Nutritional Assessment in pregnant and lactating women aged 15-49 years
Secondary data analysis NFHS -5

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by

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List of Abbreviations

ANC	Ante Natal Care
ANM	Auxiliary Nurse Midwifery
ASHAs	Accredited Social Health Activist
BMI	Body Mass Index
DHS	Demographic Health Survey
GoI	Government of India
ICDS	Integrated Child Development Services
IFA	Iron Folic Acid
LW	Lactating Woman
NFHS	National Family Health Survey
NITI	National Institute for Transforming India
NRHM	National Rural Health Mission
PW	Pregnant Woman
SC/ST	Scheduled Caste/ Scheduled Tribe
SDG	Sustainable Development Goals
THR	Take Home Ration
WFP	World Food Programme
WHO	World Health Organisation

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Abstract

Nutrition access to pregnant and lactating women is an important component of Sustainable Development Goals. India has made considerable progress by improving access to nutrition and micronutrients through various public health initiatives. However, the bottlenecks in maternal and child health infrastructure for providing nutrition accessibility, affordability and feasibility still exist and has been contested by scholars. This is despite the fact that government schemes like JSY (Janani Suraksha Yojana' April'2005) were able to create a significant impact on reducing maternal mortality ratio in India. However, low performing states such as Uttar Pradesh, Uttarakhand, Bihar, Jharkhand, Madhya Pradesh, Chhattisgarh, and Assam are making slow improvement in nutrition indicators as per maternal and child health report' 2017 for pregnant and lactating women. Hence, the association of quality nutrition access and current governance across the country needed to be examined. In addition, the association between number of ANC visit during pregnancy and attained nutrition information in pregnant and lactating women leading to better nutritional status was also studied. This study shows association of household characteristics such as wealth index or income, socio demographic factors like caste, religion, and their influences on nutritional status in pregnant and lactating women ages 15-49.

Keywords: Pregnant and breast feeding, Indian women, Health, Nutrition access, ANC, Governance

Introduction

United Nations Sustainable Development Goal 2 & 3 (SDG 2) aims "To end hunger, achieve food security and improved nutrition and promote agriculture" and (SDG 3) aims "To ensure healthy lives and promote healthy well- being for all at all ages". In order to analyse the critical importance of food security and nutrition in the Indian society with respect to pregnant and lactating women some statistics and definitions are discussed in the next section.

1.1 Basic Background

Food security, Improved Nutrition and Good health - wellbeing has been at the centre of the development discourse. As per the World Health Organization (WHO) and the World Food Programme for food security which aid 87 million vulnerable people across the world where half of the population are women and children and the COVID – 19 pandemics could now double that number for the vulnerable groups across the globe [i].

1.2 Definition and Standards for Nutrition in Maternal and Child Health

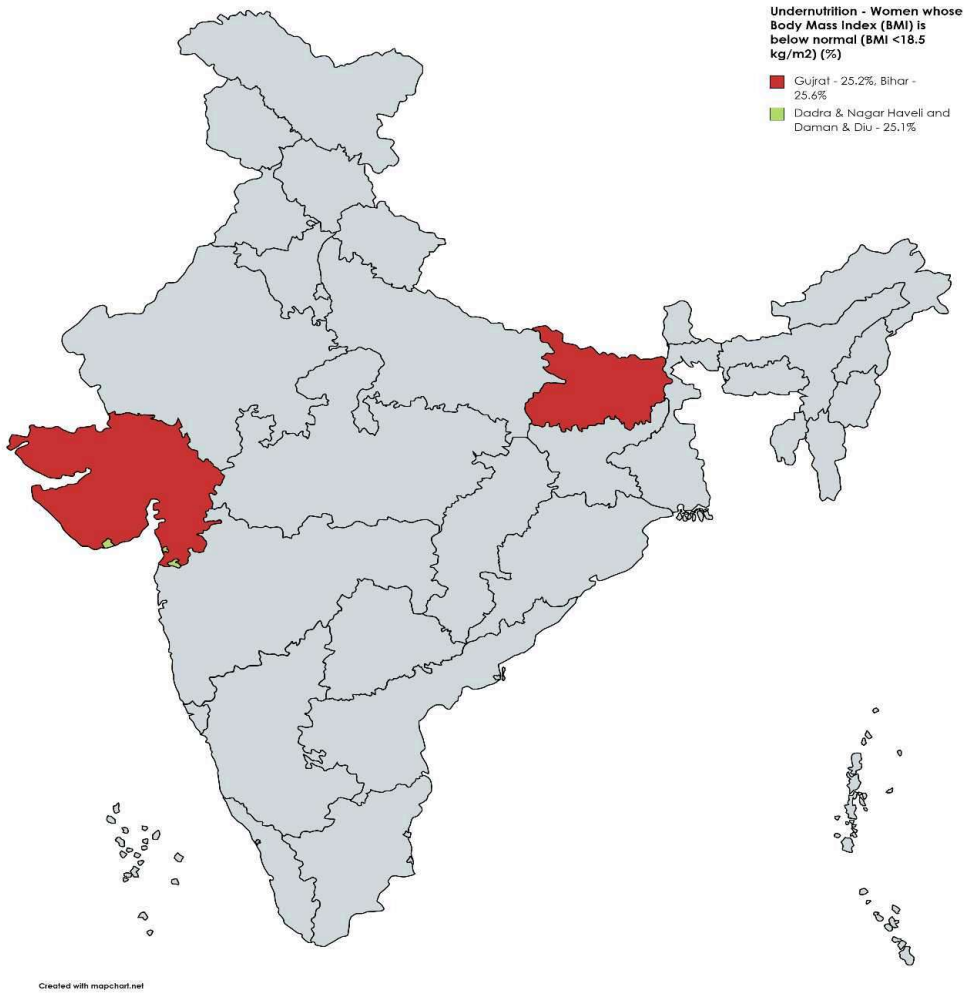
Nutrition as defined by the WHO guidelines ensures better dietary access leading to improved infant and maternal health with safer pregnancy and childbirth, she faces no adverse health risks. [ii]. Standard for Nutrition in Maternal and Child health is increase in caloric intake by 300 kcal/day during pregnancy maintaining haemoglobin more than 10.5 g/dl or a hemocrit more than 32% is standard, any less is anaemic. [iii]

