (48.9)	70 (51.1)	2.1 (0.3-15.1)
	BPL	91 (36.7)	157 (63.3)	1.5 (0.2-10)
THR packets received from AWC	1-3	40 (50.6)	39 (49.4)	1
	4-6	188 (61.4)	118 (38.6)	0.5 (0.2-1.2)
THR packets consumed	1-3	78 (47.9)	85 (52.1)	1
	4-6	80 (36.03)	142 (64)	0.7 (0.4-1.2)
IFA tablets received from AWC	<30	61 (35.5)	111(64.6)	1.4 (0.6-2.8)
	60-90	97 (45.6)	116 (54.5)	1.2 (0.6-2.6)
IFA tablets consumed	<30	86 (38.1)	140 (61.9)	1
	60-90	72 (45.3)	87 (54.7)	1.3 (0.6-2.7)
Main source of water for drinking	Piped water into dwelling	20 (33.9)	39 (66.1)	1
	Public tap	56 (47.1)	63 (52.9)	2.2 (0.5-9.6)
	Tube-well	82 (39.6)	125 (60.4)	4.2 (1-17.5)**
For cooking	Piped water into dwelling	24 (40)	36 (60)	1
	Public tap	82 (38.5)	131 (61.5)	0.4 (0.1-1.4)
	Tube-well	52 (46.4)	60 (53.6)	0.4 (0.08-1.7)
For bathing, washing utensils	Piped water into dwelling	24 (34.3)	46 (65.7)	1
	Public tap	90 (39.3)	139 (60.7)	1.01 (0.3-3.6)
	Tube-well	44 (51.2)	42 (48.8)	2.07 (0.5-8.8)
Water purification method	Boiling	110 (69.6)	202 (89)	1
	Use as it is	48 (30.4)	25 (11.01)	0.6 (0.3-1.5)
	Alum	0	0	0.4 (0.01-8.1)
Type of drainage system	Open	136 (38.6)	216 (61.4)	1
	Closed	22 (66.7)	11 (33.3)	2.9 (1.1-7.7)**
Item used during menstruation	Pad	21 (42.9)	28 (57.1)	1
	Cloth	137 (40.8)	199 (59.2)	1.7 (0.7- 4)

Significant at **p<0.05, ***p<0.01

The following were the findings from both the analysis-

1. The logistic regression revealed that after adjusting the effect of predictors used in the model, the likelihood of having an adequate MDD was found to be associated with increased level of education of the mother.

2. Safe source of drinking water and a closed drainage system were also some determinants.

3. Households with a total monthly expenditure on food of up to 75% showed a higher chance of MAD feeding. Other determinants for the same were, households with an APL card, households with piped water into dwelling as a source of drinking water, and for bathing, washing utensils, water purification method and type of drainage.

4. The factors that did not influence the MAD and MDD were age of mother, caste, THR packets consumed and IFA tablet consumption by mother during pregnancy.

Table 4.10: Results showing chi-square value for children with adequate MDD and MAD

Variables	Categories	MDD F(%)(n=158)	MAD F(%) (n=9)	χ² value
Age of child	6-8 m 9-11 m 12-17 m 18-23 m	22 (13.9) 26 (16.5) 64 (40.5) 46 (29.1)	1 (11.1) 2 (22.2) 3 (33.3) 3 (33.4)	0.6
Sex of child	Female Male	62 (39.2) 96 (60.8)	3 (33.3) 6 (66.6)	0.08
Age of mother	15-24 years 25-29 years 30-49 years	30 (19) 95 (60.1) 33 (20.9)	4 (44.5) 2 (22.2) 3 (33.3)	6.4
Education of mother	HSC Middle school Certificate Intermediate/ post HSC	52 (32.9) 16 (10.1) 90 (57)	3 (33.3) 2 (22.2) 4 (44.5)	2.4
Occupation of mother	Housewife Livestock rearing Agricultural labourer Landless farmer Employed NREGA	72 (45.6) 53 (33.5) 22 (13.9) 8 (5.06) 3 (1.9)	5 (55.6) 3 (33.3) 1(11.1) 0 0	4.04
Caste	General Schedule caste Schedule tribe OBC	16 (10.1) 33 (20.9) 49 (31.01) 60 (38)	0 (0) 1 (11.2) 3 (33.4) 5 (55.6)	3.4
Monthly expenditure on food	75% 50%	53 (46.5) 105 (38.7)	3 (33.4) 6 (66.6)	12.4***
Type of govt. card	APL BPL	67 (48.9) 91 (36.7)	4 (44.4) 5 (55.6)	8.1**
THR packets received from AWC	1-3 4-6	40 (50.6) 188 (61.4)	2 (22.2) 7 (77.8)	11.6***
THR packets consumed	1-3 4-6	78 (47.9) 80 (36.03)	4 (44.4) 5 (55.6)	0.1
IFA tablets received from AWC	<30 60-90	61 (35.5) 97 (45.6)	3 (33.3) 6 (66.7)	1.1
IFA tablets consumed	<30 60-90	86 (38.1) 72 (45.3)	5 (55.6) 4 (44.4)	0.01
Main source of water for drinking	Piped water Public tap Tube-well	20 (33.9) 56 (47.1) 82 (39.6)	2 (22.3) 3 (33.3) 4 (44.4)	13.8***
For cooking	Piped water Public tap Tube-well	24 (40) 82 (38.5) 52 (46.4)	1 (11.1) 5 (55.6) 3 (33.3)	5.3
For bathing, washing utensils	Piped water Public tap Tube-well	24 (34.3) 90 (39.3) 44 (51.2)	1 (11.1) 5 (55.6) 3 (33.3)	9.9***
Water purification method	Boiling Use as it is	58 (36.7) 100 (25.9)	2 (22.2) 7 (77.8)	21.1***
Type of drainage	Open Closed	136 (38.6) 22 (66.7)	6 (66.7) 3 (33.3)	6.03***
Item used during menstruation	Pad cloth	21 (42.9) 137 (40.8)	3 (33.3) 6 (66.7)	7.6***

Significant at ***p<0.01

2. Infant and young child feeding practices

Breastfeeding among children-

The breastfeeding practices of the mothers of children aged 6-23 months, were studied with respect to initiation and continuation of breastfeeding, and the results are presented in table 4.11.

Table 4.11: Breastfeeding Practices of the study population

Breastfeeding practices	Frequency (%) (n=385)
Ever been breastfed	
a) Yes	384 (99.7)
b) No	1 (0.3)
Males	207 (53.9)
Females	177 (46.1)
Total	384 (100)
Still being breastfed	
a) Yes	362 (94.1)
b) No	23 (5.9)
Males	167 (46.1)
Females	195 (53.9)
Total	362 (100)

Despite the fact that breastfeeding is almost widespread in Gujarat, only 65% of children met WHO recommendations for 6 months of exclusive breastfeeding in 2019–20. Between 2015–16, the proportion of children under the age of 3 has decreased by 12% (going from 50% to 38%) while the rate of exclusive breastfeeding has increased by about 10%.

In addition to early breastfeeding initiation, exclusive breastfeeding is also important. Even if a consistent milk supply is not established within the first three days, prelacteals should be avoided because they impact the infant's suckling frequency. According to the NFHS-5 survey, women without any formal education, births attended by inexperienced medical staff, and home deliveries had lower rates of prompt breastfeeding initiation. Early breastfeeding initiation and exclusive breastfeeding may reduce neonatal mortality by 20%, infant mortality by 13%, and under-five mortality by 13%.

Cow milk and water were some of the prelacteals given to the children.

IYCF practices like exclusive breastfeeding and introduction to complementary foods were assessed. All women reported breastfeeding their child with 98.2% women still continuing breastfeeding.

Majority of mothers (90%) started breastfeeding at birth. Some of the common prelacteals given were honey, goat milk and cow milk. Apart from that, majority of mothers started complementary feeding at 7 months of age of the child. The first meals consumed were biscuits, cow milk, dal and rice mashed in a paste, and rice pudding.

Majority of mothers also stated that they fed their child 3-4 times a day in small quantities. In most cases, the child ate with the mother, from the same plate. Some of the common complementary foods given were biscuits, sheera, khichdi, rice and dal water, juice, mashed dal rice, papad, gathiya (processed foods), roti sabzi.

4.4 Nutritional status of women

According to NFHS 5 data, 25.2 percent women in Gujarat, have a Body Mass Index that is below Normal (BMI<18.5 kg/m²).

Data on classification of Body Mass Index is shown in table 4.12. A total of 49.9 percent women had Normal BMI, followed by 44.7 percent women being Mild underweight, 4.9 percent women being Moderate underweight and 0.5 percent women being Severe underweight.

Table 4.12: Classification of nutritional status of women by Body Mass Index

Classification	Frequency (%) (n=385)
Normal	192 (49.9)
Mild underweight	172 (44.7)
Moderate underweight	19 (4.9)
Severe underweight	2 (0.5)

Data on nutritional status of women was further classified on the basis of relation of undernutrition with MDD in mothers in table 4.13. A total of 47.1 percent women belonged to the category of Mild underweight, followed by Normal, about 46.8 percent, moderately underweight, about 5.2 percent and severely underweight, about 0.9 percent.

