

Addressing Anaemia in Indian Pregnant Women: Examining the Challenges and Developing a Future Direction

Komal Singh¹, Dr. Sween Sheoran², Rohini Singh³

¹Department of Food & Nutrition, BBAU, Satellite Centre, Tikarmani, Amethi, Uttar Pradesh

²Associate Professor, Department of Radiology, Command Hospital Air Force, Bangalore

³Govt Medical College, Azamgarh, Uttar Pradesh

Email ID : komalsingh16037@gmail.com

ABSTRACT

This study looked at the barriers and variables affecting the prevention and management of anaemia in Indian pregnant women. Prenatal care must be continued in order to produce healthy babies and positive delivery outcomes. However, pregnant women frequently consume insufficient amounts of vital nutrients, especially in lower- and middle-income countries like India, which leads to high rates of mother and newborn mortality. Individual, economical, interpersonal, and organisational variables all have a role in the prevention and treatment of anaemia. The prevalence of anaemia in pregnant women in various Indian states was covered in this study. In addition to stressing the necessity for comprehensive strategies that successfully address the many levels of influence required to prevent and cure anaemia, it emphasises the measures and activities the government and World Health Organisation (WHO) have put in place to address the problem. To guarantee adequate diet and iron supplements, it demands more knowledge, better education, and better healthcare services. Effective anaemia prevention and treatment initiatives depend on bolstering healthcare infrastructure and enlisting the help of family members and medical professionals in assisting expectant mothers.

Keywords: Iron deficiency anemia, Maternal and infant mortality, Anemia Mukh Bharat, Iron and Folic acid, High-risk pregnancy, Severe anemia in pregnancy, Pregnant females

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1. INTRODUCTION

It is often known that maintaining adequate diet has several benefits, particularly during prenatal care. Healthy and balanced diets throughout pregnancy result in better birth outcomes and healthier babies. Nutrient deficiencies, including insufficient intake of vitamins, minerals, proteins, iron, and folic acid (IFA) based on appropriate levels for both mother and child, are common in poorer and middle-income countries (Marshall et al., 2022). One out of four Indian women, according to the National Family Health Survey-4 (NFHS-4), have an undernourished diet, with a body mass index (BMI) of less than 18.5 kg/m², which results in deficits such iron deficiency anaemia. The most effective and scalable strategy that lessens the burden of undernutrition and has been demonstrated to have a favourable influence on a number of health outcomes is giving mothers nutrition supplements in the form of IFA tablets (WHO, 2020). Pregnant women who have haemoglobin (Hb) levels of 11 g/dL or higher are classified as non-anemic according to the World Health Organization's categorisation of anaemia. People who have haemoglobin values between 10.0 and 10.9 g/dL are considered mildly anaemic, while those who have haemoglobin levels between 7.0 and 9.9 g/dL are considered moderately anaemic. Finally, a person is considered severe anaemic if their haemoglobin levels are less than 7.0 g/dL. Over the years, India has put in place a number of health initiatives to avoid anaemia, yet more than half of expectant mothers still suffer from it. This study evaluates the attitudes and behaviours of women with anaemia towards their disease and looks at the barriers to avoiding anaemia (Kalaivani and Ramachandran, 2018).

Review

2. METHODOLOGY

Eligibility Criteria

All review papers and original research that examined the variables affecting anaemia in expectant mothers met the qualifying requirements. Included were review papers that covered the fundamentals of anaemia and government initiatives

to combat pregnancy. Studies and articles that addressed anaemia in males or children were not included. Other exclusion criteria did not exist.

3. LITERATURE SEARCH STRATEGY

Each and every author searched the literature. The search for relevant material was conducted using the PubMed electronic database. Articles from 2011 to 2025 were among the publications that were searched; the most recent search was conducted on July 2, 2025. To find relevant material, the following keywords were used: "anaemia," "pregnancy," "maternal mortality," "infant mortality," "Anaemia Mukht Bharat," "low-weight babies," "high-risk pregnancy," and "iron deficiency anaemia." Both "AND" and "OR" adjuncts were used in conjunction with these to evaluate certain article subtopics

Data Extraction

Each author individually read the abstracts of the publications that came from the literature search. The whole texts of those who satisfied the selection criteria were examined and evaluated. The flow chart in Figure 1 illustrates the search procedure.

