Evidence Updates

Prevalence of anaemia among women of reproductive age (15–49): A spatial-temporal comprehensive study of Maharashtra districts

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ABSTRACT

Anaemia is conjugation with other prevalent diseases, has given rise to a significant health crisis that causes severe physical and cognitive damages. The present work aims to the prevalence of Anaemia among women of reproductive age in India – especially at district level of Maharashtra India. The study is based upon two-time points of the National Family Health Survey (NFHS-4, 2015–16 & NFHS-5, 2019–20) in India. The result shows the prevalence of anaemia has been increased 6.2% in 2019-20 from 2015 to 16. The changes result shows that few districts have in improvising stage of women health but, the majority of the state districts of Maharashtra highlighting a serious health picture. Out of 36 districts, 16 districts have a higher prevalence of more than 55% of anaemia in Maharashtra. Out of 35 districts, 2 districts in 2015-16 and 16 districts in 2019-20 have higher prevalence (>55%) of anaemia in Maharashtra. Furthermore, a remarkable temporal change has taken place between the periods. As a result, 30 districts of Maharashtra shown increasing change, in which 16 districts marked as >10% changes of women anaemia in 2019-20. Spatial-temporal changes help to identify the vulnerable districts of Maharashtra on the level of anaemia. Therefore a straight policy needs to be implemented targeting specific health issues in the specific regions of Maharashtra.

1. Introduction

Anaemia is defined as the decrease in the concentration of red blood cells in the body, and the blood cells are not sufficient to meet the person's physiological requirements.¹ Anaemia poses serious health threats to women of reproductive age, pregnant women, and adolescent girls, which, in turn, significantly contributes to maternal deaths and morbidity.^{1,2} There is evidence that maternal anaemia is associated with complicated childbirth that includes the risk of preterm birth, stillbirth, perinatal morbidity, and low birth weight, and these, in turn, increase maternal morbidity and mortality rate.³ Anaemia among young women is a cause of double burden – firstly, it affects their cognitive development, and secondly, it has specific grave physiological outcomes, which create severe health problems in performing the daily tasks.²

Profound studies reported that globally 16.20 billion people were affected by anaemia. It has been also suggested on an average of 16% maternal mortality and 22% of perinatal deaths occurred in developing countries in last three decades.^{1,4–6} Further, anaemia in pregnant women substantially contributes to maternal morbidity and mortality.^{2,7} World Health Organization's estimate on anaemia in 2011 found

the worldwide prevalence of anaemia among pregnant women was found to be 38.2% (32.4 million), and the same among the non-pregnant women was about 29% (496.3 million).^{8,9} However, the widespread presence of anaemia during pregnancy and post-partum was higher in low and middle-income countries than in high-income countries. Such imbalances were mainly caused by the differences in the dietary pattern, deficiencies in intake of micronutrient, and prevalence of infections such as malaria and hookworm in the developing countries.⁷

In India, recent rounds of NFHS-4 reported that the prevalence of anaemia was 53% among women of fertile age group.¹⁰ Study from Bangladesh, 43.4% of women who are less educated and undernourished were found to be anemic.¹² Iron deficiency anaemia is another burden for pregnant and non-pregnant women in developing countries.^{13,16}

Epidemiological studies pointed out that several influences for developing anaemia among reproductive women were found such as women's age, place of residence, and smoking habits.^{2,17} In developing countries, anaemia has several deleterious health risks associated with it: low dietary intake of iron, records of illness due to chronic disease, excessive menstrual bleeding, and history of malaria, history of

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Table 1
Percentage prevalence of anaemia of all districts of Maharashtra, India.

Districts of MH	NFHS-4 (2015–16)	NFHS-5 (2019–20)	Changes
Ahmadnagar	46.1	50.3	4.2
Akola	38.7	52.6	13.9
Amaravati	42.83	53.4	10.57
Aurangabad	45.01	52.4	7.39
Bhandara	52.66	65.3	12.64
Bid	36.51	50.8	14.29
Buldhana	40.95	57.8	16.85
Chandrapur	48.73	55.5	6.77
Dhule	53.53	61.2	7.67
Gadchiroli	51.65	66.2	14.55
Gondiya	55.07	60.4	5.33
Hingoli	41.99	51.3	9.31
Jalgaon	51.7	65.2	13.5
Jalna	43.91	58.2	14.29
Kolhapur	46.79	50.1	3.31
Latur	37.51	50.7	13.19
Mumbai city	49.44	45.9	−3.54
Nagpur	46.59	53.6	7.01
Nanded	47.53	57.3	9.77
Nandurbar	60.22	64.2	3.98
Nasik	54.71	56.2	1.49
Osmanabad	36.35	49.1	12.75
Parbhani	46.38	58.8	12.42
Pune	49.99	51.9	1.91
Raigarh	53.07	54.2	1.13
Ratnagiri	47.26	43.4	−3.86
Sangli	51.2	47.5	−3.7
Satara	49.41	49.6	0.19
Sindhudurg	44.42	41.2	−3.22
Solapur	44.28	54.5	10.22
Suburban Mumbai	50.41	50	−0.41
Thane	48.35	58.8	10.45
Wardha	42.46	60	17.54
Washim	35.46	56.4	20.94
Yavatmal	46.92	58.4	11.48
Maharashtra	48.0	54.2	−6.2