Table 4.13: Relation of MDD with undernutrition in mothers

Classification	Adequate MDD Frequency (%) (n=77)	Inadequate MDD Frequency (%) (n=308)
Normal	48 (62.3)	144 (46.8)
Mild underweight	27 (35.1)	145 (47.1)
Moderately underweight	2 (2.6)	16 (5.2)
Severely underweight	0 (0)	2(0.9)

4.5 Nutritional status of children

According to NFHS 5 data, in Gujarat, 25% of infants under five are wasted or too short for their height, 39% of children under five are stunted or too short for their age (below - 2 standard deviation), and 11% are severely wasted. Moreover, 40% of children under the age of five are reported to be underweight, which includes both chronic and acute undernutrition.

Data on nutritional status of children was classified under the following heads:

1. Mean anthropometric measurements of the children

   Data presented in table 4.14 on mean anthropometric measurements of the children demonstrated that the mean data for weight, height and MUAC for male children was 9.26, 74.52 and 11.89 respectively. The mean data for weight, height and MUAC for female children was 9.26, 74.08 and 11.80 respectively.

Table 4.14: Mean anthropometric measurements of the children

Gender	Measuring indicator	Mean	SD
Male	Weight	9.26	1.11
	Height	74.52	5.90
	MUAC	11.89	0.62
Female	Weight	9.26	1.18
	Height	74.08	6.01
	MUAC	11.80	0.62
Total	Weight	9.26	1.14
	Height	74.32	5.95
	MUAC	11.85	0.62

2. Mean Z scores of Anthropometric Indices

   Data presented in table 4.15 on mean Z scores of Anthropometric Indices demonstrated that mean Weight-for-Height Z score was -0.11 and 0.36 for male children and female children respectively. The mean Height-for-Age Z score was -0.13 and 0.18 for male children and female children respectively. The mean Weight-

for-Age Z score was -0.23 and 0.28 for male children and female children respectively.

Table 4.15: Nutritional status of children 6-23 months by Anthropometric Indices

Gender	Mean	SD
WHZ		
Male	-0.11	1.87
Female	0.36	1.52
Total	0.10	1.73
HAZ		
Male	-0.13	3.17
Female	0.18	3.07
Total	0.008	3.13
WAZ		
Male	-0.23	1.51
Female	0.28	1.30
Total	0.003	1.44
MUACZ		
Male	-2.62	0.67
Female	-2.27	0.66
Total	-2.46	0.69

3. Prevalence of malnutrition among children

Data presented in table 4.16 demonstrated prevalence of malnutrition among children with respect to the Weight-for-Height Z score, Height-for-Age Z score, Weight-for-Age Z score and MUAC in the parameters of normal, mild, moderate and severe stunting, wasting and underweight.

Table 4.16: Prevalence of malnutrition in children

Parameter	Frequency (n=385)	Percentage
WHZ		
Normal	27	7
Mild wasted	317	82.3
Moderately wasted	20	5.2
Severely wasted	21	5.5
HAZ		
Normal	57	14.8
Mild stunted	253	65.7
Moderately stunted	29	7.6
Severely stunted	46	11.9
WAZ		
Normal	44	11.4
Mild UW	311	80.8
Moderately UW	22	5.7
Severely UW	8	2.1
MUAC		
Normal	283	73.5
MAM	102	26.5

Data from NFHS 5 for Panchmahal district, Gujarat, reveals a total of 47.1% children under the age of 5 are stunted in the region. A total of 35.7% children under the age of 5 are wasted and a total of 51.9% children under the age of 5 are underweight. According to a study done in India, the nutritional status of children was significantly influenced by elements like maternal height, BMI, education, and household affluence. It was also found that dietary diversity was a major factor influencing the nutritional status of children. Other factors, such as household air quality, sanitation, and vaccination, contributed relatively less to describing variation in children (Miller et al., 2016).

Data was further analysed on gender wise prevalence of malnutrition under the heads of normal, mild, moderate and severely underweight.

Table 4.17: Gender-wise prevalence of malnutrition

Nutritional status	Frequency (%) (n=207) Males	Frequency (%) (n=178) Females
WAZ		
Normal	33 (15.9)	11 (6.2)
Mild UW	154 (74.4)	157 (88.2)
Moderately UW	14 (6.8)	8 (4.5)
Severely UW	6 (2.9)	2 (1.1)
HAZ		
Normal	39 (18.8)	18 (10.1)
Mild UW	124 (59.9)	129 (72.5)
Moderately UW	16 (7.7)	13 (7.3)
Severely UW	28 (13.6)	18 (10.1)
WHZ		
Normal	19 (9.2)	8 (4.5)
Mild UW	161 (77.8)	156 (87.6)
Moderately UW	12 (5.8)	8 (4.5)
Severely UW	15 (7.2)	6 (3.4)
MUACZ		
Normal	65 (31.4)	79 (44.4)
Mild UW	102 (49.3)	37 (20.8)
Moderately UW	40 (19.3)	62 (34.8)

Prevalence of malnutrition in children was further classified into age group ranges of 6 to 8 months, 9 to 11 months, 12 to 17 months and 18 to 23 months. A majority of children were mildly underweight, mildly wasted and mildly stunted in all categories of WAZ, WHZ, HAZ and MUACZ.

Table 4.18: Age-wise prevalence of malnutrition in children

Nutritional status	Frequency (%) (n=121) 6-11 months	Frequency (%) (n=162) 12-17 months	Frequency (%) (n=102) 18-23 months
WAZ			
Normal	116 (95.9)	139 (85.8)	56 (54.9)
Mild UW	5 (4.1)	17 (10.5)	22 (21.6)
Moderately UW	0 (0)	6 (3.7)	16 (15.7)
Severely UW	0 (0)	0 (0)	8 (7.8)
WHZ			
Normal	96 (79.3)	136 (84)	85 (83.3)
Mild UW	10 (8.3)	9 (5.6)	8 (7.8)
Moderately UW	6 (5)	9 (5.6)	5 (4.9)
Severely UW	9 (7.4)	8 (4.9)	4 (3.9)
HAZ			
Normal	104 (86)	108 (66.7)	41 (40.2)
Mild UW	15 (12.4)	29 (17.9)	13 (12.7)
Moderately UW	2 (1.7)	14 (8.6)	13 (12.7)
Severely UW	0 (0)	11 (6.8)	35 (34.3)
MUAC			
Normal	48 (39.7)	88 (54.3)	45 (44.1)
Mild UW	46 (38.01)	42 (25.9)	37 (36.3)
Moderately UW	27 (22.3)	32 (19.8)	20 (19.6)
Severely UW	0 (0)	0 (0)	0 (0)

A decrease in the prevalence of stunting in children under the age of five can be achieved via focused efforts to improve maternal health status and other related factors. another possible risk. IYCF practices, WASH practices, and lack of access to food in the house are all risk factors for stunting (Rana et al., 2019).

In an investigation of 62 low to middle income nations' demographic health surveys, it was discovered that higher maternal education levels were linked to lower rates of stunting (Vollmer et al., 2017). According to research, the likelihood of stunting is also inversely correlated with the wealth quintiles of households and the parents' level of education (Dhirar et al., 2018).

4.6 Sanitation and Hygiene

Data on sanitation and hygiene facilities at the households is presented in table 4.19.

Table 4.19: Hygiene and Sanitation facilities at the households

Source of water	Frequency (%) (n=385 HHs)
For drinking	
a) Piped water into dwelling	207 (53.8)
b) Public tap	119 (30.9)
c) Tube-well	59 (15.3)
For cooking	
a) Public tap	213 (55.3)
b) Piped water into dwelling	112 (29.1)
c) Tube-well	60 (15.6)
For bathing, washing clothes and utensils	
a) Public tap	229 (59.5)
b) Piped water into dwelling	86 (22.3)
c) Tube-well	70 (18.2)
Method of purifying water	
a) Use as it is	318 (82.6)
b) Boiling	65 (16.9)
c) Put alum	2 (0.5)
Washing hands	**Frequency (%) (n=385)**
Before cooking	385 (100)
Before eating	
a) Yes	383 (99.4)
b) No	2 (0.6)
Before feeding the child	
a) Yes	384 (99.7)
b) No	1 (0.3)
Before and after cleaning the child	
a) Yes	382 (99.2)
b) No	3 (0.8)
After using the toilet	
a) Yes	380 (98.7)
b) No	5 (1.3)
Hands washed with	**Frequency (%) (n=385)**
Water + soap	220 (57.2)
Only water	165 (42.8)

According to the findings, the main source of water for drinking in a majority of households was piped water into dwelling, about 53.8 percent. The main source of water for cooking in a majority of households was public taps, about 55.3 percent. And the main source of water for bathing, washing clothes and utensils in a majority of households was public tap, about 59.5 percent. The main method of purifying water was to use it as it is, about 82.6 percent. The main facility used for defecation was sharing a washroom, about 95.6 percent. Majority of households had an open drainage system, about 91.4 percent. The main method of household waste disposal was

throwing the waste out in the open, about 45.1 percent and the main item being used by women during menstruation was a cloth, about 87.3 percent.

