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Maternal health situation in Empowered Action Group of states of India: A comparative analysis of state reports from National Family Health Survey (NFHS)-3 and 4

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ABSTRACT: Motherhood is often claimed as the most positive and fulfilling experience. Nevertheless, there exist several women whose motherhood was associated with suffering, ill-health and even death. The condition is graver in few states of India which are socioeconomically backward (also called Empowered Action Group of states). The present study adopted a narrative description of various key indicators of maternal health as outlined in the NFHS-3 and NFHS-4 state reports. The prime focus was to examine whether the performance of those states has got better or worse in these two survey reports. The study has also discussed various factors related to the performance of each key indicator of maternal health. The overall limiting success of maternal health status in these states calls for improvement in execution of various maternal health related activities.

KEY WORDS: maternal health, NFHS, EAG, empowered action group, state reports

Introduction

Maternal health refers to the state of complete physical, mental, and social well-being of women during pregnancy, childbirth, and the postpartum period. Maternal with subsequent newborn health care is pre-eminent to social, human and economic development. Poor maternal health is globally the most important risk factor for illness and death, with hundreds of millions of expecting mother and their infants being affected. Achieving the maternal and child health are central to the achievement of National Health Goals under the National Health Mission (NHM), Ministry of Health and Family Welfare, Govt. of India.

In India, the government has constituted a special group for few states that are socioeconomically backward and are often perceived to be most deficient in

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socio-demographic indices and are thus in need of special attention. This group is named as Empowered Action Group (EAG) of states and include eight states of Bihar, Chhattisgarh, Jharkhand, Madhya Pradesh, Odisha (Orissa), Rajasthan, Uttarakhand and Uttar Pradesh (Fig. 1). These states contain a larger share of the country's population that is almost 45% (Gupta and Talukdar 2017). This group has been formed so that the aforementioned eight states will get focused attention which will eventually promote accelerated achievement for different programmes of health and family welfare so that there is a tangible improvement of the performance of the states. The EAG also facilitates the preparation of area specific programmes to address the unmet need for supplies, services, health care providers and health infrastructure.

There is a growing body of evidences that studied health and nutritional status of EAG group of states in India (Arokiasamy and Gautam 2008; Mani et al. 2012; Arokiasamy et al. 2013; Mohanty and Srivastav 2013; Kumar and Singh 2016). Apart from health and nutritional status, studies also exist regarding socio-economic, demographic and lifestyle variables in those states (Sengupta and Das 2012; Kumar et al. 2017). A recent review by Dehury and Samal (2016) compared the maternal health

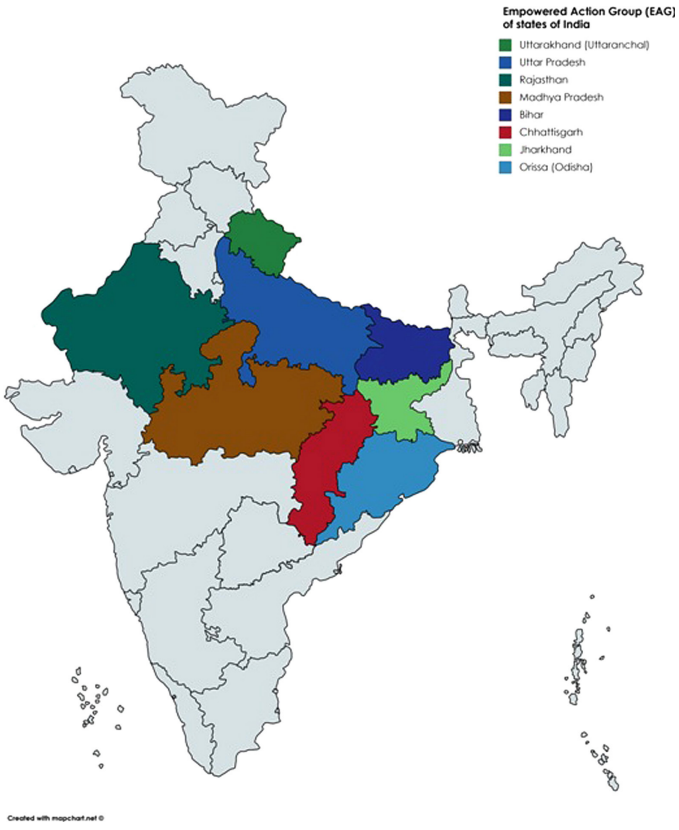

Fig. 1. Map showing the Empowered Action Group (EAG) of States of India

situation in two EAG states (Bihar and Madhya Pradesh) using National Family Health Survey fact sheets of NFHS-3 and NFHS-4. The review had also centralized on the progress in the maternal health status from 2005–06 (NFHS-3) to 2015–16 (NFHS-4). Similar review has been done to scrutinize the maternal health status in Sikkim and Goa (Dehury et al. 2017).

