



## **Delivery Safety of Women from Tribal and Non-tribal Areas, in the State of Maharashtra, India**

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### **Authors' contributions**

*This work was initiated and conducted by author PPD. Author SRD helped in conducting training session and writing the article.*

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### **ABSTRACT**

**Aims:** The study was conducted to obtain information about place and mode of child delivery and compare unsafe deliveries between tribal and non-tribal areas.

**Study Design:** This was a retrospective study with the follow up of registered pregnant women in the Primary Health Centers (PHC).

**Place and Duration of Study:** The study was conducted in the PHCs of the State of Maharashtra, India. They were divided into two groups, tribal and non-tribal. The study was carried out in 2009-10.

**Method:** A format was prepared to obtain details of delivery of children by women. The Auxiliary Nurse Midwives filled the format for all the pregnant women registered during calendar year 2008, through house to house visits in their respective areas.

**Results:** More than one million pregnancies were registered. There were 21.88% home deliveries, of which 6.96% were not attended by a skilled birth attendant. About 5% of the babies were delivered through Cesarean section. The proportion of home deliveries (46.79%) and the absence of a skilled birth health professional (16.19%) were significantly higher in tribal areas. Even in institutional deliveries, interventional assistance was offered to lesser extent in these areas. The relative risk of undergoing unsafe delivery was 3.25 (95%, C.I. 3.20-3.29) in tribal PHCs. The district wise analysis

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also supported the findings that home deliveries and overall unsafe deliveries were more in tribal districts.

**Conclusion:** The study concludes that substantial number of women from tribal areas is exposed to unsafe deliveries.

*Keywords: Pregnant women; tribal area; institutional delivery; skilled birth attendant.*

## 1. INTRODUCTION

Among the Millennium Development Goals accepted all over world, three goals are directly related to health. Many targets and indicators are pertaining to Reproductive and Child Health. Indicator 17 of Target 6 in Goal 5 is the proportion (%) of births attended by a skilled health attendant. Services of skilled birth attendants at child birth certainly help in achievement of reduction in two indicators, infant mortality and maternal mortality, out of the three targeted goals under National Rural Health Mission of India (NRHM). NRHM was launched in 2005 and includes many schemes like Janani Suraksha Yojana (a conditional cash transfer scheme for recently delivered women), institutional strengthening, deployment of special manpower in the form of attractive contractual appointment or newly created cadre of Accredited Social Health Activists in villages, and various trainings like skilled birth attendance, Basic and Comprehensive Essential Obstetrics Care, Life Saving Anesthetic Skills (LSAS) especially for Cesarean Section etc. For achieving the goals, information pertaining to the progress and present status of the indicators in the different populations is essential. The health indicators are despicable in lower socio-economic class including tribal population. The tribal population in India is mostly scattered in the central and north-east states. Maharashtra occupies the second rank in inhabiting tribal population. They live away from urban habitation and mostly in forest and hilly regions. Lack of modern communication systems lead to continuation of age-old practices of agriculture, poorly developed infrastructure and lack of trained service providers. All these factors ultimately contribute to their poor health status, which has been documented [1]. Delivery details such as preterm deliveries, place of delivery, assistance by skilled birth attendant, assisted deliveries, Lower Segment Cesarean Section (LSCS), among them are scarcely available. In the Health Management Information System (HMIS) reports, such indicators are not included. National level surveys provide some information separately for urban and rural areas and scheduled castes and scheduled tribes. The Government of India expects special attention towards tribal population in the National Rural Health Mission (NRHM). The investigators therefore decided to compare the preterm deliveries, place of delivery, the presence of skilled birth attendant in home deliveries, assisted deliveries in institutions (episiotomy, forceps, vacuum and Cesarean Section) of children born alive in the rural areas and tribal areas in the state of Maharashtra, India.

