A Reflection on Child and Infant Mortality in Selected South Asian Countries

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By

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Abstract

Objectives: This study aims to explore the infant and child mortality rates in relation to (i) a range of conventional covariates including household characteristics, literacy rates, cultural and social factors, treatment method, mother's history like preceding birth interval between children & multiple births and provision of facilities like electricity, safe water and sanitation etc. (ii) some policy variables like health facilities related to cesarean section and women empowerment related to health which is a very nascent concept in public health literature.

Methods: The study design is cross-sectional which exploits the latest Demographic Health Surveys from the selected South Asian countries including Pakistan (2012), Bangladesh (2011) India (2012) and Nepal (2011). The Cox's proportional hazard model is used to establish the factors that affect the infant and child mortality.

Conclusion: The results of the study support the argument of health interventions in the region that should be designed to reach the most undeserved: women and children. More specifically, we recommend particular focus on better cesarean section method of delivery and women empowerment in health related issues.

Keywords: *Infant and child Mortality Rates, Developing Countries, cross-section, Socioeconomic, Women Empowerment*

JEL Codes: *I12, I18, I21, I28, J13*

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Introduction

Child mortality rate has received tremendous attention of researchers and policy makers since last 3-4 decades. Developing countries are struggling with this issue and targets are far to achieve. The causes of children dying before their 5^{th} and 1^{st} birthday are wide in range and diversified in nature. Starting from pre and postnatal care along with many social-economic and factors related to mother history are responsible for high child mortality rates in most of developing and underdeveloped countries. Although there has been a substantial reduction in infant and child mortality rates in most developing countries in the recent past, it still remains a smoldering child health issue in South Asian countries. The issue is more serious for Pakistan because it is the most child populous (children below five years of age) country and have high infant and child mortality rates.

Substantial amount of literature is available on the topic but still the issue requires deeper analysis that may help in focused policy. Literature provide consensus on few issues: for example, a reasonable collection of studies provide evidence that female literacy has significant impact on mortality rates (Guilkey & Riphahn, 1998, WHO, 1995; Pritchett and Summers, 1996 and Klasen 2003). The preferences for sons are analyzed in case of Bangladesh and their analysis suggest the prenatal and neonatal male mortality is high in Bangladesh but postnatal and infant mortality is high for females, which also indicate the preferences for sons (D'Souza and Chen 1980). Moderate number of studies suggests a positive relationship between family planning and child mortality rates (Hobcraft et al., 1985 and Trussell and Pebley 1984). Lawn et al., 2005, emphasize and provide a detailed analysis of neonatal deaths and find that the proportion of child deaths that occurs in the neonatal period (38% in 2000) is increasing. Along with many useful insights the paper reports that 450 newborn children die every hour, mainly from preventable causes, which is inconceivable in the modern age in 21st century. A significant reduction in child mortality rates is only possible if the high numbers of deaths are addressed by maternal, newborn, and child health interventions (Black et. al., 2010).

The significance of this study is the simultaneous focus on child and infant mortality rates. Second, we employ a better model specification; for instance, we examine the impact of cesarean section method of delivery (for infant mortality) in conjunction

with the available health facilities and mother's empowerment in health related issues for better policy implications.

Data

We employ Demographic Health Surveys collected and administered by USAID. Demographic and Health Surveys (DHS) are nationally representative household surveys that provide data for a wide range of variables in the area of health. We include Pakistan (2012), Bangladesh (2011) India (2012) and Nepal (2011), for this study.

Pakistan has high mortality rates among its peer countries (Fig. 1). Pakistan has witnessed stagnant or an insignificant decline in mortality rates in 60's and 70's as well (Cleland and Sathar, 1984 and Alam and Cleland, 1984; Irfan, 1986, Sathar, 1991 and Sathar, 1995). Overall, under five-year mortality rates are substantially higher than infant mortality rates, which clearly shows the impact of lack of care, environmental, social and nutritional factors are responsible for the difference between child and infant mortality rates.

Our choice of variables includes child gender, parental educational status, mother's empowerment, household characteristics and selected variables of mother's birth history. We use the mother empowerment in two different dimensions i.e., if mother is working and other is if women participate in health related issues. We expect different signs for both variables for instance former measure reduces the child care time and later shows mother's participation and healthcare decisions. The later dimension of women empowerment is not exploited earlier in literature on issue of child mortality, however some of the evidences support the relationship between women empowerment and child health outcomes in general. This variable is measured as a categorical variable[‡]. Mother's age and child mortality rate forms a J-shape relationship as suggested by some of earlier literature (see Akoto and Hill, 1988). For household characteristics we prefer to include water, sanitation and electricity for household wealth index. Further for maternal history we include three different indicators; number of children ever born, interval between successive births and cesarean section.

[‡] If women make health regarding issues of herself and children and along with consent of her husband=1 and zero otherwise (including if husband solely or any other member of the household make decision on health related issues).