As already mentioned earlier, the EAG states require special attention owing to adverse sex-ratio. It has been observed that male headed households usually originate in the EAG states thereby leading to huge reduction of women's autonomy (Gupta and Talukdar 2017). This occurs due to preference to baby boy, lower status of women, social and financial security associated with sons, socio-cultural practices including dowry and violence against women. As a result of this fact, women and children of these states suffer a lot of health disparities compared to non-EAG states. The present study seeks to size up the maternal health situations of EAG states of India based on NFHS-3 and NFHS-4 state reports.

Materials and methods

Data from the NFHS in India have been widely used to make national and state-level policy decisions (Dandona et al. 2016). The present study adopted a narrative description as displayed in NFHS-3 and NFHS-4 state reports available online (Table 1). The present study looked for various key indicators related to maternal health situation among EAG

Table 1. The links for the state reports of NFHS-3 and NFHS-4

EAG states	NFHS	Links
Bihar	3	http://rchiips.org/nfhs/NFHS-3%20Data/Bihar_report.pdf
	4	http://rchiips.org/nfhs/NFHS-4Reports/Bihar.pdf
Chhattisgarh	3	http://rchiips.org/nfhs/NFHS-3%20Data/Chhattisgarh_report.pdf
	4	http://rchiips.org/nfhs/NFHS-4Reports/Chhattisgarh.pdf
Jharkhand	3	http://rchiips.org/nfhs/NFHS-3%20Data/Jharkhand_report.pdf
	4	http://rchiips.org/nfhs/NFHS-4Reports/Jharkhand.pdf
Madhya Pradesh	3	http://rchiips.org/nfhs/NFHS-3%20Data/madhya%20pradesh_state_report_for_website_17feb09.pdf
	4	http://rchiips.org/nfhs/NFHS-4Reports/MadhyaPradesh.pdf
Odisha	3	http://rchiips.org/nfhs/NFHS-3%20Data/Orissa_state_report.pdf
	4	http://rchiips.org/nfhs/NFHS-4Reports/Odisha.pdf
Rajasthan	3	http://rchiips.org/nfhs/raj_state_report.pdf
	4	http://rchiips.org/nfhs/NFHS-4Reports/Rajasthan.pdf
Uttarakhand	3	http://rchiips.org/nfhs/Uttarakhand_report.pdf
	4	http://rchiips.org/nfhs/NFHS-4Reports/Uttarakhand.pdf
Uttar Pradesh	3	http://rchiips.org/nfhs/NFHS-3%20Data/UttarPradesh_report.pdf
	4	http://rchiips.org/nfhs/NFHS-4Reports/UttarPradesh.pdf

states. All the statistical analyses were performed using StatPac software. A two-sample t-test between proportions/percent was performed to determine whether there was a significant difference between EAG states with respect to the percent mentioned for each key indicator. This test can be used to compare percentages drawn from two independent samples. The t-statistic was considered significant at the .05 critical alpha level.

Results

For convenience, the percent mentioned for each indicator in the state reports are framed in Tables 2–7. The statistical findings of the two-sample t-test between percents would eventually provide an aid as to whether there exist any statistical significant differences between the percents or not. Often it becomes difficult to put forward a casual assumption on the differences in two percents, especially when they are from different sample sizes. This calls for a statistical test to check the differences. Now, let us analyze the results based on the tables and the statistical findings.

While comparing the percent of each indicator, it was observed that there exist statistical significant differences between the two survey reports (NFHS-3 and NFHS-4) of each EAG state. This has been attributed by the large differences in sample sizes taken in the two survey periods. The total fertility rate (TFR) was observed to be highest in Bihar (NFHS-3 = 4.00; NFHS-4 = 3.41) and Uttar Pradesh (NFHS-3 = 3.82; NFHS-4 = 2.74). The TFR was found to be lowest in Odisha (NFHS-3 = 2.37; NFHS-4 = 2.05). It was fortunate to observe that the TFR decreased in all EAG states while moving from NFHS-3 to NFHS-4 (Table 2).

