

**A STUDY TO ANALYSE THE EFFECT OF FEMALE LITERACY AND
ACCESSIBILITY TO HEALTHCARE FACILITIES ON THE
PREVALENCE OF CHILDHOOD (6-59 MONTHS) ANEMIA IN RURAL
INDIA**

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by

Dr Gaurav Paul

Under the Supervision and Guidance of

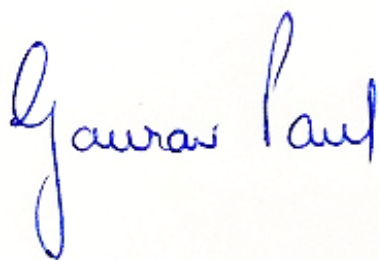
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2023

Declaration by student

I hereby declare that this dissertation titled 'The effect of female literacy and accessibility on the prevalence of childhood anemia (6-59 months) in rural India: a study of healthcare facilities is the bonafide record of my original research work. I declare that it has not been submitted to any other university or institution for the award of any degree or diploma. Information derived from the published or unpublished work of others has been duly acknowledged in the text.



Dr Gaurav Paul



CERTIFICATE

This is to certify that Gaurav Paul in partial fulfillment of the requirements for the award of the degree of MBA (Hospital and Health Management) from the IIHMR University, Jaipur has successfully completed her/his internship at Child Rights and You (CRY) during February 20- May 20, 2023.

Place: New Delhi

Date: 29.05.2023

A handwritten signature in blue ink, reading "Ragini Pant", is positioned above the printed name.

Ragini Pant, Senior Research Manager
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Child Rights and You

Certificate

This is to certify that dissertation titled ‘The effect of female literacy and accessibility on the prevalence of childhood anemia (6-59 months) in rural India: a study of healthcare facilities’ is a record of the research work undertaken by Dr. Gaurav Paul in partial fulfilment of the requirements for the award of the degree of MBA Hospital and Health Management from the IIHMR University, Jaipur under my guidance and supervision and his approach to the research study has been sincere, scientific and analytical.

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Abstract

Background:

For 6 to 59 months aged children, who live in rural regions, anemia is a tremendous and vastly grave medical problem in India. This study examined the relationship between female literacy and healthcare facility accessibility and the frequency of childhood anemia in rural India. We examined statistics on the prevalence of anemia, maternal education, and access to healthcare services from healthcare facilities all over India.

Methodology:

This dissertation used a review that included government reports, grey literature, and both qualitative and quantitative studies that have been published in peer-reviewed publications to evaluate the contribution of health infrastructure to reducing child mortality in India.

Indicators of childhood anemia (6–59 months) were taken from National Family Health Survey 5 (NFHS 5). Then, these indicators were correlated with data on female literacy from the NFHS 5 for various states of India. Shortage of health facilities data was taken from Rural Health Statistics 2021-22 (RHS 2021-22).

Results:

The study examined the relationship between female literacy and accessibility to healthcare settings with childhood anemia prevalence in rural India. The findings suggested that maternal literacy and healthcare access are important determinants of child health outcomes, including anemia. The study highlighted the need for integrated interventions that address both education and healthcare access to reduce the burden of anemia in India.

Discussion:

Implementation of female literacy programs faces several barriers, including socio-cultural factors, lack of resources, and inadequate infrastructure. The study emphasized the importance of sustained investment in healthcare infrastructure and education to improve child health outcomes in rural India.

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List of Abbreviations

NFHS	National Family Health Survey
RHS	Rural Health Statistics
WHO	World Health Organization
SIDA	Swedish International Development Cooperation Agency
ASER	Annual Status of Education Report
IFA	Iron Folic Acid
IMCI	Integrated Management of Childhood Illness
UNICEF	United Nations Children's Fund
POSHAN	Prime Minister's Overarching Scheme for Holistic Nutrition
SSA	Sarva Shiksha Abhiyan
BBBP	Beti Bachao Beti Padhao
AMB	Anemia Mukht Bharat

Chapter 1

Background

With a rate of 67.1%, which represents an almost 10% increase since the NFHS 4 (2015-16), the NFHS 5 (2019-21) reports that the occurrence of anemia among six to fifty-nine months is a severe public health concern. This number is alarming and raises major public health concerns.

One of the highest incidences of childhood anemia in the world is found in India, a country with a population of more than 1.3 billion. In South East Asia, India has the greatest prevalence of childhood anemia (6-59 months), which is only surpassed globally by the African continent¹. Anemia is a medical condition that is indicated to decrease amount of hemoglobin or cells in the blood. If addressed, it can result in serious health issues, such as cognitive impairment, developmental delays, and higher rates of morbidity and mortality.

Children who are anaemic may have weakness, weariness, attention problems, and delayed cognitive development. Anemia not only impairs the immune system but also makes a youngster more vulnerable to infections. Anemia is a significant public health issue in India due to its high prevalence, especially among demographic groups that are more vulnerable, such as mothers and children.

Poor diet, especially the absence of iron, folic acid, and vitamin B12 in the diet, is one of the main contributors of anemia in India². Other elements that contribute to the deterioration of a person's general health, such as poverty, restricted access to healthcare services, and poor sanitation and hygiene, make this situation even worse³. Anemia affects women more than males because of things including menstrual blood loss, pregnancy, and breastfeeding⁴. Preterm birth, poor birth weight, and maternal mortality are just a few of the negative effects of anemia during pregnancy.⁴ Anemia in children can result in delayed growth and development, increased morbidity, and mortality.

