Infant Mortality among Tribes Population in India: Regional Analysis from Multiple Surveys

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ABSTRACT Present paper tries to understand the levels, trends and regional variation of infant mortality rate (IMR) among one of the disadvantaged caste group that is, Scheduled Tribes (STs) of central and eastern Indian region of the country. The analysis was based on National Family Health Surveys: 1993-2006, Sample Registration Survey: 1992-2005, Census of India: 2001-2011 and Rural Health Statistics: 2012 data. Results indicate that the tribes of central and eastern Indian states of Jharkhand, Madhya Pradesh, Odisha and Chhattisgarh had relatively higher levels of infant mortality rate. Trend analysis of IMR among tribal children showed that except Odisha the pace of infant mortality transition were stagnant in other three states and the levels of IMR among tribal families were higher than 80 infant deaths per 1000 live births in all the four states. In all states of the region, only ten percent of deliveries among tribal women took place in an institution and nearly half of the tribal women utilised Antenatal Care (ANC) services. Gap in literacy rate between tribes and general population ranges between nine percent in Jharkhand to twenty-one percent in Odisha.

INTRODUCTION

Infant and child mortality, a developmental indicator, explains the socio-economic milieu of any nation. India has made considerable progress in the reduction of infant mortality rates (IMR) over the years. Historically, the levels of infant and child mortality in India had been very high; before 1921, the life expectancy at birth was only about 20-23 years with an IMR of about 225 per 1000 live births. At the time of independence IMR was about 161 per 1000 live births, which declined modestly to 146 per 1000 live births in the sixties and 130 during seventies. Currently IMR level in India is 37 infant deaths

per 1000 live births (RGI 2015). IMR for the country has been declined by 30 points in the last 20 years at an annual average decline of 1.5 points. The progress made did not favour the country to achieve its UN Millennium development goal target of 29 infant deaths per 1000 live births by 2015. There are certain pockets and certain groups in the country which still experiences a very high infant and child mortality (Ranjan et al. 2016) . In India, social class has been considered as a proxy for socio-economic status and poverty, and it has a substantial impact on infant health and mortality. One of the social classes in India, Scheduled Tribe (ST), has been an integral part of the country's population for a long time. According to the third round of the National Family Health Survey (NFHS 2005-06), in rural areas where a majority of ST children lives, contributed about eleven percent of all births and almost one-fourth of all deaths under the age of five years. Children born to women from scheduled castes (SCs) and scheduled tribes

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(STs) have higher mortality rates than children born to women from other backward classes (OBCs) and other than SCs/STs and OBCs. Because of striking differences in socio-economic status and cultural practices between tribes and non-tribes, the maternal and child health status of tribal populations is different from that of non-tribal populations. For example, the average Indian child had twenty-five percent lower likelihood of dying under the age of five years compared with *adivasi* (tribal) children born in 2001-2005 (Das et al. 2010). A study in Odisha found that the infant mortality rates (IMR) are higher among the ST which are mainly governed by poverty (lower levels of assets), low levels of education, and poor access/utilization of health services (World Bank 2007). A longitudinal survey in the tribal dominated Bolangir district in Odisha found that villagers took a young child to the hospital only when his or her condition was critical (Van Dillen 2006). The health of the child (or risk to death) is greatly influenced by factors related to the mother, her education, her situation prior to and post the pregnancy, the care received before, during and after the pregnancy, location of birth, birth order, and the care received by the child during the first few years of his or her life. Another obvious factors is the household's socio-economic status which influences mother's ability to provide better health care, food with adequate nutrients, clothing, clean tap water, and clean sanitary conditions to their children (Barrett and Browne 1996; Defo 1997; Aber et al. 1997). Previous demographic studies on tribes of Madhya Pradesh (MP) also reported a very high infant and child mortality. About three-fourth of the infant deaths among tribes in Madhya Pradesh occur during the neonatal period (Pandey 1988; Pandey and Tiwari 2001). A comparison of population indicators has revealed that the primitive tribes are lagging behind the general population of the state by about three decades (Pandey 1988). Poverty rate is extremely high among the STs residing in Jharkhand, Odisha, Madhya Pradesh and Chhattisgarh (Table 7). Central region also depicts high rate of infant mortality among ST population and situation is worse among the people of tribal groups (PTGs) like Birhor, Korwa, Abhujmaria, Kamar and Baiga in Chhattisgarh (Dhar 2013). More than ninety percent of the STs women of Jharkhand deliver their babies at places other than medical institutions (Singh and Ram 2006).

The situation of Scheduled Tribes is not good when it comes to fully immunising their children (Singh and Ram 2006). Children born in families with low socio-economic status are at greater risk of mortality than those born in advantaged groups (Baqui et al. 2007).