Source: National Family Health Survey (NFHS-4, 2015-16 and NFHS-5, 2019–20), MH-Maharashtra

abortion, genetic disorder, diarrhea, food fortification, and blood loss during labor, close-spaced of pregnancies.^{18–20} Besides the direct reason, there is also some indirect basis such as educational attainment; regional and biosocial factors, which include the BMI status of women.²⁷

Evident research of Anaemia among the populations of Maharashtra India. The National Family Health Survey of India (2016) is crucial as it showcases the national data on various characteristics related to the health of women who belong to the reproductive-age.¹⁰ It also provides useful data besides Anaemia child health, maternal health, and nutrition among women of reproductive age. Hence, considering all this information, this present study is designed to examine the spatial prevalence of Anaemia among women of childbearing age in all districts of Maharashtra India, which have not been investigated yet comparing national representative sources.

2. Materials and methods

2.1. Study setting

The present study uses collected data of NFHS-4 (2015–16).¹⁰ It provides useful information about the basic demographic and health indicators related to men, women, and children. The complete survey data set is publicly available on the DHS program website upon subsequent authorization and registration, followed by an official protocol. For comparing with previous data of NFHS-4, we use existing pieces of literature and the recently published factsheet of NFHS-5 (2019–2020).¹¹

2.2. Data analysis

Bivariate analysis was also executed to understand the prevalence of anaemia in Maharashtra. For representing spatial prevalence, the study uses spatial analysis software of ArcGIS 10.8. Additionally, analysis of data was carried out in STATA version 14.

3. Results

3.1. Prevalence of anaemia among reproductive-age (15–49) women of Maharashtra, India

The result shows the prevalence of anaemia of Maharashtra including all districts (Table 1). The state average prevalence shows an impressive picture of the women's health status of Maharashtra state. But insights prevalence of all districts shows insignificant. In 2015-16 the prevalence of Anaemia among women (15–49) is highest in Nandurbar (60.22%) districts and low in Washim (35.46%) districts of Maharashtra. In 2019–20, Gadchiroli (66.20%) represents the highest prevalence whereas Sindhudurg (41.20%) has a low. Changes result show that few districts have come-up with good outcomes in terms of women anaemia health. However, the majority of the state of all districts of Maharashtra highlighting a serious picture. For example, Washim (20.94%), Wardha (17.54%) Budhana (16.85%) districts show the highest positive changes, which means serious women health problems may arise compare with the rest districts of Maharashtra. Other side, districts like Ratnagiri, Mumbai city, Sindhudurg found negative changes and improving women's health status than other districts of Maharashtra.

3.2. Spatial prevalence of anaemia among married women of Maharashtra, India

In 2015–16, the prevalence of anamia of all districts of Maharashtra was demonstrated in Fig. 1. Out of 36 districts, 16 districts have a higher prevalence (more than 55%) of anaemia in Maharashtra. Out of 36 districts, 12 districts are 50% and a higher prevalence of anaemia. Only 5 districts have shown less than fifty percent of anaemia prevalence among all districts of Maharashtra. Fig. 2 represents anamia prevalence of 2020 of all districts of Maharashtra. Out of 36 districts, only two districts have a higher prevalence (more than 55%) of anaemia in Maharashtra. Out of 36 districts, 7 districts are 50% and higher prevalence of anaemia. But 27 districts have shown less than fifty percent of anaemia prevalence among all districts of Maharashtra. Fig. 3 shows the changes in anamia prevalence between 2015 and 2020 in all districts of Maharashtra. Out of 36 districts, 16 districts have shown higher prevalence (more than 10%) of anaemia from 2015 to 2020 of Maharashtra, which is indicating serious women problems still existing in those districts, therefore a straight policy needs to be implemented targeting specific health issues. Out of 36 districts, 14 districts have found to be an improvising stage of women's health. But only 3 districts have shown a good health status of women compared with all districts of Maharashtra.

4. Discussion

The present study was carried out to recognize the prevalence of anaemia among married women at the district level of Maharashtra, India. Further, this study expressed spatial maps to highlight spatial prevalence and variation over districts of Maharashtra. The analysis has been carried out using NFHS-4 data of all districts of Maharashtra and tried a spatial comparison with the latest published reports of NFHS-5 fact sheet literature of India.^{10,11} Anaemia is one of the major public health issue of married women of India and across states and Maharashtra has not found dissimilar results. Given the fact that of 54.2% women are anaemic in Maharashtra which (high prevalence) indicates a severe public health problem out there in studied regions.¹¹ Although

Fig. 1. Anaemia prevalence at district-wise of Maharashtra of married women of NFHS-4, 2015–2016.