1.3 Nutrition in pregnant and lactating mothers' in India

The health of women is linked to their status in the society. The demographic impact of women has presented itself in a variety of ways, including female infanticide, mortality rate, low sex ratio, and lower levels of literacy than those of men. The breadth of women's nutritional status is typically determined at the home level by cultural norms, customs, and socioeconomic variables. As per the **National Family Health Survey**

(NFHS-5), 52.2% of pregnant women and 60.6% in breastfeeding women aged 15–49 years were anaemic and demonstrate poor nutritional status in India. ([iv],[v]) Also, it is the second leading cause of maternal deaths in the country. In addition, women who work intensively at household and in agriculture are more likely to be undernourished. Additionally, during lactation, women have increased physiological needs that are reflected in higher nutritional requirements. The health of the mother as well as the amount and quality of milk are negatively impacted by failure to attain the required weight. Therefore, monitoring body weight status (BMI) throughout pregnancy and breastfeeding as well as monitoring the prevalence of undernutrition through food intakes might help identify the underlying causes. However, if women are undernourished, they are more likely to give birth to low weight infants (less than 2500 gm) resulting in **high infant mortality rate**.

Figure 1: Relative location Gujrat, Bihar and Dadar & Nagar Haveli and Daman & Diu are the states where women are highly undernourished depicted using Mapchart (1)



[1]According to NFHS 5 (19-21) Above displayed are the most undernourished states for women whose BMI is below the normal range (BMI < 18.5 kg/m2) percent

To identify the causes of undernourishment in pregnant and lactating women ages 15-49, this research study aims to answer a research question with three objectives using secondary data analysis and literature review.

[1] Source -Malnutrition free India https://pib.gov.in/PressReleasePage.aspx?PRID=1781673

RQ 1	Does increase in ANC visit during pregnancy leads to better nutritional status in women?
Objective 1	To examine social economic barriers leading to undernutrition in pregnant and lactating women in India
Objective 2	To assess number of ANC visits by pregnant and lactating women in health centres, leading to undernutrition in India
Objective 3	To measure the research gaps, national maternal health policy to offer recommendations for future action

The structure of the research study is - In section 2, a methodology for analysis is described. Then the section 3 details the literature review completed to extract key variables of interest. Subsequently, variables extracted from the sample data set which is NFHS 5 (19-21) based on the methodology and the knowledge gained from literature review which is explained in section 4. The conceptual model in section 5 followed by results, interpretation of the logistic regression and probit regression model in section 6. Further, in section 7, a few key results are analysed and tested after which policy recommendations are proposed. Limitation of research is discussed in section 8 and in section 9 concluding remarks are presented.

2. Methodology

This section introduces a few basic definitions for the type of research adopted in the research study. The study's main objective is to analyse the available data to test the major research hypotheses and look at the conclusions drawn from them. This study is analytical cross-sectional, and it makes use of NFHS-5 (2019–2020) data from India. The International Institute of Population Sciences (IIPS), Mumbai, is conducting this nationwide survey with a large sample size including all states and union territories with the assistance of the Ministry of Health and Family Welfare (MoHFW).[vi]

The 2011 Indian Census served as the basis for the sample in NFHS-5; in the initial sampling, villages served as the Primary Sampling Units (PSUs) in rural regions and Census Enumeration Blocks (CEBs) in urban areas. Phase-I results from 22 States and UTs were made public in December 2020. Phase II of the Survey, which included the remaining 14 states and UTs, was postponed. Its results were released in May 2022.[vii],[viii]

