Internship Training

at

CARE India Solutions for Sustainable Development (CISSD), Bihar

Maternal and childhood nutrition with special focus on anaemia in five districts of Rajasthan: A situational analysis

by

Dr. Avish Sethi

PG/21/020

Under the guidance of

Dr. Sidharth Sekhar Mishra

Assistant Professor

PGDM (Hospital & Health Management)

2021-23

International Institute of Health Management Research

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Date: 15/06/2023

Dissertation completion certificate

This is to certify that **Dr. Avish Sethi** pursuing Post Graduate Diploma in Management in Hospital and Health Management (PGDM) at the International Institute of Health Management and Research (IIHMR), Delhi has completed his dissertation with the **CARE India Solutions for Sustainable Development (CISSD)** during 17/01/2023 to 15/06/2023.

As a part of this dissertation, he undertook the work on assigned topic **"Maternal and childhood nutrition with special focus on anaemia in five districts of Rajasthan: A situational analysis".**

During this period, he displayed commendable adherence to protocols for deliverables, appreciable level of cognition, high level of sincerity and exemplifying commitment. Based on his learning abilities, it appeared that, given chance he can pick up to very high level of performance and knowledge.

Wishing him the best for the future,

Dr Tanmay Mahapatra
Director Data & Learning, CML Unit
CISSD-BTSP

Regards

Dr. Anup Gopalakrishnan Nair
Deputy Director - HR and OD

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TO WHOMSOEVER IT MAY CONCERN

This is to certify that **Dr. Avish Sethi,** a student of PGDM (Hospital & Health Management) from International Institute of Health Management Research, New Delhi has undergone internship training at **CARE India Solutions for Sustainable Development (CISSD), Bihar** from **17.01.2023** to **15.6.2023**.

The Candidate has successfully carried out the study designated to her during internship training and her approach to the study has been sincere, scientific, and analytical. The Internship is in fulfilment of the course requirements. I wish him all success in all her future endeavours.

Dr. Sumesh Kumar
Associate Dean
Academic and Student Affairs
IIHMR, New Delhi

Siddharth Sekhar Mishra
Mentor
IIHMR, New Delhi

Certificate of Approval

The following dissertation titled **"Maternal and childhood nutrition with special focus on anaemia in five districts of Rajasthan: A situational analysis"** at **"CARE, INDIA"** is hereby approved as a certified study in management carried out and presented in a manner satisfactory to warrant its acceptance as a prerequisite for the award of **PGDM (Hospital & Health Management)** for which it has been submitted. It is understood that by this approval the undersigned do not necessarily endorse or approve any statement made, opinion expressed or conclusion drawn therein but approve the dissertation only for the purpose it is submitted.

Dissertation Examination Committee for evaluation of the dissertation.

Name	Signature
Dr. Kalpana Goyal.	
Dr. Arif Jeveri	
DR. RATIKA	

Certificate from Dissertation Advisory Committee

This is to certify that **Dr. Avish Sethi**, a graduate student of the PGDM (Hospital & Health Management) has worked under our guidance and supervision. She is submitting this dissertation titled "**Maternal and childhood nutrition with special focus on anaemia in five districts of Rajasthan: A Situational Analysis**" at "**CARE** India Solutions for Sustainable Development **(CISSD),** Bihar" in partial fulfilment of the requirements for the award of the PGDM (Hospital & Health Management).

This dissertation has the requisite standard and to the best of our knowledge no part of it has been reproduced from any other dissertation, monograph, report, or book.

Dr. Sidharth Sekhar Mishra
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Dr. Tanmay Mahapatra
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INTERNATIONAL INSTITUTE OF HEALTH MANAGEMENT RESEARCH,

NEW DELHI

CERTIFICATE BY SCHOLAR

This is to certify that the dissertation titled **Maternal and childhood nutrition with special focus on anaemia in five districts of Rajasthan: A Situational Analysis** and submitted by **Dr. Avish Sethi** Enrolment No. **PG/21/020** under the supervision of **Dr. Sidharth Sekhar Mishra** for award of PGDM (Hospital & Health Management) of the Institute carried out during the period from **17.01.2023** to **15.6.2023** embodies my original work and has not formed the basis for the award of any degree, diploma associate ship, fellowship, titles in this or any other Institute or other similar institution of higher learning.

Avish Sethi

Signature

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FEEDBACK FORM

(ORGANIZATION SUPERVISOR)

Name of the Student: Dr. Avish Sethi

Name of the Organisation: **CARE** India Solutions for Sustainable Development **(CISSD),** Bihar

Area of Dissertation: Maternal and childhood nutrition with special focus on anaemia in five districts of Rajasthan: A situational analysis

Attendance: Perfect adherence to the dissertation norms

Objectives achieved: The student understood the details of the concept, theoretical underpinning, worked on the study design, study implementation, data quality control, field monitoring and handholding support, coordination and supervision of data collectors. Participated in data cleaning, data analysis, support to presentation of findings for district level data dissemination and prepared the dissertation under guidance of local mentor.

Deliverables:

1. Literature review and scientific paper writing on "Maternal and childhood nutrition with special focus on anaemia in five districts of Rajasthan: A situational analysis"
2. Literature review and scientific paper writing on "Essential new-born care practices in Rajasthan."
3. Data management and analysis
4. Preparation of Impact report of CARE (2017-2022)
5. Preparation of slide desk on Nutrition Assessment under Satat Jeevikoparjan Yojana (SJY)
6. Slide desk preparation of District scoring and prioritization of Bihar
7. Preparation of budgets for different projects

Strengths: Sincerity, hard work, intelligence and proactiveness, diligence and eye of work. An excellent performer.

