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UNDER-FIVE MORTALITY RATE REDUCTION-A CHALLENGE AND OPPORTUNITY FOR MADHYA PRADESH, INDIA

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ABSTRACT

Introduction: India was leading in total number of under-five deaths in 2015 with 1.2 million deaths. The present study was planned to find the differences among the factors related to continuum of care for maternal, newborn and child health that may be associated with higher U5MR in Madhya Pradesh as compared Tamilnadu.

Materials and Methods: The study was carried out from the data of 13 States available from NFHS-4. Data entry and analysis using chi-square was done with help of statistical software OpenEpi.

Results: There was significantly lower women's education, higher child marriages and poor maternal, newborn and child health care such as poor ANC, poor PNC and poor immunization, poor nutritional status etc. in rural and urban areas of MP compared to TN.

Conclusions: MP had challenges of lower women's education, higher child marriages, poor antenatal and postnatal care and other factors related to continuum of care for maternal, newborn and child health in rural and urban areas compared to Tamil Nadu (TN).

Keywords: Under-five mortality rate, Madhya Pradesh, Antenatal, Post-natal, Skilled birth attendant, Breastfeeding

INTRODUCTION

India was leading in total number of under-five deaths in 2015 with 1.2 million under-five deaths and 20 percent share of global under-five deaths. [1]In 2015, globally India ranked 48 for under-five mortality rate (U5MR) with U5MR of 48 per 1000 live births and it was higher than global average of 43 per 1000 live births and also higher when compared with adjacent countries i.e. Sri Lanka, Nepal and Bangladesh with U5MR of 10, 36 and 38 per 1000 live births respectively. [1]

As per WHO 5.9 million children under the age of 5 died in 2015 and more than 50 % of under-five deaths are preventable by simple, affordable methods like quality antenatal care, skilled attendant at birth, quality postnatal care to newborn, early initiation of breastfeeding within hour of delivery and immunization along with oral rehydration therapy for diarrhea and antibiotics for pneumonia and nutritional supplements. [2] Sustainable Development Goal (SDG) goal 3 target 3.2 is to end preventable deaths of newborns and under-5 children by 2030. [2]

As per the results from the first phase of the National Family Health Survey (NFHS-4), 2015-16 released in January 2016 for 13 states, U5MR was found unevenly distributed among the states

[3].Tamil Nadu had lower U5MR of 27 per 1000 live births compared to Madhya Pradesh i.e. 65 per 1000 live births.[4,5] As far as place of residence was concerned , U5MR was higher in rural area compared to urban i.e. 69 per 1000 live birth in Madhya Pradesh compared to 31 per 1000 live births in rural area of Tamil Nadu and it was 52 and 24 per 1000 live births in urban area of Madhya Pradesh and Tamil Nadu respectively.[4,5]

In era of Sustainable Development Goals (SDGs), to achieve the goal 3 target 3.2 is to end preventable deaths of newborns and under-5 children by 2030, there is need to follow the better performer in region and within country. [1]

So, the present study was planned to find the differences among the factors related to continuum of care for maternal, newborn and child health that may be associated with higher U5MR in poor performer Madhya Pradesh as compared to better performer Tamil Nadu.

MATERIALS AND METHODS

The study was carried out from the data of 13 States available from National Family Health Surveys-4 (2015-2016). [3, 4, 5] Among the data available for U5MR of 13 states, Madhya Pradesh had higher U5MR of 65 per 1000 live births compared to 27 per 1000 live births for Tamil Nadu. As far as distribution of U5MR in terms of place of residence was observed, U5MR in Madhya Pradesh was higher in rural area, 69 per 1000 live births and in urban areas ,52 per 1000 live births compared to 31 per 1000 live births in rural area of Tamil Nadu and 24 per 1000 live births in urban area of Tamil Nadu.[4,5]So the present study was a comparison study for factors that may have significant contribution for higher U5MR in Madhya Pradesh as compared to Tamil Nadu in rural and urban areas. The Ministry of Health and Family Welfare, Government of India assigned International Institute for Population Sciences, Mumbai as the nodal organization to conduct NFHS-4. NFHS-4 fieldwork for Madhya Pradesh and Tamil Nadu was carried out with information from 52,042 households, 62,803 women, and 9,510 men and from 26,033 households, 28,820 women, and 4,794 men respectively and survey schedules, collection of information were available in factsheets of concerned states. [4, 5]

The study had used publicly-available database available on the website of the following organization: the National Family Health Survey -4. [4, 5] Because publicly-available database was used in this analysis, no ethical approval was sought. Statistical Analysis: Data entry and analysis using chi-square was done with help of statistical software OpenEpi.

