Brief Communication

High Under-five Mortality Rate in Rural Madhya Pradesh, Time to Identify High-Risk Districts Using National Family Health Survey-4 Data with Comparison to Low Under-five Mortality Rate in Rural Tamil Nadu, India

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Abstract

Background: India had highest number of under-five deaths, 1.2 million deaths out of 5.9 million (2015). As per the results from the first phase of National Family Health Survey (NFHS-4), 2015–2016, under-five mortality rate was highest in rural area of Madhya Pradesh (MP), 69/1000 live birth as compared to urban areas, 52/1000 live birth. The objective of the study was to identify potentially high-risk districts (HRD). **Methods:** This study was carried out from the secondary data of 50 districts of MP State which was available from NFHS-4 with information from 49,164 households. Scoring method was used to identify HRD by comparing variables related to maternal and child health care of rural MP with rural Tamil Nadu. **Results:** Eleven HRDs were identified with poor maternal and child health care along with high women's illiteracy and high percentage of child marriages in women. Indore division had 3 topmost HRD, Alirajpur, Jhabua, and Barwani followed by Rewa division with 2, Singrauli and Sidhi along with Sagar division. **Conclusions:** HRDs should be considered for targeted interventions using the strategies for reducing under-five mortality rate in rural MP.

Keywords: *Antenatal care, high-risk districts, Madhya Pradesh, postnatal care, under-five mortality rate*

Introduction

In 2015, India had highest number of under-five deaths, 1.2 million deaths out of 5.9 million and was in top rank in total number of under-five deaths.[1]

As per the outcomes from the first phase of the National Family Health Survey (NFHS-4), 2015–2016, U5MR was found irregularly distributed among the states.[2] Tamil Nadu (TN) had lesser U5MR of 27/1000 live births contrasted to Madhya Pradesh (MP), 65/1000 live births.[3,4] U5MR was higher in rural area, 69/1000 live birth in MP compared to urban area, 52/1000 live births.[3] There is a paucity of information on districts which are potentially high risk for U5MR.

Hence, the present study was planned with the objective of identifying potentially high-risk districts (HRD) in MP and suggesting possible reasons for it and suitable strategies.

Methods

This study was carried out from secondary data of state MP available from NFHS-4 (2015–2016).[2-4] The details of sampling method, interview schedule, and definitions used were available in NFHS-4 factsheets.[3,4]

Inclusion and exclusion criteria

Based on availability of estimates for rural area in district factsheet of Madhya Pradesh.

Inclusion criteria

Districts having 30%–70% or more than 70% rural population were included as estimates for rural area were available in district factsheet.

Exclusion criteria

Districts having <30% rural population were excluded as estimates for rural area were not available in district factsheet.

Hence, out of 50 districts, 48 were included after excluding Bhopal and Indore with <30% rural population and as data were not available for these two districts for rural area in district factsheet of MP in NFHS-4 data factsheet.[3] NFHS-4 fieldwork

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for MP after excluding Bhopal and Indore was carried out with information from 49,164 households, 59,287 women, and 8950 men of 48 districts and survey schedules, collection of information were available in factsheets of concerned states which was adequate to provide reliable estimates of most indicators for rural areas.[3,4]

Operational procedure to identify high risk districts

Scoring was done for positive and negative attributes as shown in Table 1. Total score was 40 for district and minimum score of zero by comparison of variables of rural MP with rural TN. Total score was calculated by comparing attributes with that of rural TN as U5MR for rural TN was 31/1000 live births as compared to 69/1000 live births for rural MP, and it was recommended that there is a need to follow the better performer within country to decrease U5MR and it was based on comparison between TN and MP.[1,3,4]

Cutoff for labeling a district as very high risk was score of more than or equal to 20 and for HRD it was more than or equal to 14. Those districts having more than equal to 50% (20 and above score) will be topmost HRDs and those having more than equal to 35% (14 and above score) will be HRDs.

Ethical approval

This study had used publicly available record available on the website of the following organization: the NFHS-4.[3,4] Because freely-available database was used in this analysis, no ethical approval was sought.

Statistical analysis

Data entry were done using Microsoft Office Excel worksheet.

