

Child mortality in India: a complex situation

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Background: The countdown database to track the maternal and child survival rate, as set by the Millennium Development Goal, reported recently that India's progress is not satisfactory in reducing newborn and child deaths.

Data sources: Articles on neonatal and child mortality in India were accessed from PubMed/MEDLINE. Risk factors associated with neonatal and child mortality were reviewed in three crucial phases of pregnancy, childbirth and postnatal period.

Results: The review revealed economic disparity acts through various avenues of cultural belief and restrictions and is indirectly associated with care seeking behavior and utilization of health care, resulting in slow decline of child mortality rate in India. Secondly, cultural norms, practices, and beliefs are strongly associated with high neonatal mortality, contributing to the sluggish decline of overall child survival rate. Proximate determinants of child mortality, i.e., income, cultural behavior and beliefs, in multiplicity of Indian cultures, are closely associated with health seeking behavior, antenatal care, delivery practices and postnatal care of infants.

Conclusions: Apart from raising awareness among community leaders, family members responsible for care giving should be specially targeted for removal of hostile perceptions and barriers for improvement of child survival. Also there is need for developing new strategies for health education based on indigenous concerns, addressing socio-cultural barriers.

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Introduction

The south central Asian region comprising India, Bangladesh and Pakistan has the world's second largest population of children. Of these three countries, only Bangladesh has reduced under-five deaths to almost half of its 1990 level by 2002, at an average annual reduction rate of 5.2%. In contrast, India and Pakistan are still lagging behind in reducing the child mortality rate below the 1990 level.^[1] Also, the countdown database to track the maternal and child survival rate, as set by the Millennium Development Goal, reported recently that India's progress is not satisfactory in reducing newborn and child deaths.^[2]

India is interesting for several reasons. Firstly, neonatal death rate is the highest in the world (43 per 1000 live births).^[3] Secondly, despite widespread improvement in access to healthcare and nutrition, there has been stagnation in the decline in child mortality rates in some states during the last decade.^[4] For example, the decline was low or at a moderate level in Kerala, Tamil Nadu, West Bengal, Punjab, Maharashtra and Karnataka, while the high level of stagnation was recorded in Orissa, Uttar Pradesh, Rajasthan and Bihar.^[5]

Neonatal deaths in India

A quarter of world's neonatal deaths (one million) each year take place in India,^[3] mostly at home (65.4% of all births and 75.3% of births in rural areas occur at home).^[6] It may be noted that despite the great importance of the subject, no information is available regarding the details of the causes of deaths.^[7-9] It is believed that infectious diseases such as sepsis, pneumonia, tetanus, diarrhea, preterm birth and complications of asphyxia may be responsible for most of these deaths in the neonatal period. It is well established that better post partum health care practices reduce neonatal mortality and morbidity to a large extent, and safe delivery practices like clean cord care (cutting the umbilical cord with sterilized instrument and tying it with a thread), thermal care (drying and wrapping the newborn immediately after delivery and delaying the newborn bath for at least 6 hours or for several days to reduce the hypothermia risk) and initiating breastfeeding within the very first

hour after birth are the main factors for reduction of neonatal mortality.^[10,11] But in India, different beliefs and cultural practices among traditional populations have adverse consequences on child survival rate (Table 1).^[6,12-20] The cultural beliefs operate through diverse socioeconomic and income related factors, and have strong influence on child mortality, starting from the mother's womb and continues through the neonatal, post neonatal period and persists throughout the life cycle. In this context, maternal health is an important factor in determining neonatal mortality.

Maternal health and neonatal mortality

The intricate web of cultural restrictions and preferences starts before the birth of the child with the advent of pregnancy, and the health of pregnant women is an integral part of human survival as life starts from the mother's womb and it is the intrauterine environment that shapes up the health of new off-spring. The concept of hot and cold food and consumption of various nutritious foods are tabooed during pregnancy in different Indian societies. Some of these beliefs result in poor nutritional status of pregnant women as high calorie and protein rich food are needed during