## 2. METHODS

### 2.1 Study Area

The state of Maharashtra has an area of 308,000 km<sup>2</sup> and as per the last census carried out in 2011, a population of 112.37 million people. About 54.77% are residing in rural areas. In the state, 47 scheduled tribes have been identified accounting for 9.4% of the total population. The population belonging to all these scheduled tribes in general is termed as tribal and is concentrated in 15 districts. There are 35 districts in the state, out of which two

are exclusively urban, constituting Greater Mumbai Municipal Corporation. The rural population is scattered in remaining 33 districts. The tribal population is confined almost exclusively to rural areas. The total rural population is covered by a network of sub centers for provision of health services. These sub centers function under Primary Health Centers (PHCs). One male and one female health worker are posted in each sub center. The female health worker is a qualified Auxiliary Nurse Midwife. She registers all the pregnant women in her area and provides them antenatal services. In the first week of every month health related information from all the sub centers is collected at PHC level. Health assistants (supervisors) from the PHC level carry out the compilation of the information for on line data entry for HMIS. At the time of the study there were 10,579 sub centers and 1,816 PHCs in the state, out of which 320 were from the notified 15 tribal districts.

## **2.2 Study Population**

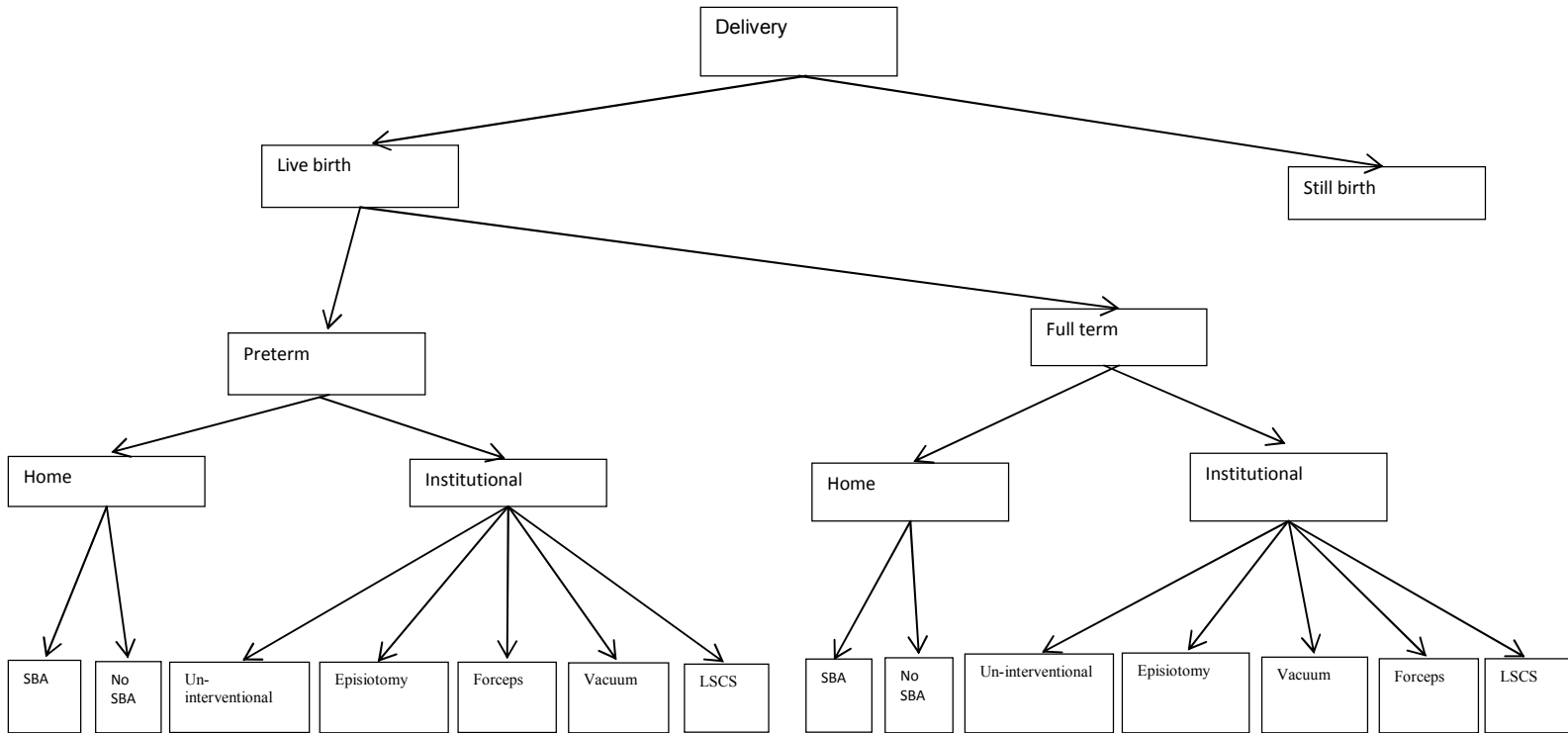
Investigators collected information about deliveries of all the pregnant women registered in the calendar year 2008 in Maharashtra. The source of information of number of already registered pregnant women was the HMIS of the Directorate of Health Services, Government of Maharashtra.

