Effect of socio-economic characteristics on fertility and under-five mortality: examples from the Santals of Birbhum district, West Bengal, India

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ABSTRACT: Fertility and under-five mortality are considered as key health indicators of a population. Both the fertility and under-five mortality varies across countries, regions, ethnic groups and so on, which may bedue to disparities in socio-economic and cultural factors. The study aimed to better understanding the association of fertility and under-five mortality with selected socio-economic characteristics of the Santal labourer group of Birbhum district, West Bengal. Cross-sectional data have been collected on fertility, mortality and socio-economic characteristics from 627 ever-married Santal women. Descriptive statistics, multivariate logistic regression and Cox proportion hazard analysis have been done. Total fertility rate (TFR) of the present study group was 2.9 and the mortality rate was 105.1. In the present study,educational status, age and household size of the women have significant association with fertility. Under-five mortality has significant association with educational status of mother and birth order of the children. The study indicated that education was the one of the important factors (socio-economic characters) that had most significant impact on both fertility and under-five mortality of the Santal labourer group.

KEY WORDS: Total fertility rate, under-five mortality, educational status, Santal women

Introduction

Demographic events like fertility and mortality are the key indicators of the population health and it plays important role in national planning for the social and national development of the country as well (Population Council 2009; CDC 2013). In India, policies and strategies during recent years from both government and non-government sectors enable the country to go through a phase of demographic transition, which is characterized by reduction in death rate (particularly infant and child) followed by reduction in birth rate (Rao 1996; Sikdar

2008). However, the countryis still lagging behind to achieve the optimal values in both fertility and mortality by 2015, as proposed in 'Millennium Development Goals' (MDGs) (United Nations 2015).

In a national level study, Sahu et al. (2015) pointed that the reasons may be due to the disparities in economy and culture among different states, regions and ethnic groups of the country. The factors affecting fertility and mortality of a particular population or community may not essentially be similar and are likely to vary from community to community. It means a child born to a scheduled tribe family has always higher risk of dying at early ages than a child born to non-tribal family in India (NIMS, ICMR and UNICEF 2012). Secondly, the pattern of fertility is not similar among the different social groups of the country (Kapoor and Kshatriya 2000). Thus, the socio-economic background and socio-cultural practices which includes education of the spouses, economic condition, social customs and taboos (age at marriage, child bearing age, parity, etc.), cultural practices (child delivery system, pre-natal and post-natal child care, etc.) among the different communities are important determinants of fertility and mortality (Dyson and Moore, 1983; Jain, 1985).

Many studies have mentioned that mother's education is one of the key factor that influence both fertility and child mortality (Martin 1995; Akmam 2002; Kravdal 2002). Educational attainment has a direct effect on reducing early age at marriage and early age at first child birth and has effect on birth parity and number of children, which indicates that educational status is a catalyst that directly or indirectly reduce the fertility (Rindfuss et al. 1980). An inverse relationship between fertility and economic condition on the other has been reported by many studies (Frisancho et al. 1976; Verma 1977; Bharati 1981). Survey reports also revealed a consistent decrease in fertility in relation to social-class and income/expenditure level (NSS 1971). Age at marriage is also an important determinant of fertility. Early marriage has a longer fertile time and is expected to end up with high fertility, while late marriage is expected to have a lower fertility (Wall 1973).

On the other, the prevalence of child mortality is a useful indicator of community health, because children are most susceptible towards harmful effects of environment including infections, malnutrition, poor maternal health care facilities (Watson et al. 1995; Kapoor et al. 2003; Sikdar 2012). Several studies indicate that factors like mother's education, mother's economic status, mother's age at marriage, mother's age at child birth, sex of child, birth order of child, household size and rural-urban residence have direct association with child mortality (Pandey et al. 2004; Saha et al. 2014). Evidences indicate that child mortality was less among higher educated mothers than their less educated counterparts (Das and Dey 2003; Khasakhala 2003; RamaRao et al. 1997). Because, literate mothers know better health care and have more influence in decision making for treatment of sick children, which results in lower mortality of children (Desai and Alva 1998). The effect of economic condition on child mortality shows an inverse relationship, indicates that risk of child death was more among lower economic group than higher economic group (Cutler et al. 2006). Many studies (Islam and Azad 2007; Ettarhand Kimani 2009) have also reported dispar-

