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Determinants of Infant and Child Mortality in Periurban Areas of Kolkata city, India

Rohini Ghosh, MSc, PhD, and Premananda Bharati, MSc, PhD

Recent Indian studies indicate stagnation in decline of child mortality, though various health care interventions were introduced during the last 2 decades. This study examined the rates of infant and child mortality and associated demographic and socioeconomic factors in 2 socioeconomically vulnerable populations, comprising 195 Munda and 334 Poundrakshatriya women having similar access to health care facilities in a periurban region of Kolkata city. Higher infant mortality rate (IMR) was noted in the older and younger Munda women, in contrast to lower IMR in younger Pod women. Child mortality rate was lower in younger women in both the ethnic groups. Stagnation in IMR in younger Munda women indicates poor delivery practices whereas lower rate among the Pod reflects better adoption of safe delivery practices. Differential association of factors with infant and child deaths in the 2 populations indicate that a better understanding of determinants in culturally heterogeneous populations at the community or household level is needed to develop more effective strategies for child survival and development.

Keywords: Munda; Poundrakshatriya (Pod); mortality; periurban area; socioeconomic factors

South Asia has made progress in reducing child mortality rates since 1990, but countries such as India and Pakistan still struggle to attain the required pace of reduction. India's 1 billion plus population, together with young and large populations in Bangladesh and Pakistan, means that the region has the world's second largest population of children. Of these 3 countries, only Bangladesh has reduced under-5 deaths to almost half of its 1990 level by 2002, at an average annual reduction rate of 5.2%. In contrast, India and Pakistan is still lagging behind.[1] UNICEF's (2000)[2] data show that India is one of the South Asian Nations with high number of under-5 deaths (2.5 million in 1998). Between the mid-1980s and early 1990s significant progress was made toward reducing the mortality levels in India, but recent data indicate that the decline in child mortality has slowed down.[3] In 1998, about 2.5 million children younger than 5 years died in India, the highest total for any country.[2]

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Apart from this there is wide disparity in child mortality rates in different states, though India has been successful in reducing poverty and has experienced considerable economic growth. A country-level analysis of the National Family Health Survey (NFHS) data on infant mortality rate (IMR) and its causative factors indicated that the pace of decline in IMR has slowed down during the last decade.[4] Low or moderate level of decline was noted in states such as Kerala, Tamil Nadu, West Bengal, Punjab, Maharashtra, and Karnataka, whereas high level of stagnation was recorded in Orissa, Uttar Pradesh, Rajasthan, and Bihar.[4] The above study argued for raising the socioeconomic level and strengthening the existing public health delivery system, with easy availability and accessibility of the maternal and child health care and nutritional programs. Other macrolevel studies (especially data from NFHS-I and NFHS-II) stressed on various issues such as education, health care utilization,[5] mother's tetanus immunization,[6] female autonomy and female work status[7,8] to improve the child survival rates in India. This prompted research into the nature, pattern, and determinants of mortality decline among children, especially at the household level.

The slow decline in India's child mortality rates calls for new approaches to understand the problems of child mortality and its determinants in various regions with different environmental conditions. Moreover, there is scarce evidence of child mortality and its determinants in the periphery of urban metropolitan areas in India and elsewhere in the world, as periurban areas are growing in most of the developing countries because of rapid urban migration.

Populations residing in the periurban areas consist of heterogeneous cultural groups with respect to ethnicity, income level, language, and social norms. They are regions in transition between rural and urban zone and are defined as a poorly planned and regulated mosaics of land, housing, agriculture, and industry, in a state of rapid change.[9] Because of the the vicinity to the City, the periurban region gets the facilities of urban education, health, and strong medical interventions. Periurban regions may be more complex than either rural or urban communities and present a unique challenge to study the mortality rates and their determinants.

The state of West Bengal has high rates of child mortality in rural (42 per 1000 live births) and urban areas (32 per 1000 live births).[10] The mortality rates in the periurban region of West Bengal and India is less understood and estimated. The periurban area in the southern outskirts of the city of Kolkata, has some indigenous tribal population (Munda, Oraon, Santhals, etc) living and sharing the environment with local agricultural Poundrakshatriya population. In this article, we examined the infant and child mortality rates and the associated socioeconomic and demographic risk factors with infant and child deaths at household level in 2 different cultural groups. The outcome of this result may help us identify some factors associated with child mortality at THE micro level in a multicultural setting, where a single set of health care intervention may not be useful to combat with the problem of child mortality in a periurban environment. The sets of variables may be useful for programs and policy initiatives to further enhance child survival in India and elsewhere in the world with similar environmental settings.