From the data presented in table 4.19 on hand washing practices, it can be also be concluded that all mothers reported washing hands before cooking and eating. 42.8 % women washed hands with only water, whereas 57.2% women reported using soap and water to wash their hands. All mothers reported washing their hands before feeding the child and a majority of them washed hands with soap and water (61.8%) after using the toilet.

Table 4.20: Waste disposal practices of the study population

Waste disposal	Frequency (%) (n=385 HHs)
Facility used for defecation	
a) Sharing	368 (95.6)
b) Open defecation	15 (3.9)
c) Public toilet	2 (0.5)
Type of drainage facility	
a) Open	352 (91.4)
b) Closed	33 (8.6)
Method of HH waste disposal	
a) Thrown out in the open	174 (45.1)
b) Burnt	113 (29.4)
c) Dustbin	98 (25.5)
Item used during menstruation	
a) Cloth	336 (87.3)
b) Sanitary pad	49 (12.7)
Disposal of pad (n=49)	
a) Dustbin	21 (42.9)
b) Open	16 (32.7)
c) Store and throw collectively	12 (24.4)
Disposal of cloth (n=336)	
a) Was and reuse	283 (84.2)
b) Throw as it is	52 (15.5)
c) Wrap in plastic/paper and throw	1 (0.3)

A study conducted in India revealed that piped or bottled water was related with higher odds of access to dietary diversity, compared to protected/unprotected springs and surface water (Choudhary et al., 2021). There are numerous potential processes underlying this connection. Firstly, a number of foods require a lot of water for processing and growing (such as irrigation) (e.g., wash-down). Fresh fruits and vegetables may be avoided in water-stressed environments in favour of a select few items like beans and wheat, which require less water to produce. Secondly, inadequate water access may have detrimental economic effects, such as increased time costs for

bringing water from far-off sources and increased medical costs for treating illnesses brought on by tainted water from unprotected wells. Budgets for a family's appropriate and varied food supply could be affected by this.

4.7 Food Environment

4.7.1 Food safety net programs

The life cycle approach to dietary diversity and food security is utilised by the food-based safety net programmes like ICDS and PDS to provide nutritional assistance at different periods of life. These food safety net programmes, which are governed by the National Food Security Act (NFSA), offer nutritional assistance to new-borns, school-age children, pregnant and lactating women, as well as senior citizens. Additionally, this research attempts to understand how food-based safety net initiatives might enhance India's dietary diversity.

Utilization of Public Distribution System (PDS)
Table 4.21 shows data on utilization of different food safety net programs. Fifty-three percent (N=204) government card holders were BPL and 34 % (N=131) were APL. Thirteen percent participants had no card (N=50). Sixty-one percent participants purchased food from the PDS.

Three commodities' consumption—rice, wheat, and sugar—from PDS purchases as well as consumption from other sources were taken into account. Through ration shops, fair price shops, and control shops, PDS delivers these necessities at reduced prices.

Table 4.21: Households purchasing food grains through Public Distribution System

Availability	
Ration card status	**Frequency (%) (n=385)**
BPL ration card	204 (53)
APL ration card	131 (34)
Hold no card	50 (13)
Utilisation	
HHs buying or not buying ration	**Frequency (%) (n=385)**
Buy ration	235 (61.1)
Do not buy ration	150 (38.9)
1. Reason for not buying	
a) No need	56 (37.3)
b) Issue with ration card	50 (33.3)
c) Unsatisfactory quality	44 (29.4)
Accessibility	
Misclassification of subjects with respect to ration cards	**Frequency (%) (n=385)**
Hold the right card	257 (66.75)
APL card allotted to BPL	78 (20.26)

IFA supplementation during pregnancy

Data on the IFA supplementation of the pregnant women during pregnancy is presented in the table 4.22. It can be concluded that 100% of all women received IFA tablets from the Anganwadi. 44.9 % women reported go have received less than 30 IFA tablets and 55.1% women received 60-90 IFA tablets. When it comes to consumption, 58.9% women consumed less than 30 tablets whereas around 41% women consumed 60-90 IFA tablets during the course of their pregnancy. As part of antenatal treatment, daily oral iron and folic acid supplementation is advised to lower the risk of low birth weight, maternal anaemia, and iron deficiency.

Table 4.22: Availability and utilization of IFA tablet from AWC by mothers

Provision status of IFA tablets and number of women	Frequency (%) (n=385)
Women provided with IFA tablet	385 (100)
No. of IFA tablets provided from AWC	**Frequency (%) (n=385)**
60-90	212 (55.1)
<30	173 (44.9)
No. of IFA tablets consumed by the mother	
<30	227 (58.9)
60-90	158 (41.1)

Utilization of ICDS services

Data presented in the table 4.23 on utilization of supplementary nutrition during pregnancy reveals that majority of women (99.7%), received THR packets from the Anganwadi centres. Around 90.6 % women reported receiving 4-6 packets per month from the AWC. 42.6% women reported consuming 1-3 packets whereas 57.4% consumed around 4-6 packets per month.

Table 4.23: Presence and utilization of supplementary nutrition services of ICDS by children

THR provided by AWC	Frequency (%) (n=385)
4-6 packets	349 (90.6)
1-3 packets	33 (8.6)
>7 packets	3 (0.8)
THR consumed	**Frequency (%) (n=385)**
4-6 packets	221 (57.4)
1-3 packets	164 (2.6)

Food environment can be directly linked with food security. A study reveals that food safety net programs like the Public Distribution System, despite being the largest food network in the world, suffers from insufficiency, miss-targeting i.e. misclassification of government cards and corruption, leaving behind a large amount of food insecure people in India (George and McKay, 2019).

Food availability is also linked to food security. It was observed that the communities often consumed food items that are grown in the area, limiting their options of achieving a diverse diet, which results in poor nutritional status in both women and their children.

4.7.2 Consumption of processed foods

Data was further analysed for consumption of processed foods by the study population in table 4.24. The item consumed most by both mothers and children were biscuits, being 95.6% and 84.7% respectively. The main reason for purchasing these items was found to be likeness of the taste (26%), followed by affordable prices (21.1%), trust on shopkeeper (20.3%), and so on.

The items were consumed majorly once a week by the mothers and children, being 59.2 % and 42.7 % respectively. The main reason for consumption was found to be time convenience (78.4%), and the main source of information for these items was through friends and family (44.9%), followed by advertisements on TV/radio (38.1%), packaging/ labels (15.2%), and so on.

Table 4.24 Consumption of processed foods by the study population

Items consumed by mother (multiple responses)	Frequency (%) (n=385)
Biscuits	367 (95.6)
Chips	363 (94.6)
Noodles	233 (60.7)
Juices	150 (39.1)
Bakery items	72 (18.8)
Carbonated drinks	40 (10.4)
Items consumed by child (multiple responses)	**Frequency (%) (n=385)**
Biscuits	325 (84.7)
Chips	314 (81.8)
Noodles	247 (64.3)
Juices	182 (47.4)
Bakery items	127 (33.1)
Carbonated drinks	63 (16.4)
Reason for purchasing these items	**Frequency (%) (n=385)**
Like the taste	100 (26)
Affordable prices	81 (21.1)
Trust on shopkeeper	78 (20.3)
Habit	75 (19.4)
Easily available	51 (13.2)
Frequency of consumption by mother	**Frequency (%) (n=385)**
Once a week	228 (59.2)
Thrice a week	122 (31.7)
Daily	27 (6.9)
Weekly	4 (1.1)
Monthly	4 (1.1)
Frequency of consumption by child	**Frequency (%) (n=385)**
Once a week	164 (42.7)
Thrice a week	157 (40.9)
Weekly	45 (11.6)
Daily	19 (4.8)
Reason for consumption (multiple responses)	**Frequency (%) (n=385)**
Time convenience	301 (78.4)
Different or unusual taste	273 (71.1)
Easily available	214 (55.7)
Good appearance or texture	116 (30.2)
Source of information	**Frequency (%) (n=385)**
Friends/ family	173 (44.9)
Advertisements on TV/ Radio	146 (38.1)
Packaging/ labels	59 (15.2)
Newspapers/ magazines	7 (1.8)

Considering the harmful effects processed foods have on the health of both mother and child, when asked the reason for consumption, majority of mothers stated that their children consumed these items regularly and refused to have their regular meals without the addition of these items.

Promoting consumer knowledge of a healthy diet, creating school policies and programmes that encourage children to choose and maintain a healthy diet, and frequently giving nutrition and dietary counselling in primary care facilities are all ways to increase consumer demand for healthy foods and meals. Adequate new-born and young child feeding habits must be promoted and upheld by government policies (Paul et al.,2022).

4.8 Observation of food produced and available

Assessment of food environment revealed the presence of cultivated foods as well as processed packaged foods within close vicinity of the study households. Cotton and castor are the most grown cash crops. Pearl millet (bajra), corn (makai), wheat, rice are the most grown cereals in the area and are also the most consumed. Bhakri (wheat crisps), rotla (flattened bread) (both bajra and wheat), dal bhat (pulses and rice), sheera (sweetened porridge) are the most consumed dishes with vegetables like cabbage, brinjal, cauliflower, potatoes, onions, peas, spinach, French beans, bitter gourd, bottle gourd and cucumbers.