ities in child mortality between rural and urban locations, which was mainly due to more access to health care facilities, improvement in economic status and lifestyle in the urban areas. Maternal age at child birth have a strong relationship with the viability of children, generally young and old aged mothers have higher risk of child death than middle aged mothers (Manda 1999). However, findings of child mortality in regard to birth order and sex of child were not consistent. Some studies reported higher order births were associated with increased risk of child mortality (Chowdhury et al. 2013), while, other reported higher order births decreased the risk of child mortality (Kembo and Ginneken 2009). Study conducted in Nairobi slums of Kenya showed that male children were significantly more likely to die than female children (Mutisya et al. 2010). Contrast to that, study from India revealed that male children were significantly less likely to die than female children indicative of social values and bias on sex of children (Nath et al. 1994).

Therefore, the findings of the existing literature are not consistent with each other, which may be due to differences in socio-cultural or economy in different population/ethnic group. In view of the above the aim of the present study is to understand the association of fertility and under-five mortality with selected socio-economic characteristics of the Santal labourer group of Birbhum district, West Bengal.

Material and methods

Present data is a part of a larger bio-medical project. Cross-sectional data have been collected from Santal labourer group of Suri sub-division of Birbhum district,

West Bengal. The study was restricted to single ethnic group (i.e. Santal) in order to avoid possible ethnic/genetic effects in respect of variables under study. Santals are the largest marginal *(schedule tribe)* and endogamous community of West Bengal and distributed in most of the districts (Census 2001). They were classified as 'Pre-Dravidian' tribe. Their language, *Santali* belongs to the Mundari branch of Austro-Asiatic language family (Mukherjea 1962) and now they have their own script i.e. 'O*l-Chiki*'.

Demographic data including fertility and mortality as well as socio-economic characteristics have been collected from 627 ever-married Santal women by using pre-tested questionnaire/schedule. To keep ethnic/genetic homogeneity in the sample, only Santal ethnic group were considered. Therefore, settlements dominated by Santals were chosen for data collection. There were 16 such settlements in the study area of which 12 settlements were chosen through random sampling (consulting random numbers). Total enumeration of all the families of each settlement was targeted. However, due to absence of household members in the house at the time of survey a few (arpprox.10 in number) families were not included in the present study. For selecting study participants, no sampling methods were adopted. Individuals who have been persuaded to participate and voluntarily agreed with written consent have been included in the present study without any bias. The research was conducted after prior approval from the Ethical Committee for the Protection of Research Risks to Humans, Indian Statistical Institute.

Fertility and mortality data: For fertility and mortality data, each ever-married woman was asked to provide information

on complete reproductive history, which included number of pregnancies, number of child births, survival status (dead/alive), birth order and sex of each birth. The information on age at death was recorded in nearest to days, months and years. The under-five mortality is considered as the death of a child whose age is less than five years (UNICEF 2015).

Socio-economic and demographic data: Socio-economic data in terms of educational status, household size, age at first marriage and expenditure level in terms of per capita monthly expenditure (Rupees per month in Indian currency) have been taken. Due to absence of age records in some of instances (specifically formothers), the ages of the study participants were estimated with reference to important local events and cross-checked with elderly individuals. Further the age was compared with the ages of individuals for whom age records existed.

