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Changes in Infant Mortality and its Causes **Over** a Decade

THERE has been a general feeling among academicians as well as administrators engaged in the formulation and implementation of family welfare programme in India that the impact of the programme in reducing fertility and mortality has not been commensurable with enormous inputs invested in the programme.

The rapid growth of public health and medical services coupled with some improvement in socio-economic condition did result in some decline in overall mortality in the country as well as in the states, though the level of mortality in India is still higher than even some of the developing countries. The high level of mortality in India is because of its high infant mortality. Infact, percentage of infant deaths to total deaths per year in India is as high as 32. Though we have no firm data about the trends of infant and child mortality, we have enough evidence that infant mortality is still very high. The estimated infant mortality rate in India for the decade 1951-61 was about 146[1] per thousand live births whereas the corresponding IMR for the decade 1961-70 was about 129[2].

The infant mortality rate is generally considered as one of the important indicators of socio-economic development and health conditions prevailing in the area under study. Further, it has been noticed about couples who accept family planning, that they do so after having a rather large number of children. One of the main reasons for this may be that under the Indian socio-cultural setting when the chances of survival of the children are slender, couples opt for the large families in the hope that at least few would survive to adulthood.

Reducation in infant mortality over time and the awareness of such improvements among the people in the community may ultimately lead to the growing preference for lower fertility, due to the removal of the fear of death to their

children. It is, therefore, necessary, from the policy point of view, to know the the true levels of infant mortality of an area under study at different periods of time and explore the extent of changes in the levels of infant mortality and its causes over time.

India is a large country with a wide diversity in social, economic and demographic characteristics of the people at the regional level. And in order to understand the nature of interaction of various facets of population and development in India, it is essential to study these aspects at the state and even lower level of a district or a taluka within the state as the execution of some of the state and national plans generally take place at that level.

The present study was undertaken in Baroda district in Gujarat state located in the western most part of India. This district has the characteristics of being one of the most developed districts in the Gujarat state.

The objectives of the present study are :

(i) to estimate infant mortality, by direct and indirect methods, in Baroda city and the rural areas of the Baroda district in 1965 and 1975 respectively;

(ii) to estimate the extent of change in infant mortality during the decade 1965-75 in both rural and urban areas respectively,

(iii) to study rural-urban differentials in infant mortality during 1965 and 1975 respectively; and

(iv) to study the causes of infant deaths.

Coverage

A base line Fertility Survey was undertaken in 1965 and it was repeated in 1975. Baseline Survey was undertaken in Baroda taluka comprising Baroda city and the rural part of Baroda taluka. On the other hand, Repeat Survey took place in Baroda district comprising Baroda city and the rural parts of the Baroda district, by taking an independent sample. Both these studies collected information on infant mortality during the reference period of a year. As mentioned earlier though there were some differences in the geographic area covered by the two studies in the rural area, they do not differ much in their characteristics. The urban area covered in both these studies was common and hence the analysis of changes over time in urban area of the Baroda district poses no problem.

Based on a multistaged stratified sampling design, a sample of 2,911 and 1,770 women in the age group 15-44 were selected from 2,520 and 1,223 households in the 1965 and 1975 survey respectively in Baroda city. And a sample of 1,385, 1,009 women in the age group 15-44 was selected from 1,251 and 699 households in Baroda district in the 1965 and 1975 surveys respectively.

The data on infant mortality by sex and causes was, however, obtained from the available records of the Municipal Corporation and SSG Hospital Baroda,

respectively. The data on cause of death maintained in this Hospital is based on international classification provided by the W.H.O. and the patients enrolled in this Hospital either come from Baroda city or the adjoining rural areas.

Level of Infant Mortality

Those who are familiar with the cross sectional data obtained from a survey can fully appreciate how risky it is to have a complete reliance on a single infant mortality estimate. Several alternate estimates are, therefore, attempted to figure out the true value of infant mortality in the area under consideration.

Based on the reference period infant deaths and births, both in the Base Line Survey in 1965 and the Repeat Survey in 1975, infant mortality rates for rural and urban areas of the Baroda district are obtained, by direct method, and are presented in Table I.

TABLE 1-ESTIMATES OF INFANT MORTALITY RATES IN BARODA DISTRICT DURING 1965 AND 1975 AND THE PERCENTAGE CHANGE IN THESE RATES DURING 1965-1975

Estimates Obtained by	*Infant Mortality Rate*					
	Rural			*Urban*		
	1965	*1975*	*Percentage Change*	1965	*1975*	*Percentage Change*
Direct Method	98	101	-3.1	99	67.6	31.7
Brass Method	145	110	24.1	120	67.5	43.8
Sullivan Method	150	123	21-2	136	67.5	50.4
Trussell Method	148	111	25.0	132	68.5	48.1

SOURCE : Baroda fertility study and its Repeat Survey (1961-75) PRC, Baroda.