Results

Women's literacy was lowest in Alirajpur district, 22% followed by Jhabua 24.3% [Table 2]. Maximum prevalence of child marriage was observed in Jhabua, 53.8% and Ratlam district 51.3% [Tables 2 and 3]. Out of 11 High Risk Districts (HRD), lowest use of family planning method was seen in Jhabua district, 8.3% followed by Vidisha and Ratlam with 23.8% and 26.4%, respectively [Tables 2 and 3].

Full antenatal care (ANC) which was defined as, no less than 4 antenatal visits, one tetanus toxoid injection and consumption of iron folic acid (IFA) tablets for 100 or more days[3] was lowest in district Sidhi 1.9%, Tikamgarh 2.6%, Alirajpur 3.4%, and Jhabua 4.8% [Tables 2 and 3].

Table 1: Scoring method to identify high-risk districts of rural Madhya Pradesh

Variables	Characteristics	Rural MP (%)	Rural TN (%)	Difference from expected	Score*
Women's education in terms of literacy (able to read and write with understanding)	Positive	51.4	72.9	21.5	3
Women age 20-24 years married before age 18 years	Negative	35.8	18.3	−17.5[a]	2
Use of family planning method	Positive	51.3	52.3	1	1
Mothers who had at least 4 antenatal care visits	Positive	29.6	81	51.4	6
Mothers receiving tetanus toxoid injection	Positive	88.3	69.7	−18.6	−2
Mothers who had consumed iron-folic acid for 100 days	Positive	20.5	62.9	42.4	5
Mothers who had full antenatal care	Positive	8.3	43.8	35.5	4
Mothers who received postnatal care from health personnel within 2 days of delivery	Positive	50.3	73.8	23.5	3
Births assisted by health personnel SBA	Positive	73.8	99	25.2	3
Women whose BMI is below normal	Negative	31.8	18.5	−13.3[a]	2
Pregnant women aged 15-49 years anemic	Negative	56.4	52.1	−4.3[a]	1
PNC child after birth from a health personnel within 2 days	Positive	16.7	35.8	19.1	2
Children age 12-23 months fully immunized	Positive	50.2	66.8	16.6	2
Children with ARI in the last 2 weeks taken to a health facility	Positive	68.3	81.1	12.8	2
Breastfed within 1 h of birth	Positive	35.5	54.2	18.7	2
Children under 5 years who were stunted	Negative	43.6	28.6	−15[a]	2
Children age 6-59 months who were anemic	Negative	69.9	52.5	−17.4[a]	2
Total score					40

[a]Negative attribute with negative difference was considered as positive. *Score of 1 was given if the difference for given attribute from rural MP was in range of 0-9%, score of 2, if the difference was in range of 10-19%, score of 3, if the difference was in range of 20-29%, score of 4, if the difference was in range of 30-39%. SBA=Skilled birth attendant, BMI=Body mass index, PNC=Postnatal care, MP=Madhya Pradesh, TN=Tamil Nadu, ARI=Acute respiratory infection

Table 2: Distribution of topmost high-risk districts in Madhya Pradesh for maternal and child health care

Variables (%)	MP (rural)	Division				
		Indore division			Rewa division	
		District			District	
		Alirajpur	Jhabua	Barwani	Singrauli	Sidhi
Women's literacy	51.4	22	24.3	32.5	47.1	55.3
Child marriage	35.8	38.3	53.8	50.3	37.7	46.4
Use of family planning method	51.3	30.7	8.3	50.5	35.9	32.3
Mothers with 4 antenatal care visits	29.6	19.7	20.5	22.8	15	11
Mothers receiving tetanus toxoid injection	88.3	67	81	69.9	67.2	83.6
Mothers who consumed iron folic acid for 100 days	20.5	11	18.8	17.7	17	9.9
Mothers who had full antenatal care	8.3	3.4	4.8	6.7	7.6	1.9
Mothers who received PNC from health personnel within 2 days of delivery	50.3	40.6	48.9	38.5	27.8	24.5
Births assisted by a health personnel	73.8	47.9	67.5	47.5	39.8	56.5
Women whose BMI is below normal	31.8	37.5	31.1	45.2	21.4	27.7
Pregnant women age 15-49 years who are anemic	56.4	64.7	75.5	68.7	40.8	45.1
Postnatal care received by child within 2 days of birth from a health personnel	16.7	15.6	16.5	19.4	11.7	2
Children age 12-23 months fully immunized	50.2	22.1	19.9	38.3	39.8	33.3
Children with ARI taken to a health facility	68.3	57.7	59.4	68.9	53.8	66.6
Breastfed within 1 h of birth	35.5	53.6	21.6	34.9	34.4	48.7
Children under 5 years who are stunted	43.6	76.6	45.8	54.5	34.4	48.4
Children age 6-59 months who are anemic	69.9	75.4	73.4	83.1	64	68.7
Total high-risk score		28	26	25	23	20