pregnancy. In addition, maternal anemia and infections during pregnancy is often associated with high child mortality due to low birth weight, prematurity and sepsis, resulting in a high maternal mortality rate in India. Maternal mortality rate is defined as the number of maternal deaths to women in the age group of 15-49 years per 100 000 of women in that age group. Recent bulletin on maternal mortality in India 2007-2009 released in June 2011 indicated variation in maternal mortality rate in different states of India [a higher rate in some states like Uttar Pradesh (40.0%), Rajasthan (35.9%), whereas the lowest in Kerala (4.1%)].^[21] Moreover, the incidence of maternal anemia is also as high as more than 50% in most of the Indian states.^[6] Apart from the above biological factors, young age at marriage, frequent child-bearing, unplanned motherhood and abortions result in poor nutritional status of Indian women and poor survival rates of their children.^[22,23] Poor nutritional status with a high burden of infections needs health care and proper antenatal care during pregnancy. But restrictions of consulting male practitioners, poor utilization of available free medical facilities, and very poor antenatal care are common in India, leading to high perinatal and neonatal mortality.^[24,25]

Table 1. Beliefs and customs of some traditional Indian population during pregnancy, childbirth and postpartum period

Period	Beliefs	Populations	Consequences	Studies
Pregnancy				
Care during pregnancy	No special diet	Bhils	High child mortality	-
	Hot and cold food items, e.g., papaya prohibited	Bhils		
	Non vegetarian diet	Bhils		
	Buttermilk, curd, tomato, ladyfinger	Kols		
Child birth				
Removal of the umbilical cord	Blade, sickle, bamboo or arrow head to remove umbilical cord in case of males, knife or blade in case of females	Munda, Oraon, Santhals, Poundrakshatriya, some Scheduled caste population of Northern India	High neonatal mortality due to sepsis and tetanus for reasons not defined	Mawar and Jain, 1997; Pandey and Tiwari, 2001; Pandey and Abbad, 2002; Verma and Roy, 1993; Ghosh and Bharati, 2010; Ghosh and Sharma, 2011 ^[13,15-20]
	Khapra (edged piece of earthen pot), stone or sickle	Baigas, Kols		
Person responsible to cut the umbilical cord	Traditional birth attendants ("dai")	Most of the traditional population of India	High neonatal mortality	NFHS-3, 2007; Ghosh and Sharma, 2011 ^[6,20]
Application after removing the umbilical cord	Mustard oil, Tulsi (ocimum sanctum) sap, goat dung's ash	Poundrakshatriya, Munda some castes of Northern India, Hill Korwas	High neonatal mortality due to sepsis and tetanus	Ghosh and Bharati, 2010, Ghosh and Sharma, 2011 ^[19,20]
	Mixture of mustard oil and ash, soil, bark of some trees mixed with oil, oil or ash	Kamars, Bharias, Pando, Kols		
After birth				
Prelacteal feeds	Prelacteal feeding like honey, goat's milk, warm water	Most of the traditional population in India	High neonatal mortality for reasons not defined	NFHS-3, 2007 ^[6]
Consultation of recognized medical practitioner	Very low utilization of health care	Most of the traditional population in India	High neonatal mortality	Ghosh and Sharma, 2011 ^[20]

Delivery practices and neonatal mortality

In the second most crucial phase, i.e., during childbirth, unhygienic delivery practices conducted by traditional "Dhais" or midwives (birth attendants) escalate the risk of neonatal mortality. The midwives inherit the cultural methods of deliveries and are ignorant about scientific methods. Yet they are preferred for their easy availability, intimate relations and low charges. These "Dhais" use different types of instruments like blades, knives, bamboo edges, etc to cut the umbilical cord of the newborn (Table 1) and are not aware of the concept of using sterile instrument. After cutting the umbilical cord, they use different applications on the navel of the newborn (Table 1). Some of them are injurious and lead to infections like tetanus and sepsis. Methods of cleaning and washing the newborn and the mother also vary between cultures resulting in high-risk hypothermia. Although training programs on safe delivery are imparted to the midwives as a part of government interventions, traditional methods of deliveries are still preferred.^[20] The situation would continue till the experts' concepts have not entered the social representations among the laypersons and traditional healers in the rural settings.

Breastfeeding, introduction of prelacteals and neonatal mortality

After delivery human milk is one of the most important protective glycans, which is the basis for the development of novel prophylactic and therapeutic agents that inhibit diseases caused by mucosal pathogens. The National Family Health Survey (2004-2005) revealed that 23.4% children under three years of age were breastfed within one hour of birth, and complementary feeding increased to 55% from 33% recorded during 1998-1999, indicating that exclusive breast feeding is very low in India during the initial 6 months. Various studies in different settings of India noted ignorance of colostrums feeding, early or very late weaning, especially in rural areas.^[26,27] The harmful cultural beliefs causing barriers for exclusive breastfeeding and early weaning in India with introduction of various traditional prelacteals, prepared in unhygienic conditions, are often associated with neonatal deaths.