As mentioned in earlier studies^{5,7}, there are numerous socioeconomic factors that affect childhood anemia in addition to the clinical factors that affect it. Wealth, residence, maternal

education, and access to healthcare are a few of them. Maternal education is one of these that has received the least attention, and that is what this study will focus on.

The high incidence of child red blood cell disease in India caused by number of reasons. The health and wellbeing of children in India have been significantly impacted by the traditionally lower female literacy rates in India compared to male literacy rates.⁶ Anemia rates are decreased, and child health outcomes are improved as a result of maternal education, especially female literacy, according to a study⁸.

Accessibility to healthcare facilities is another significant factor that may have an impact on the prevalence of childhood anemia in addition to female literacy⁹. India has a complicated healthcare system with regional variations in accessibility and quality. If children live in a region with poor access to medical services or if they are unable to receive medical care due to financial or other obstacles, they may be more prone to develop anemia.

Understanding the factors that lead to this illness is crucial for creating efficient therapies given the high frequency of childhood anemia.

1.1 Burden of anemia in India and the world:

The prevalence of anemia among six groups as per the NFHS 5 (2019-21), is “25.0 percent in men (15-49 years) and 57.0 percent in women (15-49 years). 31.1 percent in adolescent boys (15-19 years), 59.1 percent in adolescent girls, 52.2 percent in pregnant women (15-49 years) and 67.1 percent in children (6-59 months)”¹⁰.

As per the Global Nutrition Report 2022, India has been categorized as “No progress or worsening”¹¹. India accounts for one of the highest anemia prevalent countries in Southeast Asia.

Addressing the burden of anemia in India is critical to improving the overall health and well-being of the population and achieving sustainable development. It requires a multi-sectoral approach that includes improving access to nutritious foods, providing iron supplementation and fortification, promoting good hygiene and sanitation, and increasing awareness about anemia and its prevention and treatment. These sectors include the “Health sector (Ministry of Health & Family Welfare), Women and Child development sector (Ministry of Women and Child Development), Water, sanitation, and hygiene sector (Ministry of Jal Shakti), Education sector (Ministry of Human Resource Development), Energy sector (Ministry of Petroleum

and Natural Gas) and Growth sector (Ministry of Finance/Ministry of Rural Development)”¹². The increase in female literacy will provide women more authority to decide for themselves and their children's health. The improvement in female literacy will in turn increase the utilization of medical services and hence yield greater benefit¹³.

As is evident by the above data, focus needs to be directed towards the management of anemia in 6-59 months children. Let us look at the different effects that anemia has at this young age:

- **Developmental outcomes:** Physical and cognitive development can be impeded in young children with anemia. Their capacity to study and perform in school may be negatively impacted by this, which may have an influence on their long-term educational outcomes and future employment chances.
- **Increased morbidity and mortality:** Infections like pneumonia and diarrhoea, which are major sources of morbidity and mortality in this age range, are more likely to affect children with anemia.
- **Long-term health implications:** Early childhood anemia may have long-term effects on an adult's ability to maintain good health. The likelihood of long-term illnesses like diabetes, cardiovascular disease, and cognitive decline has been linked to it.
- **Economic costs:** Young children with anemia may experience higher medical expenses, less productivity, and a lower quality of life. Families and the nation at large may suffer economically as a result of this.
- **Inter-generational implications:** Anemia in young children can have long-term consequences since it may harm the health of future generations. Preterm birth and low birth weight are two issues that are become more likely by anemia during pregnancy and can contribute to the anemia epidemic.

1.2 Initiatives to tackle anemia in India:

1. **National Iron+ Initiative:** With this plan, "all pregnant women," "children under the age of five," and adolescent females are to receive iron and folic acid supplements. The programme also involves public awareness initiatives to inform people about the value of consuming foods high in iron.
2. **Anemia Mukht Bharat (Anemia-free India) initiative:** Its stated goal is to "reduce the prevalence of anemia among women and children in India by 3% per year" as of 2018. The

programme comprises anemia testing, offering iron and folic acid supplements, and promoting the value of a healthy diet to the general public.

3. Weekly Iron and Folic Acid Supplementation (WIFS): Young people "between the ages of 10 and 19 years" are the target audience for this programme. Under this program, children are provided with "iron and folic acid supplements" on a weekly basis to prevent anemia.

4. Mission Indradhanush: This initiative aims to improve vaccination coverage in India, including the provision of vaccines for preventable diseases that can lead to anemia, such as measles and rubella.

5. Janani Suraksha Yojana: This program provides financial assistance to pregnant women for institutional deliveries and encourages them to avail of antenatal care services, including screening and treatment for anemia.

1.3 What is missing in different programs?

There has been multitude of programs and interventions that has been implemented by India. But as the data suggested, over the years, the efficacy of these programs has had questionable success. Female literacy, which is an important factor in the management of childhood anemia, has not been addressed or incorporated in any of the government schemes till date. For an individual's total health and well-being to improve, India must take a holistic approach to anemia control. This approach requires a sustained and multi-sectoral effort that addresses the multiple factors contributing to anemia and promotes healthy behaviors, access to healthcare services, and education.

1.4 Socio-Economic & Demographic Factors:

Proper nutrition is the key to effectively managing the burden of anemia, but it has also been pointed out in a study that, "socio-demographic factors like maternal age, type of residence and *maternal education*, as well as wealth index, among others correlate with incidence of childhood anemia"¹⁴.

Another study has identified a different set of factors namely, "higher birth order, high index of poverty, low level of *maternal education*, mother's anemia, non-intake of iron supplements during pregnancy"¹⁵.