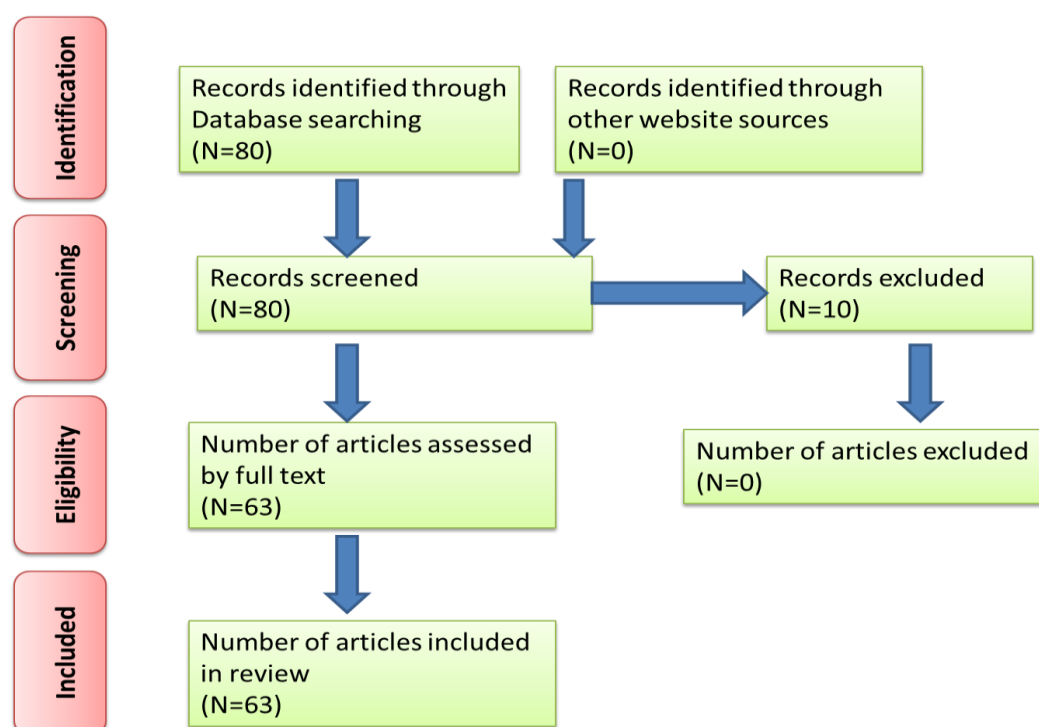


Fig. 1: PRISMA flow diagram for choosing and screening articles for variables affecting pregnant women's anaemia. PRISMA stands for Preferred Reporting Items for Meta-Analyses and Systematic Reviews.

Interventions taken by the government

The World Health Organisation (WHO) and the Indian government have been working together to address anaemia, one of the country's main health issues. 52.2% of pregnant women in the nation between the ages of 15 and 49 are deemed anaemic, according data from the National Family Health Survey (NFHS-5). Ladakh (78.1%), Bihar (63.1%), Gujarat (62.6%), West Bengal (62.3%), and Odisha (61.8%) are the states with the greatest frequency. The state or union territory (UT) government in question is primarily responsible for improving healthcare services, which includes carrying out National Health Programs. However, under the National Health Mission (NHM), the Ministry of Health and Family Welfare provides both financial and technical assistance.

The Anemia Mukht Bharat (AMB) initiative, which the Indian government introduced in 2018, aims to eliminate anemia in mothers, children, and adolescents using a life cycle approach. An integrated approach has been implemented to combat anemia in specific populations, focusing mainly on adolescent girls and pregnant women. The strategies include targeted interventions such as providing preventive IFA supplements to girls aged between 10 and 19 years, conducting behavior change communication campaigns, promoting delayed cord clamping, and utilizing digital hemoglobinometers as a point of care testing (POCT) for immediate anemia testing and treatment.