Prelacteals or "first food" (food first given as soon as the baby is borne) also poses great risk to child survival: in India they vary from honey, cow or goat milk to offerings of God ("Prasad") which include various juices of herbs. A recent survey^[6] reveals high percentage of prelacteal feeding (56% of children were given something other than breast milk during the first three days of life) (Fig. 1). The most common prelacteal feed is milk of cows and goat, followed by honey. Cow's milk

is considered to be sacred in India, but not recommended by the American Academy of Pediatrics for children under 1 year. There is little awareness that infants fed on whole cow's milk do not get enough vitamin E, iron, and essential fatty acids, but they get a high dose of protein, fat, sodium, and potassium. These levels are too high for the infant's system to handle. Cow's milk can have dramatic effects on the infant's iron levels. Studies^[28] have shown that infants often have low iron levels when started on cow's milk at 6 months of age.

The second most common prelacteal feed is honey, a delicious natural sweetener. Numerous studies^[29,30] have shown that the ingestion of honey under one year of age is linked with infant botulism, a disease that results in a blockade of voluntary motor and autonomic functions. Apart from this, other prelacteal feeds get contaminated due to unhygienic environment, especially in rural India and in urban slums, resulting in infantile diarrhea. Thus, a wide range of prelacteal feeds and the introduction of early supplements result in recurrent diarrhea with multiple illness finally ending lives because of inaccessibility and unaffordability of treatment and delayed or inappropriate care seeking behavior.^[31]

Postnatal treatment and neonatal mortality

Care-seeking patterns among newborns increase the risk of neonatal mortality. Neonatal deaths due to respiratory infections (lower), septicemia, diarrhea and severe malnutrition may often present typical or masked signs, and can all take a precipitous life-threatening course, and require immediate assessment and aggressive treatment, which may not be well understood among the caregivers. The preference of home remedies and traditional treatments from local herbal doctors or unrecognized quacks is part of common health seeking behavior, especially in rural

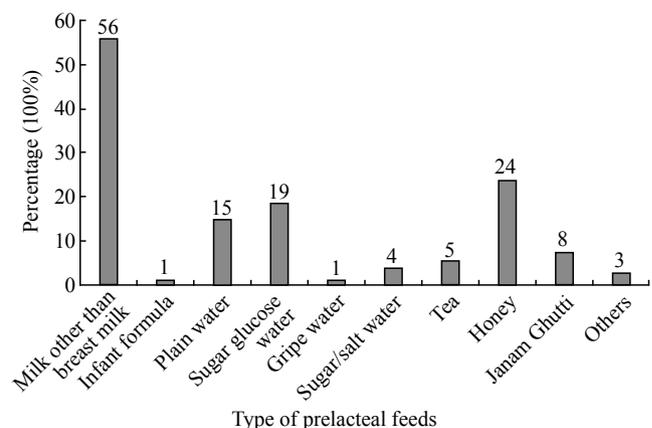


Fig. 1. Proportion of children who received specific prelacteal feeds (NFHS-3, India, 2005-06).^[6] Based on last-born children under age 5 years who received a prelacteal feed.

and peri-urban India.^[20,25] Other forms of health seeking behavior include practitioners of alternative systems of medicine, herbalists, indigenous and folk practitioners, compounders and others.^[32] Dependence on these traditional providers and delay in appropriate and timely action by the caregivers often complicate the illness and increase the risk of child survival.^[31,32] Mothers are not considered to be competent to deal with newborns. The decision to seek health care mostly involves the male members in the family.^[32] Lack of perception of severity of neonatal illness and ascribing the conditions to gods, goddess or evil eye increases the complications.^[32] Families' decisions and beliefs, after all, play a major role in health care seeking among the neonates.^[32,33]

Cultural practices in different ethnic groups thus challenge safe and hygienic antenatal, delivery and postnatal care among the mothers and the newborn

babies, even though access to and availability of health care facilities are available. The structural and cultural disadvantages seem to neutralize the positive effects of health intervention programs on the part of state and civil society and are often associated with high neonatal mortality in India, contributing to the stagnation in the decline of overall child mortality rate.