Suggestions for Improvement: Advanced analytical thinking skills, subject and programmatic knowledge

Date: 15-06-2023
Place: Patna, Bihar

Signature of the Officer-in-charge

Local Mentor: Dr Tanmay Mahapatra

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ABSTRACT

The baseline survey, termed as Health and Nutritional Situational Assessment (HANSA), was carried out in five Rajasthan districts: Ajmer, Bhilwara, Chittorgarh, Rajsamand, and Udaipur. Following that, this study examines maternal and childhood nutrition with a special focus on anaemia in five Rajasthan districts: A situational analysis. Malnutrition among mothers and children is a major public health concern in Rajasthan. In India, underweight, stunting, wasting, protein energy malnutrition (PEM), and micronutrient deficiencies cause childhood death and morbidity, but they also cause long-term physical and perhaps mental developmental impairment in those who survive, and anaemia is one of the leading causes. Under the study, literature and secondary data were reviewed to examine the sociodemographic and anthropometric measurements based on child nutritional status and mothers' haemoglobin estimation. The research examined the existing situation in these areas to determine the causes leading to anaemia and malnutrition, including cultural and economic aspects, and to suggest viable solutions to these challenges. The study concludes that mothers with a higher socioeconomic status who were more educated, employed, and had a higher socioeconomic status had more knowledge and maintained better dietary habits than those with a lower socioeconomic status who were less educated, unemployed, or had a lower socioeconomic status. Maternal employment was also found to be a substantial positive predictor of high nutritional status, most likely because it enables mothers to improve their social standing by providing access to education, health care, decision-making, and economic independence. Children who have mothers who use or own a smartphone, have one or fewer than three children, and were exposed to social media were less likely to be underweight. Stunted children were less likely to live in a joint family. Wasting is associated with low and middle-income tertile households. It had been emphasized that parental education is relevant to improving children's nutrition.

ACKNOWLEDGEMENT

It is an esteemed pleasure to present this dissertation report by thanking everyone who helped me.

The opportunity I had with **CARE India Solutions for Sustainable Development (CISSD), Bihar** was a great chance for learning and professional development. Therefore, I consider myself a very lucky individual, as I was provided with the opportunity to be a part of it. I am also grateful for having the chance to meet so many wonderful people and professionals who led me through this period.

Bearing in mind previous, I am using this opportunity to express my deepest gratitude and special thanks to **Dr. Tanmay Mahapatra (Director, Data & Learning),** who, in spite of being extraordinarily busy with his duties, took time out to hear, guide, and keep me on the correct path, allowing me to carry out my project at their esteemed organization and extending during the training.

I express my deepest thanks to **Mr. Kaushik Chakraborty (Manager, Data & Learning), and Dr. Shuchi Sree (Technical Associate, Data & Leaning)** for taking part in useful decisions, giving necessary advice and guidance, and arranging all facilities to make my project easier. I chose this moment to acknowledge their contribution gratefully.

It is my radiant sentiment to place on record my best regards and deepest sense of gratitude to **Dr. Sutapa Bandyopadhyay Neogi (Director, IIHMR Delhi)** and my mentor **Dr. Sidharth Sekhar Mishra (Assistant Professor, IIHMR Delhi),** for their careful and precious guidance, which was extremely valuable for my study both theoretically and practically.

I would like to give my special thanks to **Dr. Tulika Rajan** for all the help, guidance, and support that made this dissertation possible.

Sincerely,

Dr. Avish Sethi

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Organization Profile

CARE INDIA is a non-profit organization that empowers marginalised women and girls through strengthening communities. Sustainable and comprehensive interventions in Health, Livelihood, Education, Disaster Relief, and Resilience bring novel answers to long-standing development issues. Along with access to an international network of expertise, combine internal knowledge with a robust network of relationships to offer solutions at scale to various stakeholders.

CARE India is a member of the CARE International Confederation, which assists millions of people in living a dignified life and has a presence in over 100 countries.

They have contributed to India's tremendous growth over the past 75 years, from when it was a freshly created nation to now, when it is one of the world's fastest-expanding economies.

In 2020–21, we had an influence on the lives of more than 52.7 million individuals through 53 programmes in 18 states.

Core Values:

1. Respect, upholding each individual's dignity
2. Integrity entails following an ethical rule of behaviour in all acts.
3. Dedication, carrying out our tasks and societal responsibilities
4. Setting high performance criteria and holding yourself accountable to them.

Approach:

• Gender Equality

• Knowledge, Management and Learning

Health and Nutritional Situational Assessment (HANSA)

HANSA stands for Health and Nutritional Situational Assessment.

• The project's purpose was to promote the health and well-being of children under the age of six by enhancing the efficacy of the government's Integrated Child Development Services (ICDS) Programme.

• The evaluation's ultimate goal was to generate credible and representative estimates of a set of quantitative indicators in the target districts. Success would be judged primarily through the following important indicators:

i. % of 0-71-month-old children wasted, stunted, or underweight among target districts.

ii. % of mothers and carers use age-appropriate IYCF for children aged 6–23 months.

iii. % of women having at least four prenatal care visits, 90 IFA pills consumed, and acceptable dietary diversity

- This study aided in mapping children's nutritional status as well as the knowledge and practices of moms and care providers. The findings aided in the development of actions to minimize childhood malnutrition, maternal anaemia, and mothers' awareness and practices.

Introduction

Maternal and childhood nutrition, with a focus on anaemia, refers to a pregnant woman's and a child's dietary practices, nutrient requirements, and nutritional status during their early years of life, with an emphasis on how nutrition affects the prevention, treatment, and effects of anaemia.