In both these studies information on the number of live births and number of living children by age of the mother is also obtained. Using Brass, Sullivan and Trussell's methods of estimation of infant mortality, the three different estimates are also obtained both for rural and urban areas of Baroda district. These estimates of infant mortality rates are obtained for the year 1965 and 1975 respectively and are also presented in the Table 3.

The estimates of infant mortality obtained by Sullivan's and Trussell's methods are invariably higher than the one obtained by using Brass method. Even if it is assumed that the Brass method may be estimating the infant mortality of the community under consideration, to be nearer to the true value, the extent of under estimation of rural and urban infant mortality obtained by direct method in the 1965 survey was 32.4 and 17.5 percent respectively.

On the other hand, the extent of underestimation in the rural and urban infant mortality in the 1975 Survey was much less and was of the order of 8 percent and zero percent respectively.

Table 1 reveals that the reference period births and infant deaths obtained by a survey, especially in an urban community under consideration, are more nearer to the true value than that obtained from the rural community. Further, the recall lapse errors in reporting the data, do diminish out over a period of time and with more care taken, through probing, in locating the birth and infant death in the reference period.

Based on indirect methods of estimation, the percentage decline in the infant mortality in rural area, during 1965-75, ranged between 21.2. in the case of Sullivan's method to 25.0 in the case of TrusselPs method. And the corresponding decline in the infant mortality in urban area during the same period ranged from 43.8 percent, in the case of Brass's method to 50.4 percent in the case of Sullivan's method. This, in other words, means that the percentage decline in infant mortality in the urban part of Baroda district, during 1965-75, is roughly two times the one observed in the rural Baroda district.

Estimates of infant mortality obtained by Brass method and Trussell method appear to be nearer to the true value. Whereas, the estimates derived by using Sullivan method seem to over estimate the infant mortality rates both in rural and urban Baroda district.

Table 2 clearly delineates the rural-urban differentials in infant mortality rates at two points of time with a gap of a decade, Infact the gap between the

TABLE 2—RURAL-URBAN DIFFERENTIALS IN INFANT MORTALITY RATES IN BARODA DISTRICT DURING 1965 AND 1975

Estimates Obtained by	*Percentage Difference in Rural-Urban Infant Mortality Rate in*	
	1965	1975
Direct Method	—1.02	33.17
Brass Method	17.24	38.64
Sullivan Method	12.82	45.12
Trussell Method	10.81	38.29

SOURCE : Computed from **Table 1.**

rural and urban infant mortality rates has increased substantially in 1975 in comparison with the corresponding gap in 1965. The extent of difference between rural urban infant mortality rales in 1965 varied between 11 to 17 percent according to various estimates. But this difference during 1975 ranged between 33 to 45 percent. This urgently calls for more intensive rural oriented health

and family education programmes in order to create more awareness and better utilization of the health services in the rural area.

Distribution of Infant Death by Age **and Sex**

Table 3 presents the percentage distribution of infant deaths in the neo-natal (0-30 days) and post-natal (1-12 months) periods during the years 1965 and 1975 respectively.

TABLE 3—PERCENTAGE DISTRIBUTION OF DEATHS OCCURRING IN THE NEONATAL, POST-NEONATAL PERIOD BY SEX **DURING 1965 AND 1975**

Characteristic	*1965*		*1975*	
	Age of the Infant		*Age of the Infant*	
	0-30 days	*1-12 months*	*30-0 days*	*I-12 months*
M	42.13	57.87	54.70	45.30
F	36-73	63.27	44.05	55.95
T	39.24	60.76	49.72	50.28
Age	*Sex of the Infant*		*Sex of the Infant*	
	M	*F*	*M*	*F*
0-30 days	50.00	50.00	58.58	41.42
1-12 months	44.36	55.64	47,97	52-03

SOURCE : **Birth** and Death Records, **Baroda** Municipal Corporation, Baroda.

This table indicates that the proportion of male mortality in the neo-natal period is higher than female mortality. The reverse is true in the post-neonatal period. The main reason of high mortality of males in comparison with females in the neo-natal period is that biologically female is a stronger sex and this pattern is true world wide. As regards the high post-neonatal mortality of females in comparison with the males, this pattern is true in the case of India as the female child is less cared than the male child.