All eligible women between the ages of 15 and 49 who completed the Woman's Questionnaire provided data on subjects like Health of the mother and child, breastfeeding, and nutrition: Prenatal, postnatal, postpartum, postpartum amenorrhea, breastfeeding, and infant feeding procedures. [ix]

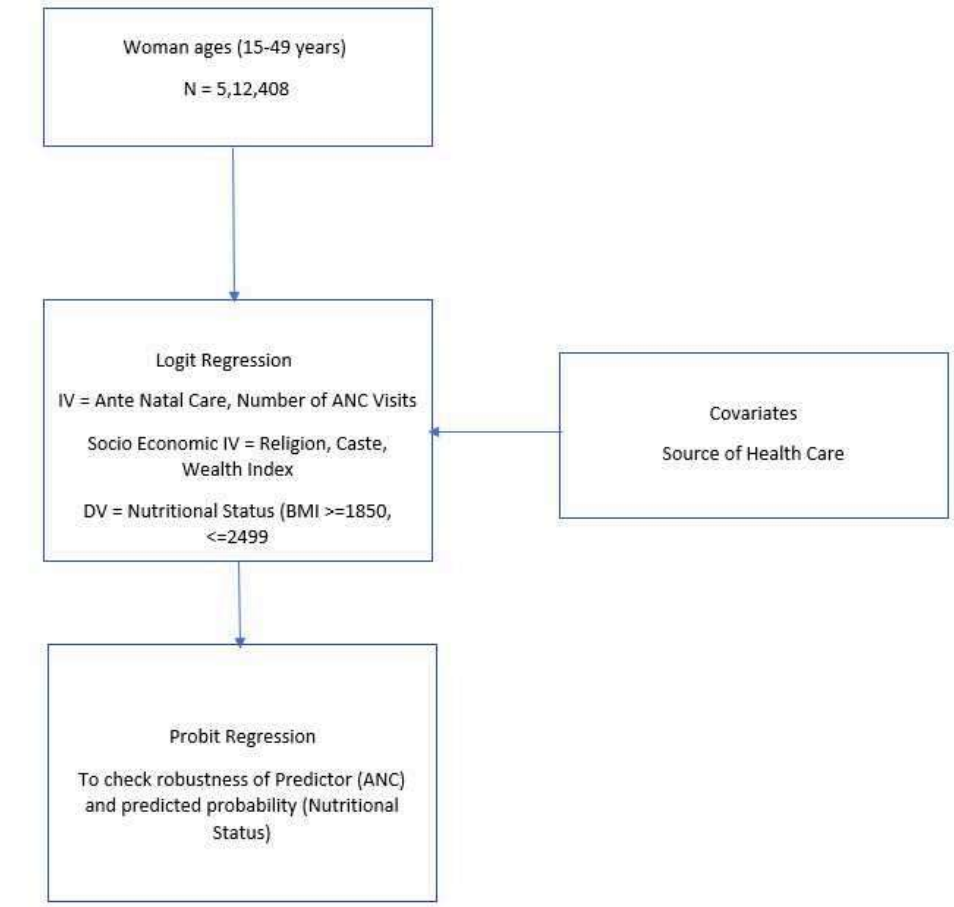
The Biomarker Schedule covered measurements of height, weight, waist, and hip circumference for women aged 15-49 years (*see Annexure – 2*)

The design for sampling and survey procedures are detailed in the NFHS-5 national report.

2.1 Study participants

Number of women from 15-49 years in each background characteristics category depicted in Table - 1, were (1,215,417). Out of which women who were not within the age range i.e., 15-49 years were "currently not pregnant and lactating" during NFHS-5 survey were excluded from the study. Total number of women ages 15-49 years reported were 5,12,408 were included in the study. Figure – 1 shows the research design using flowchart with statistical test applied and independent and dependent variables considered for this research study.

Figure 1. Flow chart depicting the research design (NFHS 5, 2019-21)



2.2 Outcome Variable

The selected variables shown in Table - 2 are extracted from literature review. The availability of antenatal care services and ANC visits during pregnancy are the study's outcome variables.

The association of number of ANC visits during pregnancy and uptake of ante natal care package at different sources of health centres will have an impact on nutritional status of pregnant and lactating women in India and whether they are considered as healthy.

For measuring the association women were asked a set of questions. The responses were either 'no' (given code '0'), yes (given code'1') or 'don't know' (given code'9').

The responses were converted into binary classification where 'yes' was coded as '1' and 'no' and don't know were coded as'0'. If the women responded 'yes' to at least number of visits at any health source centre for ante natal care services more than four times were considered as healthy and maintaining normal BMI i.e.18.5 – 24.9 kg per metre square, were considered healthy.