Certain locations also place emphasis on addressing issues that go beyond diet, such as fluorosis, haemoglobin abnormalities,

and malaria. Pregnant women with severe anaemia are treated with intravenous iron sucrose or blood transfusions, and medical staff in high-priority regions are encouraged to spot and track instances. A nationwide deworming program is also carried out twice a year for pregnant women, women of reproductive age, and children ages 1 to 19. In order to guarantee successful implementation, medical officials and frontline staff are trained on new recommendations, and Accredited Social Health Activists (ASHAs) run awareness campaigns at the community level. Rajasthan, Madhya Pradesh, Haryana, Jharkhand, and Bihar are among the states covered by the AMB's anaemia case management interventions for expecting mothers (government anaemia eradication movement, 2020).

Factors

We have put the factors into a model to help us understand the obstacles to avoiding anaemia. The model is separated into the following four major categories: (1) personal, (2) financial, (3) cultural, and (4) institutional. The factors influencing obstacles to pregnancy prevention. It has been broken down into individual variables and the four previously stated groups.

These ideas recognise that a person's behaviour and health are influenced by their systems, immediate environment, and interpersonal relationships. The idea covers a wide range of influence levels that may be used to affect people's quality of life, including organisational, cultural, and individual factors. Health is greatly impacted by each of these effect levels (Williams et al., 2020).

4. INDIVIDUAL FACTORS

Awareness

A 2021 research of 210 anaemic mothers in India found that 35.2% of the participants knew about the need for iron during pregnancy, 74.8% knew about iron supplement pills, and 35.2% knew about iron tablets that the government distributed for free. The importance of "eating well" was acknowledged by the participants. They also concurred that foods high in iron include spinach, carrots, pomegranates, jaggery, beets, and green vegetables. Regardless, the cost of food proved to be a deterrent to healthy eating (Williams et al., 2020; Mishra et al., 2021). Participant awareness of anaemia prophylaxis and the need for iron to raise blood counts was found to be "moderate" in another Puducherry research that was published in 2020. Because the health providers focused on providing health information, many moms reported taking iron supplements (Lavanya et al., 2020).

Attitudes

According to an Indian study, these women's opinions on anaemia varied; 48.1% thought pallor meant anaemia needed to be treated, while 54.7% thought gaining weight was essential for a good pregnancy. Just 20.9% of respondents thought that experiencing shortness of breath and being easily tired were concerning. 61.9% of women increased their intake of iron, folic acid, and calcium. Just 9.5% of expectant mothers maintained taking iron supplements on a regular basis and had their haemoglobin levels monitored during the first trimester. In this experiment, 90% of individuals did not take their iron supplements as prescribed. Twenty percent were unable to comply because they were forgetful, and 21.5% were unable to comply because there were not enough materials. Due to adverse effects, including constipation (4.7%) and gastritis (5.7%), many women refused to maintain consistency (Mishra et al., 2021).

Age

A research carried out in India found that pregnant women between the ages of 21 and 30 frequently suffered from anaemia (Suryanarayana et al., 2017). Low body mass index, which greatly raises the risk of anaemia, low economic status, and inadequate education are risk factors for these women (Chen et al., 2013). Furthermore, teenage women are more likely than older women to experience anaemia due to unplanned pregnancies and poor physical health prior to conception (Wright et al., 2017).

Socioeconomic factors

Education

The general knowledge of reproductive health programs and accommodating policies, such as supplemental nutrition, has been shown to be influenced by women's educational attainment in recent research (Vishnu et al., 2019). Women with secondary or higher education had a lower anaemia burden (18.0%) than those with just elementary school (58.6%) or no formal education (23.4%), according to Tanzanian study (Ngimbudzi et al., 2021). Anaemia is less common in pregnant women with higher levels of education. Our results show that the prevalence of anaemia decreases by 1.12% for every 1% increase in higher education. For every 1% increase in educational attainment, anaemia falls by 0.001% (Naik and Sasdhar, 2019).

