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Child Mortality and its biosocial correlates in a village of West Bengal, India

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ABSTRACT

Background and objectives: Biosocial studies offer valuable designs for studying the interface between biological and social factors affecting human well-being. Biosocial correlates of child mortality were examined in the present study in a village population of West Bengal, India.
Material and Methods: In this study, 59 general castes (GC), 58 other backward castes (OBC), 150 scheduled castes (SC) and 55 scheduled tribes (ST) mothers were studied. These mothers have completed fertility. Child mortality was calculated following the method of Khan (1987) and Garma (1983). Whereas, child nutrition was assessed using the Gomez's and Indian Academy of Pediatrics classification (Gomez et al. 1956; ICMR 1972, 1984). The path analysis is performed, using multiple regression equations, to find out the causal model to depict the relationships among different biosocial correlates and child deaths.
Results: Index of child mortality is highest (86.33) in the ST and lowest in the GC (60.15), whereas the OBC (75.34) and SC (83.55) show an intermediate position. A considerable overlap exists in the ranges of consumption of every food item in four cultural groups. Variables like antenatal care, treatment of child and mother's sense of personal hygiene in the GC; household income, maternal nutrition and mother's sense of personal hygiene in the OBC; antenatal care, treatment of child and mother's sense of personal hygiene in the SC and household income, maternal nutrition and mother's sense of personal hygiene in the ST show some impact with child deaths.
Conclusion: General castes enjoy better nutrition and health care facilities and they are more health conscious than other backward castes, scheduled castes and scheduled tribes. As a result, level of child deaths is found to be lowest in this group. The other backward castes show a similar trend with general castes in this respect. Whereas, among the scheduled castes, a reverse trend is perceptible and they show a similarity with the scheduled tribes in respect of health and nutrition. It is interesting to mention that both the scheduled castes and scheduled tribes occupy the lower segment in society in Sahajapur village.

Key words: Biocultural factors. Child mortality. Village population. West Bengal. India

INTRODUCTION

Child mortality studies did gain its momentum all over the world after the celebration of the International Year of Child in 1979 by the United Nations. India received the award from "Liguris International Technology for Development" in 1991 for its Integrated Child Development Services (ICDS), which is a significant development of 1991 in the field of child welfare in this country. In India though a declining trend in infant and child mortality is seen, yet it is much higher in comparison to Western as well as some of its Asian counterparts. The significant growth of India's population in one hand and increasing infant and child mortality on other hand is a matter of serious concern not only for the demographers, social scientists, economists and policy makers but also for each serious citizen of this country.

India's population is divided into a large number of endogamous groups consisting of different castes, tribes, minorities, religions etc. The determinants of infant and child mortality vary between geographical regions, between cultural groups and also between the countries of various economic statuses. Among the infants and children the risk of death is closely related to the environment in which they grow. The deaths occur because of less medical facilities to deal with infections, inadequate food and lack of elementary hygiene (U. Ko. Ko. 1987). Mosley and Chen (1984) have proposed in their analytical framework that all social and economic determinants of child mortality necessarily operate through a common set of biological mechanism, or proximate variables, to exert an impact on mortality. In this backdrop, an attempt has been made in the present study to examine biosocial correlates of child mortality in Sahajapur village of Birbhum district, West Bengal, India.

MATERIAL AND METHODS

Sahajapur is a medium sized village, situated in the district of Birbhum in the state of West Bengal in India (for a map of study area please sees Adak et al. 2014). This village is multiethnic. While the upper position of the society is occupied by the general castes, middle position is occupied by the other backward castes. The scheduled castes and the scheduled tribes occupy the lower position.

Placement of Caste/communities as per Constitution of India in Sahajapur (after Adak et al. 2014) :

General castes (GC): Brahman, Bairagya, Sadgop, Aguri, Ranakarmakar

Other backward castes (OBC): Tantubay, Tili, Sutradhar, Swarnakar, Moyra, Kumbhakar, Goala

Scheduled castes (SC): Dom Ankure, Dom Magheya, Dom Turi, Jele Kaibarta, Namasudra, Lohar, Poundrakhatriya, Ruidas, Sunri

Scheduled tribes (ST): Mahali, Santal, Bedia

In this study 59 general castes (GC), 58 other backward castes (OBC), 150 scheduled castes (SC) and 55 scheduled tribes (ST) mothers, who have completed their fertility, were studied. To do this all the households in Sahajapur village were covered. Different castes have different culture. It is due to the traditional practices of each caste.

