

## Survival of under-five children and its socio-demographic correlates among the Oraon tea plantation inhabitants of Dooars, Northern West Bengal

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**Abstract:** A dearth of empirical knowledge on the socio-demographic correlates of under-five mortality among the marginalized tribal tea plantation workers of Bengal calls for a better understanding of the issue. The present cross-sectional study investigated under-five mortality scenario among the Oraon tea plantation inhabitants of Northern West Bengal. Data were collected using a pre-tested questionnaire from 445 ever-married Oraon adult women on their socio-demographic characteristics, fertility and mortality records. Survival analysis was performed to examine the potential risk factors of under-five deaths of children. Study population exhibited an under-five mortality rate (U5MR) of 96.86, much higher than the national rate. Diarrhea was the predominant cause for under-five deaths. In sum, study majorly discerned that under-five death of children was significantly increased by lower birth order of child (HR 1.52; 95% CI: 1.040 to 2.22), lower educational status (HR 2.18; 95% CI: 1.60 to 4.48), practice of open defecation (HR 1.84; 95% CI: 1.13 to 3.00) and underage marriage of the mother (HR 1.40; 95% CI: 1.00 to 1.95). The study suggests urgent promotion of education among women and sensitizing the mass regarding sanitary practices in order to eradicate cases of under-five deaths.

**Keywords:** Child death, Cox regression, Indigenous population, Survival analysis.

### Introduction

Death of children under the age of five is a major concern for the sustainability and well-being of a population (Eneh, 2011; Guilmoto, 2016). India as a country fails to meet the major Sustainable Development Goals (SDG) when it comes to the under-five mortality rate. Despite having significant reductions in under-five mortality (Bora and Saikia, 2018), India accounts for the largest share of under-five mortality with a rate of 50.0 (United Nations, 2015; United Nations Development Programme, 2015; Guilmoto, 2016; Bora and Saikia, 2018). However, the population in India shows an enormous diversity in both genetic and non-genetic (social and environmental) aspects, hence, exhibits disparities in under-five mortality scenario across the nation. Factors such as maternal educational and economic status (Dinçer, Kaushal and Grossman, 2014; Getachew and Bekele, 2016), type of residence and toilet facilities in the household (Chowdhury, Hossian, Khan and Hoq, 2013), mother's age at live-birth (Becher et al., 2004), birth spacing (Miller, Trusell, Pebley and Vaughan, 1992; Becher et al., 2004), antenatal care during pregnancy (Bora and Saikia, 2018), sex and birth order of the child (Sahu et al., 2015), maternal nutritional condition (Rao et al., 2006) etc. determines the under-five mortality differentials around the country. The under-five mortality scenario is worse in rural sectors (Bhandari, Mandowara, Agarwal and Jagdev, 1988; Malakar and Roy, 2017), among tribal populations (Rao et al., 2006; Sahu et al., 2015) and also in lower socio-economic groups (Ghosh and Sharma, 2011). In support to this

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argument, many existing works on India's tribal demography highlighted that tribal groups are socio-culturally distinguished compared to the non-tribal populations, therefore, exhibiting different demographic behavior (Maharatna, 2000; Das et al, 2010). Socio-economical attributes such as poverty, poor utilization of health services, and remoteness of region, low educational, short birth interval and higher birth order (World Bank, 2007; Sahu et al., 2015; Ranjan et al, 2016) makes the under-five mortality scenario worse for the tribal populations especially from rural sectors. Nevertheless, there is a dearth of knowledge on the under-five mortality issue of tribal groups of West Bengal. The rural sectors of northern West Bengal region of India is populated with several marginalized tribal populations such as Oraons, Mundas, etc. who are chiefly engaged as tea plantation workers and earn a very low wage (Sharma and Das, 2009). The present study is, perchance, the first to address the issue of under-five mortality and associated socio-demographic factors among the tea plantation inhabitants of northern West Bengal, India.

## Materials and Methods

### *Study area and Population*

The present cross-sectional study was conducted in a rural tea plantation area under Falakata block of Alipurduar district, West Bengal, involving a single indigenous community, Oraons, to eliminate the genetic/ethnic effect(s) from the data. The Oraons migrated to northern West Bengal nearly 100 years ago to join as tea garden workers in Dooars, Northern West Bengal. They presently speak 'Sadri' language, an admixture of Hindi, Bengali and Nepali. The Oraons in the area primarily practice endogamous marriage (They marry within the community).