Monthly Income

Pregnancy-related anaemia is thought to be more likely in those with lower incomes (Simon et al., 2021). A 2020 study conducted in Punjab found that 350 of the 500 women with anaemia earned less than 10,000 rupees, whereas 34 earned

between 10,000 and 20,000 and 25 earned more than 20,000. Those with monthly earnings under \$10,000 per capita had a greater frequency of anaemia (85.6%). Individuals from lower socioeconomic groups are more likely to be illiterate and to struggle financially. The discovery that low-income women typically consume meals lacking in vitamins, proteins, and minerals (Bansal et al., 2020) further supports it.

Environmental Factors

Toilets, housing type, cooking fuel type, tobacco smoke, and seasonality are the five primary components that make up environmental factors. The frequency of anaemia was greater in families without toilet facilities, according to a 2014 study that examines the relationship between the home environment and anaemia prevalence in India. The kind of home also had a significant effect; those living in kaccha or semi-pucca homes were more likely to have it. Anaemia was more common in those who lived in homes with dirty fuels than in people who lived in homes with clean fuel. Compared to those who had no exposure to tobacco smoke at all, a greater proportion of those who reported experiencing anaemia symptoms had been exposed to tobacco smoke at home. The seasons also influenced anemia; it was more common in the summer and during the rainy season than in the winter (Baranwal et al., 2014).

Cultural factors

Anaemia was shown to be far more common in nuclear homes, which are typically described as family units made up of a married couple and their kids. This might be because of their hectic schedules or because there aren't enough family members in nuclear households who could look after expecting women. Consequently, pregnant women may not obtain proper nutrition and diet treatment (Bhavsar et al., 2012). In rare instances, family beliefs may be the reason why the mother is unable to take iron supplements. According to the study, the women said that their family members had advised them against using IFA supplements, usually because of concerns that doing so might cause the foetus to grow too large and make delivery more difficult (Williams et al., 2020). According to a 2014 behavioural research on attitudes towards prenatal iron-folic acid supplements, husbands help their spouses in nuclear families by helping out around the home and promoting a healthy diet (Nisar et al., 2014). Future research must identify the most effective strategies for enlisting husbands, mothers-in-law, and sisters-in-law to assist anaemia prevention and therapy compliance, such as scheduling visits with a doctor or an ASHA employee. It would be quite beneficial to provide husbands certain duties or obligations to assist their wife (Diamond-Smith et al., 2016).

5. ORGANIZATIONAL FACTORS

Healthcare Providers

In India, auxiliary nurse midwives (ANM), Anganwadi workers (AWW), and ASHAs are usually responsible for providing IFA supplements to expectant mothers. Auxiliary nurse midwives are one type of professional that works at a primary health care centre (PHC). On the other side, Anganwadi personnel only work in their communities and are mostly concerned with giving mothers, children, and young girls wholesome food and supplements (particularly those who are pregnant and nursing). In a similar vein, ASHA employees assist their designated community, particularly youngsters and expectant mothers. They coordinate delivery and maintain records of vaccinations and supplements. It's also crucial to remember that government facilities offer free IFA supplements to women with anaemia diagnoses, regardless of whether or not they are pregnant (Sedlander et al., 2020). According to research, women's awareness and adherence to anaemia treatment increased when their healthcare providers informed them about their haemoglobin (Hb) levels during pregnancy and lactation, the negative effects of anaemia during pregnancy and on the growing foetus, and the side effects of iron and folic acid supplements (Kalaivani, 2009).

Healthcare Schemes

The Indian government has started a number of programs to alleviate the existing anaemia situation among all of the designated groups. Through the National Health Mission, the government provides financial and technical assistance for the implementation of the Anaemia Mukht Bharat initiative. To guarantee this, the government has created a number of initiatives. These programs are highlighted in Table 1 below.

Table 1: The government's main initiatives under the Anaemia Mukht Bharat policy are listed in the table below.