Most consumed fruits are bananas, apples, papaya and ber (Indian jujube) with oranges and other fruits being seasonally consumed.

Vegetables and fruits were being purchased through local shops in the village. The shopkeeper sourced these items from the main local market and sold it in the village at a slightly more expensive price.

SUMMARY
AND
CONCLUSION

5. SUMMARY AND CONCLUSION

This chapter summarises the major findings and the conclusion emerging from the results of the study.

The present cross-sectional study aimed to map the dietary diversity in women of reproductive age (14-49 years) and their children (aged 6-23 months), from selected villages of in Kalol taluka, of the Panchmahal district, Gujarat. All the households (N=385) with mothers and children aged 6-23 months were enrolled in the study after obtaining their consent.

1. The mean age of the mothers at the time of the interview was 27.2± 3.78 years, and that of the children was 14.1± 4.47 months. The mean monthly income was INR 11203.6± 8313.2, indicating that the households belonged to lower-middle socio-economic class. Sixty nine percent of the families spent three-fourth of their monthly income on food which indicates poor/low food and nutrition security as well as diminished resources for education, health and other amenities. Other Backward Classes (OBC) was the largest ethnic group in the population (34.3%), followed by Scheduled Tribe (ST) (30.9%). In majority of the households, the husband served as the family's head, and their highest education qualification was an intermediate or post-high school diploma.

2. The occupations followed by the head of the family were service (29.6 %), land owning farmers (28.1 %) and agriculture labourers (15.1 %). Majority of the women were housewives (31.9 %) followed by livestock rearing (23.1 %) and agriculture labourers (19 %).

3. Assessment of food environment revealed the presence of cultivated foods as well as processed packaged foods within close vicinity of the study households. Cotton and castor were the most widely grown cash crops, pearl millet (bajra), corn (makai), wheat, and rice were the most popular foods consumed in the form of bhakri (wheat crisps), rotla (flat bread) (both made from wheat and bajra), rice and dal, and sheera (sweet porridge). The most popular vegetables were cucumbers, bitter gourd, bottle gourd, cabbage, brinjal and cauliflower. The consumption of processed foods was also examined; biscuits emerged as the most popular food. Taste similarity, reasonable costs, shopkeeper trust, and time convenience were revealed to be the key drivers of

these purchases. Friends and family, radio and television commercials, product packaging and labels, and other sources were the primary sources of information for these goods.

4. Piped water supply was available in 53.8% of the households. In the majority of houses, public taps served as the primary supply of water for bathing and cooking, and the primary method of water purification was just using the water as is. Sharing a toilet facility was the mode of defecation, and the majority of homes had an open drainage system. Women used primarily cloths during menstruation, and the primary means of disposing of domestic waste was tossing it out in the open.

5. The study aimed to assess the presence and utilisation of food safety net programs and its role in promoting dietary diversity and food security in the study population. The results showed that 61.1% of participants bought food from the PDS, and that 53% (N=204) of government card holders were BPL and 34% (N=131) were APL. Thirteen percent (N=50) participants did not hold a government card. The Anganwadi provided IFA supplementation during pregnancy; 44.9% of women received fewer than 30 IFA tablets, and 55.1% received between 60 and 90 IFA tablets. Moreover, 99.7% of the population received THR packets from the Anganwadi centres; 42.6% of this population consumed 1-3 packets every month, and 57.4% consumed about 4-6 packets.

6. Diet Quality Questionnaire (DQ-Q) was used to calculate women's dietary diversity score. Only 20.1 percent of the women consumed five food groups that were advised namely, starchy grains, vegetables, fruits, pulses, nuts and seeds, and animal-based meals (mainly fluid milk and yogurt) for an adequate dietary diversity. The major food groups consumed were grains and white roots, tubers, and plantains, whole grains, legumes, and sweet tea/coffee/coca that contributed simple and complex carbohydrates and small amount of protein to their diet.

The NCD-Protect Score was found to be 3.6. The NCD- Protect score is an indicator used to capture consumption of a diversity of fruits, pulses, vegetables, nuts and seeds and whole grains associated with meeting the required recommendations. The higher the NCD- Protect score (0-9), the more recommendations have been met. The NCD-Risk score is additionally a proxy indicator of ultra-processed food consumption. The lower the NCD-Risk score, the lower the percentage of dietary energy from ultra

processed food. The NCD- Risk score is an indicator that reflects dietary risk factors for NCDs. The NCD-Risk Score was found to be 0.8. The consumption of sweet beverages, sweet foods, salty packaged snacks, instant noodles, fried foods, fast food and processed and red meat is negatively associated with meeting the recommendations. The lower the NCD- Risk score (0-9), the more recommendations have been met.

7. A majority of the mothers (90%) began breastfeeding their children at birth. Complementary foods were introduced at the age of 7 months by 90 % of the mothers. Forty-one percent of the children met minimum dietary diversity MDD and only 2.3% of the children (N=9) met the requirements for a Minimum Acceptable Diet. A low MDD and MAD are factors documented to be associated with the high burden of malnutrition and consequently high burden of morbidity and mortality among infants. MDD and MAD was found to improve with children's age, mothers' educational levels, access to safe drinking water, and closed drainage systems.

8. Biscuits mashed in cow milk, soft, cooked/mashed dal and rice and rice kheer were among the first foods fed to the child. Majority of mothers fed their children small meals three to four times per day. Observations on safe production, handling storage and feeding practices revealed that all mothers washed their hands before eating and cooking.

9. It was also evident that mothers were unaware about the minimum number of meals and types of food groups to be fed to the child. There was lack of counselling on all aspects of complementary feeding to the community.

10. The results of the logistic regression showed that the families that spend up to 75% of their monthly income on food had a higher likelihood of engaging in MAD feeding. Households having an APL card, homes with piped water for drinking, bathing, and washing utensils, and mothers who practised good hygiene and sanitation practises were additional predictors for the same.

11. Prevalence of undernutrition was found to highest by wasting in 6-11 months age group (8.3%). Stunting was found to be highest in –12-17 months age group (17.9%). Highest prevalence of underweight was seen in 18-23 months age group (21.6%)

12. The women of the home take socio-cultural variables related to a variety of diets and purchase vegetables and fruits from neighbourhood stores in the villages. The decision to spend money on food and groceries each month belongs to the household's head, which in a majority of households was found to be the husband (44.7%).

Conclusion-

1. Although there was maximum availability, there was little utilisation of it mostly due to a lack of nutritional education and a widespread perception that government services are of low quality.

2. Water scarcity may be experienced to carry out various functions, therefore even though there was availability of water, accessibility of water was poor. Some families had to get water from outside premises, which poses the risk of contamination if not properly kept and used.

3. In terms of income and spending, mothers had little influence and power.

4. Utilization was severely constrained due to the low availability of safe drinking water for drinking and sanitation needs. Toilets were there, but not enough water was available for proper hygiene and sanitation.

5. The use of processed foods was at an all-time high, with mothers and children in particular regularly and heavily consuming these meals.

6. Outcome indicators like mothers' BMI, stunting, wasting, and underweight children (6–23 months) were all more common in the insecure side.

7. It can be said that the research population's dietary diversity was moderate. Even though there may be appropriate availability and fair access, usage is quite low.

Findings from the Focus Group Discussion

The main purpose or objective of the focus group discussion was to gain insights into the reasons for low Minimum Dietary Diversity (MDD) and Minimum Acceptable Diet (MAD) observed among children 6-23 months of age from the study population.

The participants of the first group belonged to the age group of 20-25 years, and had children in the age group of 12-17 months. All participants had low educational status with majority of participants having middle school certification and were housewives with the exception of two of the participants being agricultural labourers. The participants in the second group belonged to the age group of 23-30 years. The age of their children ranged from 6-23 months. In terms of educational status, majority of the participants had a high school certification with one participant holding a graduate degree. All participants were housewives. The participants were then briefed about the study and the different aspects of maternal and child dietary diversity.

The entire discussion was sub-divided into following themes-

1. Initiation of breastfeeding and current status of breastfeeding

To open the discussion, the group was asked about their young child feeding practices. The findings showed that a majority of mothers started breastfeeding at birth. At the time of the discussion, all mothers responded positively to breastfeeding their children.

2. Pre-lacteals given

Some of the common pre-lacteals given were honey, goat milk and cow milk.

3. Age of introduction of complementary foods, their frequency and the reasons for consumption

A majority of mothers started complementary feeding at 7 months of age of the child. The first meals consumed were biscuits, cow milk, dal and rice mashed in a paste, and rice pudding. One participant said, "I started complementary feeding somewhere between 6th and 7th month. I also fed my child rice pudding and "sheera" during the initial phase. I discontinued breastfeeding as I realised my child wasn't benefitting from breast milk. He kept losing weight and would get sick often, which is why I introduced food." A majority of mothers stated that they fed their child 3-4 times a day in small quantities. In most cases, the child ate with the mother, from the same plate.