No statistical sampling was performed for the selection of participant as it may have raised suspicion among the individuals. Total enumeration of all ever-married adult women was attempted and afterwards a list was made before the survey. Initially, a total of 532 healthy adult ever-married women (Who had already attended menopause, widowed or separated and reported sterilization through operation) were enlisted and were verbally informed properly about the purpose of the study and approached to participate. Women, who were pregnant, were excluded from the study. Finally, 445 ever-married women voluntarily agreed to participate (response rate = 83.64 percent). The informed consent was either signed by them or thumb impressions were obtained (in case of the women who could not read or write).

### *Data collection*

Data were collected using a pre-tested questionnaire (Malakar and Roy, 2017), modified and written in both 'Hindi' and 'Sadri' languages for operational convenience and covered a range of information. The data were collected in two parts. The first part of the data included several socio-demographic and economic traits related to women viz. age (in completed years during interview), educational status, occupational status, household size, monthly household expenditure, practice of defecation. Age of the study participants was verified with voter's list and/or cross-verified with reference to local events. The second part of data included age of woman at marriage (in completed years), number of pregnancies, age at child-birth, sex of the child, birth order of child and living status of the child along with the sex and age at the time of death (in months) of deceased child..Additionally, participants were also asked to provide information on number of miscarriages, still-births and cause of death for under-five children. The detail description of selected variables is mentioned in Table 1.

**Survival of under-five children and its socio-demographic correlates among the Oraon tea plantation inhabitants of Dooars, Northern West Bengal**

‘Under-five mortality’ was considered as the death of a child for less than 60 months. Under-five mortality rate (U5MR) in the study group was calculated using the formula:

$$\text{Under 5 mortality rate (U5MR)} = \frac{(\text{Death at age} < 5 \text{ years}) \times 1000}{\text{Live births}}$$

**Statistical analysis**

Data were entered into a PASW electronic database. Cox proportional hazard analysis was performed to calculate the hazard ratio (HR) to find out the effect of socio-demographic characteristics on under-five mortality. Both ‘Enter’ and ‘Stepwise backward’ method were preferred to prevent the ‘over fitting’ of the model. The ‘stepwise’ analysis removed the least useful predictors until the model contributed significantly. The dependent variable was ‘Survival time’ (Deceased child’s age at death) and independent variables were educational status, occupational status, household size, monthly household expenditure, practice of defecation, age at marriage (yrs.), age at child birth (yrs.), sex of child and birth order of child. For statistical convenience, all the selected variables were categorized. The description and reference group (Ref.) for each categorical variable is mentioned in Table 1.

Table 1: List of variables collected in the present study

No.	Variables	Categories
1.	Women’s age (in yrs.) <sup>†#</sup>	[1] <20 years, [2] 20-29 years, [3] 30+ years
2.	Educational status	[1] Non-literate, [2] Primary, [3] Secondary and above (Ref.)
3.	Occupational status	[1] Homemaker, [2] Tea plantation workers (Ref.)
4.	Household size <sup>#</sup>	[1] Smaller [≤5 individuals], [2] Larger [>5 individuals] (Ref.)
5.	Monthly household expenditure (₹) <sup>†#</sup>	[1] Low [≤₹ 5000/-], [2] High [>₹ 5000/-] (Ref.)
6.	Practice of defecation	[1] Use of pit latrine, [2] Open defecation (Ref.)
7.	Age at marriage (in yrs.) <sup>#</sup>	[1] <18 years, [2] ≥18 years (Ref.)
8.	Age at child birth (in yrs.) <sup>#</sup>	[1] <20 years, [2] 20-29 years, [3] 30+ years (Ref.)
9.	Sex of the child	[1] Male (Ref.), [2] Female
10.	Birth order of child <sup>#</sup>	[1] First, [2] Second, [3] Third or later (Ref.)
11.	Number of pregnancies <sup>†#</sup>	-
12.	Number of miscarriage <sup>†#</sup>	-
13.	Number of still-births <sup>†#</sup>	-
14.	Under-five mortality <sup>§</sup>	[0] Dead before 60 months, [1] Alive
15.	Cause of under-five mortality <sup>†#</sup>	-

<sup>†</sup>Not used in statistical analysis;

<sup>#</sup>Note: Age, continuous data (in completed years); Household size, discrete data (count of household members); Monthly household expenditure, continuous data (in ₹); Age at marriage, continuous data (in years); Age at child birth, continuous data (in years); Birth order of child, discrete data; Number of pregnancies, miscarriage and still-births, discrete data (count of pregnancy, miscarriage and stillbirth); Cause of under-five mortality, descriptive data.

<sup>§</sup>Used as ‘dependent variable’ in statistical analysis.

Abbreviation: Ref., Reference group.