These regional disparities and group differentials in child health outcome possess a research question that inspite of having flagship programmes related to maternal and child health (MCH). India does not attain the uniform growth for all sections of society. It is very essential for us to reconsider and revamp our policies in such a way that MCH indicators would improve at aggregate level and other national and international goals could be achieved. Belonging to a social group, however, is not an independent risk factor for mortality. Its effect on mortality appears to be mediated through other social, economic and environmental factors. In this context, it is useful to examine the relative position of Tribes of the four states of central and eastern Indian states of Jharkhand, Madhya Pradesh (MP), Odisha and Chhattisgarh in terms of levels and trends of IMR and related health sector achievement by these tribes over the years post-independence compared to national estimates. Also, a comparative performance of general population of these states who are getting all is also presented facilities of the government quickly relative to tribes.

Now, the present paper tries to present the recent situation on various health dimensions affecting the infant mortality including accessibility and utilisation of health facilities among one of the neglected and disadvantaged sections of the society; that is the Schedule tribes (STs) in four high focussed national health mission Indian states of Jharkhand, Madhya Pradesh, Chhattisgarh and Odisha. STs are accounted for more than twenty percent of the population in the Central and Eastern states of Madhya Pradesh, Odisha, Jharkhand, and Chhattisgarh (RGI 2011c). These four states are highly focused because maternal and child health related indicators are poor (RGI 2011b). Given the presence of Scheduled Tribes population in the central and eastern Indian region, the level shows that IMR of Scheduled Tribes is very high and it needs swift attention of the policy makers in view of post United Nations

Millennium Development Goals (UNMDGs) period of sustainable development.

Tribes in India: A Brief Profile

The tribal population of the country is 10.43 crore, constituting 8.6 percent of the total population with ninety percent of them living in rural areas (RGI 2011c). There are certain pockets in country where tribes are much larger in number, for example, Madhya Pradesh (14.6%), Maharashtra (10%), Odisha (9.1%), Gujarat (8.5%), Rajasthan (8.8%), Jharkhand (8.2%), Chhattisgarh (7.5%), Andhra Pradesh (5.6%), West Bengal (5%), and Karnataka (4%) (RGI 2011c). These states accounted for more than eighty percent of the total Scheduled Tribe population of the country and out of that Madhya Pradesh, Odisha, and Jharkhand and Chhattisgarh (Central and Eastern Indian Region) contributed forty percent itself. Apart from the North-eastern states, Madhya Pradesh (21.1%), Jharkhand (26.2%), Odisha (22.8%) and Chhattisgarh (30.6%) are the only states in India which have more than twenty percent of its population as tribal (RGI 2011c).These four states are also backward in terms of demographic as well as development indicators. For example, Madhya Pradesh which is the second largest state in India contributes maximum to the infant deaths (59 infant deaths per thousand live births, RGI 2011a) in the country and these four states belong to the low development category in Human Development Index (HDI) for the country (Planning Commission 2011).

METHODOLOGY

The data from Sample Registration System (SRS) (1992-2012), National Family Health Survey (NFHS) (1993-2005), Census of India (2001-2011) and Rural Health Statistics (2012) have been used in order to examine the levels and trends of infant mortality among tribes of central and eastern Indian states of Jharkhand, Madhya Pradesh, Odisha and Chhattisgarh. Intra-regional variations in Infant mortality, socio-economic and demographic characteristics and various other dimensions like availability of health facilities among the tribes was studied in these states using all the above data sets. Study mostly did bivariate analysis to understand the various aspects of high tribal infant mortality in the region. Brass indirect estimation of infant mortality for the region was applied to estimate IMR using census 2001 and 2011 data on tribes by utilizing the information given in the census on children ever born, child survival and total number of women in order to get the snapshot of present scenario of infant mortality (Brass 1964). The indirect estimation was done using Mortpak 4.1 software and we used the average estimates of infant mortality rate for the age group 20-35 of south Asian model life table.

RESULTS

Comparative Picture of Characteristics of Tribes and Non-tribes in the Central and Eastern Indian States

Table 1 reveals the total population of tribe, its distribution by rural-urban and percentage contribution of tribes in the total population in four selected central and eastern Indian states and for India. It is observed that in all four states more than twenty percent of its total population are tribes and 9 out of 10 are living in rural areas. Among the selected states the percentage of tribes living in urban areas in Jharkhand was

Table 1: Demographic characteristics of tribes in India and selected central and eastern states according to census 2001 and 2011

India/ State/ Union Territory	ST population census 2011			ST census 2001	ST census 2011
	Total	Rural (%)	Urban (%)	Total (%)	Total (%)
India	1042,81,034	90.0	10.0	8.2	8.6
Jharkhand	86,45,042	91.0	9.0	26.3	26.2
Odisha	95,90,756	93.8	6.2	22.1	22.8
Chhattisgarh	78,22,902	92.4	7.6	31.8	30.6
Madhya Pradesh	153,16,784	93.2	6.8	20.3	21.1

Note: ST: Schedule tribes
Source: Register General of India, India's Census 2001, 2011

nine percent followed by Chhattisgarh (8%) and it was lowest in urban area of Odisha (6%) according to census 2011.