2.3 Background Characteristics

The variables considered include the woman's present age (15-19, 20-24, 25-29, 30-34, 35-39, 40-44, 45-49 years), wealth index (poorest, poorer, middle, richer, richest), caste categories (Scheduled Caste/Tribe, Backward Classes, and others), religion (Hindus, Muslims, Christians, and others), woman's level of education (no education, primary, secondary, and higher education).

2.4 The Analysis : Logistic Regression

The logistic regression is a non – linear model. There are situations where the dependent or response variable is expressed in binary classification.

For example, there are large number of situations where variables are coded as a binary or variables are between '0' and '1'. Survey responses that are "Yes" or "No" can easily be recoded as a binary variable. If the variable expresses the probability of an event, then its value will be between zero and one.

The logistic regression model is a model that can be used when the response variable is binary. The basic form of logit model is given by -

$$P(Y| X1, X2. . . Xk) = F(\beta0 + \beta1X1 + . . . \beta kXk) = 1 / 1+ e - (\beta0 + \beta1X1 + ... \beta kXk)$$

where F is the cumulative standard logistic distribution function [x].

Another way of expressing the same is $logit(Y) = \beta0 + \beta1X1 + . . . \beta kXk$

$$logit(V0) = \beta1V1 + \beta2V2 + \beta3V3 + \beta4V4 + \beta5V5 + \beta6V6 + \beta7V7 + \beta8V8 + \beta9V9 + \beta10V10 + \beta11V11 + \beta12V12 + \beta13V13 + \varepsilon$$

Represented in Annexure - 1 provides summary of variables extraction for logistic regression model.

The coefficients of the explanatory variables can be computed either as log-odds or odd-ratios where odd ratios are the ration of the probability of the event (indicated by the response variable) happening to the probability of the event not happening.

Lack of thereof is best expressed as binary variables - "Yes" for having the capability and "No" for the absence of it. In such scenarios where binary dependent variables are present logit models are suitable. Hence, in this study a logistic model is used.

3. Literature Review

In more than 25 years of maternal health journey for Indian women, it is important to review the Nutritional status of pregnant and lactating women and if we have improved in some key areas such as ANC visits, Maternal Mortality Rate (MMR), uptake of health services at various health source centres. The Family **Health Survey (NFHS-5)**, states that undernutrition is at 52.2% of pregnant women and 60.6% in breastfeeding women.

India has seen a considerable decline in MMR in the past 20 years with targeted intervention such as JSY and JSSY launched to address maternal and child nutrition and health which is at 103/1,00,000 live births according to SRS – 18. [xi].

3.1 Basic Background for Nutrition and governance

Access to nutrition, affordability to pregnant and lactating women cannot exist without governance. This section aims to discuss a few aspects of Nutrition and governance in India with respect to Maternal health.

The Integrated Child Development Scheme program under the Ministry of women and child development. A flagship program working towards providing supplementary nutrition, health education to beneficiaries such as children under 6 years, and pregnant and lactating mothers through Aganwadi workers and help groups. These services are provided by Nation Rural Health Mission (NRHM) & Health Systems. These services are integrated and well in built in the health system to increase the efficacy of the package including services like immunization, health check-ups. ICDS program intervention for more than 10 years have impacted over 330.33 lakh (88.06 percent) which includes children under 6 years and pregnant and lactating women. [xii]

Another flagship program, POSHAN abhiyan to improve nutrition outcomes among pregnant women, lactating mothers and children. It has significant four key elements such as – a. Deliver a high impact package of interventions targeting first thousand days of a child's life. b. Strengthen the delivery of these interventions by use of technology and management. c. Improve the capacity of frontline workers d. enhance behaviour change and community mobilization.

A research study conducted by IDS Global on social behaviour change communication [xiii], summarizes the intensive campaigns undertaken by POSHAN Maah with an aim to encourage pregnant women and lactating mothers to practice healthier nutrition behaviours. The first 1000 days, were set as a target for these campaigns to disseminate over 10 nutrition related messages using 20 platforms, including mass media and Interpersonal communication channels followed by a qualitative research study to understand the gaps for bringing positive behaviour change in pregnant women and lactating mothers. It was reported that women with knowledge of anaemia, ANC visits and early breastfeeding increased significantly during the intervention by 35%.

3.2 Nutrition and Ante Natal Care

Micronutrient deficiency is observed higher in adolescent pregnancy as they have more dietary needs than a pregnant woman reported by a qualitative study in Dhaka, Bangladesh. In many cases adolescents are unaware of their pregnancy where they do not have autonomy and decision-making power, a right to choose to maintain nutritious diet. Also, their access to health system and ante natal care services remains low, because of wide gaps in knowledge for safer pregnancy and nutritional guidelines.

Mostly pregnant adolescents' needed permission from their husbands to visit health care facility and uptake number of ante natal care visits. Importance of availability of family counselling is equally essential in nutritional planning given with ANC package. [xiv]

The outreach of Ante natal care in India in pregnant and lactating women is fragmented by policy makers and pertinent administrative divisions. The outreach per se is found to be uneven and display concerning variations across the country. The contributing factors on both demand and supply side portray for any maternal and child health programme success.