Method

The study design is cross-sectional which exploits the latest Demographic Health Surveys from the selected South Asian countries. The Cox's proportional hazard model is used to establish the factors that affect the infant and child mortality.

$$h(t) = h_0(t)e^{\beta_i X_i}$$

where $h_0(t)$is the baseline hazard function and X is the matrix of covariates. The effects of covariates on infant and under-five mortality are measured as relative risk differentials (RRD). The relative risk differentials are calculated by subtracting one from relative risk ratios (RRR).

The results of Hazard model estimates, both for child and infant mortality, are presented in Table 2, which presents two different model specifications. First model presents the determinants of infant mortality (children below the age of one year) and second model presents the determinants of child mortality (children between age of 1 and 5 years).

Results and Discussion

The gender coefficients in both models presented in Table 2 have negative sign, which shows higher probability for girl's survival though not statistically different from zero. This trend is reported in most of the world in general and for developing countries in particular. However, India and China are exceptions, when it comes to Asia. Girls have advantage over boys because of better immune system and genetically lesser vulnerability. Waldron (1998) investigate the sex differentials in child mortality rates and briefly explains that girls have advantage over boys because of perinatal conditions, congenital anomalies, and infectious diseases.

Both mother and father's education have significant and positive impact on child survival and reduces the probability of child mortality. If the father's education is further increased to one standard deviation (4.7 years of schooling) from mean, the probability of child and infant mortality can drop to 8% and 12% respectively (See table 3). Similarly, one standard deviation increased in mother's education also increases the probability of both infant and child survivals by 13% and 9% approximately. The coefficients of mother's education in both models are significant

and substantially high as compared to for father's education. The negative relationship between parental education and child mortality is extensively discuss and noticeably established (See for example Strauss & Thomas (1995); Grossman & Kaestner, (1997); Grossman, (2000); Kumar et al., (2013); Chalasani, (2012); Mazumdar, (2010); Pradhan & Arokiasamy, (2010) and Caldwell & McDonald, (1982). This result is a strong argument in favor of targeting girls' education. Deaton (2002) presented his proposition that expenditure on education have larger return on health outcomes as compared to expenditure on healthcare system.

Mother's employment status has positive and significant effect on child mortality. This result clearly shows lack of childcare, which results in child mortality. In rural areas the livelihood of household depends on farming and women's participation is high in rural areas especially on their own piece of land. Thus mother if working cannot take care of infants or young children up to a certain level because of time constraint. Further lack of education and healthcare units supplement to this and results in high child/infant mortality. Similarly, in urban areas, there is dearth of good quality daycare facilities. Usually the newborn children are left at home where the older children or other household members take care of infants, which are not a perfect substitute for mothers. Earlier literature also supports this argument that probability of child survival decreases if mother is working (Basu and Basu 1991; Kishor and Parasuraman, 1998) and the reason is obvious i.e., reduction in time for childcare activities (Desai and Jain 1994).

Women empowerment literature got immense attention since last few decades. In demography and fertility outcomes; empowerment have been recently considered for women and children's health (e.g. Bloom, Wypij & das Gupta, 2001) but literature on women empowerment in relation with infant and child mortality is still nascent. Our estimates suggest the probability of child survival increases if mother makes the decision about children's health. Since mother spend more time with children and better understand their health issues if she is allowed to make decision and her opinion is considered seriously the child mortality decreases (Desai & Johnson, 2005).

The household characteristics include electricity, toilet facility and piped water are not determined with statistical precision. Since last few decades South Asian courtiers

invested in household quality and thus have improved quality on these dimensions (Andres et al. 2014). Alongside the statistical insignificance of place of residence, negative sign of child mortality explains the environmental factors with less pollution and better nutrition in rural areas. Children those who are able to survive after first year of their birth - they have less probability of mortality in rural areas. The opposite sign of infant mortality shows less chances of survival in rural areas because of unavailability of initial healthcare facilities like immunization and provision of vitamins. The earlier literature on child or infant mortality presents ambiguous results of urban or rural residence. For instance; Cantrelle, (1980) shows that child and infant mortality is less in rural areas of Senegal but in Central African Republic it is same for both rural and urban residents. In Latin America infant mortality is positively affected by residence in urban area (Puffer and Serrano, 1973).

Further, in household characteristics we also include household size and square of household size to examine the crowding effect. Our estimates for child mortality suggest that with the increase of household members the mortality decreases because there are other members in the household to take care of mother and child. However, the household square decreases the child survival significantly because of overcrowding and lack of resources.

Increase in preceding birth interval reduces the chances of mortality, earlier literature reports the same results, for instance: Rutstein 1983; Hobcraft et al. 1985, 1985; Miller et al., 1992; Miller, 1991; Winikoff, 1983; Millman and Cooksey, 1987. Thus high mortality is expected with large number of children ever born or absence of family planning. The South Asian countries are still struggling with high fertility rates. Another interesting variable is the impact of twin birth on child and infant mortality (Misra and Ananth, 2002). This variable is important in both infant and child mortality cases. Both child and infant mortality increases if a mother gives birth to many children, this variable is also highly significant. In case of child mortality for rural or economically less privileged households, rearing of two children becomes difficult with limited resources. Gardner et al., (1995) finds that twins accounted for a disproportional amount of preterm birth and associated morbidity and mortality while using US data. In Asian context we find the twins are at high risk of dying during their first year of birth and even between 1 to 5 years they remain more at high risk of

mortality. Health planners need to give specific importance toward this issue and policies can play very important role in terms of training to lady health workers particularly in rural areas where households have less facilities, in those situations the lady health workers or mobile health can provided to women with twin babies to improve their chances of survival.