Analysing the percent of teenage pregnancies (Table 3), it can be observed that there was a huge increase in number of teenage women in NFHS-4 compared to NFHS-3. In both the state reports, Bihar (NFHS-3= 25%; NFHS-4= 12.2%) and Jharkhand (NFHS-3= 27.5%; NFHS-4= 11.9%) had the highest number of teenage pregnancies. Fortunately, the percent of teenage pregnancies had decreased to a value less than 15% in all EAG states in NFHS-4. Uttarakhand (NFHS-3= 6.2%; NFHS-4= 2.9%) had the least percent of teenage pregnancies in both the state reports. Uttar Pradesh had shown a vivid decline in percent of teenage pregnancies i.e., 14.3% in NFHS-3 to 3.8% in NFHS-4. Moving on to next indicator i.e., receiving antenatal care (ANC) from skilled provider (Table 4) showed that Chhattisgarh (NFHS-3= 75.5%; NFHS-4=91.2%), Madhya Pradesh (NFHS-3= 73.7%; NFHS-4=68.9%), Rajasthan (NFHS-3=73.1%; NFHS-4= 82.7%) and Odisha (NFHS-3= 74.0%; NFHS-4= 83%) had better performance in this key indicator. The difference in the percent of women receiving ANC from skilled provider among these four aforementioned states was statistically insignificant in NFHS-3 whereas NFHS-4 had witnessed highest percent in Chhattisgarh (91.2%). On the flip side, Bihar had witnessed the lowest percent of women receiving ANC from skilled provider (NFHS-3= 33.0%; NFHS-4= 49%). Shifting our focus to the next indicator in Table 4, we can compare the percent of mothers who had ANC visit in the first trimester during the survey period of NFHS-3 and NFHS-4. In other words, it includes those women who had their first ANC visit within 3 months of their pregnancy (until the

Table 2. Total fertility rates for the three years preceding the survey (as per NFHS-3 and NFHS-4 state reports)

Indicators	Bihar		Chhattisgarh		Jharkhand		Madhya Pradesh		Odisha		Rajasthan		Uttarakhand		Uttar Pradesh	
	NFHS-3	NFHS-4	NFHS-3	NFHS-4	NFHS-3	NFHS-4	NFHS-3	NFHS-4	NFHS-3	NFHS-4	NFHS-3	NFHS-4	NFHS-3	NFHS-4	NFHS-3	NFHS-4
Total Fertility Rate (TFR)	4.00	3.41	2.62	2.23	3.31	2.55	3.12	2.32	2.37	2.05	3.21	2.40	2.55	2.07	3.82	2.74

Table 3. Percentage of women (aged 15-19 years) who had begun childbearing (as per NFHS-3 and NFHS-4 state reports)

Indicators	Bihar		Chhattisgarh		Jharkhand		Madhya Pradesh		Odisha		Rajasthan		Uttarakhand		Uttar Pradesh	
	NFHS-3	NFHS-4	NFHS-3	NFHS-4	NFHS-3	NFHS-4	NFHS-3	NFHS-4	NFHS-3	NFHS-4	NFHS-3	NFHS-4	NFHS-3	NFHS-4	NFHS-3	NFHS-4
% of teenage pregnancies	25	12.2	14.6	4.8	27.5	11.9	13.6	7.3	14.4	7.6	16.0	6.3	6.2	2.9	14.3	3.8
Total no. of teenage women	946	10059	841	4694	677	5589	1260	11624	883	5572	817	8136	624	3250	2993	22015

Table 4. Percentage of women who had a live birth in the five years preceding the surveys and received services related to maternal health care