Stagnation and disparity in child mortality

Between the mid 1980s and early 1990s significant progress was made toward reducing the child mortality levels in India, but recent data indicate that there has been stagnation in child mortality rate at an unexpectedly higher level.^[4] India's gross national income (GNI) per head has increased by 82% from US\$450 in 2000 to \$820 in 2006, yet the rate of decline in child mortality is only 19% from 94/1000 births to

Table 2. Neonatal, infant, child and under-five mortality rates and state wise per capita net domestic product (NSDP), 2005-2006.

States	Neonatal mortality*	Infant mortality*	Child mortality*	Under-five mortality*	Per capita income (in Rs)†
India	39.0	57.0	18.4	74.3	20 858
North					
Delhi	29.3	39.8	7.3	46.7	49 172
Haryana	23.6	41.7	11.1	52.3	32 724
Himachal Pradesh	27.3	36.1	5.6	41.5	27 163
Jammu & Kashmir	29.8	44.7	6.8	51.2	NA
Punjab	28.0	41.7	10.8	52.0	28 872
Rajasthan	43.9	65.3	21.5	85.4	14 660
Uttaranchal	27.6	41.9	15.5	56.8	20 328
Central					
Chattisgarh	51.1	70.8	21.0	90.3	16 365
Madhya Pradesh	44.9	69.5	26.5	94.2	12 290
Uttar Pradesh	47.6	72.7	25.6	96.4	10 605
East					
Bihar	39.8	61.7	24.7	84.8	6610
Jharkhand	48.6	68.7	26.1	93.0	14 990
Orissa	45.4	64.7	27.6	90.6	13 967
West Bengal	37.6	48.0	12.2	59.6	20 485
North east					
Arunachal Pradesh	34.0	60.7	28.8	87.7	20 037
Assam	45.5	66.1	20.2	85.0	14 786
Manipur	18.7	29.7	12.6	41.9	17 950
Meghalaya	23.6	44.6	27.1	70.5	18 274
Mizoram	16.3	34.1	19.5	52.9	19 691
Nagaland	19.8	38.3	27.5	64.7	NA
Sikkim	19.4	33.7	6.7	40.1	20 609
Tripura	33.1	51.5	8.2	59.2	21 231
West					
Goa	8.8	15.3	5.0	20.3	47 507
Gujrat	33.5	49.7	11.9	60.9	26 543
Maharashtra	31.8	37.5	9.5	46.7	29 085
South					
Andhra Pradesh	40.3	53.5	10.2	63.2	21 334
Karnataka	28.9	43.2	12.1	54.7	21 629
Kerala	11.5	15.3	1.0	16.3	25 657
Tamilnadu	19.1	30.4	5.3	35.5	24 308

*: National Family Health Survey, 2007 (Survey 2005-2006);^[6] †: Central Statistical Organization, 2008; NA: not available.

76/1000 births. During the same period Bangladesh's GNI increased only 25%, but its child mortality dropped by 25% from 92/1000 to 69/1000.^[33,34] Unlike Bangladesh, evolving a common effective policy for targeting households in need for interventions is difficult in India, as vast socioeconomic disparities exist between and within habitations (at household level). For example, an in-depth investigation on inter and intra household neonatal mortality noted behavioral differences in adopting antenatal care, delivery practices and postnatal care among women between their first and last born child and also between households in a peri-urban area of Northern India.^[25] In India, very little is known about the importance of inequalities in the determinants of health and most probably in service utilization. Moreover, the relationship between inequality and determinants of child survival has been quite dynamic and has been changing with time. In this context, great variations were noted in child mortality rates in various regions and states of India, and between different socioeconomic strata, as measured by wealth quintiles (Table 2, Fig. 2).^[6]

Factors associated with child mortality

Inequalities in the proximate determinants of health vary according to specific determinants, multiple traditions and cultural practices and beliefs related to childbirth, antenatal and postnatal care, prevailing in different states, districts, communities and households. Various macro-level studies stressed the issues of education, female autonomy, women's work status and economic condition of the household associated with child mortality.^[35-38] Also access to clean water, basic sanitation, nutritional status of mothers and infants, and

level of immunization affect the child mortality in India. In addition, gender disparity and inequities for women and girls (in terms of nutritional status and access to primary health care and education) are often related to high female child mortality in India.^[6,39-41]