Fig. 2. Prevalence of anaemia of all districts of Maharashtra NFHS-5, 2019–2020.

the recent report of NFHS 2016 shows the prevalence of anaemia (48%) is in Maharashtra state lower than the national average (53%).¹⁰ But the degree of prevalence anaemia is varied across states of India.²¹ Therefore, there is existing discrepancies in anaemia prevalence within regions and over districts. Profound studies have found that the anaemia is more prominent in younger age group compared with other age groups.^{9,22} Likewise, other study shows that young women are substantially more likely to suffer from anaemia but opposite for pregnant women.²¹ This is due to of pregnant women are usually given more care than any other age group of women. However, distinctive associations were found with women's pregnancy and developing anaemia in Ethiopia and Nepal.^{23,24} This could be due to distinguish socio-cultural settings of the study population.

On the other hand, other cross-sectional and community-based studies have shown the prevalence of anaemia was relatively low among adolescent and late adolescent women in India.²¹ Such disparity because of study area selection by researchers which found to be dissimilar with usual findings.^{9,26} Similarly, few International studies have also shown that about 57% prevalence of Anaemia in Bangladesh at reproductive age women and whereas in Pakistan, it is as high as 51.1% and about 41% in Nepal.^{1,26,27} Nevertheless, the differences in the prevalence of Anaemia point to the heterogeneity in the health conditions within the same regional settings of South-East Asia.¹ These inequalities were observed across the states of India like Maharashtra, Manipur, and Nagaland.^{28–30} and Karnataka.

Through this study, women from low economic status, past birth recode more than three children are significantly associated with developing anaemia. Thus, besides the low wealth status of women, the

health status in northeastern states women of India reflecting gender discrimination of both biosocial characteristics and socially within the household and in society. Therefore, among factors, nutritional deficiencies contribute to the onset of anaemia which may lead to iron deficiency anaemia. On the contrary, the present study shows that being users of traditional (10% higher) family planning methods are associated with developing anaemia than modern contraceptive methods. This finding is consistent with a study from eastern Africa where the use of modern contraceptive methods with lower prevalence with anaemia.³¹

5. Limitation

Similar to another study, this study has also some limitations. The primarily present study is comparing with recently published fact sheet of NFHS-5 but that has only 21 states/union territories.¹¹ The study is based on overall women of Maharashtra which may give insignificance results with final reports, therefore, it is quite difficult to comprehend those identified district results with or are in real and inappropriate for generalization with all women in India.

6. Conclusion and recommendations

Findings of the present study indicating that Anaemia is one of the major problems in the majority of districts of Maharashtra India. The changes result from nfhs fourth round to nfhs fifth round shows that few districts have come-up with good outcomes in terms of women health. Districts like Washim, Wardha, Buldhana districts show positive changes, which noiselessly indicates serious health problem might have occurred

Fig. 3. Changes anaemia prevalence in half decade of all districts in Maharashtra, India.

than other districts of the state. However, other side, districts like Ratnagiri, Mumbai city, Sindhudurg have shown positive and successful health picture especially women's health status than other districts of Maharashtra. Further, Fig. 3 displays that out of 36 districts, 16 districts have shown an increased mood from NFHS-4 to NFHS-5, therefore a strong and sustain, policy needs to be implemented targeting specific health issues in specific regions.

The study emphasizes that there is a need for comprehensive intervention and developing strategies that will make women aware of the negative impact of Anaemia. The proposed strategies considered an intervention approach and include following elements:

1. State and vulnerable regions should adopt quality and modern strategies and build a local training institute that aims to reach all segments of the population with an acceptable and affordable environment.
2. Iron supplementation should facilitate and make sure of expansion of fortification cereal flour with iron. It will help to increase sustainable iron in food for a longer time.
3. Through these crucial findings we can recommend policy advocacy for benefit of women's health (including girls and pregnant). Since the government has initiated a special program of Integrated Child Development Schemes (ICDS) and Information Communication and Technology (ICT) to create various health awareness programs and hygiene associated issues among women. The government should adopt these study outcomes before implementing any project of these regions targeting to combat anaemia.

Ethics approval & consent to participate

This research does not have an ethical code because this research work was performed based on secondary data, which is freely available in the public domain; thus, the authors do not require any ethical clearance and consent to participate. For more information about data: https://dhsprogram.com/data/dataset_admin/index.cfm.

Declaration of competing interest

The authors declared no potential conflicts of interest concerning the research, authorship, and/or publication of this article.

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