4. Food groups included and not included in the diet and the reasons

Common complementary foods given were biscuits, "sheera", "khichdi", rice and dal water, juice, mashed dal rice, "papad", "gathiya" (processed foods), "roti sabzi".

5. Consumption of ultra-processed food, foods fed, their frequency, and the reasons for consumption

The group was given a brief explanation about the meaning of the said topic and asked questions about the concerning consumption of processed foods by the study population, especially the children. Considering the harmful effects processed foods have on the health of both mother and child, when asked the reason for consumption, majority of mothers stated that their children consumed these items regularly and refused to have their regular meals without the addition of these items. A participant stated," I don't consume processed food items more than once a week. My child on the other hand consumes it every other day. The only reason why I allow him to purchase these items is because the child has become habitual to eating these from a very long time. Every time we pass a shop, the child starts crying and throwing a tantrum because he wants me to buy the item for him. Chips and noodles are the most consumed items." On being asked about the source of information of these items, the participants stated that the local shops advertised the products by displaying them in a large number on the shops, which attracted the children.

6. Observation of food available and foods consumed in the area

It was found that cotton and castor are the most grown cash crops. Pearl millet (bajra), corn (makai), wheat, rice are the most grown cereals in the area and are also the most consumed. "Bhakri", "rotla" (both bajra and wheat), "dal bhat", "sheera" are the most consumed dishes with vegetables like cabbage, brinjal, cauliflower, potatoes, onions, peas, spinach, french beans, bitter gourd, bottle gourd and cucumbers. Most consumed fruits are bananas, apples, and papaya with oranges and other fruits being seasonally consumed. Vegetables and fruits were being purchased through local shops in the village. The shopkeeper sourced these items from the main local market and sold it in the village at a slightly more expensive price.

7. Socio-cultural factors affecting dietary diversity

It was found during the personal interviews that some participants consumed less than 3 meals a day. When asked about the reason for such a practice, a participant stated," I work as an agricultural labourer. Because I leave early in the morning to go work in the field and come late in the evening, I cook one meal in the morning and my family

consumes it for the whole day as it is difficult to take out time for cooking and work at the same time."

Information was further collected on food expenditure and decision making of women in households. When asked about the decision-making power of the women in their households and decisions regarding expenditure on food, A participant stated," My husband earns so he decides how much and how often we will spend on food. I just give him a list of things I require per month as groceries. He shops, he spends." Decisions like what should be cooked for the day, what should the child be fed, quantity and quality of food etc. were some decisions that were being taken by the women of the household. Monthly expenditure on food and groceries etc. remains to be the decision of the household head, who in most cases is the husband.

Recommendation-

Understanding the status, trends, and causes of poor diets in early infants necessitates a situational study. This can be accomplished by reviewing the quantitative and qualitative data, examining how current programmes are being delivered, and conducting interviews with key government officials. Market analyses of locally accessible foods, including their availability and promotion, as well as public attitudes of complementary foods made commercially can be used to identify obstacles to consuming a healthy diet. Understanding the severity of dietary restrictions can be aided by looking at food intake patterns, diet costs, and nutritional gap analyses for children aged 6 to 23 months.

By employing food-based strategies such integrating traditional and indigenous foods (IFs) that are locally foraged from the wild or raised on farms, dietary variety and micronutrient deficiencies may be improved. According to studies that have demonstrated a positive impact of production diversity on child anthropometric outcomes, better access to diverse and improved diets through home gardening and consumption of indigenous varieties of fruits and vegetables from forests and other nearby areas could probably improve micronutrient status.

Limitations-

1. Due to the short study duration, we were not able to assess the seasonal variation of dietary diversity among the participants.
2. The participants were selected through purposive selection of households in the region. Therefore, the results of the study cannot be generalised for the entire population of the region.
3. The diversity score was limited by the fact that they were based on a simple yes/no for consumption on the previous day, regardless of the number of items consumed within a given food group, or the potential healthfulness of an item.

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ANNEXURES

2. ANNEXURES

ANNEXURE 1

Consent forms-

Consent form in English-

This informed consent form is for Mothers aged 15-49 years, who we are invited to participate in research, titled, "Assessing Maternal and Child Dietary Diversity in selected villages of Kalol taluka of Panchmahal district, Gujarat".

Introduction:

I, Anushka Pathak, am pursuing M.Sc. from Department of Foods and Nutrition of The Maharaja Sayajirao University Baroda. My research Project is titled, "Assessing Maternal and Child Dietary Diversity in selected villages of Kalol taluka of Panchmahal district, Gujarat".

You will be given information to be a part of this research. Before you decide, you can talk to anyone you feel comfortable with about the research. Please feel free to ask any questions.

Purpose of the research: Poor diet diversity in mothers and children is a cause of concern and needs to be addressed. Maternal and child nutrition need to be reviewed with respect to poor dietary diversity associated with socio-cultural and environmental factors.

Type of Research Intervention: This research requires you to fill a questionnaire which will require 15-30 minutes of your time. We will need the following information from you through a structured questionnaire:

- Personal information
- General household characteristics
- 24-hour dietary recall for mother
- Infant feeding practices
- 24-hour dietary recall for child

- Hygiene and Sanitation
- Food safety net programs
- Anthropometric measurements
- Food environment

Participant Selection: Mother- child pairs aged 15-49 years and 6-23 months respectively, will be selected for the study.

Voluntary Participation: Your participation in this research is entirely voluntary.

Procedures: It is your choice whether to participate or not. If you do not wish to answer any of the questions included in the survey, you may skip them and move on to the next question. The information recorded will be confidential.

Risks: There is no perceived risk involved.

Benefits: There will be no direct benefit to you, but your participation is likely to contribute toward better understanding.

Reimbursements: You will not be provided any incentive to take part in the research.

Confidentiality: We will not be sharing information about you to anyone outside of the research team. The information that we collect from this research project will be kept private. It will not be shared with or given to anyone except the Investigator and Research guide.

Sharing the Results: At the end of the study the relevant information will be shared with you.

Right to Refuse or Withdraw: You do not have to take part in this research if you do not wish to do so. You may also stop participating in the research at any time even if you agreed earlier.

Whom to Contact: If you have any questions, you can ask them now or later. If you wish to ask questions later, you may contact any of the following:

Anushka Pathak (+91 9588285026; anushkapathak1112@gmail.com) and

 Dr. Suneeta Chandorkar (+91 9426366666; suneetachandorkar@gmail.com)

Certificate of Consent

I have been invited to participate in the research titled "Assessment of Maternal and Child Dietary Diversity in Selected Villages of Kalol Taluka of Panchmahal District". I have read the above information, or it has been read to me. I have had the opportunity to ask questions about it and the questions I asked have been answered satisfactorily.

I voluntarily agree to participate in this study.

Name of Participant_____

Signature of Participant _____

Date _____

Statement by researcher/person taking consent-

The potential participant has read the information sheet accurately shown by me. Participant has agreed to provide the following information-

- Personal information
- General household characteristics
- 24-hour dietary recall for mother
- Infant feeding practices
- Morbidity profile of the child
- 24-hour dietary recall for child
- Hygiene and Sanitation
- Food safety net programs
- Anthropometric measurements

I confirm that the participant was given the opportunity to ask questions about the study, and that all questions asked by the participant have been answered correctly. I confirm that the person has not been coerced into consenting, and that the consent is freely and voluntarily given.

Signature of Inventor _____

Consent form in Gujarati-

માહિતી પત્રક

<center>

ડીપાર્ટમેન્ટ ઓફ ફૂડ્સ એન્ડ ન્યુટ્રીશન
ફેકલ્ટી ઓફ ફેમિલી એન્ડ કોમ્યૂનિટી સાયન્સેસ
૬ મહારાજા સયાજીરાવ યુનિવર્સિટી ઓફ બરોડા

</center>

આ જાણકાર સંમતિ ફોર્મ 15-49 વર્ષની વયની માતાઓ અને તેમના 6-23 મહિનાના બાળકો માટે છે, જેમને આપણે સંશોધનમાં ભાગ લેવા માટે આમંત્રિત કરી રહ્યા છીએ, જેનું શીર્ષક છે, "ગુજરાતના પંચમહાલ જિલ્લાના કલોલ તાલુકાના પસંદગીના ગામોમાં માતા અને બાળ આહારની વિવિધતાનું મૂલ્યાંકન કરવું".

પરિચય:

હું, અનુષ્કા પાઠક, મહારાજા સયાજીરાવ યુનિવર્સિટી બરોડાના ફૂડ્સ એન્ડ ન્યુટ્રીશન વિભાગમાંથી એમ.એસસી કરી રહી છું. મારા સંશોધન પ્રોજેકટનું શીર્ષક છે, "ગુજરાતના પંચમહાલ જિલ્લાના કલોલ તાલુકાના પસંદગીના ગામોમાં માતા અને બાળ આહારની વિવિધતાનું મૂલ્યાંકન".આ માહિતી પત્રક દ્વારા હું તમને સંશોધન વિષયે માહિતી આપવા મંગુ છું અને સંશોધનમાં ભાગ લેવા આમંત્રિત કરું છું. તમે સંશોધનમાં ભાગ લેવાનું નક્કી કરો તે પહેલાં તમે મને અથવા તમને વિશ્વાસ હોય તેવી કોઈ પણ વ્યક્તિને પ્રશ્ન પૂછીને સંશોધન વિષયે સ્પષ્ટતા મેળવી શકો છો.