1.5 Importance of Female Literacy:

Female literacy is one element that has been proposed to be crucial in lowering the occurrence of childhood anemia⁵. Literate females with children are more likely to have knowledge and awareness about nutrition and healthcare practices, which can influence their own behavior as well as that of their children. Several studies have examined the relationship between female literacy and the prevalence of childhood anemia in India. Children with literate moms had a lower prevalence of anemia than those with illiterate mothers, according to a study done in rural Maharashtra¹⁶. Another study conducted in various districts of India found that children aged 6-59 months exhibited a strong relationship between mother education and a lower risk of anemia¹⁷.

Although it has been shown in numerous studies that female literacy has a significant role in the occurrence of children anemia, nothing has been done to take this fact into account in interventional programmes.

1.6 Accessibility of Healthcare Services:

In developing countries, the poor access to healthcare services has led to inordinately high prevalence of anemia.¹⁸ “The unavailability of health care provision such as access to free nutritional supplements and dietary advice also acts as major barrier to the prevention of anemia”.¹⁹ “Access to health care is very much asymmetric between rural and urban India. While urban residents have a choice between public or private providers, the rural residents face far fewer choices”²⁰. The above-mentioned studies^{18,19,20} have demonstrated the importance that the public healthcare system plays in the health of a developing country. In a country where the Out-of-Pocket expenditure is huge, efforts to develop a healthcare system which is truly accessible to the far reach rural areas will be the epitome of success in the field of healthcare.

1.7 Research question

What is the relationship between female literacy, accessibility to healthcare services and the prevalence of childhood anemia among children aged 6-59 months in India, and what are the potential implications for public health policy and interventions?

1.8 Objectives:

- To analyze the prevalence of childhood anemia and correlate it with female literacy and accessibility to healthcare services among children aged 6-59 months in India, and its correlation with female literacy.
- To assess the potential implications of the findings for structuring guidelines for health of the population and solutions aimed at reducing childhood anemia in India, with a specifically on the role of female literacy and accessibility to healthcare.
- Identify the barriers and facilitators to the successful implementation of programs to reduce the burden of anemia in India and the improvement of female literacy.

Chapter 2

Literature Review

Sl. No.	Study Name	Year	Author	Location	Sampling Technique	Salient Features
1.	Prevalence and detecting spatial clustering of anemia among children 6–59 months in the districts of India	2021	Koustav Ghosh, Gayatri Sanjiv Desai	All India	Multistage stratified sampling	Study finds 110 districts as the hot-spot areas mostly from central, western, south-western, northern, and eastern parts of India. Increase of mother's age, education, receipt of full ANC and richer wealth quantile reduce the risk of childhood anemia.
2.	Trends and drivers of change in the prevalence of anemia among 1 million women and children in India, 2006 to 2016	2018	Phuong Hong Nguyen, Samuel Scott, Rasmi Avula, Lan Mai Tran, Purnima Menon	All India	Multistage stratified sampling	Changes among a set of drivers common to children and PW accounted for the changes in Hb; these included maternal schooling (children, 10%; PW, 24%), coverage of NHIs (children, 18%; PW, 7%), socioeconomic status (children, 7%; PW, 17%), sanitation (children, 3%; PW, 9%), and meat and fish consumption

						(children, 3%; PW, 1%)
3.	Determinants of Childhood Anemia in India	2019	Nkechi G. Onyeneho, Benjamin C. Ozumba & S. V. Subramanian	All India	Multistate, stratified cluster sampling	A number of socio-demographic factors, namely maternal age, type of residence and maternal education correlate with incidence of anemia in the children
4.	Prevalence of Anemia Among Adolescent Girls in a Rural Area of Tamil Nadu, India	2019	Abilash Sasidharannair Chandrakumari, Pammy Sinha, Shreelakshmidevi Singaravelu, S Jaikumar	Tamil Nadu	NA	A notable relationship between anemia and socioeconomic status strongly recommends the need for developing and implementing policies which improve and eliminate socioeconomic disparities.
5.	Prevalence of Anemia and Its Determinants Among Pregnant, Lactating, and Nonpregnant Nonlactating Women in India	2017	Mohammad Zahid Siddiqui, Srinivas Goli, Tamal Reja, Riddhi Doshi, Swastika Chakravorty, Chhavi Tiwari, Nomita P. Kumar, and Deepshikha Singh	All India	Multistage stratified sampling	Existing program interventions are ineffective to bring them out of vicious cycle of anemia.
6.	Women literacy and prevalence of anemia for children: A district level analysis in West Bengal	2022	Satchidananda Sardar	West Bengal	Multistage stratified sampling	Female literacy rate is one of the social factors that has led to the increase in anemia

7.	Identifying Predictors of Childhood Anemia in North-East India	2013	Sanku Dey, Sankar Goswami, Tanujit Dey	Northeast India	systematic multistage stratified sampling	The literacy factor shows that children of literate mothers were comparatively at lesser risk of severe anemia than children of non-literate mothers, but they too were at higher risk of moderate and mild anemia
8.	Coresidence with mother-in-law and maternal anemia in rural India	2022	Rekha Varghese, Manan Roy	All India	Multistage stratified sampling	Women coresiding with both in-laws had fewer children, were younger, more educated & wealthier
9.	National Iron Plus Initiative: Current status & future strategy	2019	Umesh Kapil, Radhika Kapil, Aakriti Gupta	All India	Narrative review	The coverage of beneficiaries with iron and folic acid has been poor at the national level. The prevalence of anaemia has continued to remain high during the last 60 years, and there has been no significant change in the scenario due to various reasons
10.	Coverage of iron and folic acid supplementation in India: progress under the Anemia Mukht Bharat strategy 2017–20	2022	William Joe, Rinju, Narendra Patel, Ruby Alambusha, Bharati Kulkarni, Kapil Yadav, and Vani Sethi	All India	NA	AMB training and sensitization workshops have a favorable impact on increasing IFA supplementation coverage across states.