Noticeable coverage disparities for such ANC services are critical in geographical remoteness. There are the most vulnerable population like tribals minorities existing in difficult terrains and are constantly recognised as major impediments to health care system and its distribution channels. Given the reason, it affects health delivery and health seeking beneficiaries. Slums are regions where governance is in a constant state of flux. It is widely acknowledged that the uptake of ANC services, IFA and calcium supplementation remains low in such regions leading to increased maternal mortality and morbidity. [xv]

3.3 Other complementary variables

3.3.1 Religion

Religion is a major factor in determining exclusive breastfeeding pattern in India. Breastfeeding practices for recommended duration or early breastfeeding are not very common in Hindu religion. The Ayurveda literature underplay the importance of exclusive breastfeeding as cultural Hindu practices. Even though, women receive counselling from health care professionals or ANM/ASHAs explaining the importance of early breastfeeding, yet the decision is influenced by household members like mother-in-law. [xvi]

3.3.2 Caste

Raghavendra R.H in his research article[2] explains to improve national's health interventions, target vulnerable populations (SC/ST, tribals) governance must address stigma perceived and associated discrimination on the ground. Denied access on the basis of caste for SC/ST and tribal women, specifically maternal health services have been widely reported and accepted by scholars through evidence – based research studies such as study

[2] 'Literacy and Health Status of Scheduled Caste in India

published by Navsarjan Trust (2013) on Dalit women showing 46.5 percent and Valmiki sub caste (also known as traditional manual scavengers) never received ante natal care

services. Further, the report discusses key finding of NFHS - 4 that SC/ST women obtain less maternal health services of any kind in India let alone institutional births at health service centres. [xvii].

3.3.3 Household Characteristics: Wealth Index

Rammohan et al. (2018)[xviii] in his previous research study conducted in Lucknow, Uttar Pradesh with three government and private maternity hospitals measured the dietary diversity in the targeted population with 54 food items are included in the food frequency-based index. The study's main finding was that, variables like education, religion, and income, and increased contact with health service provider reduced the likelihood of dietary diversity and improved nutritional value contributing to healthy maternal nutritional status. [xix] The key variables extracted from the literature review and its impact on nutritional status is provided in Table 2

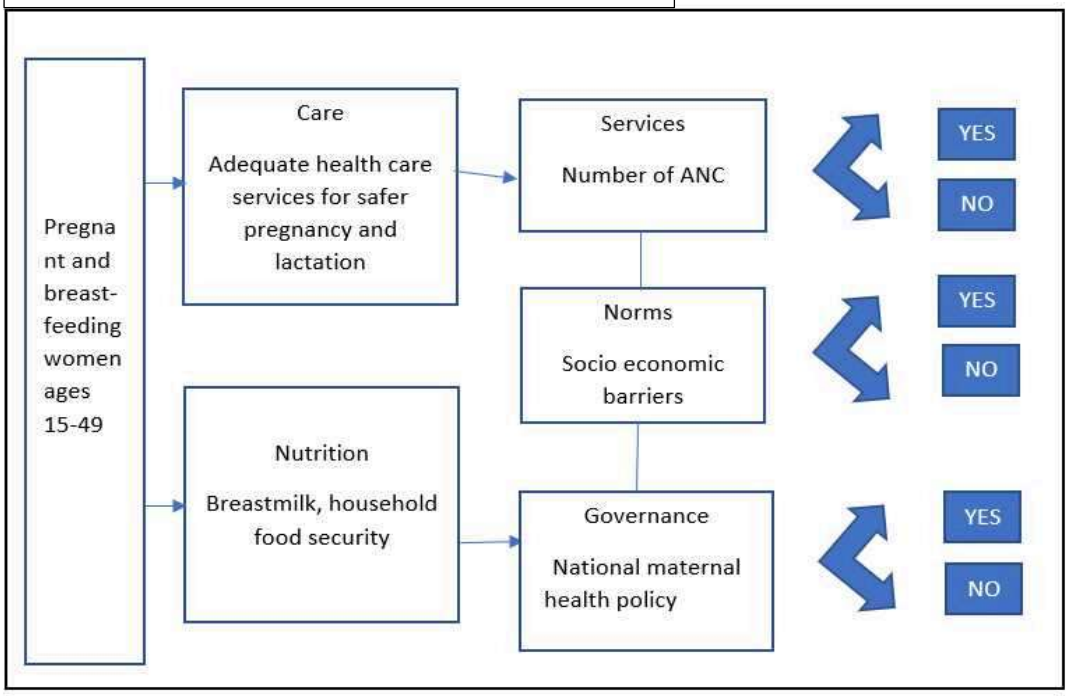
Table 2: Key variables extracted from literature review