**Ethical consideration**

Before conducting the research, ethical clearance was obtained from the institutional ethical committee (Ethical Committee for the Protection of Research Risks to Humans) of Indian Statistical Institute (Ethical clearance number: ISI-IEC/2018/10/01).

## Results

Table 2 describes the present under-five mortality scenario in the study population. About 139 deaths of children under the age of five were reported out of 1435 live births. The U5MR is 96.86. Around 56.12% of the deceased children were males. Results also found that majority (38.13%) of the children died at the age <5 years due to Diarrhea followed by Pneumonia (14.39%). The cause of death of children was unknown to parents in approximately 37 cases. Few death cases were found to be the consequences of accidents (7.91%), Tuberculosis (3.60), etc. Study results revealed that a multitude of the study participants were 'non-literate' (73.5%) and around 192 (43.1%) individuals reported household expenditure less than ₹5000 a month. About 215 (48.3%) individuals were engaged as tea plantation workers and rest of the study participants (51.7%) were homemakers. Majority of the participants (60.7%) belonged to a 'larger' household. Approximately 362 (81.3%) individuals used to practice open defecation and did not have pit latrines in the households. Around 108 of the study participants (24.3%) were married before the age of 18 (Table 3).

Table 2: Under-five mortality scenario in the study population

Under-five mortality scenario	Distribution of responses	
	N	%
Total number of live births	1435	100.00
Total number of under-five death	139	9.68
Under-5 mortality rate (U5MR)	96.86 per 1000 live births	
Males died at age <5 years	61	43.88
Females died at age <5 years	78	56.12
Cause of disease reported by parents/doctors		
Diarrhea	53	38.13
Pneumonia	20	14.39
Peptic ulcer	9	6.47
Epilepsy	4	2.88
Tuberculosis	5	3.60
Accidents	11	7.91
Not known by parents	37	26.62

Table 3. Socio-demographic characteristics of ever-married Oraon women

Socio-demographic characteristics	Category	Study Participants (n =445)	
		N	%
Educational status	Non-literate	327	73.5
	Primary	37	8.3
	Secondary	81	18.2
Monthly household expenditure	Low	192	43.1
	High	253	56.9
Occupational status	Homemaker	230	51.7
	Tea plantation workers	215	48.3
Household size	Smaller	175	39.3
	Larger	250	60.7
Practice of defecation	Use of pit latrine	362	81.3
	Open defecation	83	18.7
Age at marriage (yrs.)	<18	108	24.3
	≥18	337	75.7

**Survival of under-five children and its socio-demographic correlates among the Oraon tea plantation inhabitants of Doars, Northern West Bengal**

Results of Cox proportion hazards analysis of under-five mortality in respect of selected socio-demographic traits indicated that children were at potential risk for under-five mortality when their mothers are ‘non-literate’ (HR = 2.188; 95% CI: 1.060-4.515) and also when mothers are married before 18 years (HR = 1.304, 95% CI: 0.916-1.857). Children were at greater risk of death under 5 years of those women, who practiced open defecation (HR = 1.846, 95% CI: 1.134-3.005) compared to their counterparts. A similar trend is observed in Model VI of ‘Stepwise’ cox regression analysis (Table 4).

**Table 4: Cox proportion hazards model of under-five mortality in respect of socio-demographic characteristics of ever-married Oraon women**