## **2.3 Survey Instrument and Data Management**

The investigators developed a simple proforma to note pertinent additional details not available in the HMIS data. Through the proforma, we obtained information about four variables, period of gestation, place of delivery, person conducting delivery in home and assistance during institutional delivery, in all live births. Authors pre-tested the format with the help of medical officers of PHCs. The scheme of information collection is given in annexure 1.

With the help of government officers and the information technology group, we created a separate link on the Directorate of Health Services' website to enter the data online. Training was conducted at each divisional place for Block Medical Officers and Block Level Data Entry Operators from the constituent 3 to 4 districts in the respective division. These two cadres of trainers then trained the health assistants who were compiling the data from the sub centers. The health assistants trained the ANMs in their PHCs. Subsequent to training, the officials and training team members urged all the ANMs to record all the details in the register, after collecting the requisite information from the home visits. We started the study almost at the end of 2009 with the intention to ensure inclusion of all the women registered to complete full gestational period. The outcome was considered adverse if pregnancy resulted in abortion or stillbirth and favorable if the child was born alive. Detailed information pertaining to live births was collected and analyzed. Authors monitored the quality of data intensively and nil figures, outliers were referred back for confirmation and correction if necessary. The data was analyzed by using  $\chi^2$  test and 95% confidence limit was considered as significant. We also calculated inter quartile range and outliers which are 1.5 times of inter-quartile range away from inter-quartile range as considered in box plot. The Institutional Ethics Committee of SHSRC gave ethical clearance with waiver from informed consent.

Annexure 1



Annexure 1. Scheme of collection of information of live birth in Maharashtra, 2008-09

## 2.4 Definitions

Deliveries before 37 completed weeks were labeled as preterm and the rest were labeled as full term. Deliveries in the institutions conducted using episiotomy, forceps, vacuum or Lower Segment Cesarean Section (LSCS) were termed interventional or assisted deliveries. Home deliveries without Skilled Birth Attendants were considered unsafe deliveries. Skilled Birth Attendant included qualified Auxiliary Nurse Midwife, General Nurse, Lady Health Visitor and Doctor. All institutional and home deliveries attended by Skilled Birth Attendant were termed safe deliveries.

## 3. RESULTS

A total of 1,183,312 pregnant women were registered (18.01% from tribal PHCs) in the rural areas of the Maharashtra State in 2008. The investigators were able to follow 1,070,154 (90.44%) of them. There were two main reasons for inability to follow all of them: Auxiliary Nurse Midwives were not available at 288 sub center and some of the women migrated to other places outside the jurisdiction of sub centers and hence the ANMs were unable to follow. There were 996,425 live births. The proportion of female children in tribal PHCs (46.89%) was higher than non-tribal (45.74%) ( $\chi^2=72.99$ ;  $P<.0001$ ).