સંશોધનનો હેતુ: આપણા રાજ્યમાં વસતા અમુક તબક્કા/વર્ગની માતા અને બાળકોના ખોરાક ગુણવત્તાસભર ના હોવાથી એની આડઅસર એમના સ્વાસ્થ્ય ઉપર થાય છે. ખોરાકમાં પોષકમૂલ્ય ધરાવતા અનાજ, દાળ, ફળ અને શાકની માત્રા ઓછી હોવાથી માતા અને બાળક કુપોષણ નો (ઓછું વજન, લોહીની ઉણપ ઇત્યાદિ) શિકાર થાય છે. આહારમાં વિવિધતાના અભાવના અનેક કારણ છે દા.ત. સામાજિક, આર્થિક, શૈક્ષણિક. માતા અને બાળકોના પોષણ સ્તરને સુધારવા માટે આ પરિબળોનો અભ્યાસ કરવો અનિવાર્ય છે. ઉપર જણાવેલ ઉદ્દેશ્યથી આ સંશોધન હાથ ધરવામાં આવ્યું છે.

સંશોધન પ્રક્રિયા: આ સંશોધન માટે તમારી મુલાકાત લઇને તમારા પાસેથી નીચે જણાવેલ માહિતી એકત્ર કરવામાં આવશે.

1. વ્યક્તિગત માહિતી
2. પરિવારની સામાજિક આર્થિક સ્થિતિ
3. માતાના આહાર વિષયક માહિતી
4. ૬-૨૩ મહિનાના બાળકના આહાર વિષયક માહિતી
5. સ્વચ્છતા
6. આંગણવાડી અને જાહેર વિતરણ વ્યાવસ્થા સેવાઓનો ઉપયોગ
7. માતા અને બાળકનું વજન અને ઊંચાઇ માપવામાં આવશે
8. ખોરાક પર્યાવરણ

સહભાગીઓની પસંદગી:

અભ્યાસ માટે અનુક્રમે 15-49 વર્ષ અને 6-23 મહિનાની માતા-બાળકની જોડી પસંદ કરવામાં આવશે.

સ્વૈચ્છિક ભાગીદારી:

આ સંશોધનમાં તમારી ભાગીદારી સંપૂર્ણપણે સ્વૈચ્છિક છે. ભાગ લેવો કે નહીં તે તમારી પસંદગી છે. જો તમે કોઈપણ પ્રશ્નોના જવાબ આપવા માંગતા ન હોવ, તો તમે તેને છોડીને આગળના પ્રશ્ન પર જઈ શકો છો. નોંધવામાં આવેલી માહિતી ગોપનીય રહેશે.

જોખમો: કોઈ માનવામાં આવતું જોખમ સામેલ નથી.

લાભો:

તમને કોઈ ફાયદો થશે નહીં, પરંતુ તમારી ભાગીદારી વધુ સારી સમજણ તરફ ફાળો આપે તેવી શક્યતા છે.

વળતર:

સંશોધનમાં ભાગ લેવા માટે તમને કોઈ પ્રોત્સાહન આપવામાં આવશે નહીં.

ગોપનીયતા:

અમે સંશોધન ટીમની બહાર કોઈને પણ તમારા વિશેની માહિતી શેર કરીશું નહીં. અમે આ સંશોધન પ્રોજેક્ટમાંથી જે માહિતી એકત્રિત કરીએ છીએ તે ખાનગી રાખવામાં આવશે. તે તપાસકર્તા અને સંશોધન માર્ગદર્શિકા સિવાય કોઈની સાથે શેર કરવામાં આવશે નહીં અથવા આપવામાં આવશે નહીં.

પરિણામોની વહેંચણી:

અભ્યાસના અંતે સંબંધિત માહિતી તમારી સાથે શેર કરવામાં આવશે.

ઇનકાર કરવાનો અથવા પાછો ખેંચવાનો અધિકાર:

આ સંશોધનમાં તમારી ઇચ્છા વિરુદ્ધ ભાગ લેવાની જરૂર નથી. જો તમે અગાઉ સંમત થયા હોવ તો પણ તમે કોઈપણ સમયે સંશોધનમાં ભાગ લેવાનું બંધ કરી શકો છો.

કોનો સંપર્ક કરવો:

જો તમને કોઈ પ્રશ્નો હોય, તો તમે તેમને હમણાં અથવા પછીથી પૂછી શકો છો. જો તમે પછીથી પ્રશ્નો પૂછવા માંગતા હો, તો તમે નીચેનામાંથી કોઈપણનો સંપર્ક કરી શકો છો:

અનુષ્કા પાઠક (91 9588285026; anushkapathak1112@gmail.com) અને

ડૉ. સુનીતા ચાંદોરકર (91 9426366666; suneetachandorkar@gmail.com)

સંમતિનું પ્રમાણપત્ર

મને "ગુજરાતના પંચમહાલ જિલ્લાના કલોલ તાલુકાના પસંદગીના ગામોમાં માતા અને બાળ આહારની વિવિધતાનું મૂલ્યાંકન" સંશોધનમાં ભાગ લેવા આમંત્રણ આપવામાં આવ્યું છે. મેં ઉપરોક્ત માહિતી વાંચી છે, અથવા તે મને વાંચીને બતાવવામાં આવી છે. મને તેના વિશે પ્રશ્નો પૂછવાની તક મળી છે અને મેં પૂછેલા પ્રશ્નોના સંતોષકારક જવાબ મળ્યા છે.

હું આ અભ્યાસમાં સહભાગી થવા માટે સ્વૈચ્છિક રીતે સંમત છું.

ભાગ લેનારનું નામ_____
સહભાગીની સહી _____
તારીખ _____

સંમતિ લેતા સંશોધનકર્તા / વ્યક્તિ દ્વારા નિવેદન

સંભવિત સહભાગીને મેં માહિતી શીટ સચોટ રીતે વાંચીને બતાવી છે. સહભાગીએ નીચે મુજબ માહિતી આપવાની સંમતિ આપી છે-

1. વ્યક્તિગત માહિતી
2. પરિવારની સામાજિક આર્થિક સ્થિતિ
3. માતાના આહાર વિષયક માહિતી
4. ૬-૨૩ મહિનાના બાળકના આહાર વિષયક માહિતી
5. ૬-૨૩ મહિનાના બાળકના આરોગ્ય વિષયક મહિતી
6. સ્વચ્છતા
7. આંગણવાડી અને જાહેર વિતરણ વ્યાવસ્થા સેવાઓનો ઉપયોગ
8. માતા અને બાળકનું વજન અને ઊંચાઈ માપવામાં આવશે

હું પુષ્ટિ કરું છું કે સહભાગીને અધ્યયન વિશે પ્રશ્નો પૂછવાની તક આપવામાં આવી હતી, અને સહભાગી દ્વારા પૂછવામાં આવેલા બધા પ્રશ્નોના જવાબ યોગ્ય રીતે આપવામાં આવ્યા છે. હું પુષ્ટિ આપું છું કે વ્યક્તિને સંમતિ આપવા માટે દબાણ કરવામાં આવ્યું નથી, અને સંમતિ સ્વતંત્ર અને સ્વૈચ્છિક રીતે આપવામાં આવી છે.

શોધનકર્તાની સહી _____

ANNEXURE 2

QUESTIONNAIRE FOR ASSESSING DIETARY DIVERSITY IN WOMEN AND CHILDREN

Household No.:   Date of survey:

1. Name of the village:

2. Name of the respondent:

3. Address:

4. Contact No.:

5. Religion:

6. Caste:

    1. General

    2. Scheduled Caste

    3. Scheduled Tribe

    4. Other Backward Class

7. Name of the head of the family:

 8. Why is he/she the head of your family: 1. Relation status

2. Age
3. Only earning person
4. Other reason

9. General household characteristics:

6.1	6.2	6.3	6.4	6.5	6.6	6.7	6.8	
Name of the family member	Sex	DOB	Marital status	Relation With the head	Education	Occupation	Salary (Rs. /m)	
							Cash	Kind

No.:	Questions	Answers	Code	
7	What is your primary occupation? *(For all the working members of the family)*	Land owning farmer	1	
		Landless farmer	2	
		Livestock rearing	3	
		Agricultural labourer	4	
		Employed under NREGA	5	
		Skilled worker	6	
		Own Business	7	
		Service	8	
		Dairy	9	
		Others	10	
8	Do you have other sources of income?	Yes	1	
		No	2	
9	What is your secondary occupation? *(For all the working members of the family)*	Livestock	1	
		Poultry	2	
		Apiculture	3	
		Pottery making	4	
		Carpentry	5	
		Construction	6	
		Others	7	
10	What is the type of the secondary income?	Cash	1	
		Kind	2	
11	What is the form of income in kind?	10.1 Item:		
		10.2 Frequency:		
12	Approximately how much income is spent on food?	Half	1	
		One – fourth	2	
		Three – fourth	3	
		Don't know	4	
13	How many acres of land do you have?			
14	What is the type of ownership of your land?	Single	1	
		Partnership (how many)	2	
15	What are the crops grown on your land?	Cash crops	1	
		Kharif crops	2	
		Rabi crops	3	