Data classification: Fertility data have been classified using median value of the number of live births to all the ever married women into 'low' (fertility ≤ 3) and 'high' (fertility >3) group. Educational status was categorized into 'non-literate', 'Class I-IV' and 'Class V and/or above'. The age at first marriage, household size and economic status wasclassified into two categories each, by using median value. Age at first marriage was classified into '<18 years' and '18+years'; household size was categorized as '≤ 5 individuals' and '>5 individuals'; economic status was categorized as 'low' (≤Rs.514.29/– per month) and 'high' (>Rs.514.29/– per month). The mother's age at child birth was classified into '<20', '20-29' and '30+' and birth order of the child was classified into '1', '2' and '3+'.

Data analysis: Descriptive statistics and cross-tabulation have been computed for each variable. To find out the effect of socio-economic characteristics on fertility, multivariate logistic regression analysis performed, considering fertility group (i.e 'low' and 'high') as dependent variable while all the socio-economic variables as independent variable. Multivariate logistic regression analysis provides odds ratios (OR) and 95% confidence interval (CI).

Cox proportional hazards model (Cox 1972) has been calculated to understand the relationship between under-five mortality and socio-economic variables. Cox proportional hazards model is the multivariate survival analysis which describes the relationship between risk factors (i.e. socio-economic variables) and survival time (i.e. under-five mortality). In the present analysis, dependent variable is the survival time (i.e. children died under five years of age) and the independent variables are the all socio-economic variables [i.e. 1) educational status of mother (non-literate, Class I–IV and Class V and/or above), 2) Economic status of mother (low and high), 3) household size (≤5 individuals and >5 individuals), 4) mother's age at marriage (<18 years and 18+ years), 5) mother's age at child birth (<20, 20–29 and 30+), 6) birth order of child (1, 2 and 3+) and 7) sex of the child (male and female)]. The Cox proportional hazards model provides hazard ratio (HR) which is the probability of dying at a given point in time.

All the statistical analyses have been done using SPSS software 16.0 (SPSS Inc., Chicago, IL, USA).

Results

Table 1 shows socio-demographic characteristics of women of the study group in terms of educational status, economic condition, household size and age at marriage. Educational status indicates that majority of the study participants were 'non-literate' (81.98%). Around 50.08% and 49.92% of study participants belongs to 'low' and 'high' economic condition respectively. Majority of study participants (55.82%) belongs to household size of ≤ 5 individuals compared to >5 individuals (44.18%). The age at marriage for majority (55.34%) of study participants was <18 years compared to 18+ years of age (44.66%).

Table 2 shows age-specific fertility and under-five mortality of the Santal labourer group. Total fertility rate (TFR) was 2.90 and completed fertility rate (i.e. women of 45+ years) was 4.34. Fertility rate was highest at the age period of 20–24 years and lowest at age period of

Table 1. Socio-demographic characteristics of women of the study group

Socio-demographic characteristics		N	%
Educational status	Non-literate	514	81.9
	Class I–IV	48	7.7
	Class V and/or above	65	10.4
Economic status	Low (< Rs. 514.29/–)	314	50.1
	High (> Rs. 514.29/–)	313	49.9
Household size (individuals)	≤5	350	55.8
	>5	277	44.2
Age at marriage (years)	<18	347	55.3
	18+	280	44.7

Table 2. Age specific fertility and under-five mortality of Santal labourer group

Women's present age (years)		<19	20–24	25–29	30–34	35–39	40–44	45+	Total
No. of women		48	113	109	55	52	64	186	627
No. of live birth		24	181	242	151	164	247	808	1817
Age period (years)	<19	0.50	1.04	0.64	0.60	0.46	0.39	0.36	0.58
	20–24	–	0.56	1.28	1.11	1.21	1.25	1.16	0.99
	25–29	–	–	0.3	0.85	0.9	1.25	1.22	0.69
	30–34	–	–	–	0.18	0.48	0.7	0.99	0.42
	35–39	–	–	–	–	0.1	0.25	0.45	0.17
	40–44	–	–	–	–	–	0.02	0.16	0.05
	45+	–	–	–	–	–	–	–	–
	Total	0.50	1.60	2.22	2.75	3.15	3.86	4.34	2.90
No. under-five mortality		3	11	29	19	14	21	94	191
Death /1000 live births		125.0	60.77	119.83	125.83	85.37	85.02	116.34	105.12

40–44 years for all women irrespective of their present age.