The proportion of full term deliveries (97.35%) as well as home deliveries (46.79%) was higher in tribal PHCs (97.23% and 16.54% in non-tribal) ( $\chi^2=6.94$ ;  $P<.0084$  and  $\chi^2=77446.30$ ;  $P<.0001$ ). Proportion of home deliveries conducted by Skilled Birth Attendant (69.87%) was higher in non-tribal PHCs (65.38% in tribal areas) ( $\chi^2 =475.42$ ;  $P<.0001$ ). Among institutional deliveries, interventional or assisted deliveries (16.45% in non-tribal areas; 12.37% in tribal areas) including LSCS were more common in non-tribal PHCs ( $\chi^2 =1064.87$ ;  $P<.0001$ ), regardless the period of gestation. In all PHCs, among institutional deliveries the proportion of un-interventional or spontaneous deliveries was higher in full term deliveries (84.27% in full term; 75.23% in preterm) ( $\chi^2 =1136.43$ ;  $P<.0001$ ). This finding was persistent even in segregated analysis of tribal PHCs ( $\chi^2=53.79$ ;  $P<.0001$ ) and non-tribal PHCs ( $\chi^2=1100.32$ ;  $P<.0001$ ). The different forms of assistance in institutional deliveries are given in Fig. 1.

The percentage of unsafe deliveries was higher in tribal PHCs (16.19%) than non-tribal PHCs (12.37%) ( $\chi^2=28089$ ;  $p<.0001$ ). Relative risk of unsafe deliveries in tribal PHCs was 3.25 (95% C.I. 3.20-3.29). The details about area, period of gestation, place and mode of delivery are given in Table 1.

We also carried out district wise analysis. Due to the large population size in the study, the majority of the districts differed distinctly even with 99% confidence level, in the statistics of studied variables. Hence rather than giving district wise statistics of 33 districts, compiled information is presented in the form of median, minimum and maximum values, inter-quartile range and the number of outlier districts are given in Table 2. Among the five outliers having very high percentage of preterm deliveries, two were tribal and three were non-tribal districts. Both the outlier districts having very high percentage of home deliveries were tribal districts. The outlier high value of LSCS percentage out of total deliveries was observed in a non-tribal district. The segregated data of LSCS% among institutional deliveries for preterm deliveries showed two high figures which belonged to non-tribal districts. The district recording very high percentage of LSCS among full term institutional deliveries was again a non-tribal district. The LSCS proportion in general was higher among preterm deliveries than in full term deliveries. The two outlier districts showing high percentage of unsafe deliveries were tribal districts.

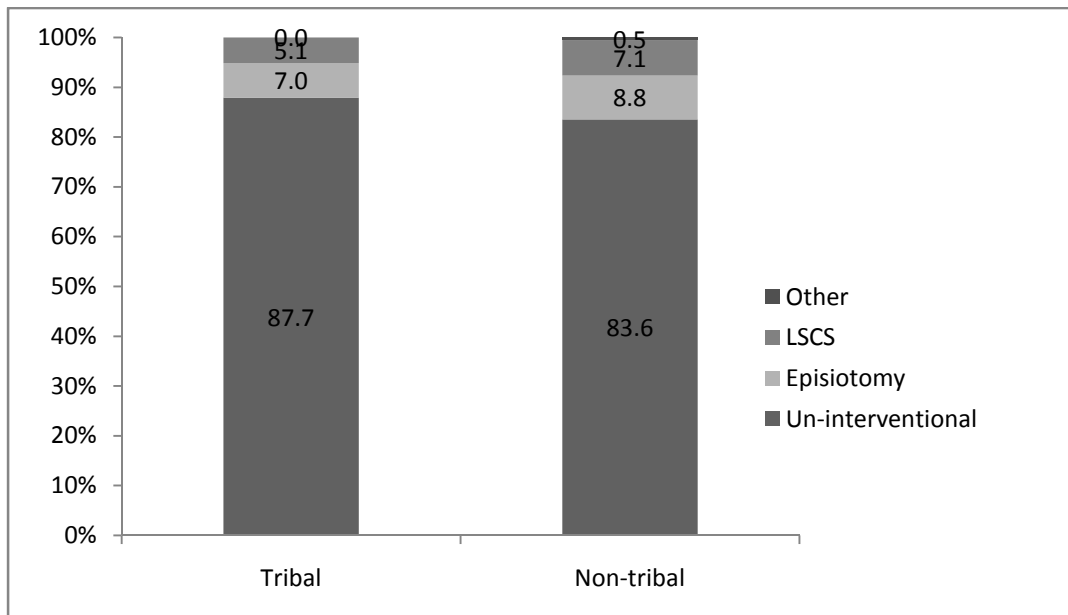
**Table 1. Delivery profile of rural women in Maharashtra, India (2008-09)**