Cesarean section is another cause of infant mortality; thus we also include C-Section in our model specification for infant mortality to measure the relative risk of dying in case of C-section. The estimates show a high and significant relative risk of C-Section for infant death. High risk to child life in case of C-section clearly indicates the provision of ill-trained doctors or health facilities. We further, include the interactive dummy of C-section with health facility. We find that the infant survival increases by more than 84% in case of normal delivery as compared to C-section. Our results suggest that both public and private sectors are contributing in curtailing the infant mortality during the C-section. However, it is surprising that government hospitals, private hospitals or clinics and other health units in South Asian countries offer similar kind of C-section facilities. This result is very imperative for health planning, as we need more trained and better facilities at our health centers.

Conclusion

The estimates of both model specifications presented in this paper provide the relative risk of selected demographic, household, environmental and maternal history toward mortality of children (age between 1-5 years) and infants (age below one year). Beside the conventional variables, those have expected signs; this study provides some additional policy variables for instance, working mothers have positive and significant impact on mortality rates. In informal sectors of the economy women are not provided with support from their employer, for example maternity leave for mother and salary of days away from work because of delivery. There is hardly any provision of follow up checkups for mothers and newborn babies. Lack of such support system leads toward worst health outcomes. Our results advocate the women empowerment in health related issues as it significantly reduces the mortality rates. Control on fertility rate and training of cesarean section requires an immediate attention of government to reduce the mortality rate.

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Figure 1: Infant and Child Mortality Rates (000) in Selected South Asian Countries

Table 1: Summary Statistics

	Infant				Child			
Variable	**Mean**	**SD**	**Min**	**Max**	**Mean**	**SD**	**Min**	**Max**
Demographic & Parental Characteristics								
Gender	48.57%				48.75%			
Father_edu	7.67	4.93	0.00	18.00	7.69	4.97	0.00	18.00
Mother_edu	6.34	5.13	0.00	18.00	6.41	5.21	0.00	18.00
Mother_age	26.63	6.14	13.00	46.00	29.32	6.40	14.00	49.00
Mother's Empowerment								
Mother_Working	22.11%				35.26%			
Decision_heatlh	57.41%				63.56%			
Household Characteristics								
Residence	58.21%				57.97%			
Flush	56.16%				58.24%			
Pipe_water	24.30%				22.64%			
Electricity	84.00%				86.03%			
Household Size	798.03%				725.87%			
Birth History								
Pre Birth Interval	46.27	30.99	8.00	214.00	47.39	33.09	8.00	319.00
Children Ever Born	2.78	1.98	1.00	14.00	3.16	2.13	1.00	16.00
Twins	2%				2%			
Normal Delivery	84.56%							
Csection#Health Facility	4.90%							

CS_Govt Hospital	
CS_Govt Health Center	1.40%
CS_Pvt Hospital/Clinic	8.47%
CS_Other	0.67%

Table 2: Estimates of Cox-Hazard Model

	Infant Mortality	**Child Mortality**
Variable	**RRD[a]**	**RRD**
Demographic & Parental Characteristics		
Female	-0.069	-0.030
Father_Edu	-0.016	-0.023***
Mother_Edu	-0.067***	-0.036***
Mother_age	-0.137	-0.063**
Mother_age_sqr	0.002	0.001
Mother's Empowerment		
Mother_working	0.546**	0.229***
Health_decision	-0.314**	-0.247***
Household Characteristics		
Residence	0.103	-0.033
Flush	0.133	-0.013
Pipe-water	0.354	-0.030
Electricity	-0.121	-0.035
HH Size	-0.050	-0.253***
HH Size_sqr	0.000	0.006***
Birth History		
Pre Birth Interval	-0.008**	-0.006***
Twins	2.841***	2.903***
Children ever born	0.150**	0.319***
Csection#Health Facility		
Normal Delivery	-0.845***	
CS_Govt Hopital	-0.580	
CS_Govt Health Center	-0.595	
CS_Pvt Hospital/Clinic	-0.396	
CS_Others	Omitted	

***, **, & * indicate significance level at 1%, 5% & 10% respectively.

a. RRD stands for relative risk differentials

Table 3: Effects on Mortality rates with change in one SD of selected variables

	Child Mortality	**Infant Mortality**
	RRD	**RRD**
Father_edu	-0.12	-0.08
Mother_edu	-0.19	-0.34

Child ever born	0.68	0.30
Preceding birth interval	-0.19	-0.24