Again the table shows that the prevalence of under-five mortality among the Santal labourer group was 105.12 per 1000 live birth. Under-five mortality reached its peak among the women of 30–34 years age group (125.80 per 1000 live birth) and the lowest was among the women of 20–24 years age group (60.77 per 1000 live birth).

Table 3 shows results of multivariate logistic regression analysis of fertility in respect of different socio-economic characteristics of Santal labourer group. Fertility (i.e. 'low' and 'high') was considered as dependent variable and all socio-economic characteristics as independent variable.

In the enter method, the high fertility group was associated with the educational status, household size and age of the women. Results indicate that non-literate status, lower household size and age are significantly related to high fertility. In stepwise method, the last model (i.e. Model III) was considered for highest R^2 (Nagelkerke R^2) value. The high fertility group was associated with the educational status, household size and age of the women. Non-literate women were more likely to have high fertility than women with educational status of class I–IV and class V and/or above. Again, women with household size ≤ 5 was less likely to have high fertility than household size>5 individuals. The women were more likely to show high fertility with increment of age.

Table 4 shows the results of Cox proportional hazards model of under-five mortalities in respect of socio-economic characteristics of Santal labourer group. Under-five mortality was considered as

Table 3. Results of multivariate logistic regression analysis of fertility in respect of socio-economic characteristics of Santal labourer group

Independent variables		Multivariate logistic regression			
		Enter method		Stepwise (Model III)	
		OR (95%CI)	*p*	OR (95%CI)	*p*
Educational status	Non-literate	5.160 (1.383–19.250)	0.015	5.071 (1.372–18.738)	0.015
	Class I–IV	3.362 (0.680–16.629)	0.137	3.345 (0.681–16.435)	0.137
	Class V and/or above	Reference group		Reference group	
Economic status	Low	1.028 (0.661–1.599)	0.902		
	High	Reference group			
Household size (individuals)	≤5	0.248 (0.159–0.389)	<0.001	0.245 (0.159–0.378)	<0.001
	>5	Reference group		Reference group	
Age at marriage (years)	<18	0.799 (0.599–1.067)	0.128		
	18+	Reference group			
Age (each additional years)		1.097 (1.078–1.116)	<0.001	1.095 (1.077–1.113)	<0.001
Nagelkerke R^2		0.455		0.454	
Model correctly predicted (%)		67.3		67.3	

Table 4. Results of Cox proportional hazards model of under-five mortalities in respect of socio-economic characteristics of Santal labourer group