Nutrition has been regarded as one of the Millennium Development Goals (MDGs) era's most lost chances.[1] Malnutrition was estimated to be responsible for 5 million deaths among children under the age of five worldwide in 2021. [2] Childhood malnutrition is associated with poor health and developmental outcomes. Anthropometric status reveals that growth limitation caused by infections and inadequate nutrition is a major cause of sickness and mortality in newborns and children.[3]

Furthermore, India is home to one-third of the world's undernourished children. Maternal and childhood nutrition is a serious public health problem in India, particularly in Rajasthan, where malnutrition is endemic. Underweight, stunting, wasting, protein energy malnutrition (PEM), and micronutrient deficiencies (a lack of essential vitamins and minerals) are all important health and nutrition issues in India. It not only causes childhood mortality and morbidity, but it also causes long-term physical and potentially mental developmental retardation in those who survive.[4]

According to the 2019–20 National Family Health Survey (NFHS-5), 35% of Indian women and 39% of Rajasthan women are underweight. Similarly, over 36% of Indian children under the age of five have stunted development, 17% have wasted growth, and 33% are underweight, whereas 39% of Rajasthan children under the age of five have stunted growth, 22% have wasted growth, and 35% are underweight. Furthermore,

anaemia affects 56% of women in Rajasthan and 53% of women in India's reproductive age range (15–49 years). In India, roughly 40% of children under the age of five are anaemic, with Rajasthan accounting for 43%. Anaemia during pregnancy is a severe reproductive health problem in India and Rajasthan, linked to increased maternal and perinatal morbidity and death, particularly among women and children.[5, 6]

50% of pregnant women worldwide are anaemic, and at least 120 million women in underdeveloped countries are underweight.[7] According to the study, being underweight diminishes women's productivity and can increase sickness and death rates. In certain places, such as South Asia, the majority of women (60 percent) are underweight. Stunting is a known risk factor for obstetric complications, which can cause harm or death to mothers and their babies, as well as diminished job capacity.[8]

Malnutrition can have long-term consequences for a woman at different stages of her life. The "life cycle approach" to satisfying women's nutritional demands can assist them in improving their nutrition. Malnutrition affects newborns, children, adolescents, and women for biological and social reasons throughout their lives. Many nutritional deficits have long-term consequences for children and adolescents.[9] Adolescents will be the protectors of future generations. Furthermore, adolescence is a commonly overlooked life period in women's nutrition. During adolescence, a time of hormonal development, several biological and behavioural changes occur, resulting in the transition from childhood to adulthood. As a result of this rapid growth, the need for energy and food is growing. Furthermore, during this stage of life, individual factors (such as attitudes, beliefs, perceived obstacles, food preferences, self-efficacy, and biological changes) as well as external influences (family, friends, fast food outlets, and social and cultural norms) and macro-systems (such as food availability, food

production, distribution systems, mass media, and advertising) have a significant impact on dietary patterns, physical activity, and eating behaviour.[9, 10] Pregnant women require additional calories in order to gain weight and start nursing. Pregnant women who are underweight or stunted are more likely to suffer obstructed labour and other difficulties. According to studies, the infant and the still-growing mother may fight for nutrition, increasing the newborn's risk of low birth weight and premature death. Women's energy requirements remain high after childbirth, therefore it's vital that they continue to eat well.[10] Children in socioeconomically deprived regions are inadequately nursed in infancy and early childhood, receive insufficient quantities of low-quality supplemental meals, and suffer from a variety of ailments throughout their first two years of life. Nutritional neglect during a child's first two years of life has both immediate and long-term negative impacts on survival, growth, development, and productivity. Many children who survive nutritional stress are stunted by the age of two, with few prospects for recovery. Similarly, in certain parts of the world, females endure prejudice in their access to food, health care, and education throughout their lives.[10] Menopause is another period in a woman's life that involves health and nutritional issues. Several negative physiological changes occur throughout this period as a result of the hormone shift.[9]Initiatives to improve population nutrition benefit women, and governments may use a variety of techniques to ensure that their citizens consume enough calories and nutrients.

Several initiatives have been launched by the government at both the national and state levels in recent years to address the issue of malnutrition. The Integrated Child Development Services (ICDS) programme, for example, provides additional nourishment to pregnant and breastfeeding mothers as well as children under the age of

six. The government has also undertaken various programmes aimed at improving maternal and child nutrition, like the POSHAN Abhiyaan and the National Nutrition Mission.[11-13] Furthermore, the Rajasthan government has launched many projects, such as the Annapurna Rasoi Yojana, which offers subsidized food grains to low-income households. The state government has also introduced many programmes, like the Rajshree Yojana, to improve maternal and child health and reduce anaemia.[14, 15] Pregnant and lactating women, as well as children under the age of five, are provided iron and folic acid supplements under the Integrated Child Development Services (ICDS) initiative. Furthermore, the government has initiated a variety of events and activities to promote awareness about the importance of iron-rich foods as well as anaemia prevention and treatment.[11]

For a better understanding and to bridge existing gaps, anthropometric measurements such as height, weight, MUAC measurements, and haemoglobin estimates were carefully examined. Although a few studies have shown that adult height can be a useful marker for identifying intergenerational health relationships because it represents a mother's health stock accumulated over her life path, particularly social and environmental exposures in her early childhood, correlations between maternal height and mortality have primarily focused on the relationship between maternal height and preterm birth and low birth weight.[16, 17] As a result, we evaluated the child's anthropometric dimensions as well as the mother's haemoglobin estimation.

Objectives

- To generate robust district level understanding of the state of nutrition of children aged 0-59 months.
- To assess the anaemia status of the pregnant and lactating mothers.