Gestational period	Details of delivery	Tribal PHCs		Non-tribal PHCs		Total	%
		Number	%	Number	%		
Pre term	HSBA*	1423	0.81	3527	0.43	4950	0.50
	HNSBA**	895	0.51	2383	0.29	3278	0.33
	Total home	2318	1.35	5910	0.72	8228	0.83
	Un-interventional	1945	1.10	12445	1.52	14390	1.44
	LSCS	233	0.13	1832	0.22	2065	0.21
	Forceps	15	0.01	185	0.02	200	0.02
	Vacuum	0	0.00	65	0.01	65	0.01
	Episiotomy	158	0.09	2251	0.27	2409	0.24
	Total institutional	2351	1.34	16778	2.05	19129	1.92
	Total preterm	4669	2.65	22688	2.77	27357	2.75
Full term	HSBA	52394	29.76	91266	11.12	143660	14.42
	HNSBA	27606	15.68	38504	4.69	66110	6.63
	Total home	80000	45.44	129770	15.82	209770	21.05
	Un-interventional	80205	45.56	559627	68.22	639832	64.21
	LSCS	4552	2.59	46904	5.72	51456	5.16
	Forceps	236	0.13	2731	0.33	2967	0.30
	Vacuum	33	0.02	539	0.07	572	0.06
	Episiotomy	6353	3.61	58118	7.08	64471	6.47
	Total institutional	91379	51.91	667919	81.42	759298	76.20
	Total full term	171379	97.35	797689	97.23	969068	97.25
Grand total	176048	100.00	820377	100.00	996425	100.00	

\* Home delivery attended by Skilled Birth Attendant\*\* Home delivery Not attended by Skilled Birth Attendant

**Table 2. Percentage to live births in the districts in Maharashtra, India (2008-09)**

S. no.	Variable	Median	Minimum	Maximum	Inter quartile range	Outlierdistricts
1	Preterm	2.45	1.27	7.08	1.65-3.05	7.08, 5.98, 5.18, 5.16, 4.90
2	Home deliveries	22.26	2.67	63.00	10.67-30.86	63.00, 62.78
3	LSCS	4.46	0.80	15.23	2.66-8.84	17.12
4	LSCS; Preterm	7.69	2.44	19.98	5.22-9.98	19.98, 15.04
5	LSCS: Full-term	5.68	1.58	17.16	3.41-10.96	17.16
6	Un-safe deliveries	6.68	0.55	21.64	3.21-10.33	21.64, 18.77



**Fig. 1. Assistance in institutional deliveries (%) Maharashtra, India**

#### 4. DISCUSSION

The study was carried out at the midpoint of the first phase of the NRHM. In the policy document adequate emphasis has been given to increase proportion of institutional deliveries. The observations therefore may be viewed on the background implementation of various activities and programs for four years of NRHM.

The investigators expect that data pertaining to premature deliveries, the extent of unsafe deliveries and mode of deliveries in institutions may help refinement of strategies in order to accelerate the NRHM achievements. The international concern over contribution of prematurity towards neonatal mortality is renewed after realizing that the prematurity rates are high and are increasing [2-4]. In various studies including one in Pune district in the state of Maharashtra the proportion of preterm births ranged from 9.6 to 13% of live births [3-7]. The investigators considered two hospital based studies, from very different locations, one from capital of the country, Delhi and other in tribal area in Maharashtra State. In these hospitals, it was observed that 5.5% and 6.2% deliveries were preterm [8,9]. In a South Indian study over a span of about two decade there was a slight decline [7]. The underestimate in the present study may due to various factors. Firstly the pre-term babies died in early neonatal period may not have been counted and mislabeled as still births. Secondly, the study population was women exclusively from rural and tribal area. Considering the very low literacy level among rural and tribal women the precise information in weeks about gestation is quite difficult to obtain. When the child is live borne, the tendency to report the delivery as full term may also have contributed to underestimate. In other words higher literacy level among non-tribal women augmented the probability of obtaining accurate information of gestational term. Lastly, the higher proportion of live preterm deliveries in non-tribal areas may be due better network of health institutions and availability of modern diagnostic and treatment facilities in them.