11.	Socio-economic and demographic determinants of childhood anemia	2015	Sankar Goswami, Kishore K. Das	All India	Multistage stratified sampling	Higher birth order, high index of poverty, low level of maternal education, mother's anemia, non-intake of iron supplements during pregnancy, and vegetarian mother increased the risks of all types of anemia among children
12.	Issues of Unequal Access to Public Health in India	2015	Debasis Barik and Amit Thorat	All India	NA	Access to health care is very much asymmetric between rural and urban India. Well-equipped health facilities in the vicinity and knowledge of disease conditions can improve the access of public health services
13.	Maternal iron-and-folic-acid supplementation and its association with low-birth weight and neonatal	2021	Rajesh Kumar Rai, Jan-Walter De Neve, Pascal Geldsetzer, Sebastian Vollmer	All India	Multistage stratified sampling	While ≥ 100 IFA consumption during pregnancy was found to be associated with preventing select types of

	mortality in India					LBW and neonatal mortality, a large variation in coverage of ≥ 100 IFA consumption across 640 districts is concerning.
14.	The use of incentives to reinforce medication adherence	2012	Anthony DeFulio, Kenneth Silverman	Review	NA	Incentive-based medication adherence interventions are promising but understudied. A significant challenge for research in this area is the development of sustainable and cost-effective long-term interventions.
15.	Moving beyond individual barriers and identifying multi-level strategies to reduce anemia in Odisha India	2020	Erica Sedlander, Michael W. Long, Satyanarayan Mohanty, Ashita Munjral, Jeffrey B. Bingenheimer, Hagere Yilma & Rajiv N. Rimal	Odisha	Random Sampling	Behavioral specificity is largely ignored (which primarily focuses on IFA supply and adherence)
16.	Anemia Among Children Under 5 Years in India: A District-Level Spatial Analysis Using NFHS-5 Data	2022	Amitha Puranik, Shreya N	All India	Multistage stratified sampling	Factors such as prevalence of nutritional supplementation in children and mothers, birth order, antenatal care, diarrhea in children, and stunting were found to be significantly associated.

Chapter 3

Methodology

Research Design:

This dissertation evaluated the existing literature on the role of health infrastructure in reducing child mortality in India. The review included secondary research of both qualitative and quantitative studies published in peer-reviewed journals, government reports, and grey literature.

Childhood (6-59 months) anemia indicators were drawn from NFHS 5. Following that, these indicators had been compared with female literacy data of various states that too from NFHS 5. Data for the accessibility of public healthcare facilities was drawn from RHS 21-22.

For data analysis, MS Excel 365 was used to calculate correlation coefficients of both female and male literacy with respect to anemia under 5 years of age.

Inclusion terms: “maternal literacy/education” AND/OR “female literacy/education”, “childhood anemia” AND/OR “anemia of children under 5 years” OR “anemia under 6-59 months” AND “healthcare facilities accessibility” OR “access to public healthcare system”.

In addition, the method of snowball article collection (citations from relevant journal articles) was also used.

The original search terms generated 639 results.

Exclusion terms:

“Inherited diseases” AND “autoimmune diseases” AND “anemia due to syndrome” resulted in 286 results. Further the search was refined by limiting studies to India which led to a total of 17 results.

These search results of the studies were generated from the peer-reviewed database PubMed.

Chapter-4

Results & Discussions

4.1 Data Analysis & Results

4.1.1 Anemia Data

The anemia data was taken up from NFHS 5 from the category, ‘Children age 6-59 months who are anemic (<11.0 g/dl)22 (%)’

The NFHS 5 data (2019-2021) is collected using a multistage cluster sampling which covers all the states and UTs of India.

Table 4. 1 Data of anemic children aged 6-59 months

Children age 6-59 months who are anaemic (<11.0 g/dl)	Urban (%)	Rural (%)	Total (%)
India	64.2	68.3	67.1
Arunachal Pradesh	52.8	57.1	56.6
Chhattisgarh	71.1	66.2	67.2
Haryana	68.1	71.5	70.4
Jharkhand	65.5	67.9	67.5
Madhya Pradesh	72.5	72.7	72.7
Odisha	56.2	65.6	64.2
Punjab	71	71.1	71.1
Rajasthan	68.3	72.4	71.5
Tamil Nadu	53.7	60.4	57.4
Uttar Pradesh	65.3	66.7	66.4
Uttarakhand	63.8	56.6	58.8
Chandigarh	55	*	54.6
NCT Delhi	68.7	81.7	69.2
Puducherry	65.3	60.8	64
A&N	47.8	33.3	40
Andhra Pradesh	58.7	65	63.2
Assam	66.4	68.6	68.4
Bihar	67.9	69.7	69.4
Goa	53.3	53.1	53.2

Gujarat	77.6	81.2	79.7
Himachal Pradesh	58.2	55	55.4
J&K	70.1	73.5	72.7
Karnataka	62.8	67.1	65.5
Kerala	38.9	39.8	39.4
Lakshadweep	45.5	36.1	43.1
Ladakh	84.1	95.1	92.5
Maharashtra	66.3	70.7	68.9
Meghalaya	38.8	46	45.1
Manipur	44	42.2	42.8
Mizoram	42.8	49.6	46.4
Nagaland	46.4	41.4	42.7
Sikkim	54.8	57.1	56.4
Telangana	64.7	72.8	70
Tripura	57.3	66.5	64.3
West Bengal	63	71.3	69

A cursory glance of the above data shows clearly that the prevalence of anemia in the rural areas of India are greater than the urban areas. The various reasons for this difference have been well documented in various research studies^{21,22}. The various socio-economic factors contributing to anemia have been discussed in the previous sections. It has been understood that the level of household income and low socioeconomic status play a crucial role in the development of anemia¹⁸. Hence, it is clear that the availability of a better standard of living in the urban areas in comparison with the rural side may have a definite advantage, no matter how small the difference.