Indicators	Bihar		Chhattisgarh		Jharkhand		Madhya Pradesh		Orissa		Rajasthan		Uttarakhand		Uttar Pradesh	
	NFHS-3	NFHS-4	NFHS-3	NFHS-4	NFHS-3	NFHS-4	NFHS-3	NFHS-4	NFHS-3	NFHS-4	NFHS-3	NFHS-4	NFHS-3	NFHS-4	NFHS-3	NFHS-4
% receiving ANC from a skilled provider	33.0	49.0	75.5	91.2	52.7	69.7	73.7	68.9	74.0	83.0	73.1	82.7	59.3	74.8	65.4	72.3
% with an ANC visit in the first trimester of pregnancy	18.7	34.6	46.0	70.8	33.2	52.0	39.3	53.1	48.3	64.1	34.0	63.0	43.3	53.5	25.7	45.9
% who received two or more TT injections during pregnancy	73.2	81.5	74.6	89.7	67.6	86.0	70.6	83.4	83.3	89.5	65.2	81.9	68.5	85.7	64.5	81.4
% who were given or bought IFA	29.7	55.8	74.6	91.3	49.5	69.4	62.8	83.1	83.1	90.5	57.7	64.6	62.6	78.3	53.2	62.7
% who took an intestinal parasital drug	3.7	9.0	1.1	23.4	4.9	12.4	3.2	18.2	4.3	31.1	1.4	7.2	2.5	7.3	2.1	7.9
% with post-natal check-up	17.8	49.4	36.5	74.6	19.6	52.8	33.8	60.2	40.9	84.5	31.8	66.8	35.8	62.7	14.9	62.0
Total no. of women	1670	16881	1198	6801	1203	8989	2262	17361	1355	8993	1402	11947	874	4318	4951	28619

Table 5. Percentage of live births in the five years preceding the survey delivered in a health facility (as per NFHS-3 and NFHS-4 state reports)

Indicators	Bihar		Chhattisgarh		Jharkhand		Madhya Pradesh		Odisha		Rajasthan		Uttarakhand		Uttar Pradesh	
	NFHS-3	NFHS-4	NFHS-3	NFHS-4	NFHS-3	NFHS-4	NFHS-3	NFHS-4	NFHS-3	NFHS-4	NFHS-3	NFHS-4	NFHS-3	NFHS-4	NFHS-3	NFHS-4
% of births delivered in a health facility	19.9	63.8	14.3	70.2	18.3	61.9	26.2	80.8	35.6	85.4	29.6	84.0	32.6	68.6	20.6	67.8
Total no. of births	2514	25530	1655	9365	1741	12282	3420	24440	1846	11038	2073	16811	1234	5853	7533	41408

Table 6. Percentage of pregnancies with an ultrasound (as per NFHS-3 and NFHS-4 state reports)

Indicators	Bihar		Chhattisgarh		Jharkhand		Madhya Pradesh		Odisha		Rajasthan		Uttarakhand		Uttar Pradesh	
	NFHS-3	NFHS-4	NFHS-3	NFHS-4	NFHS-3	NFHS-4	NFHS-3	NFHS-4	NFHS-3	NFHS-4	NFHS-3	NFHS-4	NFHS-3	NFHS-4	NFHS-3	NFHS-4
% of pregnancies with an ultrasound	7.7	30.9	10.4	51.4	9.3	37.2	10.6	46.6	14.1	59.6	17.4	67.1	23.2	67.2	9.3	44.5
Total no. of pregnancies	3162	30540	2029	11403	2183	14814	4076	29219	2316	13824	2527	20696	1537	7301	9391	53958

Table 7. Percentage of births of order 4 or more (as per NFHS-3 and NFHS-4 state reports)

Indicators	Bihar		Chhattisgarh		Jharkhand		Madhya Pradesh		Odisha		Rajasthan		Uttarakhand		Uttar Pradesh	
	NFHS-3	NFHS-4	NFHS-3	NFHS-4	NFHS-3	NFHS-4	NFHS-3	NFHS-4	NFHS-3	NFHS-4	NFHS-3	NFHS-4	NFHS-3	NFHS-4	NFHS-3	NFHS-4
% of births of order 4 or more	36.4	23.7	27.6	12.3	34.8	16.0	30.9	13.8	20.1	10.2	32.4	16.6	21.6	14.2	38.3	23.7
Total no. of births	1484	15094	967	5489	987	7407	1944	14397	1095	6517	1218	10008	754	3500	4453	24550

end of 12 weeks of pregnancy). NFHS-3 state reports claimed that less than half of the women of all EAG states had ANC visits in the first trimester. A glance at the table indicates that all EAG states are managing to have a positive trend while moving from NFHS-3 to NFHS-4. Out of eight EAG states, NFHS-4 state reports conveyed that Chhattisgarh (70.8%) has highest percent of mothers who had ANC visit in the first trimester while Bihar has the lowest percent of such criteria in both the survey periods (NFHS-3= 18.7%; NFHS-4= 34.6%). Comparing NFHS-3 and NFHS-4 data, it was observed that there is 10–18 % increase in ANC visit in first trimester among Bihar, Jharkhand, Madhya Pradesh, Orissa and Uttaranchal from NFHS-3 to NFHS-4. Other EAG states (Rajasthan, Uttar Pradesh and Chhattisgarh) proclaimed more increase in the percent attending ANC in the first trimester in NFHS-4 compared to NFHS-3.