Materials and Methods

The study was conducted during the period from 1998 to 1999 for the project "Microenvironment and Health" of the Indian Statistical Institute, Kolkata. Populations residing in the study area are largely dependent on agriculture as their main source of livelihood. The area of study is well connected with roads to the city center, though the transport facilities are very poor. The area is heterogeneous with respect to ethnicity and socioeconomic development. Munda (tribe) and Poundrakshatriya or Pod (caste) population form the largest segment of the heterogeneous population in the study area and are therefore considered for this study. The lower

castes and tribes are considered as the disadvantaged population in terms of overall socioeconomic development and may provide useful information regarding their survival outcome in a periurban environment. Settlements comprising the Munda and the Pod were selected as whole. All the Munda (215) and Pod (331) households in this periurban area were included in this study. Verbal consent of the people around the area was taken before collecting the data for the project. The review committee for protection of research risks to humans of Indian Statistical Institute, Kolkata, India, gave the ethical approval to conduct the project.

A pilot survey was done to establish rapport with the people of the study area. Interviews were conducted only after obtaining permission from the heads of the households. Widows, separated and women having gynecological problems (who can never become mothers) were excluded from the analysis for this present study. Trends of infant and child mortality were examined from the pregnancy record of all the available 195 Munda and 334 Pod married women of 15 to 45 years of age, capable of child bearing, and not attained menopause. The unit of observation was the household, defined as persons sharing the same cooking pot. All the women of the households were asked regarding their fertility history, which consisted of their current age, their age at marriage, number of live births and surviving children, child deaths in less than 5 years, and family planning methods. Maternal work status and her education were noted. Information on income, expenditure, number of persons residing in each house was gathered. Per capita income of each household was calculated by dividing the total income (from all sources) of each household by the total number of persons residing in the house. The cutoff point of per capita income of Indian rupees 401.99 (equivalent to US$9.00 approximately) was considered for measuring the poverty level of each household in the study area.[11]

Statistical Analysis

Descriptive statistics were used to examine the socioeconomic characteristics of the study area. Logistic regression analysis was used to compute odds ratios (ORs) and 95% confidence intervals (95% CIs) to explore the relationship between women's demographic characteristics and economic status of the household and the risk of infant and child mortality in the 2 ethnic groups. Stepwise multiple regression was done on infant and child mortality for the Munda and Pod data to find out the order in which the predictor variables (age of the women, their age at marriage, family planning practices, family size, poverty level of the household, work status of the women, and her education, total income of the family and per capita income) entered into (or taken out of) the model, according to the strength of their correlations with the dependent variable. We used forward selection in which SPSS entered all the variables (used in the univariate analysis) into the model one at a time, in an order determined by their strength of correlation with infant and child mortality. The effect of adding each is assessed as it is entered, and the variables that do not significantly add to the success of the model were excluded. Analysis was done by SPSS 11.0 and significant value of .05 was considered for this study.

Results

Infant and child mortality rates and age groups of the Munda and Pod women are shown in Figures 1 and 2, respectively. Higher infant mortality rates in Munda women younger than 25 years were found in this present study. Almost similar rates of infant mortality were noted

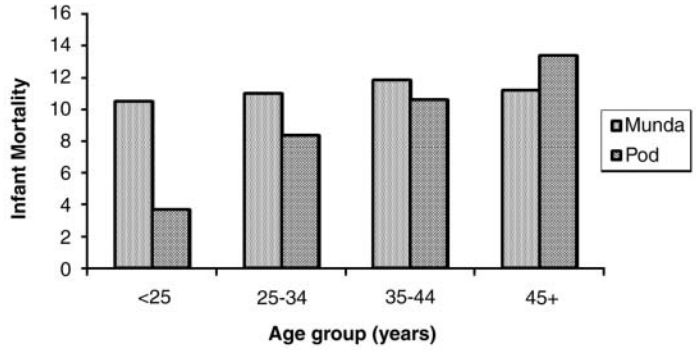

Figure 1. Infant mortality rates in different age groups of Munda and Pod women.