Under-five mortality rate is defined as - Probability of dying between birth and exactly five years of age expressed per 1,000 live births [1].

RESULTS

The under-five mortality rate of World, India and rural and urban Madhya Pradesh, Tamil Nadu were 43, 48,69,52,31 and 27 per 1000 live births respectively. [Figure 1]

Comparison of rural and urban women of Madhya Pradesh and Tamil Nadu aged 15-49 years according to education, child marriage, antenatal check-up; anemia, skilled birth attendant and post-natal care received by mother were summarized in Table 1 and Table 3 respectively. Significant difference was observed for women's education, four antennal check-ups, anemia in pregnancy, iron folic acid consumption, skilled birth attendant and births delivered by caesarean section in rural and urban area of Madhya Pradesh (MP) and Tamil Nadu (TN) except for child marriage, antenatal check up in first trimester and mother receiving postnatal check-up from health personnel within two days of delivery in urban areas. [Table 1 and Table 3]

Table 2 and Table 4 had summarized the comparison of under-five children as per post-natal check-up received within two days of birth, immunization, breastfeeding within one hour of birth, complementary feeding, and health care seeking behavior for acute respiratory tract infection and nutritional status for rural and urban area of Madhya Pradesh and Tamil Nadu respectively. Significant difference was observed for all variables in rural and urban area of MP and TN except for children receiving Vitamin A and health seeking behavior for acute respiratory tract infection (ARI) in urban areas of MP and TN. [Table 2 and Table 4]

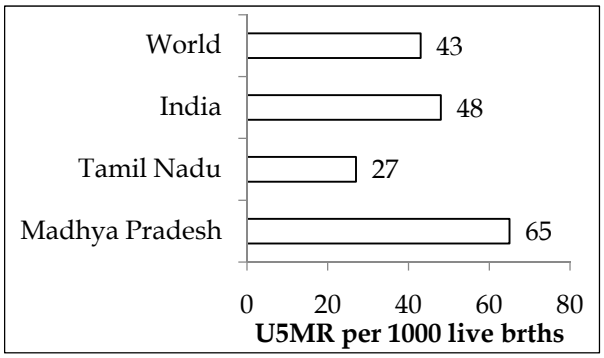

Figure 1: Under-five mortality rates of Madhya Pradesh (MP) and Tamil Nadu (TN), India in comparison to World

Table 1: Distribution of women age 15 -49 years according to important background characteristics in rural area of MP and TN

Variable (Rural)	MP	TN	$\chi 2$	P value
Literate women	51.4	72.9	8.93	0.001
Women's education in years of schooling 10 year or more	14.1	42.9	18.96	0.000
Child Marriage	35.8	18.3	6.90	0.004
Antenatal check-up in the first trimester	47.9	62.9	4.55	0.016
Four or more Antenatal care visits	29.6	81	51.38	0.000
Anemia in Pregnant women	56.4	52.1	0.37	0.271
Consumption of iron folic acid for 100 days	20.5	62.9	35.25	0.000
Births assisted by a doctor/nurse/LHV/ANM/other health personnel	73.8	99	24.92	0.000
Births delivered by caesarean section	5.1	32.3	22.58	0.000
Mother received postnatal care from a health personnel within 2 days of delivery	50.3	73.8	10.75	0.000

Table 2: Distribution of under-five children according to relevant variables in rural area of MP and TN

Variable (Rural)	MP	TN	$\chi 2$	P value
Children received a health post-natal check from health personnel within 2 days of birth	16.7	35.8	8.46	0.002
Children age 12-23 months fully immunized	50.2	66.8	5.68	0.009
Children under age 3 years breastfed within one hour of birth	35.5	54.2	7.07	0.004
Children age 6-8 months receiving solid food and breast milk	35.7	59.8	11.64	0.000
Children age 9-59 months who received a vitamin A dose in 6 months	58.6	70.5	2.60	0.053
Children with symptoms of ARI taken to health facility	68.3	81.1	3.68	0.027
Stunted Children	43.6	28.6	4.75	0.014
Underweight Children	45	25.7	7.33	0.003
Anemia in 6-59 months age children	69.9	52.5	6.38	0.006
Households with an improved drinking-water source	79.5	94.5	8.67	0.001
Households using improved sanitation facility	19.4	34	4.73	0.015