The measure of child mortality used in this study was calculated following the method suggested by Khan (1987) and Garma (1983).

$$\text{Index of child mortality} = \frac{\sum Cdi}{\sum Bi} \times 1000$$

Where Cdi = Total number of child deaths (0-4 years) reported by ith woman of the sample
Bi = Total number of live births reported by ith woman of the sample

Child nutrition was assessed using the Gomez's and Indian Academy of Pediatrics classification (Gomez et al. 1956; ICMR 1972, 1984). Side by side, for adult nutrition BMI standards for Asia Pacific as per WHO (2000) criteria was followed. The researchers were well aware of the ethical issues while working in the village. Before collection of the data, the purpose of the present research work was clearly stated to the villagers. The persons who did not wish to provide information were excluded.

RESULTS

Of all these cultural groups the index of child mortality the ST show the highest value (86.33) and the GC the lowest (60.15), whereas the OBC (75.34) and SC (83.55) show an intermediate position (Table 1).

Table 1: Child mortality

Index of child mortality (0-4 years)	Cultural groups			
	GC	OBC	SC	ST
	60.15	75.34	83.55	86.33

GC: General castes; OBC: Other backward castes; SC: Scheduled castes; St: Scheduled tribes

Table 2 shows that while 52.94 percent of the GC children fall in the category of normal status of nutrition, only 25.64 percent of the SC children fall in this category. In the OBC and ST children this frequency is 44.44 and 31.58 respectively. In the category of borderline nutrition lowest frequency is recorded in the GC (35.29) and highest in the SC (51.28). The OBC (38.89) and ST (42.10) show a moderate frequency. Malnutrition occurred in lowest frequency in the GC (11.77) and highest frequency in the ST (26.32). The SC (23.08) show more or less similar frequency like the ST. The OBC (16.67), however, show considerably higher frequency than the GC.

Table 2: Child nutrition (1-6 years) according to mid-upper-arm circumference

Grade of nutrition	Cultural groups			
	GC	OBC	SC	ST
Normal (greater than 13.5 cm)	9 (52.94)	8 (44.44)	10 (25.64)	6 (31.58)
Borderline (13.5-12.5 cm)	6 (35.29)	7 (38.89)	20 (51.28)	8 (42.10)
Malnourished (below 12.5 cm)	2 (11.77)	3 (16.67)	9 (23.08)	5 (26.32)

Note: Figures in parenthesis indicate percentage values
GC: General castes; OBC: Other backward castes; SC: Scheduled castes; St: Scheduled tribes

It can be seen from Table 3 that while more than 28 percent of the GC and OBC mothers fall in the category of underweight, 35 percent of the SC and ST mothers were underweight. Frequency of mothers with normal status of nutrition lies between 41.07 percent among the OBC and 50 percent among the ST. The GC (42.10) shows more or less a similar frequency with the OBC (41.07) and SC (46.47) show a similarity with the ST in this respect. In case of overweight the lowest frequency is recorded among the SC (10.10) and highest among the OBC (19.64). Frequency of obese-I ranges between 2.08 (ST) and 14.04 (GC). However, the frequency of obese-II is negligible in the GC (1.75) and OBC (1.79). In the SC and ST no mother falls in this category.

Table 3: Nutritional status of mother according to BMI (for Asia Pacific) as per WHO (2000) criteria

Grade of nutrition	Cultural groups			
	GC	OBC	SC	ST
Underweight (≤18.5)	16 (28.07)	16 (28.57)	35 (35.55)	17 (35.42)
Normal (18.5-22.9)	24 (42.10)	23 (41.07)	46 (46.47)	24 (50.00)
Overweight (23.0-24.9)	8 (14.04)	11 (19.64)	10 (10.10)	6 (12.50)
Obese-I (25.0-29.9)	8 (14.04)	5 (8.93)	8 (8.08)	1 (2.08)
Obese-II (≥30.0)	1 (1.75)	1 (1.79)	-	-

Note: Figures in parenthesis indicate percentage values
GC: General castes; OBC: Other backward castes; SC: Scheduled castes; St: Scheduled tribes

Average per day consumption:

Average daily consumption of different food groups per consumption unit is furnished in Table 4. There exists a considerable overlap in the ranges of consumption of every variable in four cultural groups. The GC and OBC show comparatively better consumption than the SC and ST. It can be mentioned that diet of four cultural groups were principally cereals. In comparison with ICMR reference, it is noticed that diets are deficient in several nutrients, particularly in the SC and ST. As this Table is quite self-explanatory, it needs no further description.

