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## RESEARCH ARTICLE

### Is Distribution a Problem in Iron-Folic Acid Consumption in India? An Exploration of District Level Household Survey

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#### Abstract:

#### Aims:

Anemia accounts for 40% of maternal deaths in India. In order to address this problem, the Government of India implemented the largest programme with the greatest potential to reduce maternal mortality by free distribution of Iron-Folic Acid (IFA) supplementations especially during Antenatal Care (ANC) visits. But the major concern among the policymakers and researchers has been poor adherence to the supplement among pregnant women. However, we tend to think that given the severity of the problem, there is no investigation on the adherence issue. Hence, the aim of the paper is to understand whether IFA consumption by pregnant women in India is largely a distribution problem of IFA supplements through ANC.

#### Background:

The distribution of Iron-Folic Acid (IFA) supplementation is not working especially through Antenatal Care (ANC) attendance. The program implementers believe that it is because of lack of adherence to IFA supplements by pregnant women. It is important to investigate the problem before any policy changes are made without proper evidence.

#### Objectives:

The purpose of this study is to examine whether the problem of IFA consumption by pregnant women is due to the problem of public distribution of IFA supplements through ANC attendance.

#### Methods:

This study had used the fourth round of District Level Household Survey data, which collects information on IFA supplements, their distribution and consumption. Bivariate and tri-variate analyses were used to understand the relationship between IFA distribution to pregnant women and their consumption patterns in 19 Indian states and two Union Territories (UTs) of pregnant women (88,487) and between the age of 15-49 years.

#### Results:

In almost all the states except Chhattisgarh, more than 75% of the pregnant women consumed 100 or more IFA supplements when they received 100 or more IFA supplements from providers. Similar is the case even among those women who received 100 or more IFA supplements through 1 or 2 ANC attendance except Arunachal Pradesh (60%), Meghalaya (67%), Pondicherry (57%) and Andaman and Nicobar (0%). The consumption of IFA supplements among pregnant women gets better than 75% if they receive 100 or more supplements only after attending three or more ANCs.

#### Conclusion:

It seems that distribution is a problem in the consumption of IFA supplements by pregnant women in India. Full antenatal attendance by the women could be part of the problem but not supplying at least 100 IFA supplementations to even those who attend ANC due to stock-outs and ineffective management is a serious concern. Hence, Governments should distribute at least the recommended 100 IFA supplements to the women in their 1st ANC attendance to address anaemia.

**Keywords:** Pregnant women, IFA supplement, ANC, Distribution and consumption, DLHS, India.

#### Article History

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## 1. INTRODUCTION

Anaemia affects one-quarter of the world's population, but it is largely concentrated in the African continent. For instance, the Lancet study on global trends in the prevalence of anaemia in children and women reveals that though there has been some reduction in anaemia prevalence from the mid-1990s in some regions of the World, in case of central and west Africa much effort is needed to improve the health of women and children so that global targets can be achieved [1]. Globally, nearly 41.8% of pregnant women are anaemic [2]. At least half of the burden of the anaemia is assumed to be due to iron deficiency [3]. Africa has more number of women with anemia followed by South and Southeast Asia. Member States have asked for direction from the World Health Organization (WHO) on the effectiveness and safety of daily iron and folic acid supplementation in pregnant women as a public health measure to improve pregnancy outcomes in support of their efforts to achieve the Sustainable Development Goals (SDGs). The WHO also advocates daily Iron Folic Acid (IFA) supplementation (30-60 mg iron, 0.4 g folic acid) initiation as early as possible and continued throughout pregnancy as an important intervention to address the risk of maternal anaemia and low-birthweight babies [4].

Both Folic Acid and Iron deficiency during pregnancy are peril factors for preterm delivery, anemia, low birth weight, and this contributes to the increased maternal mortality and poor neonatal health [5]. One of the significant intercessions to prevent anemia and folic acid deficiency is IFA supplementation. The WHO recommends that all pregnant women should receive a standard dose of 30–60mg Iron and 400mg Folic acid during gestation as part of their Antenatal Care (ANC) follow up [6]. However, in areas where the prevalence of iron deficiency is high (more than 40%), the supplementation should proceed for three months in the postpartum period, and many countries aim for women to receive 90 or more tablets during pregnancy [7].