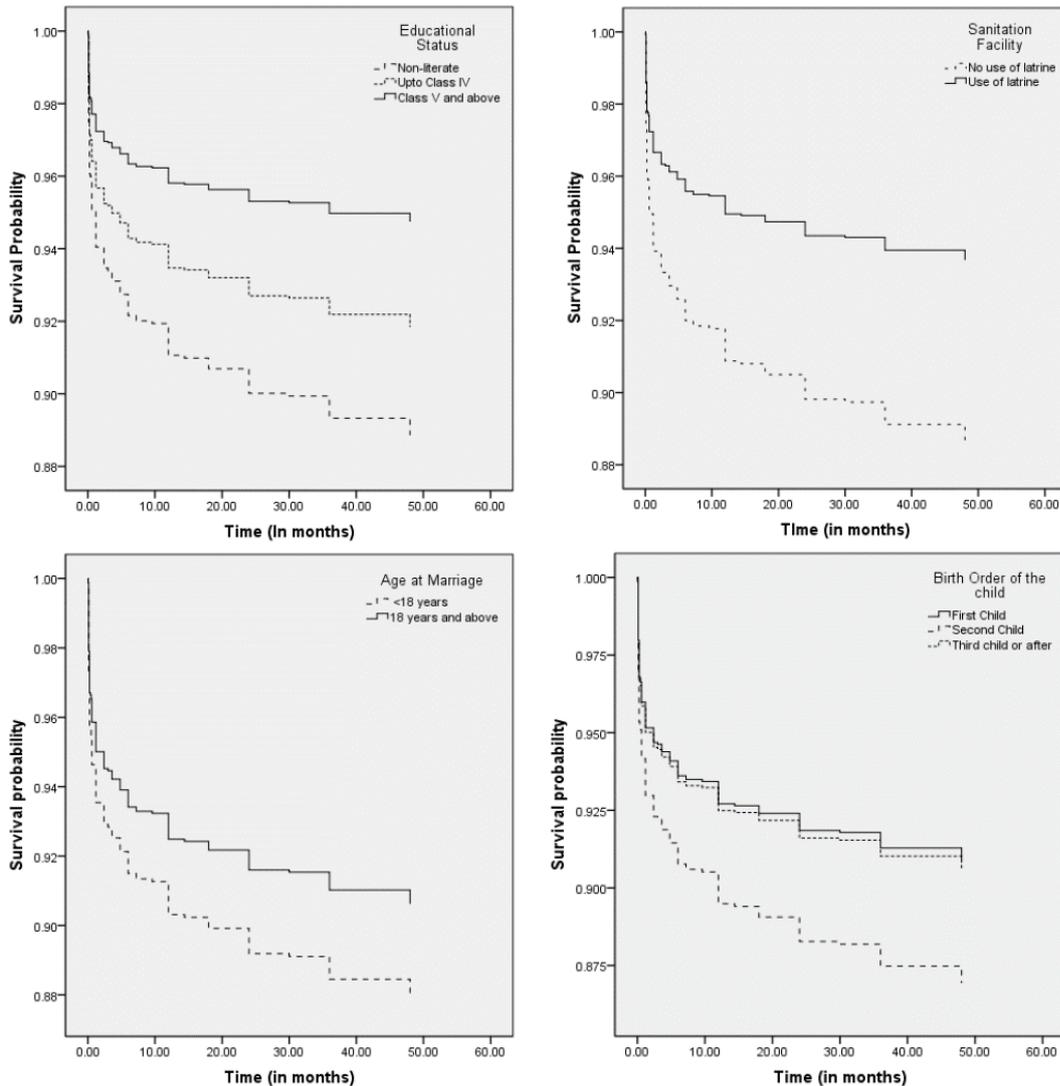
Independent variables		Cox proportional hazard			
		Enter		Stepwise (Model VI)	
		HR (95% CI)	<i>p</i>	HR (95% CI)	<i>P</i>
Educational status	Non-literate	2.188 (1.060-4.515)	0.034*	2.186 (1.600-4.484)	0.046*
	Primary	1.577 (0.584-4.256)	0.369	1.524 (0.570-4.073)	0.401
	Secondary	Reference group			
Occupational status	Homemaker	1.129 (0.818-1.558)	0.462		
	Laborer	Reference group			
Household size	Smaller	1.004 (0.697-1.446)	0.984		
	Larger	Reference group			
Women’s practice of Defecation	Use pit-latrine	1.846 (1.134-3.005)	0.014*	1.918 (1.186-3.101)	0.008*
	Open defecation	Reference group			
Age at marriage (yrs.)	<18	1.304 (0.916-1.857)	0.140	1.403 (1.005-1.957)	0.046*
	≥18	Reference group			
Age at child birth (yrs.)	<20	1.419 (0.662-3.043)	0.369		
	20-29	1.142 (0.740-1.762)	0.550		
	30+	Reference group			
Birth order of child	1 <sup>st</sup>	0.970 (0.595-1.580)	0.902	1.133 (0.765-1.677)	0.534
	2 <sup>nd</sup>	1.422 (0.944-2.143)	0.092	1.521 (1.040-2.225)	0.031*
	3 <sup>rd</sup> or later	Reference group			
Sex of the child	Female	1.180 (0.859-1.622)	0.307		
	Male	Reference group			

Note: \*Significance at 0.05 level.

Abbreviation: HR, Hazard ratio; CI, Confidence interval.

Figure 1 provided four ‘Kaplan-Meier’ survival curves to describe the survival probability of children under five in terms of (i) age of women at marriage, (ii) birth order of child, (iii) educational status and (iv) the practice of defecation. It was indicated that survival probability up to 60 months/5 years declined for (i) children of women married before 18 years, (ii) children born 3rd or later, (iii) non-literate women, and (iv) women who never used pit latrine.