4.1.2 Female Literacy Data

The female literacy data has also been taken up from NFHS 5 from the following category, 'Women who are literate (%)'. It is to be noted that in this study, the female literacy data has been used in exchange with maternal literacy as the data in NFHS 5 corresponds to data taken in 15-49 years women which is also the reproductive age of women.

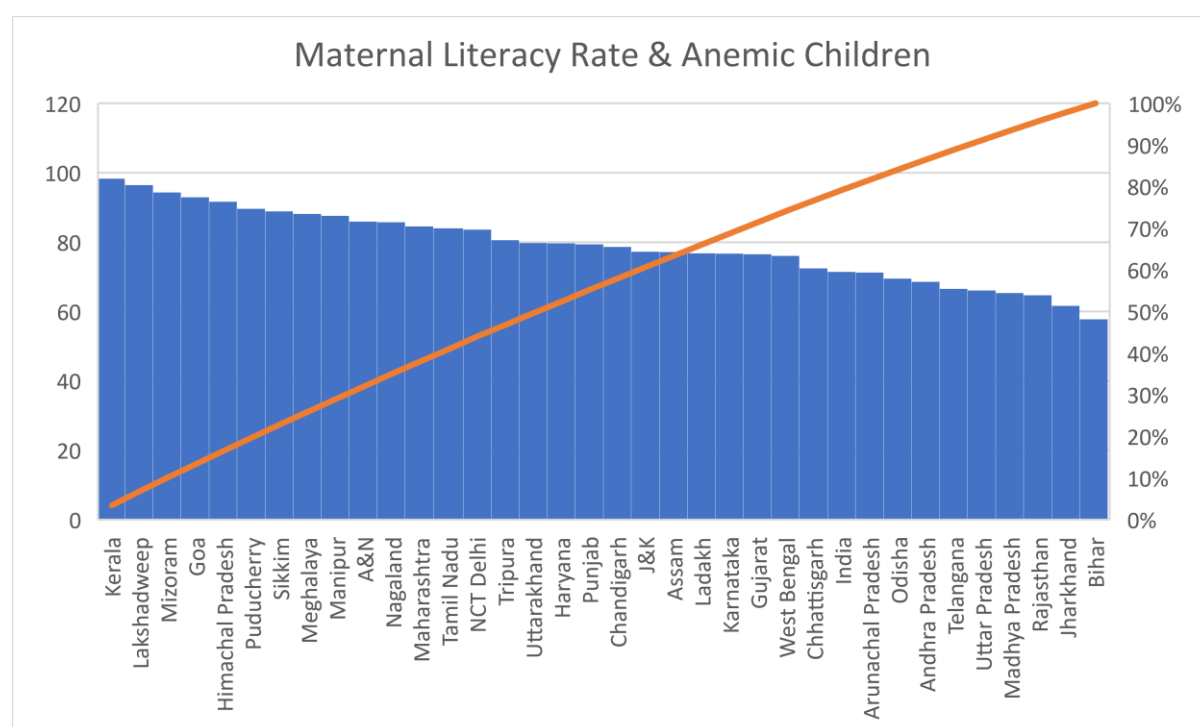
Table 4. 2 Data of literacy rate of women (15-49 years)

Women who are literate	Urban (%)	Rural (%)	Total (%)
India	83	65.9	71.5
Arunachal Pradesh	82.9	69	71.3
Chhattisgarh	83.4	69.1	72.5
Haryana	85.7	76.7	79.7
Jharkhand	80.1	55.6	61.7
Madhya Pradesh	81.5	59.2	65.4
Odisha	81.9	66.7	69.5
Punjab	81.6	78	79.4
Rajasthan	80.1	59.9	64.7
Tamil Nadu	88.9	79.6	84
Uttar Pradesh	77.2	62.4	66.1
Uttarakhand	83.4	78	79.8
Chandigarh	78.9	-57.7	78.7
NCT Delhi	83.6	87.8	83.7
Puducherry	90.7	87.4	89.7
A&N	86.6	85.6	86
Andhra Pradesh	79	63.8	68.6
Assam	87.5	75.4	77.2
Bihar	74.9	54.5	57.8
Goa	92.6	93.4	93
Gujarat	86.8	69	76.5
Himachal Pradesh	95	91.2	91.7
J&K	84.3	74.7	77.3
Karnataka	85.1	71	76.7
Kerala	99.1	97.5	98.3
Lakshadweep	96.4	96.8	96.5
Ladakh	77.7	76.6	76.8
Maharashtra	90.2	79.5	84.6
Meghalaya	97.1	85.5	88.2
Manipur	92.1	84.8	87.6
Mizoram	99.1	87.7	94.4
Nagaland	91.5	82.7	85.8
Sikkim	92.8	86.2	88.9
Telangana	81	58.1	66.6
Tripura	89.9	76.9	80.6
West Bengal	83.4	72.5	76.1

The above table again shows a much glaring disparity in the literacy rate of women in the rural and urban areas. One common fact among all the states is that the urban population is at an advantage with respect to education in comparison to the rural counterpart. It is also to be noted that while the national literacy rate for urban areas stands at 83%, none of the larger states except Kerala have been able to cross the 80% mark in rural areas.