Initiatives	Description	Reference
Surakshit Matritva Aashwasan (SUMAN)	In order to prevent preventable maternal and newborn deaths, SUMAN seeks to offer all mothers and newborns using public facilities free, dignified, respectful, and high-quality treatment.	(SUMAN, 2023)

Janani Suraksha Yojana (JSY)	JSY is a program that promotes institutional delivery through conditional cash transfers	(Initiatives for pregnant women, 2023)
Janani Shishu Suraksha Karyakram (JSSK)	Every pregnant woman has the right to free delivery at public health institutions, including caesarean sections, as well as easily available transportation, medical examinations, prescription drugs and food, thanks to JSSK.	(Pradhan Mantri Surakshit Matritva Abhiyan, 2016)
Labour Room Quality Improvement Initiative (LaQshya)	LaQshya raises the bar for care in labour rooms to guarantee compassionate and considerate treatment throughout delivery and the first few weeks following childbirth.	(Initiatives to tackle anaemia in pregnant women, 2022)
Anganwadi centers	In accordance with the Integrated Child Development Services (ICDI), anganwadi centres take part in the monthly Village Health Sanitation Nutrition Day (VHSND).	(Pradhan Mantri Surakshit Matritva Abhiyan, 2016)
Delivery locations	Over 24,000 delivery points nationwide are established to provide comprehensive Reproductive, Maternal, Newborn, Child Health, and Adolescent Health Services (RMNCH+A)	(WHO, 2020)
MCP cards and safe motherhood pamphlets	Expectant moms get MCP cards and safe motherhood literature to teach them about births in healthcare institutions, signs and symptoms of pregnancy, good food, and rest	(WHO, 2020)
Reproductive and Child Health (RCH)	The RCH portal offers internet-based tracking for expectant mothers and comprehensive prenatal and postnatal care	(WHO, 2020)

SUMAN: Surakshit Matritva Aashwasan; JSY: Janani Suraksha Yojana; JSSK: Janani Shishu Suraksha Karyakram; LaQshya: Labour Room Quality Improvement Initiative; RMNCH+A: Reproductive Maternal Newborn Child Health and Adolescent Health Services; MCP Card: Mother Child Protection Card; RCH: Reproductive and Child Health; VHSND: Village Health Sanitation Nutrition Day; ICDI: Integrated Child Development Services

It was discovered that hospitals generally gave participants free IFA supplements. A few Karnataka women purchased supplements from shops. Supplements were given by ASHA employees in Uttar Pradesh, and the National Iron Plus Initiative (NIPI) promoted the decrease of anaemia. Karnataka did not have a specialised anaemia program, although it did have comparable programs like the Matru Poorna Yojana (Pradhan Mantri Surakshit Matritva Abhiyan, 2016).

Healthcare Systems

By 2025, the World Health Organisation (WHO) wants to cut the rate of anaemia in women in the reproductive age range by 50% globally. Prioritising treatment of anaemia throughout pregnancy and lactation is essential to achieving this objective (WHO, 2023). A 2022 research in Dwarka found that there was need for improvement in the use of health and nutritional services at primary health centres. Although most women polled got either prenatal care (ANC) or postnatal care (PNC), there were restrictions regarding complete ANC and PNC. About 15 percent of women did not use PNC or ANC services. Similar outcomes were seen in Uttar Pradesh (Singh et al., 2019; Saha et al., 2022) and Delhi. As part of comprehensive health programs, women should obtain ANC and PNC, two crucial treatments during pregnancy and the postpartum period. At least four prenatal checkups are advised by the WHO, and they should take place at 16 weeks, 24–28 weeks, 32 weeks, and 36 weeks. Within six to twelve hours following birth, there should also be at least four postnatal visits. Additionally, visits should be made three to six days, six weeks, and six months following delivery (WHO, 2016). Three to four extra postnatal care (PNC) visits on the fourteenth, twenty-first, and twenty-eighth days are advised for low birth weight (LBW) newborns in accordance with the Integrated Management of Neonatal and Childhood Illness (IMNCI) recommendations. Health outcomes for mothers and children are successfully improved by home visits (Dhingra and Dutta, 2012). Comprehensive studies conducted in South Asian and African countries have shown that home visits during pregnancy and after delivery can increase the need for and utilisation of antenatal and postnatal care amenities, potentially lowering the Maternal Mortality Rate (MMR) and Infant Mortality Rate (IMR) by at least 14–19% (Dutta et al., 2023).