Issues of availability and accessibility of maternal and child health care and nutritional programs are also important in this context. Improved utilization and access of health care facilities are often interrelated with distance, socioeconomic condition and literacy levels of women.^[41] Awareness of and access to a health care center, equipped with modern maternity facilities has a significant positive impact on the health-seeking behavior and pregnancy outcome of rural women.^[42] Moreover, greater availability of obstetric services will not alone solve the problem of low institutional delivery rates. Issues are on the provider's side too, for instance, the hospital staff discharge mother and newborn without efforts to initiate breast-feeding. Programs to improve neonatal survival in such rural settings will need to invest both in strengthening primary health services provided during labor and delivery through training and monitoring, and in community promotion of improved newborn care practices.^[43] Also, financial constraints need to be addressed.^[44] Thus, the proximate determinants hindering the translation of knowledge of health care utilization into action are ignored among the parents who are lack of financial resources but have faith in supernatural causes, in addition to non-availability of recognized doctors and "responsible persons" at home.^[45]

Discussion

India, with about 1.2 million deaths of neonates each

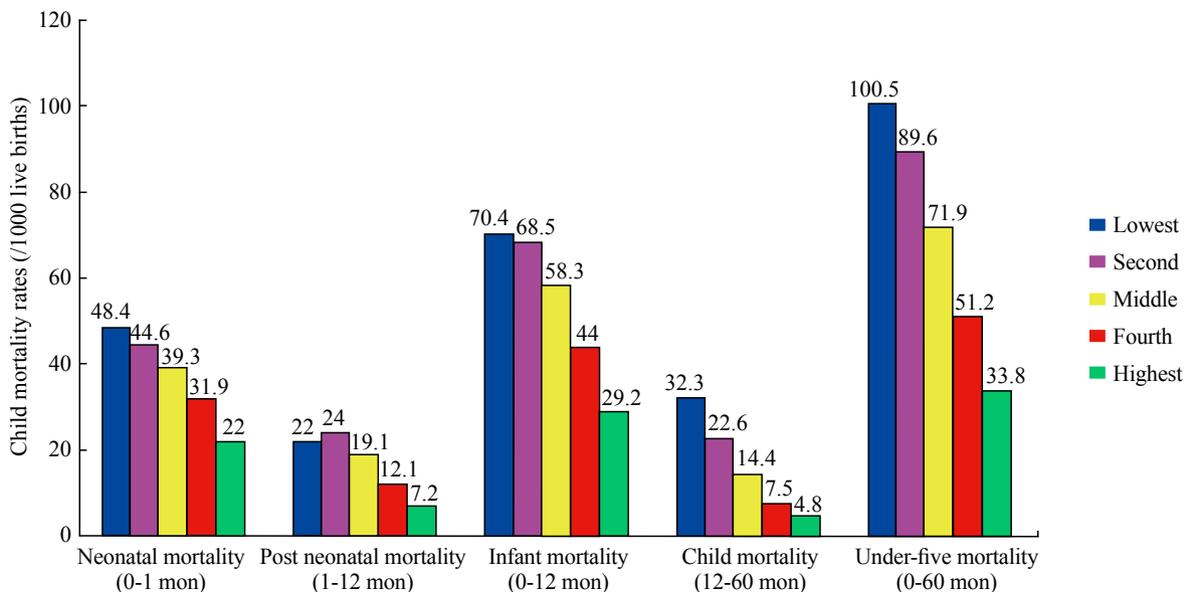


Fig. 2. Early childhood mortality rates in different socioeconomic strata measured by wealth index (NFHS-3, India, 2005-06).^[6]

year, accounts for over one quarter of all neonatal deaths in the world,^[46] reflecting the underlying influences of strong cultural beliefs, various traditional methods of crude delivery practices and unhygienic and unsafe prenatal and postnatal care of the neonates. Society and economy affect them through certain proximate determinants such as ignorance of the parents, lack of money, faith in supernatural causes and non-availability of recognized doctors and "responsible persons" at home. Income inequality and cultural beliefs prevent people from taking full advantage of existing health facilities. Studies^[47,48] of orthodox cultural settings in various regions of the world indicated the association between health illiteracy, cultural stigmas and delivery practices, which result in a high child mortality. The sluggish decline of infant mortality rates in the past decade in India and some other developing countries could be largely attributed to the high neonatal mortality which is usually influenced by economic factors and cultural beliefs.^[49]