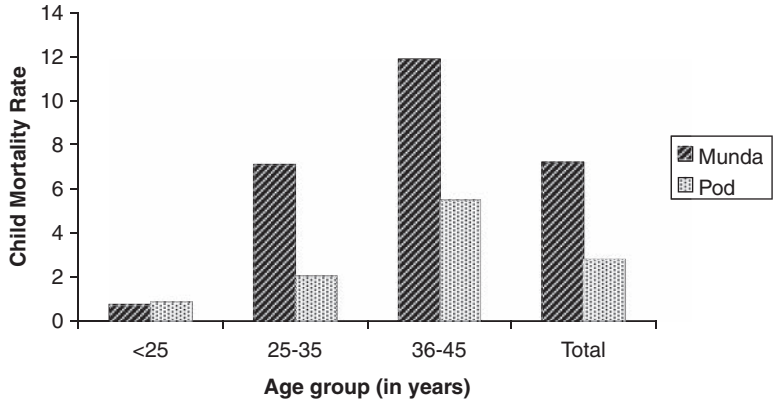

Figure 2. Child mortality rates in different age groups of Munda and Pod women.

in the older women (25 to 45 years) of both the ethnic groups. The child mortality rate indicated a reverse trend. Almost similar child mortality rate was observed in women younger than 25 years. Higher child death rate was observed among the older Munda women (both in the 25 to 35 and 36 to 45 years age categories).

The differences in infant and child deaths in various age categories are shown in Table 1. Significantly higher number of infant deaths was observed in the Munda population in the <25 years age category. Older Munda and Pod women (25 to 45 years) indicated no significant differences in infant deaths. In case of the child deaths, except in <25 years age group, Munda women had significantly higher child deaths in the 25 to 35 and 36 to 45 years age categories. However, the total number of infant and child deaths was significantly higher in the Munda population.

The demographic and economic characteristics (Table 2) indicate that Munda women are more disadvantaged than the Pod women. Munda women were married at a significantly younger age than the Pod women and had significantly higher live births, number of surviving and dead children, and infant and child deaths. The household income and per capita income were also significantly lower in the Munda households.

Univariate analysis (Table 3) of the demographic and socioeconomic factors with infant and child deaths indicate that Munda infant mortality was associated with women's age,

Table 1. Infant and Child Deaths According to Different Age Categories of the Munda and Pod Women

Age Group of Mothers (Years)	Munda		Pod		Infant Deaths			Child Deaths		
	No. of Women	No. of Live Births	No. of Women	No. of Live Births	Munda	Pod	*P* Value	Munda	Pod	*P* Value
<25	73	136	145	229	16	10	2.74[a]	1	2	0.222
25-35	91	337	132	390	37	33	1.13	24	8	3.125[a]
36-45	31	193	57	273	23	31	0.167	23	15	2.46[b]
Total	195	666	334	892	76	74	4.00[a]	48	25	3.67[a]

[a]$P < .01$.
[b]$P < .05$.
NOTE: P value stands for the Z value-equality of proportions.

Table 2. Demographic and Economic Characteristics of the 2 Populations

Variables	Ethnic group	n	Mean	SD	*P* Value[a]
Age (years)	M	195	28.34	6.76	NS
	P	334	28.23	7.33	
Age at marriage (years)	M	195	15.43	2.28	<.005
	P	334	16.04	2.32	
Number of live births	M	195	3.42	2.07	<.001
	P	334	2.67	1.64	
Number of dead children	M	195	0.73	1.08	<.001
	P	334	0.33	0.69	
Number of surviving children	M	195	2.69	1.54	<.005
	P	334	2.34	1.30	
Number of infant deaths	M	195	0.39	0.71	<.005
	P	334	0.22	0.52	
Number of child deaths	M	195	0.25	0.64	<.001
	P	334	0.07	0.32	
Family size	M	195	5.28	1.64	NS
	P	334	5.30	2.02	
Income (Indian rupees)	M	195	2783.30	1409.21	<.001
	P	334	3593.45	1664.77	
Per capita income (Indian rupees)	M	195	560.55	303.46	<.001
	P	334	724.80	347.93	

NOTES: M = Munda; P = Pod; NS = nonsignificant.
[a]*t* Test.

family size, poverty level, and per capita income of the household. On the other hand, Pod infant mortality was significantly associated with women's age, age of marriage, and their educational status. Women's age remains an integral factor and had high probability of determining the deaths of infants in both the ethnic groups. However, variation in socioeconomic factors was noted to be associated with infant deaths in both the Munda and Pod households.