Literature Review

1. **Maternal health literacy is associated with early childhood nutritional status in India done by Mira Joshi, SV Subramanian, George K Kone, Sakshi Dudeja** state that Child malnutrition has proven to be particularly difficult to combat in South Asia. All aspects of sustainable development rely on education, and maternal education is connected to child survival and growth. In this region, gender inequality and female educational disadvantage are major determinants. Their findings in two poor Indian groups indicate that mother health literacy is a strong predictor of new-born nutritional status and therefore a viable approach to solving the Asian conundrum. Health literacy is regarded as a human trait that improves the likelihood of sickness or resistance. In contrast to formal schooling, improving the availability and accessibility of health information and services through locally relevant methods can promote health literacy in the near term. Long-term advantages are anticipated, resulting in long-term rewards.
2. **Socio-economic risk factors for early childhood underweight in Bangladesh. Tuhinur Rahman Chowdhury and Sayan Chakrabarty** reveals that Underweight was related to poorer parental education, a lower family income index, residing in the Sylhet division, and the usage of non-iodized salt. The relative relevance of risk factors for underweight children is examined in terms of strategies.
3. **Utilization of maternal health care services in Southern India. K Navaneetham 1, A Dharmalingam.** The study looks at the patterns and factors of maternal health care utilisation in South India, namely in the states of Andhra

Pradesh, Karnataka, Kerala, and Tamil Nadu. According to the findings, Kerala has the highest utilisation of maternal health care services, followed by Tamil Nadu, Andhra Pradesh, and Karnataka. Maternal health care utilisation is connected not only with a variety of reproductive, socioeconomic, cultural, and programme characteristics, but also with the state and kind of health service. Variations in maternal health care programme implementation, as well as variances in availability and accessibility between states, might explain some of the interstate disparities in utilisation. There was no substantial rural-urban divide in prenatal care because of the involvement of multifunctional health professionals stationed in rural regions to offer maternal health care services. The study's findings can be used to create and execute suitable maternal health care delivery programmes to promote the health and well-being of both mother and child.

4. **Women's health: optimal nutrition throughout the lifecycle. Edith J M Feskens, Regan Bailey, Zulfiqar Bhutta and Hans-Konrad Biesalski** reveals that when investigating and developing policies for nutrition and optimal health, gender disparities must be considered. There are substantial physiologic, neurologic, and hormonal variations in women's health that affect dietary demands throughout their lifetime. These dietary demands, which differ from those of males, must be translated into a suitable nutrition policy that strives to not only avoid overt nutritional insufficiency but also improve health and reduce the risk of chronic illness. There must be sufficient access to nutritious meals as well as the knowledge to recognise and execute proven nutritional opportunities. Experts made proposals for improving current entitlement programmes to

address accessibility and other social and environmental challenges to adequately support women throughout their lives.

5. **Association of Maternal Height with Child Mortality, Anthropometric Failure, and Anemia in India. S. V. Subramanian, Leland K. Ackerson, George Davey Smith and Neetu A. John.** This study provides evidence that low maternal height is associated with greater mortality and anthropometric failure among Indian children, implying intergenerational linkages between a mother's health and social well-being during her infancy and the health of her children as they grow.
6. **Stunting and severe stunting among infants in India: the role of delayed introduction of complementary foods and community and household factors. Mansi Vijaybhai Dhami, Felix Akpojene Ogbo, Uchechukwu L Osuagwu, Zino Ugboma and Kingsley E Agho.** In India, the delayed introduction of supplemental meals and other variables were linked to stunting and severe stunting in children aged 6–8 months. To reduce the number of stunted new-borns in India, comprehensive national nutrition policy activities that target the subpopulation of women with no schooling and few resources would be required.
7. **Nutrition and economic growth in South Africa: a threshold co-integration approach. Wisdom Dube, Andrew Phiri.** To investigate the asymmetric co-integration impacts of nutrition and economic growth using yearly South African data from 1961 to 2013. The analysis uncovered several intriguing economic occurrences for South Africa. First, show a positive association between nutrition and economic growth, consistent with earlier research undertaken for emerging nations, with an estimated income elasticity of

nutritious consumption of 0.15. Second, discover bi-directional causation between nutrition and economic growth, with a greater causal influence from nutrition to economic growth. Finally, discover that when faced with equilibrium shocks to the variables, policymakers are sluggish to respond to departures from their co-integrated long-term steady-state equilibrium.

Methodology

This is secondary research and has used the following: -

Baseline Assessment

The baseline assessment has 3 components: -

a. Household survey
b. Anthropometric measurements
c. Haemoglobin level estimation

a. Household Survey:

- **Main objective** is to generate robust district level understanding of the state of nutrition of mothers and children.
- The household survey would have a structured, close ended, questionnaire-based interviews involving for eligible respondents at the population level in the 5 intervention districts in Rajasthan from mothers and anthropometry of children largely on the following domains:
- The major indicators specific for the mentioned age groups would include 0-5 months, 6-12 months, 13-23 months, 24-35 months and 36-71 months.

b. Anthropometric Measurements:

- Children between 0-59 months include height, weight and MUAC measurements (indicators from the data) for Underweight, Wasting and Stunting.

c. Haemoglobin level estimation:

- For mothers of children aged 0–11 months (lactating mothers) and mothers of children aged 12-59 months (pregnant mothers).

(Figure included in Annexure)

Sample Size

	Bhilwara	Chittorgarh	Rajsamand	Udaipur	Ajmer	Total
AWCs across district	**400**	**400**	**400**	**400**	**400**	**2000**
1 mother/Age group/AWC						
0-5m	**400**	**400**	**400**	**400**	**400**	**2000**
6-11m	**400**	**400**	**400**	**400**	**400**	**2000**
12-23m	**400**	**400**	**400**	**400**	**400**	**2000**
24-35m	**400**	**400**	**400**	**400**	**400**	**2000**
36-71m	**400**	**400**	**400**	**400**	**400**	**2000**
Adolescent girls	**400**	**400**	**400**	**400**	**400**	**2000**
						12000

Figure 1 Sample Size

Sample Selection

	Selected Districts				
Name of District	**Bhilwara**	**Chittorgarh**	**Rajsamand**	**Udaipur**	**Ajmer**
No. Of AWCs from intervention blocks	**400**	**400**	**400**	**400**	**400**

Figure 2 Selected Districts

Major areas were covered into different tools to attain the objective of study

Mothers of children aged/Adolescent girls	**0-5 m**	**6-11m**	**12-23m**	**24-35**	**36-71m**	**Adolescent girl**
Interview	✓	✓	✓	✓	✓	✓
Anthropometric measurements	✓	✓	✓	✓	✓	✓
Anaemia estimation through HemoCue machine (Finger-prick Method)	✓	✓	✓	✓	✓	✓

Figure 3 Areas covered in study

Data Collection

- Data collection was done from March 15, 2022, to May 15, 2022, through CAPI.