Like tribal population slum dwellers are also considered vulnerable. The proportion of home deliveries among slum residents varied very widely from 16% in Mumbai to 80% in Central North Indian Cities [10-12]. In two districts from Maharashtra, the proportion of home deliveries ranged from 14 % to 60.53 % and decline was also observed [13,14]. Whereas in a recent study in two tribal blocks in Maharashtra observed that 34.29% deliveries were conducted in homes [15]. In rural area of Rajasthan and Punjab 66% deliveries were conducted in home [16,17]. In tribal areas outside Maharashtra the percentage of home deliveries was 52.5% to 96.2% [18-20]. Apart from the studies, the large scale national level surveys also provide information about home deliveries. The National Family Health Survey-3 (NFHS-3) conducted in 2005-06, recorded 50.8% home deliveries in rural area of Maharashtra whereas percentage of women from scheduled tribes delivering in home was 75.8% [21]. These statistics pertain to period before the NRHM and represents preceding five years. The subsequent national level District Level Household Survey-3 (DLHS-3) conducted in 2007-08 showed a decline in percentage of home deliveries in rural area of Maharashtra state attaining 45.2% level and home deliveries among scheduled tribes declined to 65.0% [22]. The present study endorses continuous decline in Maharashtra State. In a multi-centric study conducted in developing countries the percentage of home deliveries varied from 65.5-67.8% [23]. National level statistics of NFHS records, 71.2% home deliveries in rural India and among women from scheduled tribes 90.2% are home deliveries [24]. The DSLHS-3 recorded that in India 61.4% women from rural area delivered in homes [25]. The percentage of home deliveries was 66.7% among women from scheduled tribes.

The availability of facilities of Lower Segment Cesarean Section (LSCS) is considered vital for providing Comprehensive Emergency Obstetric Care (CEmOC) services. Most of the data available about LSCS originates from hospital records and most of the hospitals are located in urban areas. Data from the small hospitals from tribal area in Maharashtra showed LSCS rate as 6.5%, almost tripling in twenty years [8]. One large hospital from Mumbai reveals that in a span of about twenty years (1981-82 to 2000-01) percentage of LSCS almost doubled from 5.07 to 10.60% [26]. Data from Delhi shows LSCS percentage as 15.3% [9]. In WHO global survey of hospitals carried out in the same period, data from India shows 17.8% LSCS deliveries [27]. Data from the field also indicates that LSCS rates are increasing to the extent that they tripled from 3.1% to 10.9% in about twenty years (1986-87 to 2004-05) in South India [7]. In rural Rajasthan the LSCS deliveries were only 2% [16]. In NFHS-3 in rural area of Maharashtra, the LSCS deliveries were 7.7% [21] and in India 5.6% [24]. The women from different scheduled tribes in India delivered 2.8% babies through LSCS [24]. On one hand CEmOC in the institutions is encouraged particularly where there is a gap. On the other hand there are allegations that women are exposed to cesarean section unnecessarily or for exploiting money [28,29]. All these criticism leveled is primarily against hospitals and that too mostly from urban areas. The women from tribal areas are not getting support of LSCS as their counterpart in non-tribal and urban areas. In a small hospital from tribal area in Maharashtra the vacuum extraction rate was 3.9% [8]. In the multi-centric hospital study in India it was observed that 79.3% vaginal deliveries were spontaneous and 2.9% operative [27]. In rural area of Rajasthan about 25% primipara and 7.8% multiparas undergoing vaginal delivery received episiotomy [16]. While in South India operative vaginal deliveries were 4.2% [7]. The observations of the present study are similar to data from field studies. Our data probably indicates the assistance in the form of intervention is not easily available in the tribal areas. The data also point that apart from cesarean section, other assisted procedures of deliveries are which part of basic emergency obstetric care too are very low in tribal areas. The Government of India also initiated special trainings like skill birth attendant, in cesarean section apart from LSAS to improve CEmOC. Higher interventional or



assisted deliveries among preterm irrespective of areas, demonstrates that the need of greater care in preterm deliveries was responded positively.