Table 3: Distribution of women age 15 -49 years according to important background characteristics in urban area of MP and TN

Variable (Urban)	MP	TN	$\chi 2$	P value
Literate Women	77.5	85.6	1.68	0.098
Women's education in years of schooling 10 year or more	43.6	58.6	4.50	0.017
Child Marriage	16.6	13	0.27	0.302
Antenatal check-up in the first trimester	66.5	65.1	0.04	0.417
Four or more Antenatal care visits	51.6	81.3	18.47	0.000
Anemia in Pregnant women	49.2	37.2	2.93	0.043
Consumption of iron folic acid for 100 days	31.6	65.1	22.47	0.000
Births assisted by a doctor/nurse/LHV/ANM/other health personnel	90.4	99.6	7.08	0.004
Births delivered by caesarean section	19.1	36.1	6.41	0.006
Mother received postnatal care from a health personnel within 2 days of delivery	67.1	74.3	0.93	0.168

Table 4: Distribution of under-five children according to relevant variables in urban area of MP and TN

Variable (Urban)	MP	TN	$\chi 2$	P value
Children received a health post-natal check from health personnel within 2 days of birth	19.6	34.9	5.16	0.012
Children age 12-23 months fully immunized	63	73.3	1.99	0.079
Children under age 3 years breastfed within one hour of birth	31.6	55.4	11.52	0.000
Children age 6-8 months receiving solid food and breast milk	45.3	76.4	19.02	0.000
Children age 9-59 months who received a vitamin A dose in 6 months	65.6	65.9	0.00	0.482
Children with symptoms of ARI taken to health facility	79.6	83.4	0.26	0.305
Stunted Children	37.5	25.5	2.80	0.047
Underweight Children	36.5	21.5	4.76	0.015
Anemia in 6-59 months age children	66.3	48.6	6.41	0.006
Households with an improved drinking-water source	96.8	86.9	5.29	0.011
Households using improved sanitation facility	66.6	69.7	0.22	0.319

DISCUSSION

The present study revealed that the U5MR of India was higher than the world in 2015, with World U5MR of 43 per 1000 live births and India 5 points higher i.e.48 per 1000 live births. Difference was observed in inter-state U5MR, with higher U5MR in Madhya Pradesh (MP), 65 per 1000 live births compared to Tamil Nadu (TN), 27 per 1000 live

births. Rural area had higher U5MR .Tamil Nadu approaching 2030 target of SDG goal 3 target 3.2, whereas Madhya Pradesh was unsuccessful to attain MDG 4 goal in deadline of 2015 .

Women's Education in rural MP was unfortunate with 48.6 % illiterate and 85.9 % having less than ten years of schooling compared to TN, 27.1% and 57.1% respectively.

Higher prevalence of child marriage in rural MP of 35.8 % compared to 18 .3 % in TN. However it was lower than that was found by Pandya Y P et al., 71.5 % in rural community of Gujarat. [6] She [6] had found that child marriages were significantly linked with women's education, 60.9 % women were illiterate among women with child marriage; however the percentage of illiterate women was lower, 51.4 % in our study for rural MP. As per World Health Organization, child marriage is defined as marriage before the age of 18 – applies to both boys and girls and 47% of all marriages in India were child marriages. [7] There is need of enforcement of legislation and improved educational opportunities for girl to decrease child marriages. Pandya Y P et al., had observed that the child marriages were significantly associated with delayed antenatal care and occurrence of spontaneous abortion, preterm delivery, low birth weight babies. [6]

Only 29.6% pregnant women had four Antenatal check-up in rural MP compared to 81.3% in rural TN. In urban MP the percentage was around 50 % compared to 82 % in TN. Women's education was found to be significantly associated with utilization of ANC services deliveries at health centers which was similar to our study findings. [8- 14]

Prevalence of anemia among pregnant women was more than 50 % in both rural MP and TN. But in urban area it was around 50 % for MP and less for TN, 37.2%. Only 20 % of Antenatal mothers consumed Iron Folic Acid (IFA) in rural MP compared to 62.9 % in TN.As far as urban areas were concerned the % of IFA consumption was lower in MP as compared to TN i.e.31 % and 65 % respectively. Acharya AS et al., had found in her study that only 32.6% women knew about consumption of iron folic acid (IFA) tablets during pregnancy. [13] Niswade et.al., had found that neonatal mortality was strongly associated with non-supplementation of Iron and Folic Acid (IFA) to mother. [15]