No.	Variable	Impact
1	Ante natal care	High probability of impact on nutritional status
2	Number of ANC visit	High probability of impact on nutritional status
3	Religion	Social identity that is associated with discrimination
4	Ethnicity (caste)	Social identity that is associated with discrimination
5	Wealth Index	Determines the capability of uptake in ANC services across govt. and private health centres

4. Conceptual Framework

The hypothesis formulated for research design and binary classification, following conceptual framework was visualized, the framework given below as Figure - 3, Maternal and child health[xx] is determined through enabling the determinants of governance, which include political, economic, social, and public and private sector measures to support women's and children's rights to nourishment and Norms (Positive social and cultural norms), Underlying determinants which are Services (adequate services, health with healthy food environments), Immediate determinants which are Care (adequate health care services for safer pregnancy and breastfeeding practices) and Nutrition (Breastmilk, household food security) used to extract further information on variables from the dataset of NFHS – 5 for the research study and frame research questions pertaining to the study mentioned in *section 1.3*.

Figure – 3 Conceptual frameworks for research study



5. Results

Table – 1 Background characteristics and percentage distribution for women's respondents

Background Characteristics	Number of Women in each category (n)	Percentage (%)
Age		
15-19	5500	0.4
20-24	77797	6.1
25-29	191453	15
30-34	231269	18.1
35-39	262276	20.6
40-44	239606	18.8
45-49	266349	20.9
Literacy Level		
No education	503709	39.5
Primary education	204272	16
Secondary education	484654	38
Higher education	81615	6.4
Number of antenatal visits during pregnancy		
0	11462	0.9
1	11032	0.9
2	21422	1.7
3	29132	2.3
4	27524	2.2
Number of visits		
1	909603	71.4
2	258164	20.3
3	71622	5.6
4	22049	1.7
5	12812	1
Religion		
Hindu	957032	75.1
Muslim	166659	13.1
Christian	94249	7.4
Sikh	24694	1.9
Buddhist / Neo-Buddhist	13633	1.1
Jain	1156	0.1
Jewish	6	0
Parsi / Zoroastrian	97	0
No religion	584	0

Other	16140	1.3
Ethnicity		
Caste	1023229	80.3
Tribe	186812	14.7
No caste / tribe	57521	4.5
Don't know	6688	0.5
Owns a house alone or jointly		
Does not own	92234	7.2
Alone only	29484	2.3
Jointly only	34411	2.7
Both alone and jointly	37226	2.9
ANC: Public: Govt./Munic. Hospital		
No	125930	9.9
Yes	39451	3.1
Total	165381	13
ANC: Public: Govt. Dispensary		
No	160614	12.6
Yes	4767	0.4
ANC: Public: UHC/UHP/UFWC		
No	162706	12.8
Yes	2675	0.2
ANC: Public: CHC/Rural Hospital/Block PHC		
No	130588	10.2
Yes	34793	2.7
ANC: Public: PHC/Additional PHC		
No	147908	11.6
Yes	17473	1.4
ANC: Public: Sub-Centre		
No	151720	11.9
Yes	13661	1.1
Ever had vaccination		
No	4329	0.3
Yes	13913	1.1
Don't know	424	0
Visited a health facility or camp for self or children in last 3 months		
No	794345	62.3
Yes	274438	21.5
Service went for: Antenatal Care		
No	1064401	83.5
Yes	4382	0.3
Wealth index within state		
Poorest	315204	24.7
Poorer	290583	22.8
Middle	264534	20.8
Richer	230468	18.1
Richest	173461	13.6

Logistic regression analysis is performed on the basis of conceptual framework. Using the variables extracted from the sample data (Table -3) the results of the analysis are as follows –

Table – 3 Logistic Regression Analysis

Nutritional status	Odds ratio	Std. error	z	P>z	[95% CI]	
anc_visit	0.77	0.08	-2.23	0.02	0.62	0.96
number_anc_visit	0.99	0.00	-0.94	0.34	0.98	1.00
Age	**0.99**	0.01	-0.38	0.70	0.97	1.01
Religion	1.00	0.00	0.78	0.43	0.99	1.01
Ethnic	1.00	0.00	2.1	0.03	1.00	1.00
Owns a house alone/jointly	1.00	0.04	0.08	0.93	0.92	1.09
ANC: Public/Govt. Municipal hospital	1.25	0.17	1.69	0.09	0.96	1.64
Govt. Dispensary	1.08	0.34	0.25	0.80	0.57	2.03
uhc/uhp/ufwc	3.02	2.40	1.39	0.16	0.63	14.37
chc/rural hospital/block/phc	1.05	0.15	0.37	0.71	0.79	1.39
Phc/additional phc	1.20	0.24	0.89	0.37	0.80	1.80
Public sub centre	2.08	0.55	2.77	0.00	1.23	3.51
Ever had vaccination	**0.99**	0.04	-0.07	0.94	0.91	1.09
Visited health care facility or camp for self or children in 3 months	1.12	0.13	1.01	0.31	0.89	1.41
Went for ANC service	0.87	0.36	-0.32	0.74	0.38	1.99
Wealth Index within state	0.92	0.03	-1.97	0.04	0.85	0.99