4.1.3 Analysis of Maternal Literacy with respect to Anemia in Children

Figure 4. 1 Pareto graph representing influence of maternal literacy on childhood anemia.



The above Pareto graph has been plotted taking into consideration maternal literacy and the prevalence of anemic children. It can be clearly observed that, as female literacy decreases, the percentage of anemic children increases as represented by the Pareto line. From the above Pareto analysis, the following states have the lowest female literacy rates and consequentially the highest children having anemia in 6-59 months of age:

1. Bihar
2. Jharkhand

3. Rajasthan
4. Madhya Pradesh
5. Uttar Pradesh

The results of the Pearson correlation analysis revealed that there was a negative correlation between maternal literacy and anemia in children between 6-59 months.

$R(33) = -0.63, p < .001$.

In other words, the Pareto graph was justified by the fact that, as *female literacy increased*, *anemia in children decreased*.

Another Pearson correlation analysis was conducted to find out a correlation between male literacy and anemia in children between 6-59 months. *It was found in that analysis that female literacy correlation ($r = -0.63, p < .001$), was higher than male literacy correlation ($r = -0.43, p < .001$).*

4.1.4 Accessibility of Healthcare Services

According to the Accessibility Standard for Healthcare²³ published by the Ministry of Health & Family Welfare, “accessible healthcare requires the *availability of services*.”

To assess the availability of healthcare facilities, data regarding the shortfall of health facilities among different states and UTs in India is used from the RHS 2021-22²⁴.

Table 4. 3 Shortage of health facilities

State/ UT	Total Shortage [#]
Bihar	189
Jharkhand	157
Uttar Pradesh	137
Madhya Pradesh	116
West Bengal	116
Telangana	106
Manipur	104
Maharashtra	101
All India	92
Assam	79

Puducherry	70
Haryana	67
Meghalaya	60
Andhra Pradesh	54
Punjab	46
Karnataka	45
Delhi	43
Chhattisgarh	40
Odisha	33
Sikkim	33
Jammu & Kashmir	33
Uttarakhand	17
Tripura	16
Arunachal Pradesh	0
Goa	0
Gujarat	0
Himachal Pradesh	0
Kerala	0
Mizoram	0
Nagaland	0
Rajasthan	0
Tamil Nadu	0
A & N Islands	0
Chandigarh	0
D & N Haveli and Daman & Diu	0
Ladakh	0
Lakshadweep	0

Total shortage is calculated by summation of the percent shortages of SCs, PHCs, and CHCs in the respective states.

It is interesting to note that 4 out of the top 5 states identified to have the highest anemic children in relation to maternal literacy, also have the highest shortfall of healthcare facilities in the rural areas. Table 4.3 shows the percentage shortage of health facilities in rural areas. It indicates that Bihar, Jharkhand, Uttar Pradesh, Madhya Pradesh, and West Bengal are the top five states that have shortage of health facilities. Interestingly, it can be seen in Figure 1, that Bihar, Jharkhand, Uttar Pradesh and Madhya Pradesh also feature in the lowest among all states, when maternal education and prevalence of childhood anemia is considered.

4.2 Discussion

The use of secondary data sources, which might not adequately reflect the intricacies of the association between maternal literacy, healthcare access, and childhood anemia, is one of the study's limitations. The study's conclusions are also restricted to rural areas of India and might not apply to cities. To further understand how maternal education and access to healthcare affect child health outcomes in rural India, more study is required.

The study's conclusions offer crucial insights into the connection between female literacy and childhood anemia in rural India, notwithstanding these drawbacks.

According to the study's findings, childhood anemia in rural India declines as female literacy rises. This finding is in line with other research that demonstrated a beneficial relationship between education and health outcomes, particularly for women and children²⁵.

The study's findings also indicate that the correlation between maternal literacy and childhood anemia is greater for females than males, highlighting the importance of women's education in improving child health outcomes.

Although persistent efforts have been made in the field of female literacy and in the management of anemia, the results have not been commensurate with the efforts. This may be attributed to the multifaceted nature of the issues at hand and the lack of a holistic idea or scheme that can encompass the entirety of the factors examined in this study.

Multiple *barriers to female education* have been identified in various studies and reports. Some of these include-

1. **Poverty:** Poverty is a major barrier to education for girls in India, especially in rural areas. A study found that poverty was the main reason for dropouts among girls in India²⁶. For families in poverty, the expense of education—which includes uniforms, books, and transportation—is frequently exorbitant.
2. **Social and cultural norms:** In many parts of India, social and cultural norms limit women's access to education. It's common for girls to be expected to stay home and assist with household duties, and it's thought that investing in girls' education is not profitable. Because of worries for their safety, several families are hesitant to bring their daughters to school. According to a study conducted by the Indian government,

females were more likely to leave school if they resided in regions with greater rates of gender discrimination²⁷.