		Others	4	
16	No. of crops grown in a year:	(list each)		
17	What source of water do you use for farming?	Rainfed	1	
		Irrigation	2	
18	Type of irrigation used :	Tube – well	1	
		Well	2	
		Canals	3	
		Others:	4	
19	What farming tools do you have?	Tractor	1	
		Plough	2	
		Leveller	3	
		Thresher	4	
		Khilna	5	
		Daranti	6	
		Axe	7	
		Chopper	8	
20	Are you registered under any of the govt. project like ATMA / KVK etc. ?	Yes	1	
		No	2	
21	Where are you registered in ?	Financial cooperatives	1	
		Farmers cooperatives	2	
		Others:	3	
22	What help do you get from there ?			
23	What was the produce last year? (from agriculture)	(list each with produce)		
24	What did you do with the produce last year?	Retain 100% for consumption	1	
		Sell 100%	2	
		Retain some, Sell some	3	
		Others:	4	
25	What do you do with your produce from secondary occupation?	Sell whole	1	
		Sell a part of it	2	
		Do not sell	3	
26	Which animals do you rear ?	Cattle	1	
		Goat	2	
		Poultry	3	
		Sheep	4	
		None	5	

		Others :	6	
27	How many animals do you have ?			
28	What type of agriculture labour do you do ?	Ploughing	1	
		Sowing	2	
		Harvesting	3	
		Others :	4	
29	For how many days do you work under NREGA?			
30	What work do you do under NREGA ?			
31	What wages do you get ?	Rs/day :		
32	What work or business do you do ?			
WASH PRACTICES				
33	What is the main source of drinking water	Tube – well	1	
		Piped water into dwelling	2	
		Public tap	3	
		Others :	4	
34	Is the water for drinking clean?	Yes	1	
		No	2	
35	What do you do for purifying it?	Boiling	1	
		Chlorine tablets	2	
		Use as it is	3	
		By putting Alum	4	
		Others :	5	
36	What is the main source of water for cooking ?	Tube – well	1	
		Public tap	2	
		Piped water into dwelling	3	
		Others :	4	
37	What is the source of water for bathing, washing clothes and utensils ?	Tube – well	1	
		Public tap	2	
		Piped water into dwelling	3	
		Others :	4	
38	What type of fuel do you use for cooking?	LPG	1	
		Kerosene	2	
		Woods	3	
		Others :	4	
39		Public toilets	1	

		Open defecation	2	
	Where do you go for defecation ?	Sharing	3	
		Others :	4	
40	What type of drainage facility do you have?	Open	1	
		Closed	2	
41	How is household waste disposed off?	Dustbin	1	
		Thrown out in the open	2	
		Burned	3	
		Composting	4	
		Others	5	
42	What do you use during your menstruation?	Sanitary pads	1	
		Ordinary cloth	2	
		Others:	3	
43	Where do you dispose the pad?	Dustbin	1	
		Open	2	
		Store it & throw collectively	3	
		Wrap in plastic bag / paper & throw	2	
44	What do you do with the cloth?	Wash & reuse	1	
		Throw as it is	2	
		Wrap in plastic bag / paper & throw	3	

INFANT FEEDING PRACTICES

		Mother	1	
45	Who is the primary care giver for your child ?	Grandmother	2	
		Sibling of the mother	3	
		Elder sibling of the child	4	
		In-laws of the mother	5	
46	How old is (NAME)?			
47	Did you ever breastfeed?	Yes	1	
		No	2	
48	Are you still breastfeeding (NAME)?	Yes	1	
		No	2	
49	Till which year did you breastfeed (NAME)?	Less than 2 yrs	1	
		Till 2 yrs	2	
		More than 3 yrs	3	
		Others :	4	
50	Do you wash your hands before cooking?	Yes	1	
		No	2	

51	Do you wash your hands before eating ?	Yes	1	
		No	2	
52	With what do you wash your hands ?	Only water	1	
		Water + Soap	2	
		Water + Ash / Mud	3	
53	Do you wash your hands after going to toilet ?	Yes	1	
		No	2	
54	With what do you wash your hands ?	Only water	1	
		Water + Soap	2	
		Water + Ash / Mud	3	
55	Do you wash your hands before feeding your child ? (in case the child cannot eat)	Yes	1	
		No	2	
56	Do you wash your hands before and after cleaning the baby?	Yes	1	
		No	2	

UTILISATION OF FOOD SAFETY NET PROGRAMS-

57	Do you have any government cards?	APL	1	
		BPL	2	
		Others	3	
58	Do you buy food from PDS?	Yes	1	
		No	2	
61	What is the reason for not buying?	Low quality	1	
		No ration card	2	
		No need	3	
		Others	4	
62	Do you get THR packets (Balbhog) from AWC?	Yes	1	
		No	2	
63	How many packets of THR do you get per week from AWC?	1-3	1	
		4-6	2	
		>7	3	
64	How many packets did the child consume in a week?	1-3	1	
		4-6	2	
		>7	3	
65	Did you receive supplementary nutrition such as take-home ration, sheera, sukhdi, upma from Anganwadi?	Yes	1	
		No	2	
66	How many packets did you get per month?	4	1	
		Less than 4	2	

		Others	3	
67	How many packets did you consume?	4	1	
		Less than 4	2	
		Others	3	
68	Did you receive Iron Folic Acid tablets from the Anganwadi?	Yes	1	
		No	2	
69	How much did you receive?	<30	1	
		60-90	2	
		100	3	
70	How much did you consume?	<30	1	
		60-90	2	
		100	3	
71	Do you get IFA tablets from Anganwadi?	Yes	1	
		No	2	

FOOD ENVIRONMENT-

72	Are you aware of different types of ultra-processed foods available in the market?	Yes	1	
		No	2	
73	Which of the following items is consumed by you?	Chips	1	
		Biscuits	2	
		Noodles	3	
		Juices	4	
		Bakery items	5	
		Carbonated drinks	6	
		Others	7	
74	Which of the following items are consumed by your child?	Chips	1	
		Biscuits	2	
		Noodles	3	
		Juices	4	
		Bakery items	5	
		Carbonated drinks	6	
		Others	7	
75	What is the reason for purchasing these food items?	Easily available	1	
		Like the taste	2	
		Affordable prices	3	
		Trust on shopkeeper/retailer	4	
		Habit	5	
		Others	6	
76	How frequently are these food	Daily	1	

	items consumed by you?	Once a week	2	
		Thrice a week	3	
		Weekly	4	
		Monthly	5	
77	How frequently are these food items consumed by your child?	Daily	1	
		Once a week	2	
		Thrice a week	3	
		Weekly	4	
		Monthly	5	
78	Why do you prefer to consume these food items?	Easily available	1	
		Time convenience	2	
		Different or unusual taste	3	
		Good appearance or texture	4	
		Others:	5	
79	What is your source of information about these food items?	Advertisement on TV/radio	1	
		Newspapers/magazines	2	
		Friends/family	3	
		Billboards/hoardings	4	
		Packaging/label	5	
		Others:	6	

Anthropometric measurements of the child-

80. Height (cm)-_____

81. Weight (kg)-_____

82. MUAC-_____

Anthropometric measurements of the mother-

83. Height (cm)-_____

84. Weight (kg)-_____

ANNEXURE 3

The Diet Quality Questionnaire (DQQ)

DIET QUALITY QUESTIONNAIRE (DQQ)

INDIA

Read: Now I'd like to ask you some yes-or-no questions about foods and drinks that you consumed yesterday during the day or night, whether you had it at home or somewhere else.

First, I would like you to think about yesterday, from the time you woke up through the night. Think to yourself about the first thing you ate or drank after you woke up in the morning … Think about where you were when you had any food or drink in the middle of the day … Think about where you were when you had any evening meal … and any food or drink you may have had in the evening or late-night... and any other snacks or drinks you may have had between meals throughout the day or night.

I am interested in whether you had the food items I will mention even if they were combined with other foods.

Please listen to the list of foods and drinks, and if you ate or drank ANY ONE OF THEM, say yes.