Around 26.2 % and 9.6 % births were not assisted by skilled birth attendant in rural and urban MP respectively compared to 01 % and 0.4 % respectively in TN. Patel A et al., in his study of 48 deaths of infants ,observed among death of 48 infants, 60.4% of pregnant women delivered at home without skilled birth attendant (by untrained personnel) . [16] Mumbare SS et al., had found that among the 34.29% home deliveries, 15.24 % were conducted by untrained persons were [8] which was lower than our findings for rural Madhya Pradesh. Parashar M et.al., in her study regarding effect of behavior change communication (BCC) intervention package among pregnant women regarding neonatal care had observed increased 1.76 times higher number of deliveries conducted by trained dais. [17]

Births delivered by caesarean section were only 5.1 % in rural MP which is a proxy indicator of Emergency Obstetric care compared to 32.3 % in TN. Chaturvedi S et.al., in her study to understand the issues in the design and implementation of the Public private partnerships (PPPs) for Emergency obstetric care (EmOC) under the Janani Suraksha Yojana (JSY) , had observed that it does not include all life-threatening complications of pregnancy and childbirth, but is restricted to Caesarean deliveries which covers only 5 % of all deliveries compared to 15% of all deliveries which would require EmOC. [18]

50 % of postnatal women of rural MP received care from health worker within two days of delivery compared to 73.8% in TN, when it comes to children who had received a health post-natal check from health personnel within 2 days of birth; it was only 16.7 % in rural MP as compared to 35.8 % in rural TN. Same was seen in urban area i.e. 19.6 % and 34.9 % respectively. However, higher percentage, 100 % was observed by Jose JA et al., 70 (100 %) women were visited at least twice at their home after delivery for post-natal care by Junior Public Health Nurse (JPHN), the designation for ANM in Kerala and attributed it to the additional hard work put up by ANMs. [9]

Only 50 % of children ages 12-23 months were fully immunized in rural MP compared to 66.8% in TN. 42 % of children age 9-59 months had not received a vitamin A dose in last 6 months in rural MP compared to 30 % in rural TN and in urban area the percentage for same was 65 % in MP and TN. However Regassa N had observed lower percentage of complete immunization, 37.2 percent. He had observed that women who were literate, had exposure to media, and women with low parity are more likely to immunize their children. [10] Nath L et al., had identified seven risk factors significantly associated with non/partial immunization. Among them, illiteracy , Muslim religion were the socio-demographic factors and five changeable risk factors namely lack of knowledge of benefits of immunization, mother not being decision maker for immunization, lack of contact with ASHA ,not being informed by ANM/ASHA about next date and four messages. (The four messages were information about vaccine given, possible

post vaccination complications, next date for vaccination, and instructions to keep the immunization card properly and to bring it in the next visit.)[12]

Immediate breastfeeding within one hour of birth was only 35.5 % which was significantly lower than in rural TN i.e. 54.2 %. In urban area same prevalence was seen i.e.31.6 % and 55.4 % respectively. Complementary feeding started to children 6 to 8 months along with breast milk was significantly lower in MP (rural and urban) as compared to TN. Globally 40 % of newborns were given breastfed within an hour of birth, rural MP had lower percentage of immediate breastfeeding , 35.5 %. Immediate breastfeeding protects the newborn from diseases and malnutrition. [1] Parashar M et.al.,had observed the effect of behavior change communication (BCC) intervention package among pregnant women regarding neonatal care and had found that there was increased percentage of beginning of breastfeeding within 1 h .He had concluded that BCC package had positive impact on behavior of mothers for neonatal care in intervention group. [17] Pandya Y P et al., [6] had observed child marriage was associated with fewer exclusively breast feeding along with poor quality complementary food. Amul Patel et al., in his study had found a total of 48 infant deaths in tribal area of south Gujarat and he had noted that out of 48 infant deaths 39.6% mothers did not breastfeed. [16] Islam S et al., had studied nutritional status of under 5 children in 500 children and he had observed initiation of breast feeding within 1 h was 69.0%, which was higher than rural MP, 35.5% and only 68.1% of children received complementary feeding during 6-12 months of age. Prevalence of stunting was significantly higher among the children who were not exclusively breastfed, deprived from colostrum feeding, and delayed initiation of breast feeding and complementary feeding. [14] Bera A et al., in her study of effect of Kangaroo mother care (KMC i.e. placing the newborn baby in intimate skin-to-skin contact with the mother's chest and abdomen coupled with frequent and preferably exclusive breast-feeding) in Low birth weight (LBW; <2500 g) newborns had observed statistically significant improvement in vital physiological parameters i.e. axillary temperature, respiration rate (RR/ min), heart rate (HR/ min), and oxygen saturation (SpO_2) on all 3 days and concluded that without using special equipment, the KMC strategy can offer improved care to LBW babies, thereby sustain wider application of KMC in LBW newborns. [19] Venkatesan M et al., had conducted one-day workshop as opportunity to celebrate breastfeeding week , for first year students of Auxiliary Nurse Mid-wife (ANM) courses and offer them skills-based training on counseling the mother about importance of exclusive breastfeeding and there was significant improvement in knowledge and skills acquired in rural Puducherry. [20] Vir SC et al. , in her four year study of mapping and counseling of "at risk" families at least once a fortnight with the help of community based mobilizers and measuring impact on maternal-child care practices had established a significant improvement in the three critical Infant and Young Child Feeding practices – initiation of breastfeeding within 1 h of birth (increased from 4.6% to 21.9%), feeding colostrum (baseline 27.9% to end-line 52.9%) and timely introduction of semi-solid foods between 6 months and 9 months (increased from 18.2% at baseline to 62.6% at the end-line). Also in a period of 4 years, a remarkable decrease of 43% in severely underweight children below 2 years and 11.8% increase in normal weight children was observed. [21]