6. CONCLUSIONS

One major public health concern in India is the frequency of anaemia among expectant mothers. This issue is caused by a variety of variables, including organisational, cultural, economical, and individual issues. Consumption of iron and folic acid is influenced by individual traits such as attitudes and awareness of anaemia. Knowledge and education are crucial for improving the health outcomes for mothers and children. Age has an impact on anaemia risk as well, with younger women being more vulnerable than older women. Two socioeconomic factors that have a major influence on the prevalence of anaemia are income and education. Households with lower incomes and women with less education are particularly vulnerable. It is crucial to improve access to healthcare services and address these disparities through focused initiatives.

Cultural factors, especially the support and involvement of family members, especially husbands, as helpful allies in the care of expectant mothers, may contribute to better health outcomes. Organisational concerns such as healthcare programs and provider engagement are crucial. IFA supplements must be easily accessible, medical personnel must be sufficient, and healthcare systems must be reinforced. In conclusion, a thorough and multidimensional approach to preventing anaemia in pregnant women in India must include raising awareness, improving education, addressing socioeconomic inequities, encouraging family support, and constructing healthcare facilities

REFERENCES

- [1] Bansal R, Bedi M, Kaur J, Kaur K, Shergill HK, Khaira HK, Suri V: Prevalence and factors associated with anemia among pregnant women attending antenatal clinic. *Adesh Univ J Med Sci Res.* 2020, 23:42-8.
- [2] Baranwal A, Baranwal A, Roy N: Association of household environment and prevalence of anemia among children under-5 in India. *Front Public Health.* 2014, 2:
- [3] Bhavsar S, Hemant M, Kulkarni R: Maternal and environmental factors affecting the nutritional status of children in Mumbai urban slum. *Int J Sci Res Pub.* 2012, 2:1-9.
- [4] Chen Y, Li G, Ruan Y, Zou L, Wang X, Zhang W: An epidemiological survey on low birth weight infants in China and analysis of outcomes of full-term low birth weight infants. *BMC Pregnancy Childbirth.* 2013, 13:10.1186/1471-2393-13-242 .
- [5] Dhingra B, Dutta AK: National rural health mission. *Indian J Pediatr.* 2011, 78:1520-6. 10.1007/s12098-011-0536-4 33. Girard AW, Olude O: Nutrition education and counselling provided during pregnancy: effects on maternal, neonatal and child health outcomes. *Paediatr Perinat Epidemiol.* 2012, 26:191-204. 10.1111/j.1365-3016.2012.01278.x
- [6] Diamond-Smith NG, Gupta M, Kaur M, Kumar R: Determinants of persistent anemia in poor, urban pregnant women of Chandigarh city, North India: a mixed method approach. *Food Nutr Bull.* 2016, 37:132-43.
- [7] Dutta RR., Chhabra P., Kumar T., Joshi A (2023). Tackling Anemia in Pregnant Women in India: Reviewing the Obstacles and Charting a Path Forward. *Cureus* 15(8): e43123. DOI 10.7759/cureus.43123
- [8] Ghosh-Jerath S, Devasenapathy N, Singh A, Shankar A, Zodpey S: Ante natal care (ANC) utilization, dietary practices and nutritional outcomes in pregnant and recently delivered women in urban slums of Delhi, India: an exploratory cross-sectional study. *Reprod Health.* 2015, 12:10.1186/s12978-015-0008-9
- [9] Global nutrition targets 2025: anaemia policy brief . (2023). <https://www.who.int/publications-detailredirect/WHO-NMH-NHD-14.4>.
- [10] Initiatives for pregnant women. (2023). <https://pib.gov.in/PressReleaseDetail.aspx?PRID=1843841>.
- [11] Initiatives to tackle anaemia in pregnant women. (2022). <https://pib.gov.in/PressReleasePage.aspx?PRID=1810999>.
- [12] Kalaivani K, Ramachandran P: Time trends in prevalence of anaemia in pregnancy . *Indian J Med Res.* 2018, 147:268-77.
- [13] Kalaivani K: Prevalence and consequences of anaemia in pregnancy . *Indian J Med Res.* 2009, 130:627-33.
- [14] Lavanya P, Jayalakshmy R, Rajaa S, Mahalakshmy T: Adherence to iron and folic acid supplementation among antenatal mothers attending a tertiary care center, Puducherry: a mixed-methods study. *J Family Med Prim Care.* 2020, 9:5205-11.
- [15] Marshall NE, Abrams B, Barbour LA, et al.: The importance of nutrition in pregnancy and lactation: lifelong consequences. *Am J Obstet Gynecol.* 2022, 226:607-32.
- [16] Mishra A, Marwah S, Divedi P, Dewan R, Ahluwalia H: A cross-sectional study of barriers in prevention of anemia in pregnancy. *Cureus.* 2021, 13:10.7759/cureus.12802
- [17] Naik K, Sasdhar PS: Socio-economic determinants of anemia among the pregnant women in Karnataka . *Indian J Econ Dev.* 2019, 7:1-5.