Talking about the percent of women who had tetanus toxoid (TT) injections, it can be seen that NFHS-3 witnessed highest percent in Odisha (83.3%) and lowest percent among Uttar Pradesh (64.5%), Uttarakhand (68.5%), Rajasthan (65.2%) and Jharkhand (67.6%), the differences in percents of the latter states were found to be statistically insignificant. In NFHS-4, the percents of all EAG states ranged from 81–90 %. Chhattisgarh (89.7%) and Odisha (89.5%) had highest percent whereas Bihar, Rajasthan and Uttar Pradesh had the lowest percent of around 81% (Table 4).

Considering the percent of women who had been given or bought IFA tablets, it can be observed that NFHS-3 witnessed the highest percent of women in Odisha (83.1%) whereas NFHS-4 witnessed the highest percent in both Ch-

hattisgarh (91.3%) and Odisha (90.5%). Bihar was witnessed to bear the lowest percent of women receiving IFA tablets in both the survey periods (NFHS-3= 29.7%; NFHS-4= 55.8%).

Moving on to the percent of mothers with intestinal parasitic drugs, it can be seen that the percent in all EAG states in NFHS-3 was below 5% with highest percent in Jharkhand (4.9%) and Odisha (4.3%) and lowest percent in Chhattisgarh (1.1%) and Rajasthan (1.4%). NFHS-4 witnessed a positive trend among all EAG states with percent ranging from around 7 % (Rajasthan: 7.2%; Uttarakhand: 7.3%; Uttar Pradesh: 7.9%) to 31.1% (in Odisha). Overall, the performance of all EAG states is, however, not satisfactory as more than 60 percent of the mothers of each of those states are devoid of such crucial drugs.

Shifting our focus to next indicator i.e., percent of women whose delivery was at health facility, it can be concluded that NFHS-3 observed very lower percent (less than 35% among all EAG states) in comparison to NFHS-4 (Table 5). NFHS-4 witnessed a moderate improvement with highest percent being at Odisha (85.4%) and Rajasthan (84.0%). Concentrating on the percent of women who had postnatal care (PNC), it was unfortunate to observe that less than half of the women received PNC according to NFHS-3 state report. States such as Uttar Pradesh (14.9%), Bihar (17.8%) and Jharkhand (19.6%) had the lowest percent of less than 20 percent of such cases whereas Odisha fetched the highest percent of only 40.9%. In NFHS-4, Bihar (49.4%) had the lowest percent and Odisha (84.5%) has the highest percent of such cases (Table 4).

Focusing at the percent of pregnancies with an ultrasound, it can be observed NFHS-3 witnessed very low percent of cases with highest percent being 23.2% at Uttarakhand and the lowest being 7.7% at Bihar. In NFHS-4, Bihar had the lowest percent of 30.9% whereas Rajasthan (67.1%) and Uttarakhand (67.2%) possessed higher number of pregnancies with an ultrasound (Table 6). NFHS-3 witnessed highest percent of births were of order 4 or more in Uttar Pradesh (38.3%), Bihar (36.4%) and Jharkhand (34.8%). The statistical differences among percents of these states were found to be insignificant. On the other hand, Odisha (20.1%) and Uttarakhand (21.6%) had comparatively lower or rather lowest percent in that survey period. In NFHS-4, Bihar (23.7%) and Uttar Pradesh (23.7%) had the highest percent whereas Odisha had the lowest percent of only 10.2% (Table 7).

Discussion

There are various indicators that can state maternal health situation in a particular state or country. The present study has mentioned only few indicators that can provide us a brief idea as to whether the EAG states are improving or worsening on the basis of key indicators mentioned below:

1. Teenage pregnancies: Pregnancies at age group of 15–19 years are a major global burden as they give rise to obstetric complications and adverse pregnancy outcomes (Mahavarkar et al. 2008). Teenage pregnancy or adolescent pregnancy is very common in rural areas of India, especially in the EAG states due to the prevalence of child marriages (Patra 2016). By good fortune, NFHS-4 had witnessed lesser percent of teenage pregnancies compared to NFHS-3. This could be

due to increase in median age of first marriage as reported by NFHS state reports.