Pregnant women in India continue to face high anemia rates [8, 9]. In India, anemia affects 50% of pregnant women, adolescent girls and children [10]. Anemia puts women at greater risk of morbidity, mortality, postpartum hemorrhage, and poor birth outcomes, as well as preterm birth and low birth weight due to poor intrauterine growth. Anemia accounts for 40% of maternal deaths in India [10]. In the case of India, IFA consumption has been low among pregnant women in spite of free distribution of IFA supplementations, especially during ANC visits. In India, the distribution of IFA supplements to pregnant women through ANC is the largest programme with the greatest potential for helping to achieve the World Health Assembly goal for 2025. But the major concern among policymakers and researchers has been poor adherence to the supplement among pregnant women. However, we tend to

think that given the severity of the problem, there is no investigation on the adherence issue. Based on anecdotal evidences, we understand that the pregnant women who attend ANC do not receive recommended 100 IFA supplements in their first visit mainly because of stock-outs and ineffective management. Hence, an attempt is made in this paper to understand whether IFA consumption by pregnant women in India largely a distribution problem of IFA supplements through ANC.

## 2. MATERIALS AND METHODS

In India, District Level Household Survey-4 (DLHS-4), is the only source of information on the number of IFA supplements distributed and consumed by pregnant women. It was a community-based cross-sectional survey conducted in 19 states and 2 Union Territories (UTs) of India from June to December 2013. It is the fourth district-level survey implemented by the Ministry of Health and Family Welfare (MoHFW), Government of India and directed by nodal agency, the International Institute for Population Sciences (IIPS), Mumbai. In the survey, the representative sample of the total of 319,695 women of reproductive age, 15-49, were interviewed in their communities. Out of the interviewed women, 88,487 women reported that they were pregnant after January 1, 2008, and among these, 86,683 women experienced live-birth. The pregnant women with live birth or stillbirth in the previous five years were asked the following questions: (i) 'How many times you received antenatal check-up during last pregnancy?' (ii) 'How many IFA tablets/bottles did you receive/purchase during the last pregnancy?' (iii) 'During the last pregnancy, for how many days and how much did you take the Iron Folic Acid (IFA) tablets/syrup bottles?'

Pregnant Women in India who attend ANC, receive either IFA tablets or syrup based on their preference. For the analysis, IFA syrup was converted into tablets with the assumption that two bottles of syrup are equivalent to 100 tablets. This has been a common practice among researchers using DLHS data [11]. In order to understand the association between distribution and consumption among those who attend ANCs, bivariate and tri-variate analyses were conducted along with the correlation coefficient using the Statistical Package for Social Science, version – 20.

## 3. RESULTS

ANC visits by the pregnant women by Indian States and Union Territories (UTs) are presented in Table 1. ANC visits are particularly low in Nagaland (37%), Meghalaya (53%) and Arunachal Pradesh (56%) of the pregnant women. On the other hand, Telangana, Maharashtra, Kerala, Chhattisgarh, Sikkim, Andaman and Nicobar, Goa, West Bengal, Andhra Pradesh and Karnataka, more than 70% of the pregnant women attended 3 or more ANC. In addition, more than 60% of the pregnant women in the States of Manipur, Mizoram, Tripura, and Pondicherry attended three or more ANC.

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**Table 1. The percentage of ANC visits among currently pregnant women (aged 15-49) by States in India, 2012-13.**

State	ANC Visits			Number
	Zero	<3	≥3	
Himachal Pradesh	28.4	13.5	58.1	1462
Panjab	25.9	16.4	57.6	7714
Chhattisgarh	11.9	15.6	72.5	278
Haryana	39.8	15.4	44.8	8476
Sikkim	09.8	05.5	84.7	960
Arunachal Pradesh	44.0	12.3	43.7	4589
Nagaland	62.9	10.8	26.3	1337
Manipur	29.4	09.3	61.3	2488
Mizoram	29.8	08.6	61.6	2688
Tripura	20.0	16.2	63.9	1199
Meghalaya	46.8	07.8	45.4	1685
West Bengal	07.9	10.8	81.3	6712
Maharashtra	13.4	08.8	77.8	12712
Andhra Pradesh	07.9	07.8	84.3	4045
Karnataka	07.9	05.8	86.3	12331
Goa	08.4	00.3	91.3	481
Kerala	12.5	01.6	85.9	2806
Tamil Nadu	23.3	05.6	71.1	8590
Pondicherry	30.7	06.2	63.1	1187
Andaman and Nicobar	08.7	00.8	90.6	427
Telangana	13.8	06.5	79.8	2967

Note: ANC-Ante-Natal Care.