- [18] New guidelines on antenatal care for a positive pregnancy experience . (2016). <https://www.who.int/news/item/07-11-2016-new-guidelines-on-antenatal-care-for-a-positive-pregnancyexperience>.
- [19] Ngimbudzi EB, Massawe SN, Sunguya BF: The burden of anemia in pregnancy among women attending the antenatal clinics in Mkuranga District, Tanzania. *Front Public Health*. 2021, 9: 10.3389/fpubh.2021.724562
- [20] Nisar YB, Alam A, Aurangzeb B, Dibley MJ: Perceptions of antenatal iron-folic acid supplements in urban and rural Pakistan: a qualitative study. *BMC Pregnancy Childbirth*. 2014, 14:10.1186/1471-2393-14-344
- [21] Pradhan Mantri Surakshit Matritva Abhiyan. (2016). <https://pmsma.mohfw.gov.in/about-scheme/>.
- [22] Saha S, Pandya AK, Raval D, Wanjari MB, Saxena D: A study of maternal anemia and utilization of antenatal and postnatal care services in Devbhumi Dwarka, Gujarat. *Cureus*. 2022, 14:10.7759/cureus.30427
- [23] Sedlander E, Long MW, Mohanty S, Munjral A, Bingenheimer JB, Yilma H, Rimal RN: Moving beyond individual barriers and identifying multi-level strategies to reduce anemia in Odisha India. *BMC Public Health*. 2020, 20:10.1186/s12889-020-08574-z
- [24] Simon NH, Akinola A, Kumar ND: Anemia prevalence and factors associated among pregnant women in India. *Int J Community Med Public Health*. 2021, 27:5084-8.
- [25] Singh R, Neogi SB, Hazra A, et al.: Utilization of maternal health services and its determinants: a crosssectional study among women in rural Uttar Pradesh, India. *J Health Popul Nutr*. 2019, 38: 10.1186/s41043-019-0173-5
- [26] Steps taken by government to eradicate anaemia among pregnant women in the country . (2021). Accessed: May 7, 2023: <https://pib.gov.in/PressReleaseIframePage.aspx?PRID=1776544>.
- [27] Surakshit Matritva Aashwasan. (2023). <https://suman.mohfw.gov.in/>.
- [28] Suryanarayana R, Chandrappa M, Santhuram AN, Prathima S, Sheela SR: Prospective study on prevalence of anemia of pregnant women and its outcome: a community based study. *J Family Med Prim Care*. 2017, 6:739-43. 10.4103/jfmpe.jfmpe_33_17
- [29] Vishnu CS, Nirgude AS, Rajarathnam A, Navya N, Akshaya KM: Do the pregnant mothers utilize supplementary nutrition along with other antenatal services? A cross sectional study from Mangaluru, Karnataka state, India. *Int J Community Med Public Health*. 2019, 6:1614-7.
- [30] WHO antenatal care recommendations for a positive pregnancy experience: nutritional interventions update: multiple micronutrient supplements during pregnancy. (2020). <http://www.ncbi.nlm.nih.gov/books/NBK560384/>.
- [31] Williams PA, Pohlman J, Moran K, et al.: Strategies to address anaemia among pregnant and lactating women in India: a formative research study. *Public Health Nutr*. 2020, 23:795-805.
- [32] Wright S, Earland D, Sakhuja S, et al.: Anemia in pregnancy in Western Jamaica . *Int J Womens Health*. 2017, 9:431-9.