India with 1700 heterogeneous cultures, in different linguistic regions, has difficulties in implantation, utilization and functioning of government health care programs. This paper has shed some light on the difficulties in functioning of health care facilities and interventions in traditional populations in diverse cultural environment. Various studies stressed the increase of education level to improve child mortality,^[50] but in unfavorable cultural circumstances, education may have not much influence on neonatal mortality, which is deeply associated with antenatal care, delivery practices and postnatal care. Restrictions on women to visit antenatal clinics and postnatal care increase the complexities of healthy and safe delivery. Income, believed to be significantly associated with child mortality also seems to have a complex interaction with survival outcome. Even high-income families prefer traditional delivery at home, especially in rural and peri-urban areas.^[25] States which are poor in terms of per capita income, like Orissa, Madhya Pradesh and some Northeastern states (largely dominated by indigenous tribal communities), have a high child mortality because of increased death rates of neonates and infants. This is due to greater reliance on traditional methods of delivery and beliefs in supernatural sources. Moreover, the caste-dominated states of Uttar Pradesh and Bihar also depict a sorrow picture of high mortality of neonates and infants. Caste and tribes are scheduled by the constitution of India as deprived groups of people with regard to their underdeveloped socioeconomic status with respect to education, health, income, poverty and other well-being measures. A review on neonatal morbidity and mortality in the antenatal, intrapartum and postpartum periods proposed priorities for community-based research

activities to develop test and adapt inexpensive, practical and sustainable interventions during these periods to reduce perinatal and neonatal mortalities in developing countries.^[51] The standards of care should also be kept in mind and the existing cultural modifications can be made while keeping in mind the beliefs and cultural adherence of people. For example, there is some locally available nutritious food like fig (rich in iron) which extremely helpful to increase the iron level during pregnancy, but little is known among the habitants. Raising awareness among these groups could improve the child survival rate to a large extent. Moreover, longer-term strategies must address the gaps in coverage of institutional delivery, skilled birth attendance, and quality by strengthening health systems, increasing demand for care, and improving community-based services. Both short- and long-term strategies to reduce intrapartum-related mortality should focus on reducing inequities in coverage and quality of obstetrical and perinatal care. Also the need for raising proportion of safe deliveries, basic intervention for newborn survival is to target the family members responsible for care-giving, and removal of specific perceptions and barriers in different cultures by improvement of awareness and education at large is needed.

Moreover, stagnation and disparity in child mortality rates require developing theoretical frameworks and methods for linking macro-level (economic/political) phenomenon with micro-level (community, household, individual) beliefs and behaviors relevant to health, as disparity in child mortality can be seen between districts, communities and even between households in a single village. Studies around the world also show that there is a large variation in health inequalities across countries, regions, within countries and socio-economic strata within a region. For example, Latin America appears to have higher inequalities in child health between poor and non-poor than other parts of the developing world, whatever health indicators are used. In contrast, inequalities in child mortality are less pronounced in sub-Saharan Africa, Asia and near East though they have relatively higher levels of inequalities concerning diarrhea and acute respiratory infection.^[52] Recent studies^[53-55] indicate that socioeconomic inequalities in health seem to be widening rather than narrowing and this is true for developing and developed countries.^[56] Economic well-being at the household level, especially income, operates through various pathways like better food availability, more hygienic conditions and better access to health services in influencing the risk of ill health and child mortality.^[57-60] A number of studies^[61,62] have shown that children in poorer households tend to be at higher risk of dying than children in the better off. Variations in pattern of child mortality are also noted in

Israel indicating no association of poverty with infant mortality,^[63] while in the United States inconsistent evidence was recorded between poverty and infant mortality.^[64]

Thus, there is an immediate need for collection of various evidences of different traditional practices in diverse multicultural groups of India. Such empirical evidence would be the best way to initiate changes to existing cultural practices. Apart from case control studies, there are some large scale surveys related to maternal and child health in India, in which cultural components lack. Adding some relevant questions for the indigenous segments of Indian population may help us to understand the traditions and practices in different states at regional level. Exploring the patterns of intra and inter household discrimination and their socioeconomic antecedents may help the demographers and planners to understand why there is a slow decline of child mortality in India. This calls for innovative approaches to understand and deal with causes of stagnation in child mortality. Although the prime driver of improvement in mortality in present day India is culture, health education strategies based on selective adoption of indigenous concerns can go a long way in improving health of mother and child especially in south Asia, and elsewhere in the world with variation in economic conditions and cultural behaviors.

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