(Table presented in Annexure)

Quality check approach

Data quality is maintained by a 15% spot check and back check, and the audio recording of the interview is reviewed at a regular interval to ensure data quality.

The following 11 indicators would be considered key indicators for the quality check review:

I. Weight of the child (Anthro tool – upto age 59 months)
II. Height/length of the child (Anthro tool- upto age 59 months)
III. No. of FLW visits during pregnancy (0-5 tool)
IV. Time of initiating breast feeding (0-5 tool)
V. Participation of the mother in Complementary feeding day (6-11m tool)
VI. Month of initiation of complementary feeding (6-11m tool)
VII. Data on which child received DPT -3 vaccine (12-23 tool)
VIII. Age of the child (any tool)
IX. Occurrence of diarrhea in the previous 30 days (24-35m tool)
X. No. of months of receiving THR (24-35m tool)
XI. Anemia among adult women (pregnant and lactating women) and adolescent girls.

Study participants and sample size estimation

The Health and Nutrition Situation Assessment (Project HANSA) was carried out in five districts in Rajasthan: Ajmer, Bhilwara, Chittorgarh, Rajsamand, and Udaipur, with the objective of addressing existing gaps. A cross-sectional study with a quasi-experimental design was carried out to collect cross-domain information from

adolescent girls and mothers with young infants (6 years of age). To guarantee minimal recollection biases, the current study covers a subgroup of the latter group with children under the age of 2 months.

Sample size estimation was done as conservatively as possible (i.e., a sample for estimating an indicator proportion of 0.5 or 50%) for estimating change and their predictors at the district and project level using the formula for binomial proportions: pqN/[(N*0.052)÷(1.962 +pq)], where, N=size of the eligible population, p=coverage/burden, q=1-p, 1.96=z-score for the 95% confidence interval, and 0.05=the range of 95% CI or +5%. The effective sample size calculated was 384 per group per district, assuming an α error of 0.05, β error of 0.2, and an absolute precision of 5%, and the final estimated target was 400 mothers per group per district (factoring for a 5% sample loss), i.e., 2000 participants altogether from 5 districts. Proportional random sampling at the Anganwadi Centre (AWC) level was followed by a systemic component at the individual level with a random start to attempt to enroll a representative sample.

Collection of Anthropometric Measurement

The Project HANSA team allocated 20 sets of anthropometric tools, including a standard weighing machine, an infantometer (used to measure the length of infants under the age of two), a stadiometer (used to measure standing height), and MUAC tapes. For the household survey, interviews with beneficiaries (mothers of children aged 0–5/6–11/12–23/36–59 months) would be conducted using systematic sampling, while anthropometric measures would be taken for children aged 0–59 months.

Estimation of Haemoglobin Level (Finger Prick Method)

The Project HANSA team provided 20 sets of Hemocue machines as well as consumables for 2500 tests (taking waste into account). The measured haemoglobin level was immediately communicated to the study's participant.

Household survey

To collect household and individual-level information from each respondent, face-to-face interviews were carried out using various modules of a structured, trained interviewer-deliverable, pre-validated mobile application-based questionnaire featuring a real-time digital data quality monitoring tool.

Measures

Measurements were obtained of recognized socio-demographic characteristics that influence nutritional status, associated behaviours, and predictions. Religion (Hindu/Others), caste [marginalised (scheduled caste and tribes)/non-marginalised (other backward classes and general)] , maternal age (21/>2135/35 years), parental education (mother and father with no formal schooling or schooling up to 8th/>8th standard), wealth tertile (a pre-validated log-transformed asset index based on multi-component tertile distribution) lower/middle/upper], occupation (mother’s and father’s: salaried/non-salaried), exposure to social media and smart phone use (yes/no), parity of respondent and self-help group member.

Underweight, stunting, wasting, and haemoglobin estimates are the most critical outcomes, with less than 8 g/dl being severe, more than 8 g/dl and less than 11 g/dl being moderate, and more than 11 g/dl and less than 12 g/dl being mild. Most exposures

and outcome factors were dichotomous throughout pregnancy, such as guidance on dietary supplements, advice as average or good for Godbharai, and participation in Godbharai at home or at the AWC.

Also, for children aged 0 to 59 months, take anthropometric measurements such as height, weight, and mid-upper arm circumference using a stadiometer (used for measuring stature and sitting height), an infantometer (used for measuring the baby's length in a lying-down position), a weighing scale, and a Shakir stirp (used to measure MUAC). By hemocue, additional haemoglobin estimates were collected for lactating mothers whose children up to 11 months and pregnant mothers with children aged 12–59 months.

Analysis

Descriptive analyses were performed to determine the distribution of various parameters in the study population to further investigate the relationships between various individual, community, and programme-related predictors and outcomes of interest, chi square test were performed as well. All analyses were carried out using SAS 9.4.

Results

Descriptive

Socio-demographics and anthropometric measures

The majority of mothers with children aged 36-71 months (20.5%) of the 2000 attempted and 1500 studied population (0-5 months: 19.9%, 6-11 months: 20.1%, 12-23 months: 19.3%, 24-35 months: 20.2%). Belonged to a non-marginalized caste (56.1%) and came from a lower wealth tertile household (33.4%, n = 504). More than two-thirds of mothers have a formal education (educated up to the eighth grade: 35.5%; educated beyond the eighth grade: 30.9%).

Two-thirds of the mothers (69.1%) were either unemployed or employed in the informal sector. A second child was present in (39.7%) of families. Almost one-fifth (18.3%) of household had a member of a self-help group (SHG). Over half of the families (78.7%) did not have a kitchen garden, while (51.9%) of mothers had access to social media platforms.