Factors such as women's age, age at marriage, and their work status along with economic factors, for instance, poverty level of the household and per capita income was associated with Munda child mortality. Death between 1 and 5 years in the Pod household was significantly associated with women's age, age at marriage, work status, and level of education.

Age and age at marriage along with work status were the common factors associated with child mortality in both the ethnic groups. Variation in association of the socioeconomic factors with higher probability of child deaths was noted in Munda and Pod households.

Table 3. Univariate Analysis of the Demographic and Economic Factors Associated With Child Mortality in the 2 Ethnic Group

Variables	OR	95.0% CI for Exp(*B*)		Significance
		Lower	Upper	
Munda infant mortality				
Age	.943	.900	.988	.013
Age at marriage	1.124	.974	1.297	.111
Family planning practices	.258	.042	1.587	.144
Family size	.771	.637	.933	.007
Poverty level of the household	1.896	1.010	3.559	.047
Women's work status	1.843	.977	3.479	.059
Women's education	1.228	.379	3.984	.732
Total income	1.000	1.000	1.000	.474
Per capita income	1.001	1.000	1.003	.029
Pod infant mortality				
Age	.889	.853	.926	.000
Age at marriage	1.467	1.246	1.727	.000
Family planning practices	.776	.380	1.583	.485
Family size	1.028	.889	1.188	.710
Poverty level of the household	1.103	.304	4.003	.881
Women's work status	1.590	.890	2.841	.118
Women's education	2.679	1.404	5.112	.003
Total income	1.000	1.000	1.000	.933
Per capita income	1.000	.999	1.001	.745
Munda child mortality				
Age	.877	.826	.931	.000
Age at marriage	1.263	1.053	1.513	.012
Family planning practices	.810	.088	7.490	.853
Family size	.891	.716	1.110	.303
Poverty level of the household	2.912	1.349	6.287	.006
Women's work status	3.536	1.506	8.305	.004
Women's education	824.983	.000	.000	.657
Total income	1.000	1.000	1.001	.041
Per capita income	1.002	1.000	1.004	.014
Pod child mortality				
Age	.864	.810	.922	.000
Age at marriage	1.326	1.060	1.658	.013
Family planning practices	.367	.083	1.618	.185
Family size	1.057	.830	1.347	.654
Poverty level of the household	1.049	.132	8.370	.964
Women's work status	3.849	1.259	11.768	.018
Women's education	3.096	1.012	9.469	.048
Total income	1.000	1.000	1.000	.700
Per capita income	1.000	.999	1.001	.838

NOTES: OR = odds ratio; 95% CI = 95% confidence interval.

Using stepwise multiple logistic regressions with infant and child deaths as the dependent variable we obtained the models shown in Table 4. For the stepwise analysis, all variables from the univariate logistic regression with *P* values <.05 were available.

Munda Infant Mortality

Factors in the univariate analysis were used in the forward conditional logistic regression and a model indicating family size as independent risk factor associated with Munda infant deaths

Table 4. Multivariate Analysis of the Factors Associated With Child Mortality of the 2 Ethnic Groups

Models	Variables	Initial −2LL	Model −2LL	χ^2	Hosmer and Lemeshow χ^2	OR	95.0% CI for Exp(*B*)		Significance	R^2
							Lower	Upper		
IMR Munda										
1	Family size	233.847	226.447	7.400[a]	3.569	0.771	0.637	0.933	.007	.053
IMR Pod										
1	Age	308.370	272.571	35.798[a]	7.510	0.889	0.853	0.926	.000	.171
2	Age	263.776	44.594[a]	5.650	0.912	0.874	0.953	.000	.224	
	Age at marriage	1.272	1.071	1.510	.006					
3	Age	258.923	49.447[a]	11.060	0.893	0.850	0.937	.000	.252	
	Age at marriage	1.278	1.077	1.516	.005					
	Family planning	0.357	0.145	0.880	.025					
CMR Munda										
1	Age	177.319	156.282	21.037[a]	12.855	0.877	0.826	0.931	.000	.169
2	Age	149.307	28.013[a]	8.912	0.881	0.829	0.937	.000	.207	
	Work status	0.317	0.130	0.776	.012					
3	Age	145.507	31.813[a]	8.075	0.888	0.834	0.946	.000	.228	
	Work status	0.313	0.127	0.772	.012					
	Poverty level of the household	0.440	0.191	1.010	.053					
CMR Pod										
1	Age	151.394	129.106	22.288[a]	8.270	0.864	0.810	0.922	.000	.177
2	Age	124.523	26.871[a]	6.663	0.866	0.810	0.926	.000	.212	
	Work status	0.313	0.099	0.991	.048					