Statistically significant results in bold, OR = Odds Ratio, CI = Confidence Interval

A Probit regression analysis is performed on the basis of logistic regression analysis to check the robustness of the results. Using the variables extracted from the sample data (Table -4) the results of the analysis -

Table – 4 Probit Regression Analysis

Nutritional status	Coefficient	Std. error	z	P>z	[95% CI]	
anc_visit	**-0.15**	0.07	-2.24	0.025	-0.29	-0.01
number_anc_visit	-0.00	0.00	-0.93	0.35	-0.00	0.00
age	-0.00	0.00	-0.38	0.70	-0.01	0.01
religion	0.00	0.00	0.8	0.42	-0.00	0.00
ethnic	0.00	0.00	2.1	0.03	0.00	0.00
Owns a house alone/jointly	0.00	0.02	0.08	0.93	-0.05	0.05
ANC: Public/Govt. Municipal hospital	0.14	0.08	1.7	0.08	-0.02	0.30
Govt. Dispensary	0.05	0.20	0.25	0.8	-0.34	0.44
uhc/uhp/ufwc	0.66	0.45	1.46	0.14	-0.22	1.55
chc/rural hospital/block/phc	0.03	0.08	0.39	0.69	-0.13	0.20
Phc/additional phc	0.11	0.12	0.92	0.35	-0.13	0.36
Public sub centre	0.44	0.15	2.83	0.00	0.13	0.76
Ever had vaccination	-0.00	0.02	-0.05	0.95	-0.05	0.05
Visited health care facility or camp for self or children in 3 months	0.07	0.07	0.98	0.32	-0.07	0.21
Went for ANC service	-0.08	0.26	-0.31	0.76	-0.59	0.43
Wealth Index within state	-0.04	0.02	-1.96	0.05	-0.09	0.00

CI = Confidence Interval at 95%

5.1 Interpretation of the results

The process of interpreting the results from the logistic regression model, caution has to be exercised. However, the results are useful highlight existing gaps in data and to shed light on some key policy issues. This section briefly outlines the results of the logit regression model and probit regression model. The interpretation and implication of the results are also discussed in this section.

The number of ANC visits and Wealth Index were found to be statistically significant at the 95% confidence interval. Also, ANC: public/government hospital and subcentre were also found to be statistically significant at the 95% confidence interval.

5.2 Association of Undernutrition or malnourishment with selected predictors and contributing factors

Pregnant and lactating women ages 15-49 who have completed more than four ANC visits in the public/government hospital and subcentres were less likely to be undernourished OR-CI 0.77 (0.62 – 0.96). To further analyse the robustness of the above logistic regression model, a Probit regression model was used where the ANC visits for pregnant and lactating women ages 15-49 years shows negative coefficient of minus 0.15 which indicates that an increase in the predictor which is ANC here leads to a decrease in the predicted probability that is nutritional status in mothers.

6. Discussion

The research study assessed all pregnant and lactating Indian women ages 15-49 as per NFHS-5 (2019-2021) dataset. The results showed significance for health service delivery system with ante natal care present at various health source centres like government/public health centres for pregnant and breast-feeding women in India and its association with nutritional status in pregnant and lactating women. Similar findings were reported in previous research. [xxi]

The study shows that increased utilization in ANC services leads to better nutritional status during pregnancy and breastfeeding period. The study population belonged to upper middle class or were from the wealthy households showed association with normal Body Mass Index for PW and LW in comparison with women from lower socio-economic strata or socially and economically backward communities. Similar association was reported in the NFHS 4 -5 findings. [xxii]

Culture and religion played a significant role in shaping the dietary patterns in PW and LW in India. Our study shows that women who represent the low socio-economic background were less likely to better their dietary needs during this period and were highly influenced by their husbands and mother-in-law decisions. Loss of autonomy and decision-making power for PW and LW in India further widens the gap in knowledge to opt healthy dietary practices and maintain a well-balanced lifestyle for herself and the child. This paradox may cause malnourishment for both mother and child. A policy gap wherein the need for a holistic outlook on behavioural change communication strategies and family counselling services in various ICDS and Aganwadi centres present will more likely improve the nutrition related habits of pregnant and lactating women amidst socio – cultural and economic influences. [xxiii]

A significant association with access to healthcare centres for pre- and post-natal care determines the outcome in maternal and child health. The government has made strenuous efforts to upskill health care professionals and strengthen the infrastructure by providing quality service delivery in various Aganwadi health centres under National Health Mission.