Another interesting feature that emerges out of the Table 3 is that more than fifty percent of the total infant deaths occur in the post-neonatal period. And that over a period of about ten years, from 1965-75, the extent of deaths in the post-neonatal period decreased from 61 percent in 1965 to about 50 percent in 1975. This means that over the period of time the deaths in the post-neonatal period has a tendancy to decline, especially among males, at the cost of increasing deaths in the neonatal period. This trend is just the reverse to what is otherwise observed in the case of developed or even those developing

countries where the mortality in general and the infant mortality in particular has gone down.

Causes of Deaths

Variety of factors including social, biological, cultural, economic, environmental, nutritional, ignorance and indifference in child care may be responsible for the high rates of infant deaths especially iu the Third World. Since the causes of infant deaths may be multifarious in nature, it may not be possible to isolate the major determinants exactly as they miy be interrelated by themselves. Therefore, it would not be pousihlr here to isolate the effect of certain major determinant after controlling the effect of other associated variables. The data on cause of death presented here is indicative of immediate cause of death. However, since the data ar; taken from the hospital records some caution is necessary in interpreting the Andings of this study and a too literal acceptance of the results.

Causes of Death in the Neo-Natal Period

Classification of the neo-natal deaths, during the year 1976, by cause of death, reveals that more than 60 percent of the deaths in the period 0-30 days occur due to infective and pamsitic diseases like neonatal tetanus, proteus septicaemia (see Table 4) Tetanus took a toll of about 24 percent of deaths in the neonatal period during the year 1976. The incidence of such diseases was found to be much higher among female babies (36 percentage) than among males (18 percent). However, deaths due to neonatal tetanus seem to have been slightly reduced over time (it was 40 percent in 1970). One possible reason of reduction in the neonatal tetanus could bv the availability of greater prenatal care and growing consciousness among the midwives to make their tools sterile at the time of delivery. However, infant deaths due to Septicaemia specified was found to be quite high in the neonatal period and it was about 36 percent in 1976.

Another interesting result (that emerges out of the Table 4 is that certain diseases of the newborn like diarrhoea and pneumonia which were prevalent earlier, very much due to unprotected and infected water, substandard food etc., seem to have been reduced in 1976. No death. under the category IV docs not imply that such diseases are not still prevalent in the general population, This only indicates that these diseases of newborn seem to be coming under some control over a period of time.

The hospital records further reveal that the diseases of the nervous system and sense organs like purulent meningitis with no organisms are still prevalent with an intensity of 12 percent deaths due to these causes. However, such diseases appear to be very much high among male babies.

TABLE 4—NEONATAL DEATHS (in 0-30 days) BY CAUSE OF DEATHS IN BARODA FOR THE YEAR 1976

Cause of Death	*Percentage Deaths in 0-30 Days*		
	M	*F*	*T*
I—Infective and Parasitic Diseases	59.1	63.6	60.6
(i) Neonatal Tetanus	18.2	36.3	24.2
(ii) Proteus Septicaemia	40.9	27.3	36.4
(iii) Septicaemia Unspecified	—	—	—
(iv) Klebsiella Unspecified	—	—	—
II—Diseases of Nervous System and Sense Organs	18.2	—	12.1
Purulent Meningitis with no organisms	18.2	—	12.1
III—Diseases of Respiratory System	—	9.1	3.0
(i) Acute Upper Respiratory Infection of Multiple or Unspecified Sites (Pri)	—	—	—
(ii) Bronchopneumonia Unspecified	—	9,1	3.0
IV—Certain Diseases of New Born	—	—	—
(i) Diarrhoea of New Born	—	—	—
(ii) Pneumonia of New Born	—		—
V—Congenital Anomalies	9.1	9.1	9.1
(i) C E D	4.6	—	3.0
(ii) Congenital Tracheoessophageal Fistula	4.5	9.1	6.1
(iii) Congenital Hydronephrosis	-	—	—
VI—Certain Causes of Perinatal Morbidity and Mortality	13.6	18.2	15.1
(i) Hemolytic Diseases of New Born with RH In Compatibility	4.5	—	3 0
(ii) ,, ,, Abo ,,	—	—	—
(iii) Immaturity unqualified	9.1	18.2	12.1
(iv) Neonatal Hyperbilirubinemia	—	—	—
(v) Sclerema Neonatorum	—	—	—

Certain causes of perinatal mortality and morbidity took a toll of 15 percent deaths in the neonatal period in the year 1976. Under this category maximum deaths occurred due to the reasons stated as 'immaturity unqualified', reflecting thereby the state of health and nutrition among pregnant and nursing mothers. However, the cases which used to die due to neonatal hyperbilirubinemia and sclerema neonatorum seem to be now responding to the treatment given in the hospital.