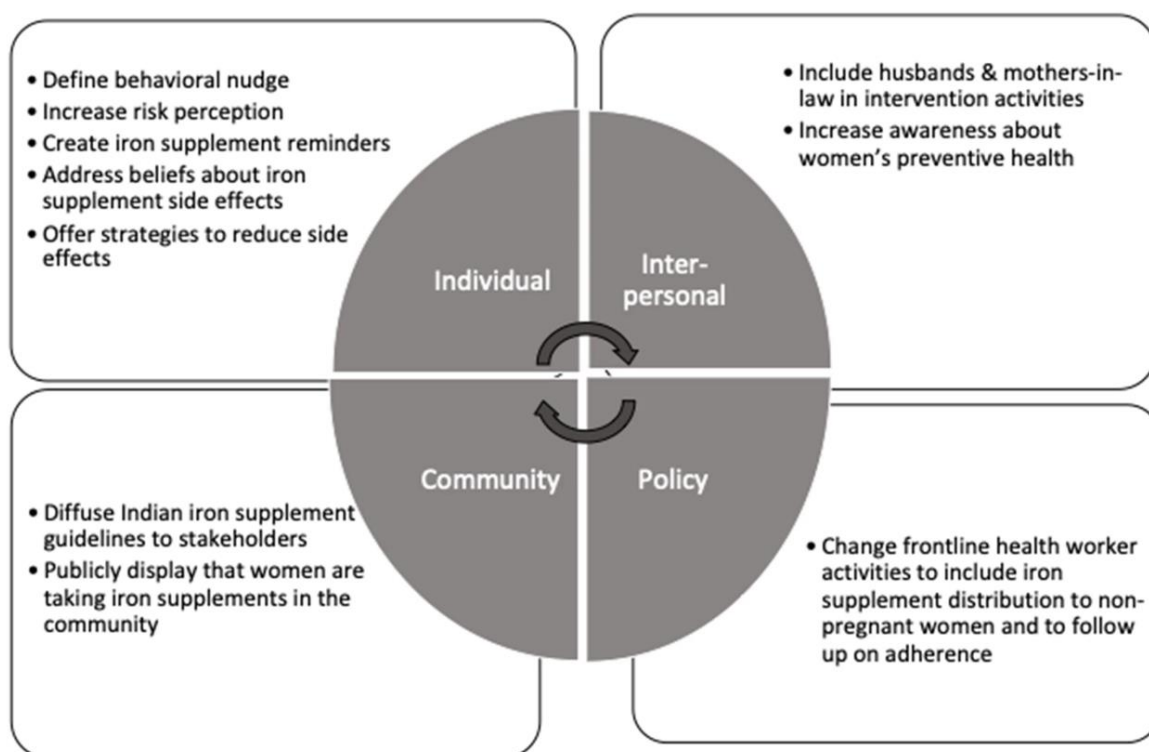
3. Lack of infrastructure: Basic educational amenities including classrooms, restrooms, and drinking water sources are sometimes lacking in remote schools. According to the Unified District Information System for Education Plus (UDISE+) 2018–19, of the 10,83,747 government schools nationwide, 10,41,327 have access to drinking water, and 10,68,726 have restrooms.²⁸.
4. Gender-based violence: Girls in India face considerable obstacles to pursuing an education because of gender-based violence, which includes sexual harassment and assault. Girls who encounter gender-based violence are more likely to drop out of school, according to a 2016 report (SIDA, 2016)²⁹. Additionally, parents may hesitate to bring their girls to school out of fear of violence.
5. Poor quality of education: Another obstacle to girls' education in India is the school system's poor quality. Children's needs are usually not met by the curriculum, and many schools lack trained teachers and instructional materials. According to a study by the Annual Status of Education Report (ASER), many kids in rural areas struggle to read and write at a level that is appropriate for their age.³⁰.

Poor nutrition is a significant obstacle to the effective execution of programmes to reduce anemia in India. Many individuals in India lack access to a healthy food that can prevent anemia, and poor nutrition is frequently associated with anemia. According to the National Family Health Survey 5, more than half of Indian women and children between the ages of 6 and 59 months and 15 to 49 were found to be anaemic. In order to prevent and treat anemia, dietary treatments are essential.

The ineffective management of anemia in India is also significantly hampered by the country's inadequate healthcare infrastructure. The successful management of anemia may be hampered by a lack of diagnostic resources and properly trained medical personnel. Building the capacity of healthcare personnel is one of the crucial interventions at the facility level, according to a study³¹ done in a slum of Kolkata. Addressing these infrastructure gaps is crucial for the effective management of anemia.

Poor adherence to treatment is another major challenge in the management of anemia in India. Many patients do not adhere to treatment due to the cost of treatment, lack of access to treatment, and side effects of treatment³². Addressing these issues requires a multifaceted approach that includes improving access to treatment, reducing the cost of treatment, and addressing the side effects of treatment.

Figure 4. 2 Suggested intervening factors at multiple levels



Suggested intervening factors

The above illustration³² provides a framework as to the kind of approach that will be needed to boost adherence to the IFA regimen and induce behavioral changes that will improve IFA intake.

There are also several facilitators that can contribute to the successful implementation of anemia reduction programs in India. Awareness campaigns can increase the knowledge and awareness of anemia and its consequences among the general public. Many programs have recorded success in their implementation and have brought about positive changes.

The POSHAN (Prime Minister's Overarching Scheme for Holistic Nutrition) Abhiyan (aims to reduce anemia by 3 percent annually) was launched by the Government of India in 2018 and conducted by *Poshan Maah* in September 2021. In this event, over 120 million women, 60 million men, and 130 million children were reached. This highlights the need for targeted awareness campaigns that reach vulnerable populations. This underscores the importance of nutritional interventions to prevent and treat anemia.