Table 2 shows the comparative picture of sample characteristics of tribes and non-tribes in the four selected central and eastern Indian states. More than eighty percent women among tribes were illiterate but among non-tribes this percent was nearly sixty. In Odisha the percentage of illiterate women among non-tribe was only forty-six percent while among tribes this figure was eighty-seven percent. In all the four states of central and eastern region, more than eighty-five percent tribe women belong to poorest or poorer wealth category while among non-tribes it was nearly sixty percent. A majority of tribal women are engaged in agricultural activities. Among non-tribe, nearly twenty percent in Odisha, about forty percent women in Madhya Pradesh and Jharkhand and fifty-five percent in Odisha were engaged in agricultural sector. Less than six percent tribal women and nearly twenty percent non-tribe women were having toilet facilities in their household in all the four central

and eastern Indian states. Less than twenty percent tribe mothers have electricity in their home in both states of Jharkhand and Odisha, while among non-tribes of these states, the figure were forty-one percent and fifty-three percent respectively. In both Madhya Pradesh and Chhattisgarh more than half of tribe mothers and slightly less than three-fourth non-tribal women have access to electricity. Less than seven percent of tribe women have taken more than 2 tetanus injection in Madhya Pradesh. The percentage of tribal women who received more than 2TT injections from Chhattisgarh, Jharkhand and Odisha ranges between twelve to twenty-four percent However, among non- tribes, percentage of women who took 2 or more tetanus injection was nearly forty percent in Jharkhand, twenty-five percent in Odisha, eighteen percent in Chhattisgarh and ten percent in Madhya Pradesh. More than half of tribes' women and one-third non-tribe women in Jharkhand did not go for any antenatal care (ANC) visit for their last child. In Madhya Pradesh, two-fifth tribe women and less than sixteen percent non-tribe women received

Table 2: Sample characteristics of tribes of selected central and eastern Indian states

Background characteristics	States								Region	
	Jharkhand		Odisha		Chhattisgarh		Madhya Pradesh		Central and Eastern India	
	TB	NTB	TB	NTB	TB	NTB	TB	NTB	TB	NTB
Place of Residence										
Rural area	95.9	72.0	92.1	82.2	95.4	74.9	94.5	71.4	94.4	74.5
Education										
No education	82.0	71.2	86.9	45.8	83.4	64.1	87.6	62.6	85.6	60.6
Wealth										
Poorer/Poorest	87.1	63.4	90.1	55.0	86.2	62.6	91.7	57.4	85.6	60.6
Occupation										
Agriculture	66.2	39.2	51.9	21.5	74.6	54.5	53.5	35.6	59.3	35.7
Toilet										
Have toilet facility	3.2	22.8	2.0	21.3	5.5	19.2	3.3	27.5	3.4	24.0
Electricity										
Have electricity	19.0	40.7	15.1	52.9	51.9	75.4	59.2	71.0	41.2	61.8
Tetanus										
More than 2TT	23.8	38.6	15.7	25.1	11.9	17.6	6.7	10.6	13.5	20.7
Antenatal Care										
No antenatal	51.1	37.1	21.8	10.0	13.3	10.7	36.9	15.4	32.7	18.0
4 or more antenatal	8.2	22.2	23.6	41.6	23.3	30.6	9.3	26.4	14.7	29.7
Delivery Assistance										
Doctor	7.9	24.0	12.2	45.1	11.9	42.2	6.2	23.2	8.8	30.6
ANM/Nurse/Midwife	10.4	22.5	12.6	35.0	9.1	18.6	9.4	28.7	10.3	27.5
Dai/TBA	81.2	65.3	30.4	16.3	73.8	68.1	65.2	52.0	62.4	48.9

Note: TB: Tribes; NTB: Non-tribes; TBA: Trained birth attendant
Source: **N**ational Family Health Survey-3 2005-2006

no ANC. Nearly one-fourth tribe women from Odisha and Chhattisgarh and less than ten percent women in Madhya Pradesh and Jharkhand visited four or more times for antenatal care. Proportion of non-tribes women who made 4 or more ANC visits were higher than tribe women in all the four central and eastern Indian states. Among states, nearly eighty percent deliveries among tribes and sixty-five percent deliveries among non-tribes in Jharkhand were assisted by *Dai* or trained birth attendant. In Odisha, thirty percent of the deliveries among tribes were assisted by *Dai* or trained birth attendant. Among non-tribes in Odisha, slightly less than half of women preferred doctors (45%) followed by Auxiliary nurse midwife (ANM)/Nurse/Midwife/Lady Health Visitor (LHV) (35%) for deliveries. A majority of deliveries among tribes and non-tribes in Chhattisgarh and Madhya Pradesh were assisted by *Dai* or trained birth attendant.

Relative Position of Central and Eastern Indian States in Infant Mortality Rate According to Various Surveys

Table 3 presents the estimates of IMR for various rounds of National Family Health Surveys (NFHS) and Sample Registration System (SRS) for comparative time periods. It has been observed that for India, IMR has consistently declined over the years and the estimates were quite close in both the surveys. The IMR for India was around 79 infant deaths per 1000 live births in the year 1992-93, which decreased to nearly 58 infant deaths per 1000 live births in the

year 2005 (in both NFHS-3 and SRS 2005). Nearly, thirty percent decline in IMR was observed during a period of 15 years but still the levels were very high. By examining the IMR of four states of central and eastern India, almost all states had higher IMR than their national estimates in both the surveys except for Jharkhand (at that time it was part of Bihar) where estimates was lower than its national estimates only in NFHS-2.