Out of the 1194 study population, SAM measured through MUAC, SAM <11.5 (0.6%, n = 7), MAM ≥11.5 <12.5 (5.1%, n = 61), and Normal ≥12.5 (94.3%, n = 1126); SAM through Z-score, out of 1144 participants, SAM <-3 SD (1%, n = 11), MAM ≥ -3 < - 2 SD (8.2%, n = 94), and Normal ≥ -2 SD (90.8%, n = 1039).

The 1447 participants in the study were determined to be underweight < - 2 SD (33.9%, n = 490) and normal ≥ - 2 SD (66.1%, n = 957). Stunting < - 2 SD (36.3%, n = 518) and Normal ≥ - 2 SD (63.7%, n = 910) were observed in the 1428 study population. There

was Wasting < - 2 SD (27.2%, n = 382) and normal ≥ - 2 SD (72.8%, n = 1024) among 1406 participants.

Out of 1406 participants, SAM < - 3 SD (13.9%, n = 196), MAM ≥ - 3 SD < - 2 SD (13.2%, n = 186), and normal ≥ - 2 SD (72.8%, n = 1024) were the SAM categories through weight for height z score.

Out of 568 participants, anaemia status in lactating women as per standard measurement given by WHO Hb <8 (severe) (2.3%, n = 13), Hb ≥8 & <11 (moderate) (46.3%, n = 263), Hb ≥11 & <12 (mild) (26.2%, n =149) and Hb ≥12 (normal) (25.2%, n = 143).

Out of 131 pregnant women, anaemia status according to WHO standards, Hb <7 severe (0.8%, n = 1), Hb ≥ 7 & 10 moderate (35.9%, n = 47), Hb ≥ 10 & <11 mild (37.4%, n = 49) and Hb ≥11 normal (26%, n = 34).[18]

(Table 1 presented in Annexure)

Stratified

Female-gender children were more significant than male children in mild acute malnutrition as measured by MUAC (6.83% $_{female}$; 3.61% $_{male}$, p = 0.0405).

Through the Z score, no formal education study participants were more significant than education up to and above the eighth grade in severe acute malnutrition (1.60% $_{no\ formal}$; 0.71% $_{upto\ 8th}$; 0.57% $_{above\ 8th}$, p = 0.0124).

Underweight, lower wealth index households were more significant than upper wealth index households (39.58% $_{lower}$; 33.26% $_{upper}$, p = 0.0018) and in education, upto 8th grade was more significant than above 8th grade (36.70% $_{upto\ 8th}$; 28.60% $_{above\ 8th}$, p =

0.0074). Respondents exposed to social media platforms, who were not using them were more significant than those who were (36.46% $_{no}$; 31.47% $_{yes}$, p = 0.455). Male gender children were more significant than female gender children to be underweight (37.35% $_{male}$; 29.97% $_{female}$, p = 0.0031).

Male-gendered children were more likely than female-gendered children to stunt (39.18% $_{male}$; 33.04% $_{female}$, p = 0.0160).

In Wasting, lower wealth index families had significant upper wealth index households (31.90% $_{lower}$; 20.47% $_{upper}$, p = 0.0002). In terms of parity, respondents with four or more children were more significant than those with one child (37.35% $_{four\ child}$; 25.45% $_{one\ child}$, p = 0.0072), respondents without a kitchen garden were more significant than those with a kitchen garden available in their household (28.57% $_{no}$; 22% $_{yes}$, p = 0.0232), and respondents not using social media platforms were more significant than those who were (30.71% $_{no}$; 23.91% $_{yes}$, p = 0.0042).

Lower wealth index families were more significant than upper wealth index households in the SAM category via weight for height z score (16.38% $_{lower}$; 9.59% $_{upper}$, p = 0.0013). In terms of parity, those with four or more children were more significant than those with 1 child (19.88% $_{four\ child}$; 12.72% $_{one\ child}$, p = 0.0073), and respondents who were not using social media platforms were more significant than those who were (16.77% $_{no}$; 11.34% $_{yes}$, p = 0.0063), and male gender children were more significant than female gender children (16.10% $_{male}$; 11.54% $_{female}$, p = 0.0477).

In anaemia in pregnant women, in moderate anaemic, lower wealth index families had significant upper wealth index households (55% $_{lower}$; 16.23% $_{upper}$, p = 0.0088). As in

mild anaemic, upper wealth index households significant than lower wealth index households (54% $_{upper}$; 25.53% $_{lower}$, p = 0.0088).

Discussion

Maternal and childhood nutrition are critical components of global health and development, and Anaemia is a frequent nutritional shortage that affects both mothers and children. Maternal and childhood nutrition is defined by the World Health Organization as the supply of vital nutrients to pregnant women, lactating mothers, and early children to support healthy growth and development. Anaemia, pre-eclampsia, hemorrhage, and mortality in women can result from poor nutrition during pregnancy, as can stillbirths, low birth weights, wasting, and developmental delays in children. Anaemia is a severe global public health concern that mostly affects young children and pregnant women, affecting 42% of children under the age of five and 40% of pregnant women globally.[19, 20]

The study's findings shed light on mothers' nutritional health, which differed greatly based on demographic parameters such as education, occupation, and socioeconomic level. Mothers with a higher socioeconomic level who were more educated, employed, and had a higher socioeconomic status had better knowledge and maintained better dietary habits more frequently than those with a lower socioeconomic status who were less educated, unemployed, or had a lower socioeconomic status.

These findings were consistent with previous research [21-23] that found a link between low literacy rates among mothers and poor nutritional status among children. An Ethiopian study discovered a link between mother education and child wasting. A cross-sectional study conducted in Karachi discovered a link between mother education and children's nutritional health. However, the impact of maternal education is also influenced by a number of other socio-environmental variables. Maternal employment

was also shown to be a significant positive predictor of excellent nutritional status, likely because it helps mothers enhance their communal standing by giving them access to education, health care, decision-making, and economic independence.