BMI=Body mass index, PNC=Postnatal care, MP=Madhya Pradesh, ARI=Acute respiratory infection

Table 3: Distribution of some high-risk districts in Madhya Pradesh for maternal and child health care

Variables (%)	Division					
	Sagar		Ujjain	Bhopal	Shahdol	Jabalpur
	District		District			
	Tikamgarh	Damoh	Ratlam	Vidisha	Shahdol	Dindori
Women's literacy	47.4	51.6	41.7	53.9	48.6	49.5
Child marriage	51.3	43.9	51.4	44.7	40.3	36.1
Use of family planning method	48.8	35.6	26.4	23.8	42.9	67.5
Mothers with 4 antenatal care visits	19.1	21.4	29	17	22.8	22
Mothers receiving tetanus toxoid injection	81.6	84.9	85.1	83.4	87	88.6
Mothers who consumed iron folic acid for 100 days	13.4	18.4	16.1	14.7	20.8	16.8
Mothers who had full antenatal care*	2.6	6.8	6.6	5.4	7	3.6
Mothers who received PNC from health personnel within 2 days of delivery	43.6	29.3	54.6	30	34.9	44.1
Births assisted by a health personnel	69.4	60	75.9	55.6	72.7	52.6
Women whose BMI is below normal	32.4	31.7	38.8	26.4	30.6	36.2
Pregnant women age 15-49 years who are anemic	38.4	52.7	72.7	48.1	68.1	61.1
Postnatal care received by child within 2 days of birth from a health personnel	9.3	4.2	18.7	5.2	3.8	14.7
Children age 12-23 months fully immunized	32.6	53	43.8	38.9	39.2	48.5
Children with ARI taken to a health facility	55.1	70.6	69	61.9	54	55
Breastfed within 1 h of birth	34	48.5	8.3	47	54.8	38
Children under 5 years who are stunted	50	43.2	50.3	43.7	37.6	46.9
Children age 6-59 months who are anemic	69.9	76.4	77.2	68.9	67.4	66.6
Total high-risk score	18	14	18	17	16	15

* Full ANC =4 ANC visits, one TT injection and consumption of IFA tablets for 100 days. BMI=Body mass index, PNC=Postnatal care, MP=Madhya Pradesh, ARI=Acute respiratory infection

The percentage of mothers who had received postnatal care (PNC) from health personnel within 2 days of delivery was only 24.5% in Sidhi and 27.8% in Singrauli district [Table 2]. Only 02% of child in Sidhi district received PNC from health personnel within 2 days of delivery followed by Shahdol, 3.8% and Damoh 4.2% [Tables 2 and 3].

Skilled birth attendance was lowest in Singrauli and Barwani district, 39.8% and 47.5%, respectively [Table 2]. Anemia in pregnant women and children was higher in Ratlam district, 72.7% and 77.2%, respectively, and Jhabua (more than 70% in both) and Barwani district (68.7% in pregnant women and 83.1% in children) [Tables 2 and 3].

Out of 11 HRD, Jhabua and Alirajpur had lowest percentage of full immunization, 19.9% and 22.1%, respectively [Table 2]. The percentage of stunting was highest in Alirajpur, 76.6% followed by Barwani 54.5% [Table 2].

Discussion

In the present study, an effort has been made to find out potential HRDs for higher U5MR. Eleven HRD were identified.