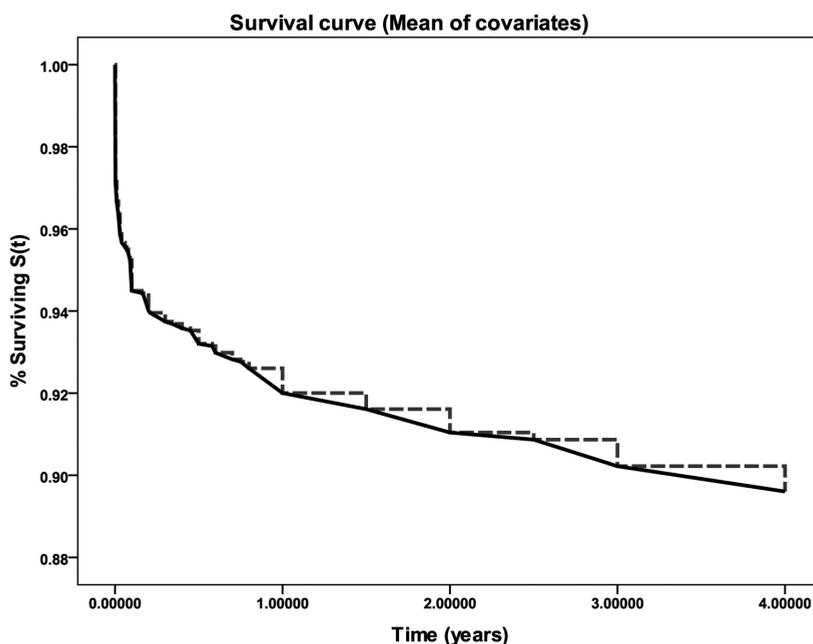| Independent variables		Enter method		Stepwise (Model VI)	
		OR (95%CI)	*p*	OR (95%CI)	*p*
Educational status	Non–literate	2.340 (0.954–5.744)	0.063	2.169 (0.887–5.301)	0.090
	Class I–IV	3.690 (1.339–10.167)	0.012	3.629 (1.319–9.988)	0.013
	Class V and/or above	Reference group		Reference group	
Economic status	Low	1.191 (0.887–1.599)	0.246		
	High	Reference group			
Household size (individuals)	≤5	1.175 (0.873–1.583)	0.288		
	>5	Reference group			
Age at marriage (years)	<18	1.224 (0.876–1.709)	0.237		
	18+	Reference group			
Age at child birth (years)	<20	0.935 (0.502–1.741)	0.831		
	20–29	0.864 (0.572–1.305)	0.487		
	30+	Reference group			
Birth order of child	1	1.489 (0.957–2.237)	0.077	1.496 (1.087–2.058)	0.013
	2	0.855 (0.551–1.327)	0.485	0.844 (0.569–1.251)	0.398
	3+	Reference group		Reference group	
Sex of child	Male	1.216 (0.913–1.620)	0.182		
	Female	Reference group			

Fig. 1. Survival curve of under-five mortality among Santal labourer group

dependent variable and all socio-economic characteristics were considered as independent variable. The non-literate mother and mother with educational status of class I–IV have greater risk to have under-five mortality thanmother with educational status of class V and/or above. Birth order of 2nd and 3+children had lower risk of (under-five) mortality than children of 1st birth. The survival curve for under-five mortality of Santal labourer group is presented in Figure 1.

Discussion

The aim of the present study was to understand the association of fertility and under-five mortality with selected socio-economic characteristics of Santal labourer group of Birbhum district, West Bengal. The individuals of the present study were from same ethnic origin and occupation, have more or less similar socio-economic condition and share same ecological setup. The protocols for data collection were similar for all the individuals and the data were collected by single investigator (BM).

The result of the present study indicates the total fertility rate (TFR) of the Santal labourer group was 2.90, which was higher than total fertility rate of both India (2.20) and West Bengal (1.80). On the other, the under-five mortality of the Santal labourer group was 105.12 per 1000 live births, which was also higher than the under-five mortality rate of India (50.0) and West Bengal (32.0) (NFHS-4).

The result of the present study depicts that educational status of women show strong association with their fertility. The fertility was high among non-literate women and low among educated women. The result of multiple logistic regression analysis also indicates that non-literate women were more likely to have higher fertility than their educated counterparts. This finding corroborates with the studies of Martin and Juarez (1995), Martin (1995), Dreze and Murthi (2001) and Kravdal (2002). In a large scale data, Dreze and Murthi (2001) reported that fertility of Indian women declined with higher educational status. Similar findings was also reported form Latin American (Martin and Juarez, 1995) and sub-Saharan African countries (Kravdal 2002). The data of world fertility survey (UN 1987) also reveal that women with no formal schooling have on an average six to seven children whereas educated women on the other have on an average two to three children. Inkeless (1973) pointed that attendence of school was an important agents of socialization, that shapes the attitudes, opinion, social values towards both productive and reproductive roles of women in the society. However, the impact of education on fertility was much evident when the level of education was secondary or above (Akmam 2002). Although, Caldwell (1980) noted that in most of the non-literate society, the reproductive norms of the community cannot be expected to alter with women's limited exposure to school environment, and suggested that as the proportion of the community receiving some schooling that may be a potent force to change the pattern of fertility of the community. Martin (1995) noted that women education can also play an important role in the use of contraceptive effectively. That may have some influence to reduce the fertility rate of the community.