NOTES: −2LL = −2 log likelihood; OR = odds ratio; 95% CI = 95% confidence interval; IMR = infant mortality rate; CMR = child mortality rate.
[a]$P < .001$.

was obtained. No other variables used in the univariate analysis entered the multivariate logistic model. Initial –2 log likelihood (–2LL) was 233.847, which decreased to 226.447 (a change of 7.400) in the final model indicating a better fit. The overall model was also statistically significant as indicated by the nested χ^2 ($P \leq .001$). The percentage of cases that were predicted in the null model (71.3%) and the final model (70.8%) were almost equal. The R^2 value for the model is .053.

Pod Infant Mortality

The –2LL for the Pod infant mortality was 308.370 in the initial stage and decreased in the final 3 models to 272.571 (model 1), 263.776 (model 2), and 258.923 (model 3) indicating a better fit with inclusion of variables such as age, age at marriage, and practice of family planning. Whereas in the univariate analysis very strong association between women's age at marriage and Pod infant deaths were recorded, this lost some of its strength of association in the multivariate analysis (*P* value changed from .00 to .05) because of the correlation between the variables. Age at marriage remained an independent risk factor as the value of odds ratio did not vary much with inclusion of family planning practices in model 3. Interestingly, the family planning practices factor, which showed no association in the univariate model, emerged as weak risk factor in the multivariate analysis (*P* value changed from .485 to a significant value of .025). Overall, the 3 models were statistically significant ($P <. 001$) as obtained from the nested χ^2 model. The overall percentage of cases that are predicted by the null and final model was almost equal. Therefore, age at marriage was strongly associated with Pod infant deaths and women's age and family planning indicated a weaker association. The R^2 value increased from .0171 to .224 and finally to .252 with the inclusion of the above variables in the 3 models.

Munda Child Mortality

Women's age, their work status, and poverty level of the household were included one by one in the 3 models obtained in case of Munda child mortality. The value of odds ratio of women's age remained unchanged in the 3 models of the multivariate analysis with the inclusion of the socioeconomic factors such as work status and poverty level of the household, indicating a strong risk factor for Munda child deaths. The *P* value, however, was weakened in the final model of the multivariate analysis of work status ($P = .004$ in Table 3 to $P =. 012$ in Table 4) and poverty level of the household ($P = .006$ in Table 3 to $P = .053$ in Table 4), indicating a weaker association. Initial –2LL of 177.319 decreased to a better fit of 156.282 in model 1. In model 2 the –2LL further decreased to 149.307 and the best of model 3 indicated a –2LL value of 145.507 with inclusion of the variables such as women's age in model 1, her work status in model 2, and the poverty level of the household in model 3. Again there was not much difference in the percentage of predicted cases in the null and final models. The R^2 value, associated with the child mortality among the Munda increased from .169 to .207 and then to .228 with the inclusion of the independent variables such as age of the women in model 1, then with addition of work status in model 2, and finally with inclusion of the factor poverty level of the household in model 3.

Pod Child Mortality

Two models were obtained when forward conditional logistic regression was performed in case of Pod child mortality. The –2LL were 129.106 (model 1) and 124.523 in model 2, a lowering of the –2LL value in the subsequent models as compared with the initial value of 151.394, indicating a better fit. The nested models were highly significant ($P <. 001$) and no difference

in the predicted cases was noted between the null and final model. Age was the independent risk factor associated with Pod child mortality as the value of odds ratio remained unchanged (0.864 in model 1 and 0.866 in model 2) with the addition of the factor of women's work status. The R^2 value increased from .177 in model 1 with the inclusion of age among the Pod child mortality and then to .212 in model 2 when work status was added.

Therefore, age was noted to be a significant risk factor for child deaths in both the ethnic groups.