Previous research found that individuals with a birth spacing of less than 2 years were more likely to be stunted and underweight, whereas children with longer birth intervals were less likely to be stunted and underweight. A longer birth interval allows for better childcare [(4)] and the high incidence of both forms of undernutrition among children under the age of five indicates that there is a significant need for educating mothers about timely feeding meals that are conveniently available in the local market and at a reasonable cost. The influence of the mother's age on the frequency of undernutrition clearly encourages the promotion of delaying female marriage and, as a result, the birth of the first child.[(24)] Based on these findings, the current study concludes that children from families with low incomes with mothers who have no formal education or have only passed the eighth grade are more likely to be underweight. Children with mothers who use or have a smartphone in the house, have one or fewer than three children, are exposed to social media, and are female are less likely to be underweight.

According to the present study's findings, children who live in a joint household were less likely to be stunted. Wasting is connected with low-income, low-income, and middle-income tertile households. Mothers who completed the eighth grade have a better probability. However, having more than three children, having a kitchen garden, and being exposed to social media reduce the likelihood of it being squandered. The research on the causes of stunting and wasting is considerable, with prenatal and postnatal periods serving as the key causal factors. A study of the research on wasting, however, fails to discover variables that are not also associated with stunting. Stunting

is associated with poverty and a lack of access to services. Seasonality, intrauterine growth restriction, early childhood body size, and illnesses are all associated with wasting, although not solely.[25] In children's aged 6–8 months, the delayed introduction of supplemental meals is related to stunting and severe stunting. Evidence shows that delayed complementary feeding impairs the quality and quantity of an infant's nutritional requirements, resulting in stunting. The WHO advises that supplementary meals be introduced in a timely, adequate, safe, and appropriate manner.[26] Stunting and wasting were nearly twice as common in children aged 12 to 24 months in Bangladesh as in babies aged 6 to 12 months.[27]

A variety of reasons are thought to explain girls have lower stunting and wasting rates than boys. For instance, gender discrimination in food and healthcare distribution within the family is less widespread than in the past.[28, 29] Second, because of gender differences, females outperform boys when given less than an acceptable amount of food. Their findings indicated that children from rural regions and the poor were more likely to suffer from malnutrition. Rural children were more sensitive to wasting and stunting than children from better-off households because they lived in poor conditions with inadequate food intake, a lack of basic health care, and a higher risk of infection.[27-29]

The importance of parental education in improving children's nutrition has been emphasized. Several studies in India, Thailand, Peru, Ghana, and Brazil discovered a link between parental education and higher child growth results.[30-33] According to the study's findings, children of mothers with a secondary or higher degree of education had far fewer issues than those of illiterate mothers. A similar conclusion was observed for

paternal education. Parental education influences childhood immunizations, family planning, visits to local health clinics, and vitamin A supplementation.[34]

Furthermore, most people agree that a greater education leads to a better salary. As a result, rising family income allows parents to invest more in their children's health care and nutrition, which may explain educated parent’s children have a lower stunting rate.[35]

Limitations

- Due to inadequate time for field validation and consequently finalising an observation, the final figure in district and state-level estimates may vary from report at once.
- The process is currently ongoing with continued conversation with local government functionaries. Interim interpretation shows changes after the decimal point only.

Conclusion

Overall, the findings indicate that, while most mothers were aware of nutritionally balanced dietary habits and their actual implementation, there is still much work to be done in this domain at the individual, family, and community levels because newly delivered mothers, often young, find it more difficult to prioritize practices in combined households or joint family set-ups where gendered social norms and expectations are more traditional and women lack negotiation skills as well. Furthermore, non-marginalized castes are still denied better access to school and employment opportunities, which impacts their conduct.

The purpose of this study is to highlight the significance of tailored interventions to improve nutritional status-related behaviours and predictors among ICDS recipients in the study group. These interventions should focus on raising awareness among mothers and health-care providers about the importance of essential newborn care practices, strengthening health-care systems to provide needed resources and infrastructure, and addressing socio-cultural barriers and traditional beliefs about nutritionally balanced dietary habits.

More study is needed to understand the variables that contribute to the observed disparities in nutritious dietary knowledge and practices among mothers as well as to create effective strategies for improving the uptake of these practices. Overall, this study provides important insights on the state of nutritious dietary practices in the region and serves as a platform for developing targeted interventions to improve nutrition status in the region.

To address this, a comprehensive approach focusing on mother and child nutrition is necessary, including boosting access to nutrient-rich foods, developing knowledge of appropriate dietary practices, and offering tailored treatments for high-risk groups. Furthermore, increasing maternal education and lowering poverty can help lessen India's malnutrition burden. To solve this issue, policymakers, healthcare professionals, and communities must all work together.

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Annexure

Household Survey

Socio-demographic information

- Religion and Caste:
- Type of house
- Family composition (no. Of family members) and type (nuclear/joint)
- Wealth Index
- Type of drinking wáter used
- Type of oil used
- Fuel used for cooking
- Possession of animals/kitchen garden
- Occupation of child'sparents
- Food insecurity

Anthropometric Measurements (Children between 7m to 59m)

- Height/Length
- Weight
- MUAC

Indicators from the data, Wasting, Stunting and Underweight

Age groups			
0-5mth	6-11mth	12-23mth	24-35mth and 36-71m

InformationofMother

- Age of the respondent
- Obstetric history of mother
- Dietary diversity of mother
- Mother's education
- Haemoglobin level
- Hand washing practices

Figure 4 Household Survey

Anthropometric Measurement						
	Bhilwara	**Chittorgarh**	**Rajsamand**	**Udaipur**	**Ajmer**	**Total number of AWCs**
AWCs across district	80	80	80	80	80	400
Age groups of children and adolescent whose anthropometric measurement would be done- 1 child/Age group/AWC and adolescent girls						
0-5m	80	80	80	80	80	400
6-11m	80	80	80	80	80	400
12-23m	80	80	80	80	80	400
24-35m	80	80	80	80	80	400
36-59m	80	80	80	80	80	400
Total	400	400	400	400	400	2000