Children with symptoms of ARI like fever and cough taken to health facility was significantly lower in rural MP as compared to rural TN. Deshmukh V et al., had noted in her study care providers of 52.6% of the neonates and 21.7% of infants and under-five children did not seek any medical care before the death of the child. Children having mothers with >5 years of schooling increased the odds of a child being taken to a care. [11]

Under-nutrition was significantly higher in MP as compared to TN .43.6 % children were stunted and 45 % underweight as compared 28.6 % and 25.7 % respectively in TN. Agarwal D et al., in his study on 458 under-five children had observed that 42.8% under-five were underweight and 41.9% had stunting. [22] Islam S et al., had studied nutritional status of under 5 children in 500 children and he had observed prevalence of underweight, stunting, and wasting as 29%, 30.4%, and 21.6%, respectively and the prevalence of stunting was significantly higher among the children who were not exclusively breastfed, deprived from colostrum feeding, and delayed initiation of breast feeding and complementary feeding. [14] Benakappa AD et.al., found that during child illness there was extensive practice of decreased breast feeds, initiating bottle feeds, feeding diluted milk and decreasing complementary feeds and thereby depriving the child of the required amount of energy and micronutrients , [23] this puts the child in vicious cycle of malnutrition.

Acharya AS et al., in her study had found that only 32.6% women knew about consumption of iron folic acid (IFA) tablets during pregnancy. [13] Niswade et al., had found that in tribal babies, neonatal mortality was powerfully associated non-supplementation of Iron and Folic Acid (IFA) to mother . [15]

Around 20 % households in rural MP were without an improved drinking-water source compared to 5 % in TN. Only 19.4 % households in rural MP were using improved sanitation facility compared to 34 % in rural TN. Diarrhea-related deaths are related to drinking water and sanitation and it had declining in great part because of upgrading in drinking water and sanitation . [1]

Limitation: The limitation of the study include that the district level analysis of factors related to continuum of care for maternal, newborn and child health that may be associated with higher U5MR was not done. This could have identified high risk districts for higher U5MR in Madhya Pradesh.

CONCLUSIONS

The challenges for Madhya Pradesh were lower women's education, high prevalence of child marriages (rural), less four antenatal check-ups, anemia in pregnancy, low iron folic acid consumption, poor skilled birth attendant at the time of delivery and less percentage of births delivered by caesarean section for emergency cases in rural and urban areas of Madhya Pradesh (MP) as compared to Tamil Nadu (TN).There is opportunity to improve the above factors with inter-sectoral coordination to increase the women's education and decrease the child marriages in rural area of MP along with improvement in the health department . Also there were challenges of lower percentage of post-natal check-up received within two days of birth, immunization of under-five, breastfeeding within one hour of birth, complementary feeding, and health care seeking behavior for acute respiratory tract infection and nutritional status for rural and urban areas of MP compared to TN and opportunity lies in highlighting these issues in District Task Force meetings of Medical Officers for corrective actions and capacity building of health workers on under-five child health care.

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