In Nagpur district of Maharashtra unsafe deliveries were 13.5% [13]. From two tribal blocks in one tribal district in the state unsafe deliveries were 34.29% [16]. In slums from Municipal Corporation in Maharashtra State unsafe deliveries ranged from 14.86% to 19.2 % [10,21]. In other states the proportion of unsafe deliveries varied from 49.6 to 92.2% [16,18]. In South India in four primitive tribes the unsafe deliveries were 65.85% [19]. A study conducted in six developing countries reported unsafe deliveries ranging from 49.6% to 60.4% [23]. Reports from NFHS-3 for rural Maharashtra indicate that 45.4% deliveries were unsafe and the statistic for women from scheduled tribes was 68% [21]. The trend for unsafe deliveries is certainly declining. The decline in rural area was about 20% but for poor population the decline was only about 12% only [30]. The decline in poor population was less evident. The DLHS-3 reports from rural Maharashtra showed that unsafe deliveries in 2007-08 were 39% and among scheduled tribes 59% [22]. In India the statistic of unsafe deliveries was 56.7% and 62.4% for rural and tribal population [25]. Although population of tribal PHCs constitute a relatively small segment of the total population, in the present study the association of higher risk of unsafe deliveries with tribal was reflected even in whole of the district. Almost all the outlier districts representing risk such as home deliveries, unsafe deliveries etc. were tribal and representing better care like institutional deliveries, LSCS were non-tribal districts. Although the overall statistics in Maharashtra are better than national averages, the situation in tribal area is not satisfactory and is worse than urban slum dwellers. Acute shortage of doctors is well known but even trained nursing personnel are not adequately available in tribal areas. Home deliveries pose substantial risk to neonatal and maternal mortality. The risk increases multifold when there is no skilled birth attendant. We have only considered presence of SBA; but factors like support in supplies, equipment and referral transport is more important. If the deficiencies estimated particularly in tribal areas are taken into consideration the safe motherhood services to women from tribal areas will be islands of mediocrity.

Recognizing the vulnerability of the tribal area, the Government of India had already relaxed the population norms for establishing health institutions. Although the norms are there; the pace of establishment is slower than population growth. Presently the available number of institutions is not proportional even to the 2001 population. Over and above the population norm, geographical norms need urgent consideration. In some states particularly Madhya Pradesh, Andhra Pradesh and recently even in Maharashtra 24x7 referral transport services through telephonic help line have been initiated, which is strongly required. Government of India also lodged another new programme Janani Shishu Suraksha Karyakram assuring free medicines and transport. Apart from these efforts from supply side, for demand generation and utilization of services special initiatives are strongly needed so that safe motherhood services undeniably reach the tribal areas.

## **5. CONCLUSION**

In spite of relaxation of norms of infrastructure development and emphasis on tribal areas in NRHM, higher proportions of women from tribal areas deliver in homes. In home deliveries tribal women are less likely to be attended by skilled birth attendants compared to their counterparts in non-tribal areas. Even in institutional deliveries assistance is less frequently offered to women from tribal areas. Safe delivery services have not reached completely in tribal areas. We suggest four pronged attack to address this problem. Government may

conduct scheduled trainings for large number of health personnel; ensure their availability in tribal areas, efficient transport services and mass educational drive.

## **6. LIMITATION**

The investigators did not obtain details of stillbirths. Although qualified and trained nurses collected data, some misclassification of early neonatal deaths, stillbirths, preterm may have remained in the study. As it was a retrospective study validation of these entities was not possible. Full term delivery included post term delivery also.

## **7. FUNDING**

The study was conducted using in-house funds available at SHSRC.

## **CONSENT**

Not applicable.

## **ETHICAL APPROVAL**

Not applicable.

## **ACKNOWLEDGEMENT**

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## **COMPETING INTERESTS**

Authors have declared that no competing interests exist.

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