2. TFR: This represents the number of children born to a woman if she were to live to the end of her childbearing years. TFR was found to decrease from NFHS-3 to NFHS-4. This could be due to higher median age at first marriage and lower teenage pregnancies in NFHS-4 since the age at which a female marries and enters the reproductive period of life has a great impact on her fertility (Singh and Alok 2018).
3. ANC by skilled provider: NFHS has defined skilled providers as doctor, auxiliary nurse midwife, nurse, midwife and lady health visitor. ANC services, especially by skilled providers ensure adequate maternal health care as they are trained to do so. All EAG states except Bihar have more than half of the women receiving ANC services from skilled provider in both the surveys. The study by Pallikadavath et al. (2004) revealed that pregnant women from poor and uneducated backgrounds in Bihar were the least likely to receive ANC services by skilled provider.
4. ANC in the first trimester: ANC visits are a necessity for every pregnant woman from the first few days of pregnancy. A thorough perception to percentages recorded in NFHS-4 state reports, it could be inferred that less than half of the women in Bihar and Uttar Pradesh had ANC visit in first trimester. This could be due to the belief that pregnancy being a natural process warranted ANC visit only when problem arose, revealed by an earlier study in Uttar Pradesh (Stephenson and Tsui 2002). Odisha and Chhattisgarh were observed to have covered a huge gap in increasing percent of mothers having at least four ANC from NFHS-3 to NFHS-4. This could be due to increase in literacy rates in these two states as disclosed by Negi et al. (2010) and Prusty et al. (2015).
5. TT injections: Tetanus toxoid (TT) vaccination is recommended for all pregnant women to prevent tetanus infections. The National Immunization Schedule in India recommends the 2 doses of TT for unknown immunization status of pregnant women i.e. the first dose of tetanus toxoid should be administered as soon as pregnancy is detected, and the second dose of TT to be administered after 4 weeks (or second dose could be given 4 weeks prior to the expected dates of pregnancy) and if a mother received 2 TT doses in the last pregnancy and mother gets again pregnant within 3 years then only one dose of TT is recommended and that dose is called booster dose (Verma et al. 2016) . The performance of all EAG states in this indicator is above average in NFHS-3 and later got more improved in NFHS-4 though the altogether performance does not suffice. A study by Thind (2005) revealed that factors such as birth order, maternal education, prenatal care provider, household standard of living, health-care-seeking decision-maker and service availability are associated with maternal TT vaccinations.
6. IFA tablets or syrup: In India, iron deficiency is held accountable for anaemia among pregnant women. Owing to this, under National Iron Plus Initiative (NIPI), the government of India provides daily doses of IFA to

pregnant women for at least 100 days during their gestation period (Kapil and Bhadoria 2014). Unfortunately, the compliance of IFA supplementation was still far behind to achieve the goal. Overall prevalence of anaemia among pregnant women in India got declined from 57.9% to 50.3% from NFHS-3 to NFHS-4. The EAG states, however, had a poor performance in distributing IFA tablets or syrup to pregnant mothers. The present study had found that Bihar has dismal performance in IFA supply to pregnant women. A recent study in Bihar has revealed that inadequate IFA supply is a huge constraint in IFA supplementation (Wendt et al. 2018). Other factors such as frequency of ANC visit, maternal education, wealth index, mass media exposure are found to be associated with required IFA intake (Chourasia et al. 2017).