Another important cause of death in the neonatal period is congenital anomalies which accounted for 9 percent of neonatal deaths reported in the hospital during the year 1976.

Causes of Death in the Post-Neonatal Period

Here again, infective and parasitic diseases (see Table 5) are the main killer of children in the age group 1-11 months. About 40 percent of the deaths reported in the hospital records, in this age group, in 1976, are due to this cause. Though the deaths due to infective and parasitic diseases might have been slightly reduced, over time, the major killer is still found to be acute infantile gastroenteritis which accounts for about 38 percent of total deaths. And it is mainly due to unprotected water supply and food for the new born. Deaths due to other diseases in this group like primary complex, pleurisy with effusion without mention of causes, diphtheria, whooping cough etc. seem to have been reduced over time mainly due to immunization programme of the Government. However, there appears to be some deaths due to st-pt/caemia unspecified.

Deaths due to endocrine nutritional and metabolic diseases especially the protein malnutrition seem to be still high. About II percent of the post neonatal deaths occurred due to these causes. It thus emphasizes the importance of malnutrition of the mother and child as constituting one of the major causes of high infant mortality in India.

Further, about 22 percent of infants died due to diseases of nervous system and sense organ like purulent meningitis with no organism and cncephulomyelitis which are mostly curable diseases.

Deaths due to the diseases of the respiratory system *like* acute bronchitis and labor pneumonia seem to have declined over time whereas deaths due to bronchopneumonia unspecified is still very high and about 15 percent of the infant deaths in the postnatal period were found in this category. They are largely attributable to the poverty, bad housing, pollution, poor environmental hygiene and lack of preventive and curative health services.

From the above analysis it appears that if efforts could be made to cut down the infective and parasitic diseases especially the acute infantile gastroenteritis, by exploring the root cause of infantile gastroenerilis, there would be a very substantial reduction in the infant mortality rate.

Further, the infant deaths due to other diseases occur mainly because of lack

TABLE 5-POST-NEONATAL DEATHS (in **1-11** months) **BY CAUSE OF DEATH IN BARODA FOR THE YFAR 1976**

Cause of Death	***Percentage** Deaths **in I-II** Monina*		
	M	*F*	*T*
I—Infective and Parasitic Diseases	42.2	35.5	39.8
(i) Acute Infantile Gastroenteritis	40-4	32.3	37.5
(ii) Primary Complex	—	-	-
(iii) Pleurisy with effusion without mention of causes	—	—	—
(iv) Diphtheria	—	—	-
(v) Whooping Cough		.	—
(vi) Proteus Septicaemia		—	—
(vii) Septicaemia Unspecified	*1.8*	3 *1*	2.3
(viii) Early Congenital	-	—	—
II—Endocrine Nutritional anil Metabolic Diseases	8-8	16.1	11.4
(i) Protein Malnutrition	8.8	**16.1**	11.4
(ii) Nutritional Marasmus	-	—	-
III—Diseases of Blood and Blood Forming Organs	1.8	9.7	4.5
(i) Iron Deficiency Anemia	1.8	-	1.1
ii) Mcgaloblaslic Anemia		.	-
(iii) Dimorphic Anemia		—	—
(iv) Anemia Unspecified		9.7	3.4
IV—Disease* of Nervous System and Sense Organs	24 fi	16 1	23 6
(i) Pneumooccal Meningitis	—	—	—
(ii) Purulent Meningitis with no organism	15.8	3.2	11.4
(iii) Encephalomyeliiis	8.8	12.9	10 2
V—Diseases **of Respiratory System**	**14.1**	19.4	15.9
(i) Aculc Upper Respiratory Infection and Multiple or Unspecified Sites (Pri)	1.8	-	1.1
(ii) Acute Bronchitis	-	—	-
(iii) Labor Pneumonia	—		-
(iv) Broncho pneumonia unspecified	12.1	19.4	14.8
VI -Congenital Anomalies	—	3.2	1.1
(i) Congenital hydrophalus	-	-	—
(ii) C E D	–	3.2	1.1
(Iii) Cong:nital hypertrophic pyloric Strnosis		—	—

of pre-natal and post-natal care, malnutrition of pregnant and nursing mother as well as of the child, lack of immunization and protection against tetanus, poor housing condition and environmental hygiene, unprotected water and food for the newborn, and insufficient preventive and curative health services.

The infant deaths are also due to endogenic causes, sucli as congenital anomalies, birth injuries, immaturity etc. which are rather uncontrollable. Therefore, our efforts to bring down infant mortality should invariably be concentrated in strengthening the immunisation, pre-natal and post-natal care programmes and in creating public awareness about better utilisation of these programmes.

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