Table-4: Average per day consumption in four cultural groups

Cultural groups	F O O D G R O U P S								
	Cereals (g)	Pulses (g)	Leafy vegetables (g)	Roots & tubers (g)	Other vegetables (g)	Fish, meat, egg etc. (g)	Fat & oil (g)	Sugar & molasses (g)	Milk & milk product (g)
GC	562.5	33.3	166.7	166.7	185.0	50.0	33.3	33.3	45.0
OBC	578.3	29.4	139.5	112.3	128.3	41.5	25.4	30.8	40.2
SC	525.0	16.7	83.3	83.33	141.7	33.3	16.7	25.0	25.0
ST	555.4	14.8	92.4	92.4	85.2	42.5	15.2	26.4	15.8
ICMR	475.0	65.0	125.0	100.0	75.0	60.0	40.0	40.0	100.0

GC: General castes; OBC: Other backward castes; SC: Scheduled castes; St: Scheduled tribes
ICMR: Indian Council of Medical Research

Data on child deaths in four cultural groups are presented in Table 5 in respect of various characteristics viz. mother and households, nutritional status and medical treatment etc. In respect of household income, more child deaths occurred among the mothers who fall in the category of low income household. This is true for all the cultural groups (GC: 50%; OBC: 45.46%, SC: 62.5% and ST: 75%). Child deaths occurred in low frequency among the mothers belong to high-income households. Non-literate mothers experienced higher child deaths in three cultural groups (OBC: 54.55%; SC: 68.75% and ST: 66.67%). In the GC no such case is recorded. Three-fourth of the child deaths occurred among primary level educated mothers in the GC. Among the OBC (36.36%), SC (25%) and ST (33.33%) incidences of child deaths is comparatively lower in this category. Side by side, child deaths occurred in higher frequency among the under-weight mothers in the GC (37.50). The same is true for the OBC (45.45), SC (65.63) and ST (66.67). Child deaths also occurred in higher frequency in the SC (34.37) and ST (33.33) mothers with normal status of nutrition. One fourth of the GC mothers experienced child deaths who were overweight. It can be seen from the Table that more or less three fourth of the child deaths occurred among the mothers of four cultural groups, who availed no antenatal care. Side by side, child deaths recorded in higher frequency among the children who availed medical treatment at times than regular. A high frequency of child deaths are noticed among the mothers who had no sense of personal hygiene. This is true for the mothers of all the cultural groups.

To find out the impact of different variables on child deaths linear regression is applied separately for four cultural groups (Table 6). For this, child death is taken as dependent variable and other variables as independent variables. It is revealed that variables like antenatal care, treatment of child and mother's sense of personal hygiene in the GC; household income, maternal nutrition and mother's sense of personal hygiene in the OBC; antenatal care, treatment of child and mother's sense of personal hygiene in the SC and household income, maternal nutrition and mother's sense of personal hygiene in the ST show some impact with child deaths. It is further seen that in the GC, OBC and SC the variables are not significantly associated with child deaths. But in the ST household income, maternal nutrition and mother's sense of personal hygiene are significantly associated with child deaths. It is interesting to note that the association is found to be inverse in case of maternal nutrition and child deaths in all the four cultural groups. Apart from this, variables like household income and mother's sense of personal hygiene in the OBC, household income and mother's education in the SC and mother's education and mother's sense of personal

hygiene in the ST show inverse relationship with child deaths. These results corroborate with the findings of Table 5.

Table 5: Child deaths among various characteristics of mother and household, nutritional status and medical treatment etc. of the four cultural groups

Variables	GC	OBC	SC	ST
Household income (in Rs.)				
Low (≤2000)	4(50.00)	5(45.46)	20(62.50)	9(75.00)
Moderate (2000-5000)	2(25.00)	3(27.27)	10(31.25)	2(16.67)
High (≥5000)	2(25.00)	3(27.27)	2(6.25)	1(8.33)
Mother's education				
Non-literate	-	6(54.55)	22(68.75)	8(66.67)
Primary	6(75.00)	4(36.36)	8(25.00)	4(33.33)
High school and above	2(25.00)	1(9.09)	2(6.25)	-
Maternal nutrition				
Under weight	3(37.50)	5(45.45)	21(65.63)	8(66.67)
Normal	2(25.00)	3(27.27)	11(34.37)	4(33.33)
Over weight	2(25.00)	2(18.18)	-	-
Obese	1(12.50)	1(9.10)	-	-
Antenatal care				
Yes	2(25.00)	3(27.27)	4(12.50)	2(16.67)
No	6(75.00)	8(72.73)	28(87.50)	10(83.33)
Medical treatment of child				
Regular	1(12.50)	2(18.18)	3(9.37)	2(16.67)
At times	7(87.50)	9(81.82)	29(90.63)	10(83.33)
Mother's sense of personal hygiene				
Yes	3(37.50)	4(36.36)	7(21.88)	5(41.67)
No	5(62.50)	7(63.64)	25(78.12)	7(58.33)