Figure 5 Anthropometric Measurement

Hb level estimation (Finger-prick Method)						
	Bhilwara	**Chittorgarh**	**Rajsamand**	**Udaipur**	**Ajmer**	**Total number o AWCs**
AWCs across district	80	80	80	80	80	400
Age-wise details for Hb estimation						
0-5m	80	80	80	80	80	400
6-11m	80	80	80	80	80	400
12-23m	Maximum 400 currently pregnant women would be taken from these age-groups for Hb estimation. It would be identified during the listing process.					400
24-35m						
36-59m						
Total (No of respondents)	**320**	**320**	**320**	**320**	**320**	**1600**

Figure 6 Haemoglobin level estimation

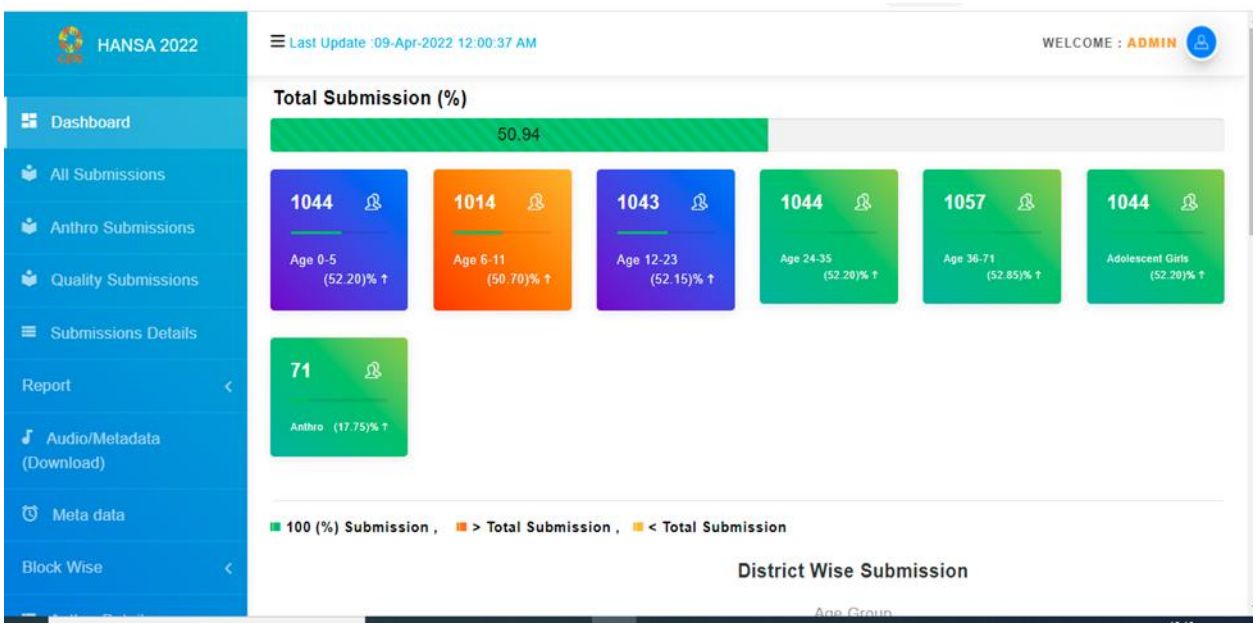

Figure 7 Dashboard for data monitoring

Table 1 Descriptive of Sociodemographic and anthropometric measurements

General attributes	Categories	n	% (95% CI)
Respondent's age groups	0-5 Age	299	19.9 (17.9-22.0)
	6-11 Age	302	20.1 (18.1-22.2)
	12-23 Age	289	19.3 (17.3-21.3)
	24-35 Age	303	20.2 (18.2-22.2)
	36-71 Age	307	20.5 (18.4-22.5)
Caste	Marginalized	659	43.9 (41.4-46.4)
	Non-Marginalized	841	56.1 (53.6-58.6)
Wealth tertile group	Lower	501	33.4 (31.0-35.8)
	Middle	497	33.1 (30.7-35.5)
	Upper	502	33.5 (31.1-35.9)
Mothers' education	Not formally educated	503	33.5 (31.1-35.9)
	Educated up to 8th standard	533	35.5(33.1-38.0)
	Educated above 8th standard	464	30.9 (28.6-33.3)
Mothers' Occupation	Non-Salaried	1026	69.1(66.7-71.4)
	Salaried	459	30.9(28.6-33.3)
Parity	1 child	467	31.1(28.8-33.5)
	2 children	595	39.7 (37.2-42.1)
	3 children	258	17.2(37.2-42.1)
	≥4 children	180	12.0 (10.4-13.6)
SHG membership within the family	No	1226	81.7 (79.8-83.7)
	Yes	274	18.3 (16.3-20.2)
Kitchen Garden in household	No	1180	78.7 (76.6-80.7)
	Yes	320	21.3 (19.3-23.4)
Mothers' use/exposure to social media platforms	No	722	48.1 (45.6-50.7)
	Yes	778	51.9 (49.3-54.4)
SAM category through MUAC Measurement	SAM <11.5	7	0.6 (0.2-1.0)
	MAM ≥11.5 <12.5	61	5.1 (3.9-6.4)
	Normal ≥12.5	1126	94.3 (93.0-95.6)
SAM category through Z score	SAM < -3 SD	11	1.0 (0.4-1.5)
	MAM ≥ -3 < -2SD	94	8.2 (6.6-9.8)
	Normal ≥ -2SD	1039	90.8 (89.1-92.5)
Underweight	Underweight < -2SD	490	33.9 (31.4-36.3)
	Normal ≥ -2SD	957	66.1 (63.7-68.6)
Stunting	Stunting < -2SD	518	36.3 (33.8-38.8)
	Normal ≥ -2SD	910	63.7 (61.2-66.2)
Wasting	Wasting < -2SD	382	27.2 (24.8-29.5)

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