Among all the four states in the IMR in Madhya Pradesh was highest and it was close to 90 infant deaths per 1000 live births (SRS 2005). Further, there was only ten percent reduction in IMR in Madhya Pradesh over a period of 15 years which is slowest among the states.

Again third round of NFHS survey displays that states like Madhya Pradesh and Chhattisgarh have highest IMR of nearly 70 infant deaths per 1000 live births in the region.

By comparing the estimates of SRS and NFHS among all four states of central and eastern Indian states, Madhya Pradesh (90 infant deaths per 1000 live births) had the highest IMR in SRS (2005) while Chhattisgarh state (71 infant deaths per 1000 live births) had highest IMR level according to NFHS-3 (2005-06). By examining the level of IMR for all the states of India in NFHS-3 survey, Chhattisgarh ranked second after Uttar Pradesh (73 infant deaths per 1000 live births) while Madhya Pradesh, Jharkhand and Odisha holds 3rd, 4th and 7th position with level of IMR more than 60 infant deaths per 1000 live births.

Table 3: Infant mortality rates for India and selected states by major surveys of India

| India/States | Infant mortality rate (per 1000 live births) | | | | | |
	NFHS-1	NFHS-2	NFHS-3	SRS (1992)	SRS (1990)	SRS (2005)
India	79.0	68.0	57.0	79.0	70.0	58.0
Jharkhand/Bihar	89.2	54.3$	68.7	73.0	63.0	61.0*
Madhya Pradesh(M.P)	85.2	86.2	69.5	104	90.0	90.0
Chhattisgarh	NA	NA	70.8	NA	NA	63.0**
Odisha	112.1	81.0	64.7	115.0	97.0	75.0

Note: * Shows that IMR estimate is given for the Jharkhand state but in other surveys and its rounds it is taken for Bihar as a rough estimate of IMR for Jharkhand
**Shows that IMR estimate is given for Chhattisgarh state but whereas for other surveys and its rounds it is taken from M.P state
$ & # Shows that IMR estimate is based on birth history 5 years preceding the survey, rest all estimates are based on 10 years birth history of child
Source: NFHS-1 (1992-93), NFHS-2 (1998-99), NFHS-3(2005-06) National Report; SRS Report 1992, 1999, 2005; NA: Not available

Trends of Infant Mortality Rate by Social Groups in the Selected Central and Eastern Indian States

Table 4 gives the trends of IMR by all the social groups in the selected central and eastern Indian states. It clearly revealed that IMR has decreased over the survey rounds but the pace of decline was different for different caste groups. Among the different social caste groups for India, although the IMR was highest among SCs in NFHS-1 (107 infant deaths per 1000 live births) and NFHS-3 (66 infant deaths per 1000 live births) with a decline of thirty-eight percent in its IMR over the years. However during the same time period Scheduled Tribes (STs) experienced relatively lesser percentage decline in IMR (only 31%). So there is a greater need to bring IMR to lower levels among STs in India by focusing on

Table 4: Infant mortality rate among social groups in the three rounds of National Family Health Survey by selected states and India

India/States	Infant mortality rate (per 1000 live births)		
	NFHS -1	NFHS -2	NFHS -3
India			
Schedule cast (SC)	107.3	83.0	66.4
Schedule tribes (ST)	90.5	84.2	62.1
Other backward class (OBC)	NA	76.0	56.6
Others cast (OC)	82.2	61.8	48.9
Jharkhand/Bihar			
Schedule cast (SC)	120.4	86.3	76.7[*]
Schedule tribes (ST)	97.2	81.9	93.0[*]
Other backward class (OBC)	NA	75.3	75.5[*]
Others cast (OC)	94.0	61.2	66.9[*]
Madhya Pradesh			
Schedule cast (SC)	90.2	101.5	81.9
Schedule tribes (ST)	87.0	101.0	95.6
Other backward class (OBC)	NA	92.3	79.0
Others cast (OC)	81.0	72.4	66.8
Chhattisgarh			
Schedule cast (SC)	90.2	101.5	63.1[**]
Schedule tribes (ST)	NA	NA	90.6[**]
Other backward class (OBC)	NA	NA	79.4[**]
Others cast (OC)	81.0	72.4	83.1[**]
Odisha			
Schedule cast (SC)	63.2	83.9	73.7
Schedule tribes (ST)	55.2	98.7	78.7
Other backward class (OBC)	NA	95.6	66.0
Others cast (OC)	36.2	79.1	53.1

Note: 1) IMR in ([*]) is given for Jharkhand state in NFHS-3, in NFHS2 and NFHS1 it is taken same as estimate for Bihar
2) IMR in ([**]) is given for Chhattisgarh state in NFHS-3 but it is Not Available (NA) for NFHS-1 and NFHS-2

certain health policies related to tribes. In NFHS-1, the IMR among the tribes was as high as 91 infant deaths per 1000 live births for India. This level was reduced to nearly 85 infant deaths per 1000 live births in NFHS-2 and it further reduced to 62 infant deaths per 1000 live births in NFHS-3. In NFHS-3, the levels of IMR among the tribes was higher than other sub-groups in all four central and eastern states. Except tribes in Odisha where IMR was around 79 infant deaths per 1000 live births, the IMR among tribes in other three states were more than 90 infant deaths per 1000 live births. Madhya Pradesh had the highest IMR among tribes which was more than 95 infant deaths per 1000 live births.