**Table 2. Percentage IFA supplements received during ANC visits among pregnant women (aged 15-49), by states in India, 2012-13.**

State	Zero ANC Visit			<3 ANC Visits			≥3 ANC Visits		
	Number of IFA Supplements Received								
	<100	≥100	N	<100	≥100	N	<100	≥100	N
Himachal Pradesh	13.2	28.1	415	20.8	50.4	198	17.9	65.8	849
Panjab	6.4	3.1	2001	27.9	23.2	1266	29.1	36.8	4447
Chhattisgarh	0.0	0.0	33	14.3	30.4	43	22.6	42.9	202
Haryana	3.6	6.2	3374	32.5	25.5	1306	33.9	34.9	3797
Sikkim	5.5	7.5	94	37.4	43.4	53	26.4	69.0	813
Arunachal Pradesh	4.5	3.2	2019	60.8	15.7	563	62.0	24.7	2007
Nagaland	3.1	1.3	841	67.0	9.3	144	55.2	27.3	352
Manipur	7.9	3.2	732	61.8	13.6	232	52.9	36.8	1524
Mizoram	14.4	19.6	800	39.0	31.5	233	29.7	56.7	1656
Tripura	7.1	4.2	239	43.1	43.7	194	66.9	27.9	765
Meghalaya	14.4	16.1	788	52.7	24.9	132	38.9	51.6	765
West Bengal	17.7	22.9	531	58.9	24.0	726	48.6	42.7	5455
Maharashtra	11.1	17.1	1702	40.8	21.4	1122	38.1	41.1	9889
Andhra Pradesh	26.5	13.8	322	52.1	29.6	315	45.9	42.2	3408
Karnataka	3.7	7.5	973	45.8	6.7	719	41.2	43.9	10639
Goa	25.4	49.2	41	0.0	100.0	1	21.4	71.8	439
Kerala	16.7	22.0	352	34.4	55.8	44	19.7	73.6	2410
Tamil Nadu	25.8	12.2	2005	47.2	34.2	480	39.8	50.4	6105
Pondicherry	10.4	35.5	365	53.3	36.8	74	29.9	59.1	748
Andaman and Nicobar	24.5	35.3	37	100.0	0.0	3	38.9	57.1	387
Telangana	29.6	17.2	409	62.3	25.1	191	43.4	44.3	2367

Note: N-Number of Women; ANC-Ante -Natal Care.

Table 2 presents the distribution of the number of IFA supplements to pregnant women during their ANC visits in the States and UTs of India. In Goa, around half of the currently married women received 100 or more IFA supplements though these women didn't visit ANC clinics. But none of the women received IFA supplements in Chhattisgarh if they did not attend ANC. Similarly, nearly one-third of currently married women in the UTs, Andaman and Nicobar, and the state of Himachal Pradesh received 100 or more IFA supplements privately. On the other hand, about one-fourth of the women in West Bengal, Kerala and Mizoram received 100 or more IFA supplements from private providers. Pregnant women from the other States, for 100 or more IFA supplements, they have to depend upon government free distribution through ANC. Among those women who attended one or two ANCs, only in Goa all women received 100 or more tablets. In case of Kerala and Himachal Pradesh around half of the women received 100 or more IFA supplements if they attend one or two ANCs; followed by 43.4% and 43.7% of the women in Sikkim and Tripura. About one fourth in Punjab and Telangana received 100 or more IFA in their first two ANC visits. For the remaining States in India, the distribution of 100 or more IFA supplements to pregnant women was low among those who attend less than 3 ANC.

Table 2 also shows that during three or more ANC visits, more than 70% of pregnant women of Kerala and, Goa states received 100 or more IFA supplements. In Tripura, Nagaland

and Arunachal Pradesh, less than 30% of pregnant women received 100 or more IFA supplements even after attending ANCs for more than three times. Around one-third of pregnant women in Punjab, and Haryana, who attended ANCs three or more times, received 100 or more IFA supplements (Table 2).