Discussion

About a quarter of global neonatal deaths occur in India (43 per 1000 live births) and the interventions to combat with neonatal deaths are crucial if child mortality is to be reduced globally and in India.[12-14] Globally the main causes of neonatal deaths are attributed to preterm birth (28%), sepsis or pneumonia (26%), and birth asphyxia (23%).[12,15] Most of the neonatal deaths and stillbirths occur at home and there is almost no information regarding the details of the causes of child mortality, [13,16,17] especially in India.

The infant mortality rate of the Munda was 11.41, per 100 births and child mortality rate was 7.21, per 100 births, which are almost similar to other tribes in India. For example, the infant mortality rate among the Dudh Kharia of Orissa was 10.24 per 100 live births[18]; in Kolam, 14.28 per 100 live births, and among the Thoti of Andhra Pradesh, 10.81 per 100 live births.[19] The rate among the Onge of Andaman and Nicobar islands was 19.2 per 100 live births.[20] High child mortality was also noted among the Sahariya, Mina, and Bhils of Rajasthan and Munda, Santhal, and Lodhas of West Bengal.[21] However, lower infant mortality rate was noticed among the Lotha Nagas of Nagaland (5.74/100 live births).[22] The Pod population in this study also revealed higher infant mortality rate of 8.30, per 100 births and child mortality rate of 2.80, per 100 births, higher than the rates of other cultural groups in India. Similarly, high mortality among low castes was noted in economically disadvantaged households.[23]

Most of these diseases, like sepsis, pneumonia and birth asphyxia are widely prevalent in the populations who are economically disadvantaged in terms of size of land holdings, income, and poverty. The Munda among the 2 study populations were economically disadvantaged in terms of total income, poverty level, illiteracy, and heavy workload among their women.[24] High rate of infant and child mortality was noted among the Munda women. Lower infant mortality rate was noted in the younger Pod women (<25 years age group), which may be associated with better adoption of antenatal and delivery care practices in the Pod population. Older women in both the ethnic groups had similar rates of infant deaths, indicating poor health care and delivery practices in this periurban region. Health care and antenatal programs have been intensified in India during the last 2 decades and the older women in both the ethnic groups did not get these facilities. Higher infant mortality rates in Munda women younger than 25 years indicate a stagnation in the decline of infant deaths. Traditional beliefs, illiteracy along with poor investment in proper medical care may have resulted in slow decline of the infant mortality rate among the younger Munda women.

Munda households having larger family size had the highest risks of infant mortality, when compared with other demographic and economic factors. Higher number of childbirths with almost no family planning practices and high rates of illiteracy in the Munda households[24] were associated with high family size. Low age at marriage with almost no family planning practices not only increased the family size in the Munda population but also stalled reduction in infant mortality.

Current age and age of marriage are associated with infant mortality rate among the Pod women. Earlier studies indicated increased risk of infant deaths in younger mothers and

mothers who were married at an early age.[25,26] The risk of infant, neonatal, and postneonatal mortality was significantly higher for younger adolescent (12 to 17 years) than for older (20 to 34 years) mothers.[27] The mean age at marriage of the Pod women is 16.04 years. Most of the women in this population are married in their adolescence and this is noted to be one of the risk factors for infant mortality.

Higher child mortality was noted among all the Munda women, except in the age group of <45 years. Unlike the factors affecting infant mortality, child mortality is more related to the socioeconomic situation of a household. Poor nutritional status of the mother, high poverty, low rates of antenatal care, low utilization of obstetric and health care services because of illiteracy, and large number of deliveries resulting in poor birth outcome have been detected in most of the studies done in rural areas of India.[28-33] This was also true for the Munda population in this periurban area, though urban health care facilities were available.

Women's age is found to be one of the risk factors associated with child mortality in both the ethnic groups. Lower child mortality rate was observed in the <25 years age groups in both the ethnic groups. It can be assumed that younger women are trying to provide better care to their children who are younger than 5 years, as the populations are exposed to an urban environment. Unlike stagnation in Munda infant mortality because of poor delivery care practices,[24] child mortality rates indicated better child and health care knowledge among the younger women in both the ethnic groups.