Trends of Proportion of Infant Death to the Under Five Deaths in the Central and Eastern Indian States

Figure 1 and Figure 2 show the trends in contribution of infant deaths to under five deaths separately for overall population and for scheduled tribes respectively during 1992-93 to 2005-06. For the overall population of India, the trends of the contribution of infant deaths in under five deaths in three NFHS rounds remained almost constant over the survey rounds which formed nearly two-thirds of the total under 5 deaths. Figure 2 also shows somewhat similar trends for STs. For the four selected central and eastern states, Bihar (later Jharkhand in NFHS-3) had almost similar trends as that of India. In Odisha, there was a reduction (nearly 10%) in the contribution of proportion of infant deaths to the under five deaths over a period of almost one and half decade. It can be visualised other way that, in NFHS-1 among tribes, the gap between the levels of IMR in Odisha and India was more than ten percentage points but in NFHS-3 the gap was almost disappeared.

Birth Delivered in an Institution and Home by Tribe and Non-tribe Mother in India and Selected Central and Eastern Indian States

Table 5 shows the proportion of tribes and non-tribes mothers who delivered their babies in their home and at health facilities for India and selected central and eastern Indian states. For India, in NFHS-1, only nine percent tribe mothers availed institutional delivery which in-
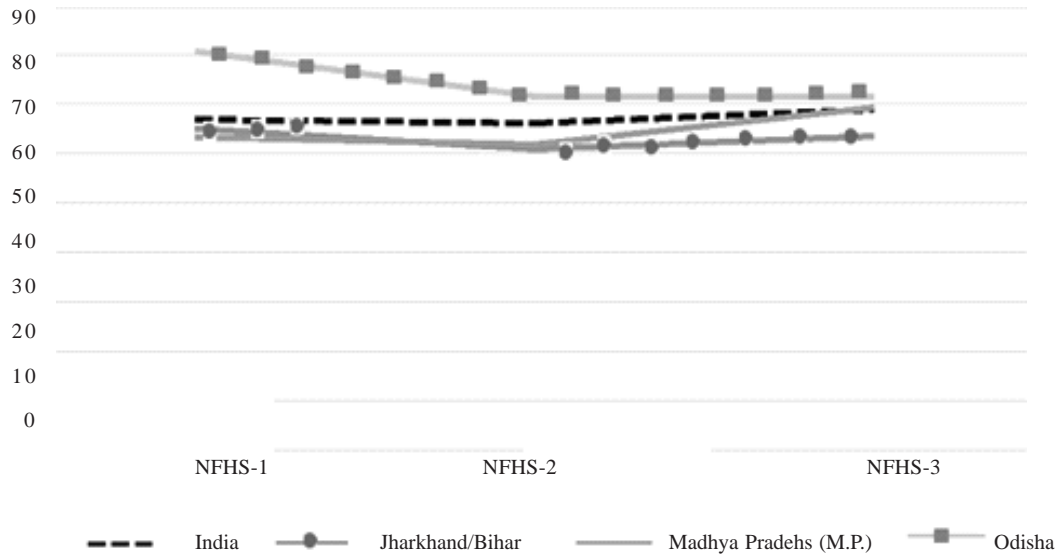
Fig. 1. Trend in proportion of infant deaths to the under five deaths in three rounds of NFHS by India and selected states
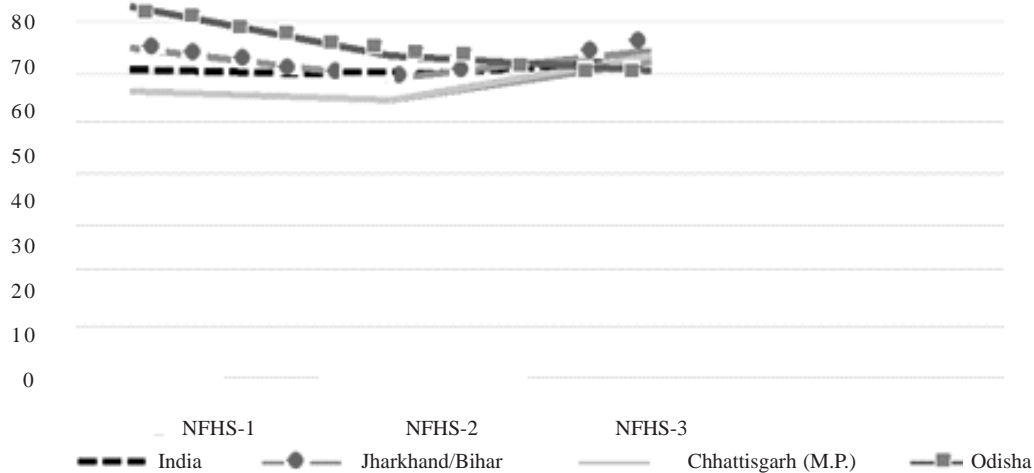

Fig. 2. Trend in proportion of tribal infant deaths to the under five deaths in three rounds of NFHS by India and selected states

creased to seventeen percent in NFHS-2 and remained at this level in NFHS-3. For non-tribes, nearly thirty percent mothers delivered in an institution in NFHS-1 which rose to thirty-six percent in NFHS-2 and nearly forty percent in NFHS-3.