Table 3 shows the distribution of pregnant women who received IFA supplements by their consumption patterns. In almost all the states except Chhattisgarh, more than 75% of the pregnant women consumed 100 or more IFA supplements when they received 100 or more IFA supplements through private providers. Similar is the case even among those women who received 100 or more IFA supplements through 1 or 2 ANC attendance with the exception of small states and UTs such as Arunachal Pradesh (60%), Meghalaya (67%), Pondicherry (57%) and Andaman and Nicobar (0%). The consumption of IFA supplements among pregnant women gets better than 75% if they receive 100 or more supplements only after attending three or more ANCs with the exception of Arunachal Pradesh (68%), West Bengal (74%) and Andaman Nicobar (74%). It is noticed that among the 21 States and UTs considered, women from 12 states and UTs consume more than 90% of the supplements when they receive 100 or more supplements after attending 3 or more ANCs. Similarly, women from 17 states and UTs consume more than 80% of the supplements when they receive 100 or more IFA supplements through 3 or more ANC attendance.

**Table 3. Percentage of IFA supplements consumed among pregnant women (aged 15-49) who have received IFA supplements during ANC visits by states, India, 2012-13.**

State	Zero ANC Visit				<3 ANC Visits				≥3 ANC Visits			
	<100	N	≥100	N	<100	N	≥100	N	<100	N	≥100	N
Himachal Pradesh	100.0	55	81.70	117	97.4	41	88.8	100	98.7	152	91.3	559
Panjab	99.3	129	85.30	62	99.2	354	80.7	294	99	1295	80.8	1636
Chhattisgarh	0.0	0	0.00	0	86.5	6	100.0	13	100	46	100	87
Haryana	96.5	122	83.70	210	94.9	425	73.1	333	97.6	1288	78.5	1323
Sikkim	100.0	5	100.00	7	100.0	20	100.0	23	99.6	215	95.1	561
Arunachal Pradesh	93.3	90	83.40	64	98.0	342	60.3	88	98.5	1244	67.9	495
Nagaland	95.4	26	77.80	11	100.0	96	86.4	13	98.2	194	95.9	96
Manipur	89.9	58	92.20	24	98.5	143	93.1	32	99.2	806	92.7	562
Mizoram	100.0	115	94.10	157	100.0	91	96.9	73	99.2	492	96.5	938
Tripura	94.0	17	85.20	10	97.2	84	99.1	85	99.8	512	97.1	213
Meghalaya	97.6	114	90.50	127	80.8	70	67.1	33	97	298	80.3	395
West Bengal	100.0	94	81.60	122	96.4	428	66.8	174	95.6	2654	74.0	2327
Maharashtra	98.0	190	93.60	291	99.4	457	90.1	240	98.2	3772	91.7	4062
Andhra Pradesh	98.3	85	91.10	44	98.1	164	89.6	93	99.2	1565	90.6	1438
Karnataka	94.7	36	84.60	73	95.6	329	82.5	48	98.4	4386	88.9	4676
Goa	93.2	10	87.90	20	0.0	0	100.0	1	98.3	94	96.6	315
Kerala	97.1	59	76.70	77	93.8	15	82.6	25	99.1	475	92.9	1774
Tamil Nadu	97.7	518	86.40	245	98.6	227	75.2	164	98.9	2430	89.9	3076
Pondicherry	94.9	38	87.50	129	90.4	39	57.2	27	96.9	224	92.3	442
Andaman and Nicobar	90.4	9	89.70	13	100.0	3	0.0	0	95.7	151	74.1	221
Telangana	94.4	121	93.30	70	100.0	119	79.5	48	98.2	1027	86.6	1049

Pearson Correlation Coefficient between IFA supplements received and consumed by pregnant women = 0.948

Note: N-Number of women; ANC-Ante-Natal Care; The bold figures below ANC visits <100 and ≥100 are the IFA supplements received by women. The percentages in the table are the IFA supplements consumed by women.

#### 4. DISCUSSION

IFA supplement supply is a public health issue in India and varies significantly across the states of India. Data on IFA programme reporting by state-wise are often absent. The programme monitoring of IFA distribution and consumption of the supplements by the women is not possible unless pregnant women supply information on the consumption of supplements that must be taken daily. Attempts at estimating coverage are consequently often made indirectly using the number of ANC visits and compliance with IFA distribution protocols and the pregnant women's compliance with IFA consumption protocols. Given the lack of monitoring capacity and coverage data for IFA supplementation programmes, our contribution in the current paper is to provide a relationship between IFA distribution and consumption by using population-based DLHS-4 data to draw the strengths and weaknesses of ANC-based IFA distribution and consumption.