Beti Bachao Beti Padhao (BBBP) scheme was launched in 2015 and ever since there has been an improvement in bringing behavioral change in society towards the rights of girl children. This is evident by the fact that during the last 6 years, the Sex Ratio at Birth (SRB) has improved by 16 points from 918 in 2014-15 to 934 in 2019-20. The Gross Enrolment Ratio of girls in the schools at the secondary level has improved from 77.45 to 81.32.

Strengthening the healthcare infrastructure, including the training of healthcare providers and the provision of diagnostic facilities, can improve the management of anemia. The Integrated Management of Childhood Illness (IMCI) is a strategy formulated by the World Health Organization (WHO) and the United Nations Children's Fund (UNICEF), which states that, strengthening the healthcare system is essential for the effective management of childhood anemia³³. This requires sustained investment in the healthcare infrastructure and the training of healthcare providers.

Anemia Mukht Bharat (AMB) launched in 2018 with the target to reduce anemia in the vulnerable age groups such as women, children, and adolescents in life cycle approach. While the program has been ambitiously designed to be implemented through six strategies, it fails to address the issue of adherence to IFA supplementation.

Providing incentives, such as financial incentives or free treatment, can improve adherence to treatment and reduce the burden of anemia. A study³⁴ has indicated clearly that incentives increased adherence by a mean of 20 percentage points. The Janani Suraksha Yojana (JSY) had a significant effect on increasing antenatal care and in-facility births. JSY payment was associated with a reduction of 3.7 perinatal deaths per 1000 pregnancies and 2.3 neonatal deaths per 1000 livebirths¹⁶. This emphasizes the requirement for novel strategies to deal with treatment adherence obstacles. The study's findings have important implications for

public health practitioners and policymakers in India. The Sarva Shiksha Abhiyan (SSA) and Beti Bachao, Beti Padhao (BBBP) campaigns, two government initiatives aimed at increasing female literacy, have significantly boosted the proportion of women in India who are literate.

Maternal literacy is crucial to addressing this issue since educated mothers are more likely to seek medical attention for both them and their children. However, the lack of healthcare facilities in rural areas may make it difficult for literate women to get anemia therapy.

In addition, a study³⁵ found a link in rural India between maternal education and the utilisation of healthcare facilities. According to the findings of this study, educated women were more likely to use healthcare facilities for both them and their children, including anemia therapy. This demonstrates the necessity of spending money on maternal literacy in order to increase the use of healthcare facilities in rural areas.

Additionally, a delay in obtaining anemia treatment might have major repercussions because healthcare facilities are difficult to access in rural locations. Numerous health issues, such as diminished cognitive function, lower productivity at work, and an increased risk of mortality, can be brought on by anemia. To avoid these problems, prompt diagnosis and treatment are crucial.

There is a need for ongoing investment in the healthcare infrastructure, particularly the supply of diagnostic facilities and the education of healthcare professionals, to solve the issue of accessibility to healthcare facilities in rural areas. This calls for a multifaceted strategy that includes expanding access to healthcare services, bringing down the cost of care, and raising public understanding of anemia.

It is intricate and multidimensional how maternal literacy and childhood anemia are related. While maternal literacy might be very significant in combating the anemia problem, it is also crucial to deal with the problem of access to healthcare facilities in rural India. It is necessary to make ongoing investments in rural women's education and healthcare facilities in order to address these concerns.

According to the study, efforts to increase female literacy can significantly lower the incidence of childhood anemia. In order to enhance child health outcomes in rural areas, the study also emphasises the necessity for coordinated interventions that address both education and healthcare access.

The results of the study highlight the significance of spending money on healthcare and education to enhance child health outcomes in rural India. In order to enhance child health outcomes, integrated interventions that target both education and healthcare access are required, as shown by the study's findings, which also demonstrate the strong association between female literacy and childhood anemia in rural India. To further understand how maternal education and access to healthcare affect child health outcomes in rural India, more study is required. To enhance child health outcomes in rural India, policymakers and public health practitioners should give priority to education and healthcare access, according to the study's findings.

4.3 Key Findings:

- There is a negative correlation between maternal literacy and anemia in children between 6-59 months.
- Having easy access to medical services is crucial for managing and preventing anemia.
- To overcome the limitations of the current programmes, a comprehensive strategy incorporating female literacy and healthcare facility accessibility needs to be conceived.

Chapter-5

Conclusion

The study offers proof of the significant connection between female literacy and paediatric anemia in rural India. According to the study's findings, increasing mother literacy and access to healthcare can significantly lower the incidence of childhood anemia.

In rural India, there are complex and nuanced interactions between maternal literacy and childhood anemia. The frequency of childhood anemia and mother literacy rates are directly correlated in this dissertation, with higher literacy rates being associated with reduced anemia prevalence.

To further understand how maternal education and access to healthcare affect child health outcomes in rural India, more study is required. To enhance child health outcomes in rural India, policymakers and public health practitioners should give priority to education and healthcare access, according to the study's findings.

Additional investigation is required, which would entail conducting a large-scale survey of both rural and urban populations. While NFHS is carried out with respect to both urban and rural population, RHS restricts itself to the rural side. Increasing the frequency of these studies can also provide us with real time information to better equip ourselves. This would paint a more accurate picture of the relationship between anemia prevalence across the country and female literacy, access to healthcare, and healthcare utilisation. An interventional component, such as the carefully supervised delivery of IFA tablets, may also be present in these trials. Using the aforementioned criteria, a longitudinal study will provide a more complete picture and inform our policymakers about the practicality of potential solutions.

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