7. Intestinal parasitic drug: Intestinal parasitic infections among pregnant women often act as a contributing factor to iron deficiency anaemia. Hence, to avoid the mishap, intestinal parasitic drug are used. However, NFHS-3 and NFHS- 4 had witnessed meagre percent of women in the EAG states utilizing this drug. The probable reasons could be unawareness of the symptoms of the infections caused by the intestinal parasites.
8. Delivery at health facilities: This could also be referred to as institutional births. Institutions could be either public health facilities (like subcentres, primary health centres, or facilities in rural areas) or private health facilities. The benefits of delivering births in an institution is related to the life-saving equipment and hygienic conditions that help reduce the risk of complications that may result in death or illness to mother and/or child (Campbell et al. 2006). Goudar et al. (2015) concluded that increased rate in institutional births is accompanied by subsequent reductions in perinatal and neonatal mortality. NFHS-4 has observed higher percent of institutional births compared to NFHS-3 though the percent is not quite satisfactory. The reasons could be unwillingness of the family members, misreporting on the onset of true labour pain, did not adequately plan for transportation, financial challenges (Wilcox et al. 2016; Gorain et al. 2017).
9. Postnatal care is one of the most neglected components of maternal care. NFHS-3 had witnessed poor percentages of women (below 50 percentages) having postnatal care. Several studies have reported poor client – provider inter-personal relationships, high out-of-pocket expenditure to be the reasons for such poor performances (Nair and Panda 2011; Mohanty and Kastor 2017).
10. Pregnancies with an ultrasound: Ultrasound during pregnancies can give the doctors or health care providers an extensive idea of the development of the fetus. NFHS-4 had witnessed a greater percent of pregnancies with an ultrasound compared to NFHS-3.
11. Births of order 4 or more: States such as Bihar and Uttar Pradesh have greater percent of births of order four or more. This occurs as child marriage is still prevalent in these states. This has eventually led to increase in the population of the states as depicted by the comparison of the sample sizes of both the surveys.

Conclusion

The EAG states have lagged behind in containing population growth to manageable levels. Bihar and Uttar Pradesh ranks the lowest in securing maternal health care. On the other hand, Orissa and Chhattisgarh have improved on many key indicators related to maternal health care. The government can improve the situation by enhancing the delivery, uptake and utilization of maternal and child health services. Comprehensive counselling by healthcare providers must be done to yield an in-depth knowledge regarding the utilization of maternal health services. Government programmes such as *Sarva Shiksha Abhiyan* must be sternly implemented to upgrade the educational status of women in EAG states. Prohibition of child Marriage Act of 2006 must be strictly followed to avoid early marriages and subsequent adolescent pregnancy.

Limitation of the study

The study has few limitations. Firstly, the study was solely based on NFHS-3 and NFHS-4 state reports and not the actual data provided by NFHS. The latter could have aided in revealing out more details of the survey. Secondly, as declared by NFHS, the figures of NFHS-4 and NFHS-3 may not be strictly comparable due to differences in sample size in each of the states and also due to change in number of population with a gap of 10 years in between the two survey period (NFHS-3: 2005–06 and NFHS-4: 2015–16). However, we can guess an approximate change in these two survey report provided by NFHS-3 and NFHS-4 by using some statistical test. We can also notice whether the trend is positive or negative in each key indicator while moving from NFHS-3 to NFHS-4. Thirdly, keeping in mind the length of the manuscript, the study could not include all the indicators related to maternal health. However, the study has attempted to highlight the important indicators relevant to the topic.

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The Authors' contribution

SR was involved in conception, literature search and writing of the manuscript. JS was involved in conception, designing and overall preparation of the manuscript. Both the authors have read and approved the final version of the manuscript.

Conflict of interest

The authors declare that there is no conflict of interest.

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References

Arokiasamy P, Gautam A. 2008. Neonatal mortality in the empowered action group states of India: trends and determinants. J BiosocSci 40(2):183–201.

Arokiasamy P, Jain K, Goli S, Pradhan J. 2013. Health inequalities among urban children in India: a comparative assessment of Empowered Action Group (EAG) and South Indian states. J Biosoc Sci 45(2):167–85.

Campbell OM, Graham WJ; Lancet Maternal Survival Series steering group. 2006. Strategies for reducing maternal mortality: getting on with what works. Lancet 368(9543):1284–99.

Chourasia A, Pandey CM, Awasthi A. 2017. Factors influencing the consumption of iron and folic acid supplementations in high focus states of India. Clin Epidemiol Glob Health 5(4): 180–4.

Dandona R, Pandey A, Dandona L. 2016. A review of national health surveys in India. Bull World Health Organ 94(4):286–96A.

Dehury RK, Samal J. 2016. Maternal Health Situation in Bihar and Madhya Pradesh: A Comparative Analysis of State Fact Sheets of National Family Health Survey (NFHS)-3 and 4. J Clin Diagn Res 10(9):IE01–04.

Dehury R, Samal J, Desouza NV, Dehury P. 2017. Status of Women's Health in Goa and Sikkim: A Comparative Analysis of State Fact Sheets of National Family Health Survey (NFHS)-3 and 4. Int J Med Public Health 7(4):196–202.