India ranks 56th in the world with high number in maternal mortality and infant mortality where 42 per cent of births in the country occur under supervision of medical institution. In rural and hilly terrains with extreme environmental conditions, most of pregnant women deliver at home, handled by unskilled person who lacks knowledge and expertise about pregnancy. Any complications during childbirth may turn fatal and result in maternal or infant deaths reported by World Health Organisation. ([xxiv]) There are many implementation gaps in enrolment status of pregnant women reported by a previous research study belonging from lower socio-economic backgrounds across the country. AWCs or PHCs enrolment process for pregnant women is found to be uneven and poor. The number of women allowed in Aganwadi centres are functioning below its holding capacity in the area. The proportion of 8:16 were found in one block. Hence, many PW and LW women remain deprived from the ICDS and POSHAN services such as take-home ration, immunization, ANC, and iron- folic acid supplementation. [xxv]

Number of visits in health centres (recommended four plus) remains low due to various reasons like family problems, ignorance, unawareness resulting in nutritional anaemia, underweight, thyroid, and other complications in pregnancy or post-natal period due to improper nutritional access during this period. It is critical to understand the bottlenecks in the maternal and child health infrastructure and to revise government strategies customized to different populations belonging to various sphere in socio – economic strata, geographies across the Indian subcontinent. Next section concludes with existing policy and governance revised recommendation to enhance the overall framework of maternal and child ecosystem in Indian context with respect to the findings and objectives of this research study.

7. Conclusion: Recommended changes from study findings

The study aimed to examine the socio-economic barriers for pregnant and lactating women in India such as caste, religion and wealth index and educational status. In India, stigmatisation of pregnant and lactating mothers is a lifelong burden with a psychological and mental cost attached.

Previous studies [xxvi],[xxvii] also shows similar association and conclude that following suggestions by identifying perceived discrimination against women based on caste in rural India.

- To identify opportunities to empower women from marginalized community for better health outcomes.
- To include targeted health education and outreach for pregnant and lactating women from marginalised community to identify and effectively deal with societal discrimination.
- To sensitize and provide training to skill birth attendants, health care providers such as ASHAs, ANMs and medical staff for avoiding biases related to healthcare.

Recommendations in existing policy and governance

According to latest NITI Aayog monitoring and evaluation report on the progress of the Union government's Poshan Abhiyan 2019-20 flags gaps and demands revised POSHAN plus and ICDS functioning, underpin challenges in programme implementation and questions its efficacy and efficiency for its outreach and effectively combat malnutrition for pregnant women and breastfeeding mothers in India. [xxviii]

- Focus shift on other social determinants such as food security, poverty alleviation, literacy level and sanitation along with strengthening the National Nutrition programme core pillars.
- The NITI Aayog's assessment and monitoring team highlighted in its report that although a variety of evidence suggests that the programme platforms have increased their reach, they are still failing to reach as many women and children as they ought to in high burden states.

- Take Home Ratio (THR) and growth tracking are two key interventions provided by the ICDS programme that require significant quality improvements to improve referrals to the health system for individuals needing inpatient care and to support community-based prevention, identification, and treatment of uncomplicated severe undernutrition.
- By maintaining strong linkage between the ICDS take-home rations and counselling, emphasising the need to make sure that both the take-home ration and behaviour modification counselling executed to every household with a child under the age of two. These two-programme intervention provide significant food security to vulnerable and food insecure households.
- To bring positive social behaviour change in household for better nutritional practices for pregnant and breast feeding women through using interpersonal communication, mass media platforms to widen the outreach using right platforms (using high reach, high recall platforms such as Home visits, community based events and television), Right messages (focusing on first 1000 days, training of frontline workers such as ASHAs in specific nutrition and health related concepts like importance of exclusive breast feeding, ANC check – ups, diversity in dietary patterns) to beneficiaries, targeting right audience(lower socio economic classes according to the availability and usage of various government SBCC platforms), and providing right quality(training of front line workers in delivering high quality counselling and addressing HOW & WHY as their subject matter expert during home visits or community based interventions).

8. Limitations

The NFHS dataset limitations are completeness of the data with many missing values have incurred bias to be crept in even when handled with caution.

The data used secondary knowledge collected cross – sectionally. The challenge with cross sectional studies is to require under consideration seasonal variations of the occurrence of many subjects.

Limitations at governance cannot be quantitatively assessed with limited knowledge on various stakeholders actively impacting the maternal and child health infrastructure.

To analyse social determinants such as gender, social barriers is a complex topic that requires qualitative research to understand the overview of the subject and draw conclusive evidence and significant conclusions.

Future research

Using Epidemiological research and household living conditions can be used to investigate further the spread of malnutrition related diseases and its link with PW and LW health.

Focused group discussions, interviews and other qualitative methods can be used to complement the quantitative analysis and to reduce bias.

The interconnected associations between caste, religion and nutrition assessment can further be analysed.

Annexures

Annexure – 1

List of Variables – Summary of variables extraction for logistic regression model

Annexure – 2

Women's questionnaire for NFHS – 5 (19-21)

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