Among the tribes in various states of the region, the situation was far worse in Bihar/Jhark-

hand as only four percent mothers went for institutional delivery in NFHS-1 which rose to five percent in NFHS-2 and in NFHS-3 it was just seven percent. In Madhya Pradesh over the 15 years period, the proportion of tribe mothers availing institutional delivery for their new-born has increased from four percent in NFHS-1 to eight percent in NFHS-3 while for Chhattisgarh

Table 5: Percent of births delivered in the health facility and home by tribe and non-tribe mothers in three rounds of NFHS surveys

India/Selected states	NFHS-1		NFHS-2		NFHS-3	
	Home	Institutional	Home	Institutional	Home	Institutional
India						
TB	90.9	9.1	82.8	17.2	82.2	17.8
NTB	72.8	27.2	64.2	35.8	58.9	41.1
Bihar/Jharkhand						
TB	96.2	3.8	94.5	5.5	92.7	7.3
NTB	87.2	12.7	84.5	15.4	76.9	23.0
Madhya Pradesh						
TB	96.0	4.0	92.7	7.3	91.8	8.2
NTB	79.3	20.7	75.6	24.4	67.9	32.1
Chhattisgarh						
TB	96.0	4.0	92.7	7.3	95.9	4.1
NTB	79.2	20.8	75.6	24.4	81.1	18.9
Odisha						
TB	95.5	4.5	92.4	7.6	88.3	11.7
NTB	83.2	16.8	73.1	26.9	55.2	44.8

Note: TB: Tribes; NTB: Non-tribes; NFHS: National Family Health Survey

only four percent mothers in NFHS-3 went for institutional delivery. Odisha has performed better than other three states in terms of availing institutional delivery as only five percent mothers delivered birth in an institution in NFHS-1 but in NFHS-3 it rose to twelve percent. While for the non-tribe population, Bihar accounted for thirteen percent institutional delivery in the states which rose to fifteen percent in NFHS-2 and twenty-three percent in NFHS-3. In Madhya Pradesh, nearly twenty-one percent mothers preferred institutional delivery in NFHS-1 which rose to thirty-two percent in NFHS-3 but in Chhattisgarh only nineteen percent mother availed institutional delivery in NFHS-3. In Odisha, mothers who went for institutional delivery rose from seventeen percent in NFHS-1 to forty-five percent in NFHS-3.

Situation of Infant Mortality Rate and Socio-economic, Demographic Characteristics and Health Infrastructure among Tribes of Central and Eastern Indian States

Census of India is one of the most important source of information which provides information about various characteristics of population and its sub-groups including Scheduled Tribes of India. Indirect estimate of infant mortality rate for tribes of different states of central and eastern region is carried out by utilizing the information given in the census on children ever born,

child survival and total number of women. Indirect estimation of infant mortality rate for tribes in Table 9 clearly reveal that the tribes of this region was experiencing very high infant mortality. During intercensal period between 2001 and 2011, IMR in all the states of this region has declined except Jharkhand. Though, the trends showed declining in nature but still the levels of IMR even in 2011 were quite high. The estimated IMR in Madhya Pradesh was highest in both the census periods. There exists a remarkable disparity in the literacy level of tribes and non-tribes and the gap between the two groups has been narrowed down. In the census year 1991 the gap in literacy level was more than twenty percent which reduced to nearly seventeen percent in the year 2001 and further reached to the level of fourteen percent in the census year 2011 (Table 6).

The analysis based on 55th round of NSS data showed that more than half of the tribes of central and eastern Indian region fell in the extremely high poverty category (Table 7). The higher number of tribes under poverty is one of the major reason for the under nutrition of children among the tribes and hence higher mortality of their children. Rural health statistics data about heath infrastructure in tribal areas of central and eastern India, reveals that except Chhattisgarh, there observed a considerable shortfall in health infrastructure at all levels and across all the states of the region at Sub-centre (SC) and at Primary

Table 6: Progress of gap in literacy rate between tribes and overall population in three censuses, 1991-2011

India/State/UT	Literacy rate - 1991		Gap in literacy rate		Gap in literacy rate - 2001		Literacy rate rate - 2011		Gap in literacy rate
	Total	ST	GAP	Total	ST	GAP	Total	ST	GAP
India	52.2	29.6	22.6	64.8	47.1	17.7	73.0	59.0	14.0
Chhattisgarh	42.9	26.7	16.2	64.7	52.1	12.6	70.3	59.1	11.2
Jharkhand	41.4	27.5	13.9	53.6	40.7	12.9	66.4	57.1	9.3
Madhya Pradesh	44.7	18.4	26.3	63.7	41.2	22.6	69.3	50.6	18.8
Odisha	49.1	22.3	26.8	63.1	37.4	25.7	72.9	52.2	20.6