Gorain A, Barik A, Chowdhury A, Rai RK. 2017. Preference in place of delivery among rural Indian women. PLoS One 12(12):e0190117.

Goudar SS, Goco N, Somannavar MS, Vernekar SS, Mallapur AA, Moore JL, et al. 2015. Institutional deliveries and perinatal and neonatal mortality in Southern and Central India. Reprod Health 12 (Suppl 2): S13.

Gupta R, Talukdar B. 2017. Frequency and Timing of Antenatal Care Visits and Its Impact on Neonatal Mortality in EAG States of India. J Neonatal Biol 6:263.

Kapil U, Bhadoria AS. 2014. National Ironplus initiative guidelines for control of iron deficiency anaemia in India, 2013. Natl Med J India 27(1):27–9.

Kumar V, Singh P. 2016. Access to healthcare among the Empowered Action Group (EAG) states of India: Current status and impeding factors. Natl Med J India 29(5):267–73.

Kumar R, Dogra V, Rani K, Sahu K. 2017. Female married illiteracy as the most important continual determinant of total fertility rate among districts of Empowered Action Group States of India: Evidence from Annual Health Survey 2011–12. J Family Med Prim Care 6(3):513–6.

Mahavarkar SH, Madhu CK, Mule VD. 2008. A comparative study of teenage pregnancy. J Obstet Gynaecol 28(6):604–7.

Mani K, Dwivedi SN, Pandey RM. 2012. Determinants of Under-Five Mortality in Rural Empowered Action Group States in India: An Application of Cox Frailty Model. Int J MCH AIDS 1(1):60–72.

Mohanty SK, Srivastava A. 2013. Cost and utilisation of hospital based delivery care in Empowered Action Group (EAG) states of India. Matern Child Health J 17(8):1441–51.

Mohanty SK, Kastor A. 2017. Out-of-pocket expenditure and catastrophic health spending on maternal care in public and private health centres in India: a comparative study of pre and post national health mission period. Health Economics 7:31.

Nair H, Panda R. 2011. Quality of maternal healthcare in India: Has the National Rural Health Mission made a difference? J Glob Health 1(1):79 86.

Negi NS, Sekhar TV, Ganguly S. 2010. Antenatal Care among Tribals: A study of Chhattisgarh and Jharkhand. Kamla-Raj 2010 Stud Tribes Tribals 8(2): 77–86.

Pallikadavath S, Foss M, Stones RW. 2004. Antenatal care: provision and inequality in rural north India. Soc Sci Med 59(6):1147–58.

Patra S. 2016. Motherhood in childhood: addressing reproductive health hazards

among adolescent married women in India. Reprod Health 13(1):52.

Prusty RK, Gouda J, Pradhan MR. 2015. Inequality in the Utilization of Maternal Healthcare Services in Odisha, India. Int J Popul Res 2015:531485.

Sengupta R, Das A. 2012. Contraceptive practices and unmet need among young currently married rural women in Empowered Action Group (EAG) states of India. J Fam Welf 58(1):1–14.

Singh R, Alok. 2018. Recent Changes in Health Status of Women in Bihar through National Family Health Survey Window. J Clin Diagn Res 12(4): E01–IE05.

Stephenson R, Tsui AO. 2002. Contextual influences on reproductive health service use in Uttar Pradesh, India. Stud Fam Plann 33(4):309–20.

Steketee RW. 2003. Pregnancy, nutrition and parasitic diseases. J Nutr 133(5 Suppl 2):1661S–1667S.

Thind A. 2005. Determinants of tetanus toxoid immunization in pregnancy in rural Bihar. Trop Doct 35(2):75–7.

Wendt AS, Stephenson R, Young MF, Verma P, Srikantiah S, Webb-Girard A, et al. 2018. Identifying bottlenecks in the iron and folic acid supply chain in Bihar, India: a mixed-methods study. BMC Health Serv Res 18(1):281.

Wilcox ML, Krupp K, Niranjankumar B, Srinivas V, Jaykrishna P, Arun A, et al. 2016. Birth preparedness and place of birth in rural Mysore, India: A prospective cohort study. Midwifery 34:245–52.

Verma R, Khanna P, Dhankar M. 2016. Vaccination during pregnancy: Today's need in India. Hum Vaccin Immunother 12(3):668–70.