Figure 1: Survival curve (Kaplan-Meier) of under-five mortality in respect of selected socio-demographic characteristics of ever-married Oraon women



## Discussion

### *Scenario of Under-five mortality*

Under-five mortality is a major public health concern in developing countries including India. The nation may have successfully reduced the U5MR in recent years (NFHS 4, 2016), but the frequent case of premature deaths in rural areas and particularly among tribal populations are appalling. In this context, the present study took the opportunity to understand the under-five mortality scenario among the tea plantation inhabitants residing in rural sectors of Northern West Bengal and to explore the possible socio-demographic correlates behind under-five death of children in the area. Overall findings highlighted a few potential risk factors of under-five deaths of children in this area. The study initially found that U5MR per 100 live births in the study population was much higher than the rate in the state of West Bengal (32.0) and India (50.0) (NFHS 4, 2016). The study population is far to achieve the SDG goals of reducing under-five deaths of 25 per 1000 live births (United Nations Development Programme, 2015). According to *The Million Death Study*

## **Survival of under-five children and its socio-demographic correlates among the Oraon tea plantation inhabitants of Doars, Northern West Bengal**

*Collaborators* (2010), pneumonia and diarrheal diseases were found to be accounted for 50% of all under-five deaths worldwide. In present study the rate was 52.52. One of the major causes of under-five deaths of children in the study area was 'Diarrhea' with a 38.13 percent of occurrence in the study population. The finding strengthens the fact why national rate of occurrence of under-five death due to diarrhea is 0.3 million per year (Nandi et al., 2017). The present rate of death caused by diarrhea was much higher than the rates provided by Bhandari et al. (1992) and Krishnan et al. (2012). However, the occurrence rate of pneumonia deaths in the study area was lower than the findings of Mathur et al. (2002) and Dalal et al. (2016). The etiologies of diarrhea and pneumonia are needed to be explored further.

### ***Potential socio-demographic risk factors of under-five mortality***

Study findings highlighted that 'Non-literacy' was a significant determining factor of under-five mortality among the Oraon women where children of non-literate women were at higher risk of death under the age of five. Findings corroborated with other pieces of literatures that proposed that low parental illiteracy leads to poor knowledge on child-rearing, poor nutritional care and poor access to health care facilities for children which makes them vulnerable to death (Bhuiya and Streatfield, 1991; Wyss et al., 1996; Buor, 2003; Chowdhury et al., 2013).

The prevalence of underage (<18 years) marriage in the present study group played a major role in determining under-five mortality among the study population. A large cross-sectional study also found that children born to women married below 18 years of age were susceptible to malnutrition and hence exposed to early death (Raj et al., 2010). Interestingly, mothers' habit of defecation was found to be a potential risk factor of under-five mortality of the children. Under-five mortality of children was more frequent for the mothers who practised open defecation due to absence of pit latrine in the household. This finding was in line with two other international studies conducted in Nepal (Gubhaju et al., 1991) and Ethiopia (Getachew and Bekele, 2016). The practice of open defecation may have led to widespread of infections that affected children's health indicating to the fact that under-five deaths due to diarrhea in the study area are common. Nevertheless, Woldmichael (2000) proposed that defecation practice was a part of complex household aspects and could only determine child mortality more accurately along with certain other household characteristics like practice of hand-washing, the resource of water, etc.

Study results challenged the earlier findings of Bhandari and colleagues (1988) and Vella et al., (1992) highlighting that higher birth order is a significant factor behind the reduced risk of under-five mortality. A further notable result was that sex of the child did not influence the risk of under-five mortality. It is possibly due to equal preferences to both sexes during neonatal care in present study group for the fact that both sexes get equal opportunities in adulthood to participate in the labor force (In some cases, female births are even preferred by the family) in the tea gardens and contribute to household earning (Sharma and Das, 2009). However, Bourne and Walker (1991) found that in India neonatal girls are vulnerable to death due to poor neonatal care compared to boys.

### **Conclusion**

Summing up, the present study highlighted that under-five mortality scenario is worse in the study population compared to the national situation. Low education and underage marriage were two of the potential socio-demographic risk factors for high under-five mortality cases among the Oraon tea plantation inhabitants. Another interesting behavioral

risk factor was the open defecation practice of mother. However, we limit ourselves to draw any strong conclusion since the nature of the study was cross-sectional. In future, studies with larger sample size and longitudinal approach are sure to fill the lacuna to get better insights on the present issue more prominently. In the end, the study put forward an important message to improve sanitary habits in the study population, to ensure better educational exposure along with improve maternal health and better management during antenatal care.

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**Survival of under-five children and its socio-demographic correlates among the Oraon tea plantation inhabitants of Dooars, Northern West Bengal**

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