Table 7: Percentage of people BPL for ALL and STs 2009-10 (Tendulkar methodology)

Incidence of poverty (%)	States
Extremely high (> 50)	Odisha, Jharkhand, Madhya Pradesh (including Chhattisgarh)
High (35 to 50)	West Bengal, Maharashtra, Assam, Uttar Pradesh (including Uttarakhand)
Moderate (20 to 30)	Andhra Pradesh, Gujarat, Karnataka, Rajasthan
Low (< 20)	North-Eastern States

Source: NSSO, 55th round, 1999-200

Health Centre (PHC) level and at Community Health Centre (CHC) level (Table 8).

DISCUSSION

The analysis indicates that the Central and Eastern Indian states of Jharkhand, Madhya Pradesh, Odisha and Chhattisgarh have relatively higher levels of infant mortality rate where a significant portion of its population are based in rural areas. The IMR among tribes in rural areas is higher than urban areas showing that the tribes residing in rural areas don't get access to health facilities and were at disadvantageous position than the tribes residing in urban areas. The trends and levels of proportion contribution of infant deaths to the under five deaths among the tribes of the region indicate that except for Odisha, the proportion contribution in the remaining three states and for India had been increased between three NFHS survey rounds. It clearly reflects that mortality condition of the children having age more than one year has been improved at much faster pace than infants. The high level of IMR showed that the region lags behind not only in terms of poor health outcome but the government programmes related to child health were not that much effective. The other problem could be a lack of sufficient health infrastructure in the region. In these four states it is evident that infrastructure development are lagging behind with respect to other regions of the country. Less than ten percent of all deliveries among tribal women takes place in an institu-

Table 8: Health infrastructure in tribal areas (March 2012)

State/UT	Tribal population in rural areas	Sub-centres			PHCs			CHCs		
		R	P	S	R	P	S	R	P	S
Chhattisgarh	7377058	2459	2984	.	368	403	.	92	84	8
Jharkhand	7767269	2589	2053	536	388	123	265	97	90	7
Madhya Pradesh	13550258	4516	2908	1608	677	328	349	169	104	65
Odisha++	8599849	2866	2689	177	429	403	26	107	135	.

Note: The requirement is calculated using the prescribed norms on the basis of provisional rural population from Census 2011 and estimated rural tribal population in 2011 using percentage of tribal population out of rural population in 2001. All India shortfall is derived by adding state-wise figures of shortfall ignoring the existing surplus in some of the states
R: Required; P: In position; S: Shortfall; **: Surplus; *: State/UT has no separate tribal area/population;#: States are predominantly tribal areas; ##: Data for 2011 repeated; +: Data for 2010 repeated; ++: State informed that there are 23 other hospitals functioning in tribal area which are equal to PHCs level facilities, *Source:* Rural Health Statistics 2012

tion rest all takes place at home. This keeps infant at higher risk of death in each of the four states. The situation of Jharkhand and Chhattisgarh is a matter of great concern and it needs more attention since the level of institutional delivery was one of the lowest among both tribes as well as non-tribes in the NFHS survey rounds. Odisha, in both tribes as well as non-tribes occupy relatively a better position than other three states in terms of institutional delivery. The role of *Dai* or trained birth attendant at village level in these states are important as in many cases deliveries conducted by these trained health workers is higher for both tribes as well as non-tribes. It also indicates that tribes developed trust on these health workers. But still the gap between tribes and non-tribes in institutional deliveries evidently suggests that even after one and half decade of developmental phase in the country in terms of better socio-economic environment, the situation among tribes in terms of healthcare utilisation remained an area of great concern for the country. There was a huge gap in mortality risk experienced by children of tribes than non-tribes due to differentials in availing safe deliveries. This shows that a majority of tribes within India still do not avail modern health facilities while going for delivery of a new born. This increases the chance of dying of a new born. Though antenatal care (ANC) coverage among tribes is relatively at higher levels but still these states account for highest number of deaths. The regional variations in various socio-economic factors lead to differential in performance of the states. The trend analysis and levels demonstrated that infant from Madhya Pradesh and Chhattisgarh had higher risk of death than Jharkhand and Odisha. The data from planning commission of India showed that tribes in this region are under extreme poverty (Com-

mission 2011). The indirect estimation of IMR using both latest and last census data showed that except Jharkhand, IMR of other three states has been reduced over the two censuses but the levels were very high. Many previous studies have shown that education of mother is one of the strongest predictor for reducing infant mortality (Caldwell and McDonald 1982; Dreze et al. 1996; Murthi et al. 1996; Rosenzweig and Schultz 1982). Many earlier studies on tribes cited poverty as one of the leading cause of infant mortality among tribes of the region (Hulme et al. 2001; Jayaraj and Subramanian 1999; Rajagopal 2001). There also exist a linkage between education, wealth and healthcare utilisation. If a household in tribal area was categorised as poor but mother is educated then it is more likely that there would minimal impact of wealth on child survival. Many previous studies have also shown that if education coverage among tribes would be increased, it would enhance their socio-economic status and also motivate them for pre and post-natal care of the baby (Dhargupta et al. 2009).