Overall women's literacy was 51.4% for rural MP. There were various studies, in which women's literacy was found to be significantly associated with utilization of ANC services.[5-13] Sarva Shiksha Abhiyan which is Government of India's flagship program for making free and compulsory Education to the Children of 6–14 years age group, a Fundamental Right, needs to be strengthened.[14]

Another issue is of higher prevalence of child marriages among women which was highest in Jhabua district, 53.8%. Child marriage had been observed to be extensively linked with women's illiteracy and was considerably associated with delay in ANC and incidence of spontaneous abortion, preterm delivery, and low birthweight babies which contributes to higher U5MR.[12,13]

As per the Prohibition of Child Marriage Act, 2006, child marriage is a crime and punishable up to 2 years imprisonment and/or a fine up to Rs. 100,000/-and is applicable to all who performs or directs a child marriage.[15]

Full ANC coverage was 8.3% for rural MP. As per NFHS-4, Bihar had the lowest full ANC percentage, 3% in rural area, followed by Tripura (6.8%), Uttarakhand (9.4%), and Assam (16.6%).[2] Singh *et al.* had found 14% of rural adolescent women had full ANC among educated women as compared to 7% among uneducated.[16] Sahu *et al*. had found association between full ANC and infant mortality, infant mortality was lower in women who had received full ANC as compared to those women who did not receive ANC.[17]

Only 20% women of rural MP had consumed IFA during pregnancy for 100 days, and it was lower in Sidhi, 9.9% which also had higher child marriage (46.4%) and illiteracy (44.7%). Wendt *et al*. in rural Bihar of India had observed that child marriage and illiteracy among women were associated with poor consumption IFA tablets, 37% during pregnancy.[18]

Mothers who had received PNC from health personnel within 2 days of delivery is an area of concern, as 50% PNC from rural MP had not received it. However, 100% PNC coverage was observed in tribal women who were visited at least twice at their home after delivery for PNC by Junior Public Health Nurse in Kerala.[6]

Even though skilled birth attendant (SBA) at the time of delivery was more than 70% in rural MP, it was only 39.8% in Singrauli district. Titaley *et al*. had observed a progressive reduction in neonatal mortality as the SBA at delivery increases.[19]

Higher percentage of pregnant women, 75.5% were anemic in Jhabua as compared to 56.4% at state level. Niswade *et al*. had found that neonatal mortality was positively associated with nonaddition of IFA during pregnancy.[20]

Another issue of concern is PNC visit of child, as only 2% of children had received a health check after birth from health personnel within 2 days in Sidhi district compared to Singrauli district 11.7%. Titaley *et al*. had observed infants were significantly protected from neonatal death if they had received PNC.[19]

Although full immunization coverage at state level was 50.2% among children aged 12–23 months, it was lowest in Jhabua district, 19.9% followed by Alirajpur 22.1%. It was observed that those women who were educated are more likely to immunize their children.[6,8]

Breastfed within 1 h of birth was lowest in Ratlam district, 8.3% followed by Jhabua district, 21.6%, whereas it was more than 34% in all HRD. Immediate breastfeeding protects the newborn from diseases and malnutrition.[1]

The reasons for higher child mortality in rural MP could be those highlighted above. These HRDs need to be focused at state, regional, and district level review meetings with objective to sensitize concerned staff regarding each and every under-five death occurring in particular district. Intersectoral coordination needs to be strengthened to prevent child marriages and to improve the women's literacy in district-level task force meetings. Furthermore, there is need to identify high-risk blocks by conducting further research in HRDs to identify the needs and actions required to meet the demands identified accordingly.

Limitation

As the datasets for the NFHS-4 were not available at Demographic and Health Survey, detailed analysis for the association of factors related to higher U5MR was not done.

Conclusions

HRDs should be considered for targeted interventions using the strategies for reducing under-five mortality rate in rural MP as limited resources are available. The Ministry of Health and Family Welfare need to expand the services

to unreached rural communities and support intersectoral coordination to improve women's education and prohibit child marriages. Another area of center of attention is to increase in the percentage of SBA at the time of delivery along with health check after birth from health personnel within 2 days during PNC visits to reduce under-five mortality.

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Conflicts of interest

There are no conflicts of interest.

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