Note: Figures in parenthesis indicate percentage values
GC: General castes; OBC: Other backward castes; SC: Scheduled castes; St: Scheduled tribes

Path analysis:

In order to find out the causal model to depict the relationships among different variables and child deaths the path analysis is performed using multiple regression equations. For this purpose the method suggested by Wonnacott and Wonnacott (1990) is followed. Due to operational feasibility reasons the variables, which have some impact on child deaths (GC: ante-natal care, treatment of child and mother's sense of personal hygiene; OBC: household income, maternal nutrition and mother's sense of personal hygiene; SC: ante-natal care, treatment of child and mother's sense of personal hygiene and ST: household income, maternal nutrition and mother's sense of personal hygiene) were only selected as independent

variables for each cultural group. However, child death has been considered as dependent variable.

Table 6: Results of linear regression of child deaths on various characteristics separately for four cultural groups

variables	GC			OBC			SC			ST		
	B	t-value	p-value	B	t-value	p-value	B	t-value	p-value	B	t-value	p-value
Household income	.005	.051	.460	-.034	-.329	.743	-.006	-.112	.911	.239	2.994	**.004
Mother's education	.025	.252	.802	.010	.127	.900	-.045	-.720	.472	-.005	-.056	.956
Maternal nutrition	-.015	-.292	.772	-.077	-1.297	.200	-.044	-.606	.546	-.254	-2.192	*.033
Antenatal care	.122	1.367	.177	.003	.025	.980	.100	1.194	.235	.005	.040	.968
Medical treatment of child	.122	1.279	.206	.010	.072	.943	.118	1.340	.182	.022	.151	.880
Mother's sense of personal hygiene	.072	.803	.425	-.152	-1.227	.225	.077	1.042	.299	-.342	-2.885	**.006

**significant at 0.05 level; **significant at 0.01 level*
GC: General castes; OBC: Other backward castes; SC: Scheduled castes; St: Scheduled tribes
Household income; Low= 0, moderate and high= 1; Mother's education; non-literate= 0, primary= 1, high school and above= 2; Maternal nutrition= underweight= 0, normal= 1, over weight= 2; Antenatal care; No= 0, Yes= 1; Medical treatment of child; at times= 0, regular= 1; Mother's sense of personal hygiene; No= 0, Yes= 1; Child deaths; yes= 0, no= 1.

The direction of causal relationship between three independent variables and one dependent variable has been conceptualized and presented in path diagram for each cultural group.

General castes:

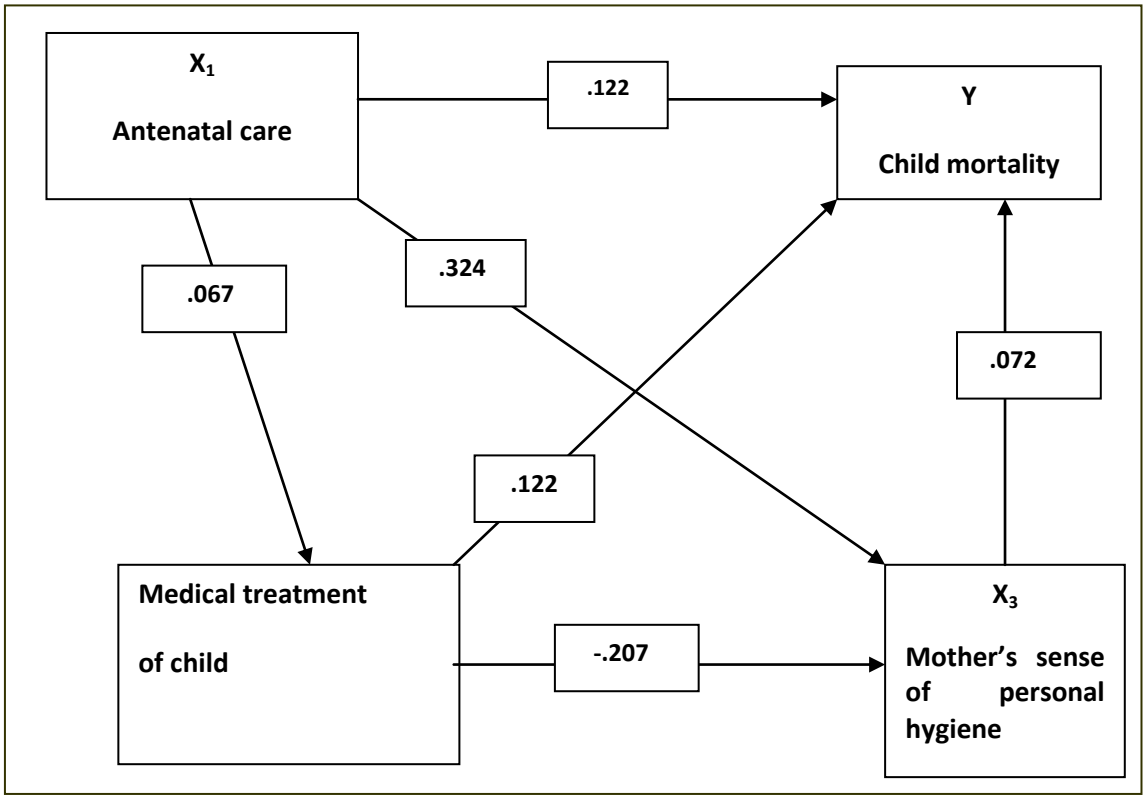
For general castes the following structural equation was evolved:

$Y=.122X_1+.122X_2+.072X_3$

$X_3=.324X_1-.207X_2$

$X_2=.067X_1$

Fig. 1: Path diagram on child mortality: General castes



The total effect of these variables on child mortality is as follows:

Direct effect of X_1 on Y: =.122

Indirect effect via X_3: (.324)×(.072) =.023

Indirect effect via X_2 alone: (.067) ×(.122) = .008

Via X_2 and X_3: (.067) ×(.207) ×(.072)=.001

Total effect =.154

It appears that in the general castes the total effect (i.e. .154) of antenatal care, medical treatment of child and mother's sense of personal hygiene is found to be positive and in lower magnitude.

Other backward castes:

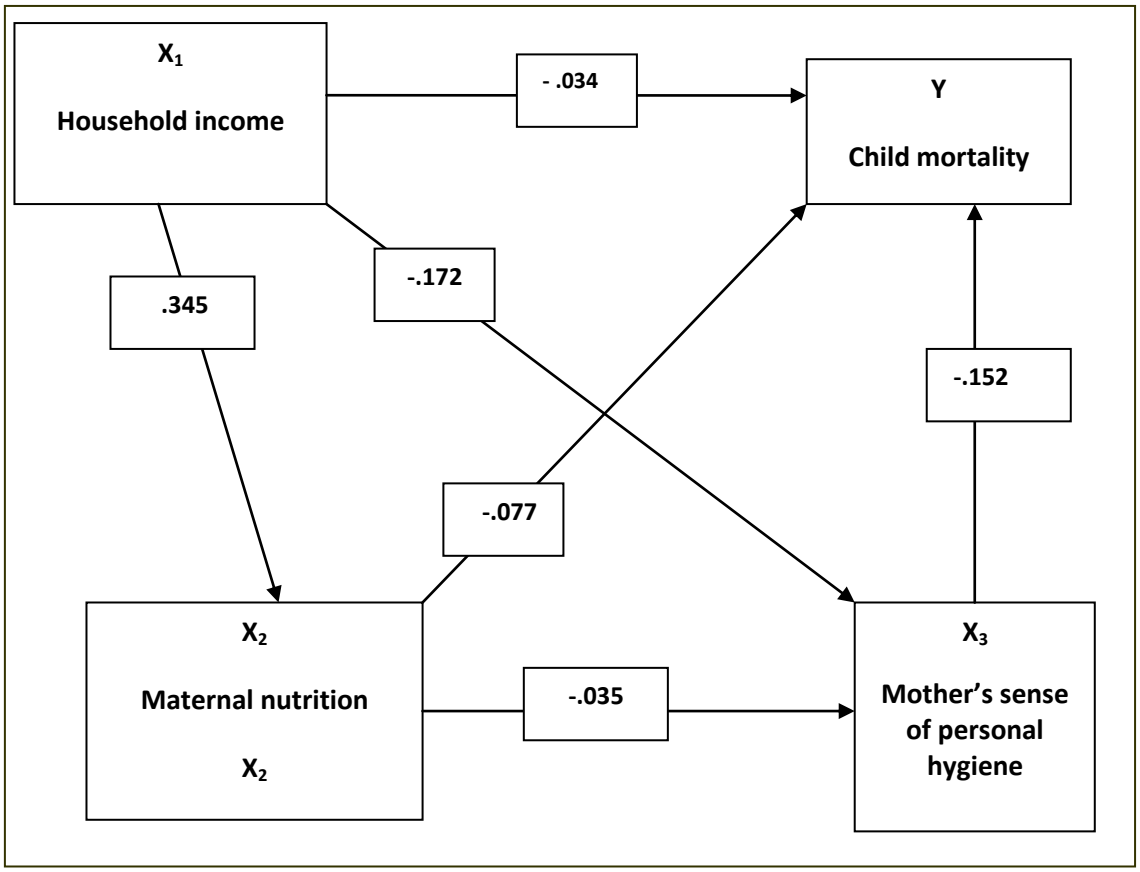
For other backward castes the following structural equation was evolved:

$Y=-.034X_1-.077X_2-.152X_3$

$X_3=-.172X_1-.035X_2$

X_2=.345X_1

Fig. 2: Path diagram on child mortality: Other backward castes



The total effect of these variables on child mortality is as follows:

Direct effect of X_1 on Y: =-.034

Indirect effect via X_3: (-.172)×(-.152) =.026

Indirect effect via X_2 alone: (.345) ×(-.077) =-.027

Via X_2 and X_3: (.345) ×(-.035) ×(-.152)=.002

Total effect =-.033

In the other backward castes the total effect (i.e. -.033) of household income, maternal nutrition and mother's sense of personal hygiene is found to be negative and in lower magnitude.

Scheduled castes:

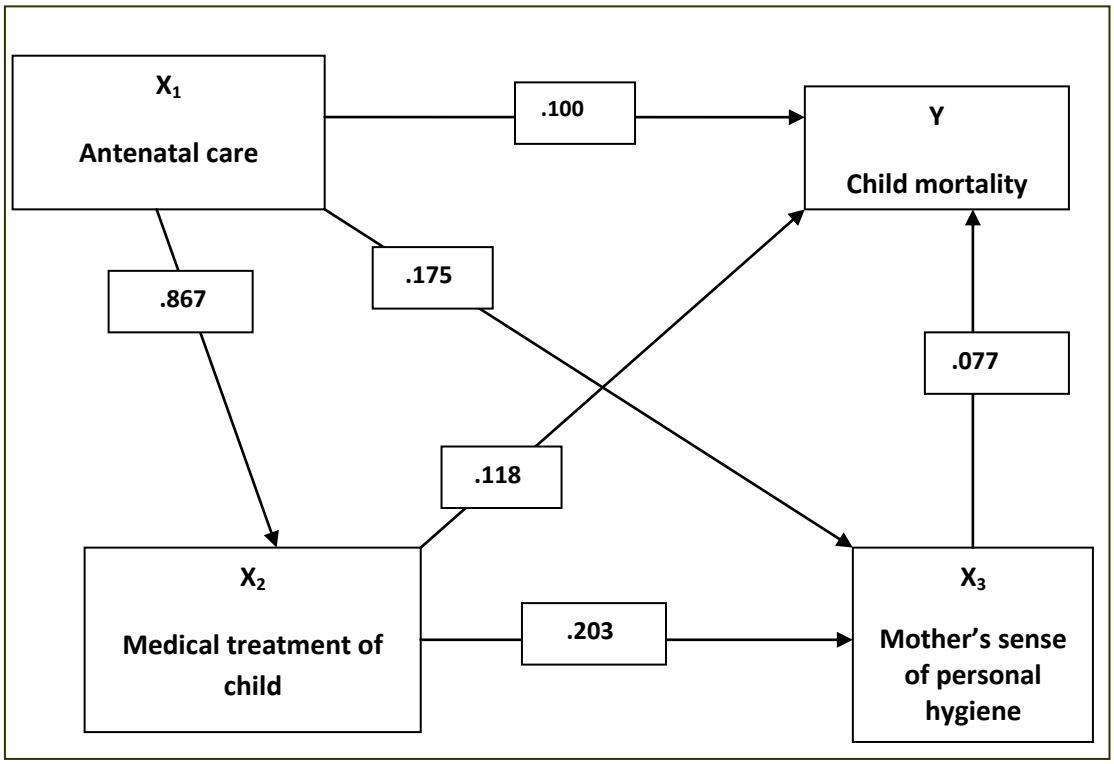
For scheduled castes the following structural equation was evolved:

$Y=.100X_1+.118X_2+.077X_3$

X_3=.175X_1-.203X_2

X_2=.867X_1

Fig. 3: Path diagram on child mortality: Scheduled castes



The total effect of these variables on child mortality is as follows:

Direct effect of X_1 on Y: =.100

Indirect effect via X_3: (.175)×(.077) =.013

Indirect effect via X_2 alone: (.867) ×(.118) =.102

Via X_2 and X_3: (.867) ×(.203) ×(.077) =.013

Total effect =.228

In the scheduled castes the total effect (i.e. .228) of antenatal care, medical treatment of child and mother's sense of personal hygiene is found to be positive and in medium magnitude.

Scheduled tribes:

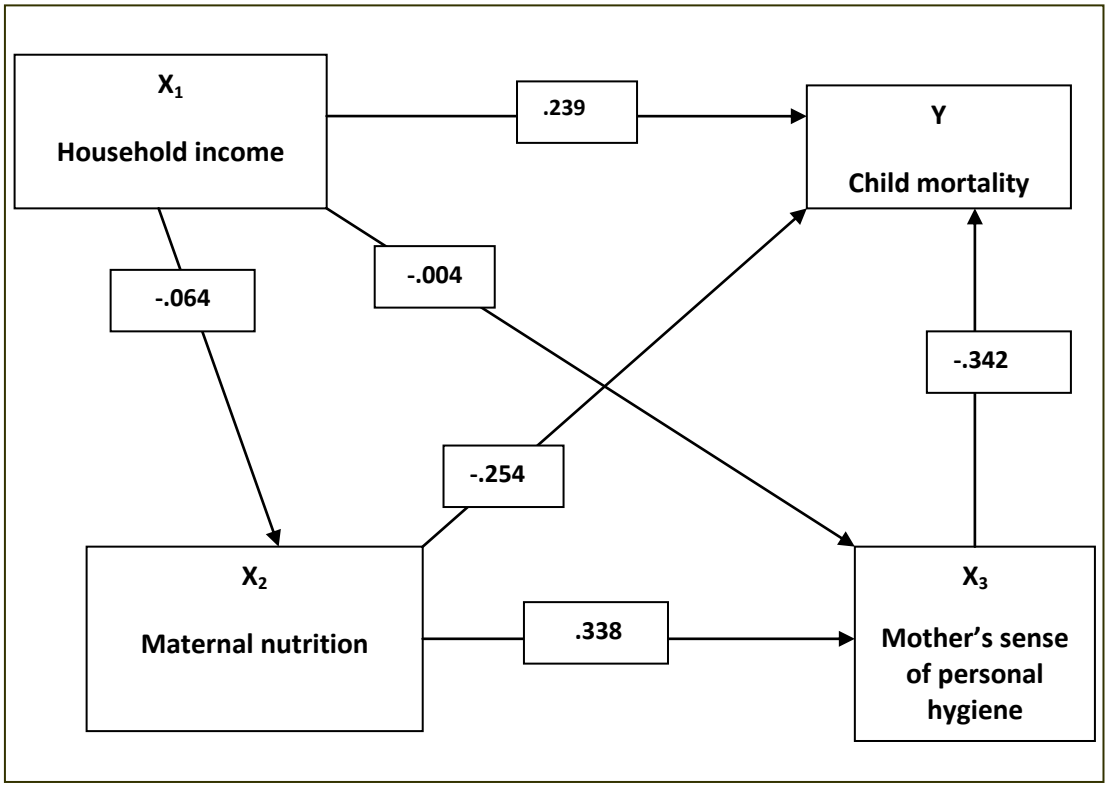
For scheduled tribes the following structural equation was evolved:

Y=.239X_1-.254X_2-.342X_3

X_3=-.004X_1+.338X_2

X_2=-.064X_1

Fig. 4: Path diagram on child mortality: Scheduled tribes



The total effect of these variables on child mortality is as follows:

Direct effect of X_1 on Y: =.239

Indirect effect via X_3: (-.004)×(-.342) =.001

Indirect effect via X_2 alone: (-.064) ×(-.254) =.016

Via X_2 and X_3: (-.064) ×(.338) ×(-.342) =.007

Total effect =.263

In the scheduled tribes the total effect (i.e. .263) of household income, maternal nutrition and mother's sense of personal hygiene is found to be positive and in medium magnitude.