	Yesterday, did you eat any of the following foods:	**(circle answer)**
1	**Rice, idli, dosa, poha, naan, kulcha, paratha, or upma?**	YES or NO
2.1	**Chapati, roti, dalia, or roasted maize?**	YES or NO
2.2	**Pearl millet or finger millet?**	YES or NO
3	**Potato, sweet potato, turnip, arum root, tapioca, or raw banana?**	YES or NO
4	**Daal, sambar, chickpeas, kidney beans, soya, or khichdi?**	YES or NO
	Yesterday, did you eat any of the following vegetables:	
5	**Carrots, or pumpkin that is orange inside?**	YES or NO
6.1	**Mustard leaves, spinach, radish leaves, cassava leaves, taro leaves, drumstick leaves, amaranth leaves, or wild greens/other greens?**	YES or NO
7.1	**Tomatoes, eggplant, okra/lady finger, French beans, cauliflower, cabbage, or beetroot?**	YES or NO
7.2	**Bitter gourd, bottle gourd, pointed gourd, ivy gourd, apple gourd, ridged gourd, or snake gourd?**	YES or NO
7.3	**Cucumber, radish, capsicum, German turnip, or drumstick?**	YES or NO
	Yesterday, did you eat any of the following fruits:	
8	**Papaya, mango, orange musk melon, or apricots?**	YES or NO
9	**Orange, tangerine, or grapefruit?**	YES or NO
10.1	**Ripe banana, apple, pear, watermelon, guava, custard apple, pomegranate, or pineapple?**	YES or NO
10.2	**Grapes, kiwi, peaches, jackfruit, chickoo, jamun, palmyra palm fruit, or other wild fruits?**	YES or NO
	Yesterday, did you eat any of the following sweets:	
11	**Cakes, cream biscuits, biscuits, suji halwa / kesari bath, jalebi, or ladoo?**	YES or NO
12	**Other mithai, rice pudding, kulfi, ice cream, milkshake, toffees, or chocolates?**	YES or NO
	Yesterday, did you eat any of the following foods of animal origin:	
13	**Eggs?**	YES or NO
14	**Paneer or cheese?**	YES or NO
15	**Curd, lassi, buttermilk, or raita?**	YES or NO
16	**Sausages or salami?**	YES or NO
17	**Mutton, beef, lamb, or liver?**	YES or NO
18	**Pork or wild meat?**	YES or NO
19	**Chicken, duck, or turkey?**	YES or NO

20	Fish, prawn, crab, or seafood?	YES or NO
	Yesterday, did you eat any of the following other foods:	
21	Peanuts, cashews, almonds, pistachios, walnuts, pumpkin seeds, or sunflower seeds?	YES or NO
22	Potato chips, namkeen or mixture?	YES or NO
23	Instant noodles such as Maggi noodles or Wai Wai?	YES or NO
24	Samosa, pakora, puri, vada, mathri, kachori, murukku, or bonda?	YES or NO

	Yesterday, did you have any of the following beverages:	
25	Milk, flavoured milk, chai with milk, or coffee with milk?	YES or NO
26	Tea with sugar, coffee with sugar, milk with sugar, flavoured milk, Bournevita, Horlicks, or Boost?	YES or NO
27	Fruit juice, packet juice such as Rasna or Frooti, sugarcane juice, or nannari sarbath?	YES or NO
28	Soft drinks such as Sprite, Pepsi, Mirinda, or energy drinks?	YES or NO
	Yesterday, did you get food from any place like...	
29	McDonald's, KFC, Pizza Hut, Domino's, Burger King, or other places that serve pizza or burgers?	YES or NO

ANNEXURE 4

QUESTIONNAIRE ON MINIMUM DIETARY DIVERSITY AND MINIMUM ADEQUATE DIET-

Eight food groups in the food group score used to calculate MDD and MAD	Q#	Food groups as described in the example questionnaire
1. Breast milk	4	*(asked separately, not as part of open recall or list-based recall)*
2. Grains, roots and tubers	7B	Porridge, bread, rice, noodles, pasta or *[insert other commonly consumed grains, including foods made from grains like rice dishes, noodle dishes, etc.]*
	7D	Plantains, white potatoes, white yams, manioc, cassava, or *[insert other commonly consumed starchy tubers or starchy tuberous roots that are white or pale inside]*
3. Legumes, nuts and seeds	7N	Beans, peas, lentils, nuts or *[insert commonly consumed foods made from beans, peas, lentils, nuts, or seeds]*
4. Dairy products (milk, infant formula, yogurt, cheese)	6B	Infant formula such as *[insert local names of common formula]*
	6C	Milk from animals such as fresh, tinned or powdered milk
	6D	Yogurt drinks such as *[insert local names of common types of yogurt drinks]*
	7A	Yogurt, other than yogurt drinks
	7O	Hard or soft cheese such as *[insert commonly consumed types of cheese]*
5. Flesh foods (e.g. meat, fish, poultry, organ meats)	7I	Liver, kidney, heart or *[insert other commonly consumed organ meats]*
	7J	Sausages, hot dogs, ham, bacon, salami, canned meat or *[insert other commonly consumed processed meats]*
	7K	Any other meat such as beef, pork, lamb, goat, chicken, duck or *[insert other commonly consumed meat]*
	7M	Fresh or dried fish or shellfish
6. Eggs	7L	Eggs
7. Vitamin A-rich fruits and vegetables	7C	Pumpkin, carrots, sweet red peppers, squash or sweet potatoes that are yellow or orange inside? *[any additions to this list should meet "Criteria for defining foods and liquids as 'sources' of vitamin A"]*
	7E	Dark green leafy vegetables such as *[insert commonly consumed vitamin A-rich dark green leafy vegetables]*
	7G	Ripe mangoes, ripe papayas or *[insert other commonly consumed vitamin A-rich fruits]*
8. Other fruits and vegetables	7H	Any other fruits such as *[insert commonly consumed fruits]*
	7F	Any other vegetables such as *[insert commonly consumed vegetables]*

I would like to ask you about everything that your child [NAME] ate yesterday during the day or the night.

Sr. no.	Food item	Answer	Code
1.	Breast milk (asked separately, not as part of open recall or list-based recall)	Yes	1
		No	2
		Don't know	3
2.	Porridge, bread, rice, noodles, pasta or *(rotla, thepla, khandvo, dhokla, khichdi, papdi no lot, muthiya)*	Yes	1
		No	2
		Don't know	3
3.	Plantains, white potatoes, white yams, manioc, cassava,	Yes	1
		No	2
		Don't know	3
4.	Beans, peas, lentils, nuts	Yes	1
		No	2
		Don't know	3
5.	Infant formula such as *dal ka paani, chawal ka pani, khichdi, sheera*	Yes	1
		No	2
		Don't know	3
6.	Milk from animals such as fresh, tinned or powdered milk	Yes	1
		No	2
		Don't know	3
7.	Yogurt drinks such as *lassi, chaas*	Yes	1
		No	2
		Don't know	3
8.	Yogurt, other than yogurt drinks	Yes	1
		No	2
		Don't know	3
9.	Any other meat such as beef, pork, lamb, goat, chicken	Yes	1
		No	2
		Don't know	3
11.	Eggs	Yes	1
		No	2
		Don't know	3
12.	Pumpkin, carrots, sweet red peppers, squash or sweet potatoes that are yellow or orange inside?	Yes	1
		No	2

		Don't know	3
13.	Dark green leafy vegetables	Yes	1
		No	2
		Don't know	3
14.	Ripe mangoes, ripe papayas	Yes	1
		No	2
		Don't know	3
15.	Any other fruits	Yes	1
		No	2
		Don't know	3
16.	Any other vegetables	Yes	1
		No	2
		Don't know	3

ANNEXURE 5

FACULTY OF FAMILY AND COMMUNITY SCIENCES
THE MAHARAJA SAYAJIRAO UNIVERSITY OF BARODA

Ethical Compliance Certificate 2022 – 2023
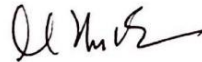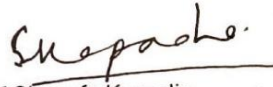
This is to certify that Ms. Anushka Pathak's study titled, "**Assessing Maternal and Child Dietary Diversity in selected villages of Kalol taluka of Panchmahal district, Gujarat**" from Department of Foods and Nutrition has been approved by the Institutional Ethics Committee for Human Research (IECHR), Faculty of Family and Community Science, The Maharaja Sayajirao University of Baroda. The study has been allotted the ethical approval number **IECHR/FCSc/MSc/2022/29.**

Prof Mini Sheth
Member Secretary
IECHR

Prof Shagufa Kapadia
Chairperson
IECHR
Chair Person

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Chair
Faculty of Family & Community Science
The Maharaja Sayajirao University of Baroda

ANNEXURE 6

Checklist for Focus Group Discussion

Planning- Among the study group, 5-8 women participants aged 15-49 years, were invited to participate. It was a homogenous group of participants with similar cultural backgrounds.

The protocol for the FGD will be as follows-

• Welcome

• Group Agreements

• Introductions

• Opening Questions

• Main Questions

• Closing

Logistics-

• A location that is easy to get to for participants will be chosen along with a space that has enough room for people to sit comfortably.

• Childcare will be provided with help from Anganwadi workers.

• Conductor will also act as a moderator with help from AWW and CHW.

• The meeting will be audio recorded for report preparation in the future.

Detail to finalize before the focus groups- The location, and time will be confirmed with the focus group participants the day before, and any outstanding questions will be answered.

Topics for discussion-

1. Young child feeding practices-
• Initiation of Breastfeeding
• Common prelacteals given
• Initiation of Complementary feeding
• Commonly consumed complementary foods
• Frequency and quantity of foods consumed by the child

2. Food environment and its association with dietary diversity
• Consumption of processed foods by the study population
• Reason for consumption
• Crops grown and commonly consumed in the area
3. Food expenditure and decision making of women in households