Despite the fact that ANC is used as the main platform for IFA supplement distribution to pregnant women in India, it's full (at least four or more visits) ANC coverage nationally is only 59% during their last pregnancy [12]. Low ANC visits are observed in the northeast Indian states. The program needs to improve ANC coverage, distribution of IFA supplements and may involve the foremost cultural change towards the consumption of the supplements. These are generally long-term propositions. Whether the coverage of ANC is low due to women's lack of physical access to care or because they do not value ANC (for whatever reason), our analysis showed that there is a fundamental health system problem [12]. It seems Iron/Folic Acid supplementation is affected by supply-related aspects than poor adherence to the supplement by the women. It is surprising that even after attending one or two ANCs, less than half (in many states, much less than half) of the pregnant women received 100 or more IFA supplements except in the case of Himachal Pradesh, Goa and Kerala. However, Himachal Pradesh and Kerala achieved barely 50%, while Goa is a small state and may be easier to manage the programme [13, 14].

In the case of African countries, it was found that when pregnant women received at least 90 Iron-Folic Acid supplements through antenatal care, the risk of neonatal mortality decreased by 34% [15, 16]. In South Asian countries, the prevalence of anaemia is the highest in the World, and India tops this list of countries, possibly leading to a high risk for neonatal and maternal mortality [17]. In India, according to DLHS-3, less than half of the mothers consumed 100 IFA tablets among those who received during their ANC visits [18]. The current analysis using the latest DLHS data shows that there is a very high correlation (0.95) between IFA supplements received and consumed by pregnant women. This implies that in the Indian States ANC based IFA distribution is a major stumbling issue. Therefore, the public distribution may have to confront the monumental task of improving IFA supplementation program, and it requires strengthening the entire health system at the state level.

Additionally, evidences have shown that among the rural and lower socio-economic groups, there were associations between caste and the use of ANC as well as service

components of ANC provided [14, 19]. These disadvantaged groups tend to receive their IFA supplements free from the Government through ANC attendance. It may be because of poverty, and these women tend to work while pregnant, coupled with high illiteracy and lack of awareness, full ANC (at least 4 ANCs) attendance can be very low. Moreover, it may not be possible for pregnant women to attend more than one or two ANCs, especially if the facility for ANC attendance is not in their usual place of residence. Our discussion with the front-line workers suggests that during the first ANC attendance, the women do not receive the recommended 100 IFA supplements due to lack of stock and untimely supply. The argument that the compliance of consumption is very low among these women is not correct. As our results indicate, nearly 80% of women do consume if they receive 100 or more IFA supplements.

#### CONCLUSION

It seems distribution is a problem in the consumption of Iron-Folic Acid supplements by pregnant women in India than the commonly perceived problem of adherence to the supplements. The consumption of IFA, it seems, is not necessarily affected due to some social reasons like false belief and lack of awareness as hypothesized by policymakers and programmers. It appears only a small percentage of pregnant women receive IFA supplements through private providers, and the majority of them depend upon the public distribution of the supplements through ANC attendance. Moreover, the attendance of 3 or more ANCs among pregnant women, especially in rural areas with low socioeconomic status can be a challenge. Anecdotal evidences suggest that during the first ANC attendance, the women do not receive the recommended 100 IFA supplements due to lack of stock and untimely supply. Hence, governments should distribute the recommended 100 IFA supplements to the women in their 1st ANC attendance to address anaemia, and in turn, morbidity and mortality among pregnant women and newborn babies. If necessary, the service component should be strengthened at the state level, and the capacity building training should be given from time to time to the front-line workers and health care providers.

#### AUTHORS' CONTRIBUTIONS

Rajeshwari A. Biradar led the literature search, analysis and interpretation, and manuscript writing along with the incorporation of feedback and comments from co-author. Shiva S. Halli has examined the results, tables, and contributed to the study design and finalized the manuscript.

#### ETHICS APPROVAL AND CONSENT TO PARTICIPATE

Not applicable.

#### HUMAN AND ANIMAL RIGHTS

Not applicable.

#### CONSENT FOR PUBLICATION

Not applicable.

## AVAILABILITY OF DATA AND MATERIALS

The raw data used in this research is publicly available large-scale health data with permission from International Institute for Population Sciences, Mumbai <http://rchiips.org/obtainingdata.html>

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None.

## CONFLICT OF INTEREST

The authors declare no conflict of interest, financial or otherwise.

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