Millennium Development Goals (MDGs) (Poverty 2015) is undergoing its transition from the era of MDGs to the era of Sustainable Development Goals (SDGs) (Robert et al. 2005). Government of India needs to re-think from the policy perspective that how the development should be made more inclusive so that the disadvantageous position of the tribe should go away and at the same time how the inequality at various levels should be addressed. The study tried to raise few issues affecting the infant mortality among tribes. There should be some target approach to deal with the mortality situation in the tribal groups of this high focussed central and eastern Indian region. It further emphasises that health care needs better planning and in-

Table 9: Estimated infant mortality rate (IMR) of tribes in India based on census

Country/State	Census 2001 IMR (per 1000 live births)			Census 2011 IMR (per 1000 live births)		
	Total	*Rural*	*Urban*	*Total*	*Rural*	*Urban*
India	84	85	61	74	76	60
Jharkhand	77	79	57	80	82	59
Odisha	92	93	75	85	86	69
Chhattisgarh	95	97	69	85	86	67
Madhya Pradesh	110	111	84	87	88	75

Source: Census 2001, 2011

vestment so that apart from inclusiveness in the development agenda, health service utilization should be accessed at affordable cost. The health programmes should be made more popular among the masses. Like National Health Mission (NHM), there should be programme especially focussing on tribes (Reddy et al. 2011). Janani Suraksha Yojana (JSY) and benefits of institutional delivery should be promoted in the remote corner of the country (Lim et al. 2010). The health infrastructure should be strengthened in the areas where a large number of tribes are concentrated which are identified as the areas with larger number of tribes. Mother's education is one of the leading factor influencing the risk of mortality of infants especially for tribes. Reproductive, Maternal, New-born, Child and Adolescent Health (RMNCH+A) approach has been launched in 2013 and it essentially looks to address the major causes of mortality among women and children as well as the delays in accessing and utilizing health care and service. The RMNCH+A strategic approach has been developed to provide an understanding of 'continuum of care' to ensure equal focus on various life stages. The 12th Five Year Plan has defined the national health outcomes and the three goals that are relevant to RMNCH+A strategic approach and one of the Health Outcome Goals established in the 12th Five-year Plan was reduction of Infant Mortality Rate (IMR) to 25 per 1,000 live births by 2017. In order to have better health outcomes of tribes, Rashtriya Bal Swasthya Karyakram (RBSK) is an important initiative which envisages Child Health Screening and Early Intervention Services, a systemic approach of early identification and link to care, support and treatment.

Other known intervention carried out by Society for Education, Action and Research in Community Health (SEARCH) in the remote tribal areas of Gadchiroli (Maharashtra) (Bang et al. 2005) is an international success story in maternal and neonatal health. The program trained ordinary villagers to be midwives and take care of infants in the absence of doctors. Estimates suggested that the intervention has resulted in a decline in the infant mortality rate in Gadchiroli from 121 per 1000 live births in 1998 to only 30 by the year 2000. Though unit cost of SEARCH was high, but this intervention was an eye opener for the government agencies and if such type of programmes will be replicated in other tribal areas at mass level, it is likely that programme would be cost effective and at the same time would tackle the problem of high mortality among the tribes (Bang and Bang 1992). There should be separate plan for tribal and non-tribal areas. The local cultural values are to be included for tribal areas planning. Many of these maternal and new-born health problems can be prevented by increasing the awareness and utilisation of antenatal care, institutional deliveries, postnatal visits and essential new-born care practices among the tribes. Appropriate Behaviour Change Communication (BCC) strategies should be developed for tribal women and their family members.

CONCLUSION

The tribes and non-tribes of the region have marked differences on many socio-economic, demographic and health dimensions. The study reflects the disadvantageous position of tribes in terms of their residence, wealth, education, antenatal care and other service utilisation like institutional delivery and delivery by a trained birth attendant/*Dai* which sometimes makes their children more susceptible to the risk of infant death. Apart from that, the incidence of poverty in the four states among tribes in the region is very high with nearly half of the total tribes in the states are under extreme poverty situation and they mainly depend upon agriculture for income generation. Even the health systems like SHCs, PHCs and CHCs are underperforming in tribal dominated areas in the four states of central and eastern Indian states which adversely affect the health of the mother and the children equally.

RECOMMENDATIONS

Government of India needs to re-think from the policy perspective that how the development should be made more inclusive so that the disadvantageous position of the tribe should go away and at the same time how the inequality at various levels among the non-tribes should be addressed. There should be separate plan for tribal and non-tribal areas. The local cultural values are to be included for tribal areas planning. Government should also promote education, awareness among tribes about modern health facilities and infrastructure development

in tribal areas. The policy initiatives should be pro tribe culture and it should be encouraging. Mass media based information about government policies should be promoted in those areas.

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