The relationship between fertility and economic condition from the present result was not clearly evident. That

may be due to less disparity in economic condition of the study participants. However, the trend indicates that the fertility was higher among the women of lower economic group than higher economic group. This finding corroborates with earlier findings (Verma 1977; Bharati 1981). In a comparative study, Verma (1977) noted that Santal settled agriculturists have a lower fertility than the nomadic and economically backward Birhors of eastern India. Therefore, the relationship between economic condition and fertility is inverse, i.e. lower the income the higher the fertility (Frisanchoet al. 1976). Contrasts to the present findings Martin (1995) noted a positive relationship between economic condition and fertility, and reported that families with high economic group can afford more children than families of low economic group.

The effect of household size on fertility shows positive association. The fertility was higher among the women who belong to larger household size than women of smaller household size. Result of multiple logistic regression analysis also depicts that women from larger household size were more likely to have higher fertility than smaller household size.That may be due to some psycho-social pressure from family members for more children, because in the traditional society children were considered as the potential source of social security and wealth (Samuel 1965). Blacker (1955) noted that among the joint families the reproductive decision of a couple is very much influenced by the other members in the family. However, contrast to the present findings, Veleti (2001) mentioned that traditional norms and behaviour within the joint family may restrict the fertility of women. Besides the effect of age of women was also shows significant association with high fertility of the women, which corroborates with the observation made by Frisancho et al. (1976) among urban Preuvian population.

Association between socio-economic characteristics and under-five mortality, Cox proportional hazards model indicates that under-five mortality were associated with educational status of the mother and birth order of the children. Similar to the present findings several other studies (Das and Dey 2003; Khasakhala 2003; Rama Rao et al. 1997) also noted mother's education had strong effect on the child mortality even than father's education. The under-five mortality was more common among non-literate mother than their educated counterparts. Desai and Alva (1998) noted that educated mothers were more likely than non-literate mothers to ensure a healthy environment, nutritious food and have better knowledge about health care facilities for their children. Study from Bangladesh also reveals that educated mother were more likely to ensure child immunization, which significantly reduce child mortality (Mozumder et al. 1998). Present study indicates an inverse relationship between birth order of children and the risk of under-five mortality, higher the birth order lowered the risk of child mortality. The plausible explanation of this finding seems to be that children born to a young mother, who is biologically/psychologically not prepared to bear and have limited knowledge and experience to bring up a child. Similar findings were also reported from different province of Africa that suggest young mother has greater risk of child mortality (Manda 1999; Becher et al. 2004; Kemboand Ginneken 2009). However, contrast to the present finding some stud-

ies (Afzal and Alam 2013; Chowdhury et al. 2013) reported that child survival decreases with birth order which reflects more intense competition faced by higher birth order children in terms of care giver's time, medical resources and nutritious food.

Furthermore, Haines (1998) mentioned the relationship between fertility and child mortality was interdependent on each other and high fertility is likely to enhance child mortality. High levels of child mortality tend to enhance fertility as well (Das Gupta 1987).

Conclusion

Present study indicates that education is one of the most important factors that have most significant influence on both fertility and under-five mortality of the Santal labourer group. However, the result of the present study is not conclusive enough due to small sample size, cross-sectional nature of the study and the study was done on a particular ethnic group. Therefore, further studies are necessary in other marginal populations, considering other concomitant factors including decadal changes in fertility and mortality (may reflect cultural behavior and modernization) to get better insight into the problem.

Authors' contributions

Both the authors participated in the study design, data analysis and the writing of the manuscript. BM collected the field data for the present study.

Conflict of interest

There is no conflict of interests regarding publication of this article.

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