DISCUSSION

Evidences of demographic differences among different cultural groups have been reported in the past (Davis 1951, Omran and Stanley 1976, Mahadevan 1979). Mortality studies carried out so far in India were largely based on data generated through census, National Sample Surveys, Sample Registration Scheme and hospital data. Most of these studies had several limitations and could not explain much of the variance in the mortality

behavior of Indian populations (Mahadevan et al., 1986). Mahadevan's (1986) study covers several cultural and nutritional variables which have great relevance in understanding mortality in traditional societies. There are some studies on mortality considering cultural and nutritional variables in other parts of India (Wyon and Gordon 1971, Mahadevan 1986) (c.f. Adak et al. 2014). But there is no such study in Eastern India in general and West Bengal in particular. This study focused on four major culturally diverse groups of population that constitute the major segment of population in rural West Bengal. Of these, the index of child mortality (i.e. within 0-4 year) was highest in the scheduled tribe and lowest in the general castes. Whereas, the other backward castes and scheduled castes show an intermediate position. Malnutrition occurred in highest frequency in the ST and lowest in the GC. The SC shows more or less similar frequency as ST. The OBC, however, shows considerably higher frequency than the GC. In case of child nutrition also more or less a similar trend is noticed. Higher frequency of malnutrition among the ST is reflective of recurrent parasitic infestations, diarrheal occurrence and infection Under-weight mothers experienced higher child deaths. Side by side, non-literate mothers and mothers belong to low income families experienced higher child deaths, which is true for all the cultural groups. More than three fourth of the child deaths occurred among the mothers of four cultural groups, who availed no ante-natal care. Child deaths also recorded in higher frequency among the children who availed medical treatment at times than regular. A high frequency of child deaths was noticed among the mothers who had no sense of personal hygiene. This is true for the mothers of all the cultural groups. It is interesting to note that in respect of all these determinants the GC and OBC are comparatively in better position than that of the SC and ST. These finding are corroborated with the findings of frequency of child deaths and child nutrition among the four cultural groups in Sahajapur village.

When ICMR reference is compared it is noticed that diets are deficient in several nutrients, particularly in SC and ST. On the basis of linear regression it is found that variables like antenatal care, treatment of child and mother's sense of personal hygiene in the GC; household income, maternal nutrition and mother's sense of personal hygiene in the OBC; antenatal care, treatment of child and mother's sense of personal hygiene in the SC and household income, maternal nutrition and mother's sense of personal hygiene in the ST show some impact with child deaths in the respective cultural groups. It is further seen that in the GC, OBC and SC the variables are not significantly associated with child deaths. But in the ST household income, maternal nutrition and mother's sense of personal hygiene are

significantly associated with child deaths. It is interesting to note that the association is found to be inverse in case of maternal nutrition and child deaths in all the four cultural groups.

It is apparent from the analysis of multiple regression that in GC the total effect of antenatal care, medical treatment of child and mother's sense of personal hygiene is found to be positive and in lower magnitude. In OBC the total effect of household income, maternal nutrition and mother's sense of personal hygiene is found to be negative and in lower magnitude. Whereas, in SC the total effect of antenatal care, medical treatment of child and mother's sense of personal hygiene is found to be positive and in medium magnitude. However, in ST the total effect of household income, maternal nutrition and mother's sense of personal hygiene is found to be positive and in medium magnitude.

It is found that the general castes enjoy better nutrition and health care facilities and they are more health conscious than other backward castes, scheduled castes and scheduled tribes. As a result, level of child deaths is lowest among them. The other backward castes show a similar trend with the general castes. Among the scheduled castes, a reverse trend is perceptible. They show a similarity with the scheduled tribes in respect of health and nutrition. It is interesting to mention that both the scheduled castes and scheduled tribes occupy the lower segment in society in Sahajapur village.

Competing interest:

The authors declare that there is no conflict of interest. The authors alone are responsible for the content and writing of this article.

Authors' contribution:

DKA, RD, SM and SSG collected field data. The idea and vision behind the paper was given by DKA, who has analyzed the data and drafted the manuscript. RD, SM and SSG have gone through the report. DKA prepared the final manuscript.

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