Apart from age, higher risk of child mortality was found among women working outside. This is true for both the ethnic groups. In India, because of poverty, mother's working condition usually involves long hours of stay outside home and this result in less breastfeeding and child care,[28] which was true for the present periurban environment. Employment of women in economic activity has several beneficial effects for women and their families, as employment increases access to resources and income. However, research in India suggests that survival of young children is negatively associated with women's work,[34,35] in spite of reduction in female child mortality. Various macrolevel analysis, especially at the district level, indicated higher rates of child mortality and women's labor force participation, even when other cultural and economic factors were controlled.[34,35]

At the household level, economic well-being operates mainly through better food availability, more hygienic conditions, and better access to health services in influencing the risk of ill health and mortality.[36,37] Households having better income will always prefer better medical treatment and will consume better quality and quantity of food, resulting in better health in terms of lower mortality and morbidity. Apart from income, poverty level of the household was associated with child mortality among the Munda in the present study. An Israeli study indicated no association of poverty with infant mortality,[38] whereas in the United States, inconsistent evidence was recorded between poverty and infant mortality.[39] Yet a number of studies have shown that children in poorer households tend to be at higher risk of dying than children in better-off households.[40,41] However, the association between economic disparity and child survival rates is not clear, especially in multiethnic heterogeneous populations such as in India, and elsewhere in the world, and further research is needed in this field to reduce the burden of health inequality.

Significant differences in the child survival rates between the 2 ethnic groups indicated that different sets of socioeconomic factors were responsible in determining the survival rates of the 2 ethnic groups, although both groups have access to the same health care and immunization facilities, and both live at the same distance from the Kolkata metropolitan city. Lower mortality among the Pod women can be attributed to better socioeconomic position in terms of education, higher income, and adoption of better methods of antenatal and childcare than the Munda mothers. This study also indicated the failure of health care interventions and antenatal care among the younger Munda women and almost no adoption of proper hygienic delivery care practices, and stagnation in the infant mortality rate was noted. Although living

and sharing the same health care facilities, the younger Pod women adopted better measures for safer delivery. Although the Government of India is implementing intensive health care interventions, antenatal and immunization programs, yet populations of various cultures show differences in their mortality outcomes. The periurban areas are no exception to this.

The difficulties faced in the present study related to the correct assessment of the women's age. These indigenous populations are ignorant about their age. As there are no written records, age was determined with recall methods and identifying with some famous events or festivals during the closest time of birth. The other limitation of the study is the availability of the Munda tribe near a periurban area. These indigenous populations usually live in forests and in inaccessible areas, and their availability in an urban area is very remote. Hence, all the Munda households available in that periurban area and their adjoining Pod households, with similar access to health care and medical facilities, were selected.

It is now necessary to examine the existing child health programs and strategies, including initiatives for the eradication and elimination of vaccine preventable childhood diseases, and specific health and nutrition interventions in the context of a child health framework that goes beyond disease program and sector-specific approaches. A better understanding of the main determinants of health for the mothers and children is needed for developing more effective strategies for child survival, health, and development. These should involve local communities in identifying needs and priorities. Thus, a microlevel approach at the community level is needed to reach the core problem of any population. But as India is a country of diverse cultural populations residing in various geo-ecological regions, the implementation and planning of health care and developmental programs is an uphill task.

The present study signifies the need to change some basic problems of the indigenous groups in India and around the world having similar rates of high infant and child mortality. These are

1. intensification of immunization for the pregnant mothers and new borne child;
2. vigorous training of the local midwives and other birth attendants and provision of delivery kits; and
3. strengthening the knowledge of hygienic delivery, importance of immunization, diet, postnatal care, especially the importance of exclusive breastfeeding for first 6 months and the harmful practice of first food (The traditional populations in India usually feed honey, cow's or goat's milk, and other herbal paste as soon as a child is born, according to the respective customs of various cultural groups.) after birth.

The media can play an important role in imparting this basic knowledge. Apart from this, utilization of health care services provided by the government should be increased. However, changes are also necessary for the health care centers with respect to the availability of good medical practitioners, hygiene, and availability of basic medicines and delivery care, especially in rural and periurban areas.

These basic changes in the implementation of the above, if provided to all the indigenous populations with varying cultural customs and taboos in India and around the world having similar problems may reduce the high rates infant and child mortality. However, education remains the integral factor, which needs to be strengthened and intensified for all to achieve equality in health status in terms of lower mortality rates and reduced burden of diseases.

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