

INFANT MORTALITY IN PONDICHERRY— AN ANALYSIS OF A COHORT OF 8185 BIRTHS

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ABSTRACT

Infant mortality rate is one of the 12 global indicators for monitoring Health for All. Reliable data on infant mortality are not available for the majority of developing countries including India. To plan strategies for bringing down the rate and, later, to evaluate them, 'Cause Specific Rates' would be necessary. Pondicherry has achieved low rates of infant mortality. A study was conducted in the Anganwadis of Pondicherry to determine the causes of infant deaths. The 8185 children born between 1-4-1987 and 31-3-1988 in Pondicherry formed the study group. The Anganwadi workers collected information on the cause of death for the 222 children dying within the first year. The infant mortality rate was 27.1 per 1000 live births. Acute respiratory infections and diarrheal diseases accounted for 45% of the deaths.

Key words: *Infant Mortality, Cause specific mortality, Anganwadi worker.*

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Infant mortality has been extensively used as an indicator of the overall mortality level for a country and is one of the 12 global indicators for monitoring 'Health for All'. It is sensitive to changes in the prevailing levels of public health. Modern medical technology—in particular immunization—can reduce infant mortality rates (IMR) within a relatively short period of time(1). The infant mortality rate in the Union Territory of Pondicherry has fallen from a level of 91.7 per thousand live births in 1983(2) to 34.5 in 1989(3). A major reason for this is the improve coverage of immunizations in the State during this period(4). Programmes for control of Acute Respiratory Infections (ARI) and Acute Diarrheal Diseases (ADD) were also implemented during this period. The contribution of the latter programmes in reducing specific mortality, however, is not known as the cause specific death rates are not available. The majority of deaths are not medically certified in India(5). The National Sample Survey of causes of death (rural) for 1986 which classifies infant deaths into ten broad groups did not relate these to total live births; further diarrheal diseases and neonatal tetanus were not recorded as causes of death, in that survey(6). In Pondicherry, a system of death registration with the municipality in the urban areas and the Commune Panchayats in the rural areas (by the village "karnam") has been functioning from the time of the French rule. This data is used for calculating IMR. As for the cause of death, information is available only for those infant deaths occurring in hospitals. Information is not available for infant death occurring at home or in the peripheral institutions. What are the causes of infant mortality when the overall rates are low? How to collect information on cause of death?

To answer the above questions a study was conducted in the Anganwadis of Pondicherry to find out the causes of infant death using the Anganwadi Worker for collecting the information.

Material and Methods

Pondicherry State has four regions viz., Pondicherry, Karaikal, Mahe and Yanam. The study was done from April to June 1989, covering all the 469 Anganwadis under the four ICDS projects in the Pondicherry region of the Union Territory of Pondicherry. The population covered by these Anganwadis was 4,07,320. All 8185 live births between 1-4-87 and 31-3-88 in these 469 anganwadi areas formed the study population. Of the 8185 births forming the study group, there were 4172 male and 4013 female births. The birth rate was 20.1 per 1000 population. There were also 18 male and 15 female stillbirths giving a still birth rate of 4 per 1000 live births. All the Anganwadi workers (AWW) and their supervisors were briefed, in small groups of twenty, zonewise, on the objectives of the study and method of data collection, including details of how to arrive at the possible cause of death, by interviewing the mother and/or other family members who were aware of the antecedents of the infant at the time of death. The AWW collected the information, retrospectively, using a predesigned proforma on the demographic and socio-economic data for all births; and in addition the cause of death, birth order and spacing for those 222 children who died within one year from birth among the said 8185 births. The period of recall, therefore, ranged from a day to two years. The cause of death was verified with the death certificates when available with the families. Ten per cent of the infant deaths

were verified by the first investigator for the cause of death.

Limitations of the study

The following limitations merit consideration (i) The over all infant mortality in Pondicherry was known to be low. A sample of Anganwadis would have, therefore, covered fewer infant deaths. Hence all the Anganwadis of the Pondicherry region were included for the study; (ii) There was no funding for the project. So data had to be obtained from each Anganwadi worker for their respective Anganwadis. Also a structured verbal autopsy was not feasible. A variation in the uniformity of information is hence possible; and (iii) The study was done at one point of time and hence the recall period theoretically ranged from a day to two years.

Results

Two hundred and twenty two infant deaths occurred in the period under study giving an IMR of 27.1 per 1000 live births. Perinatal, neonatal (NMR) and post neonatal (PNMR) mortality rates, including sex-wise rates, are shown in *Table I*. The post-neonatal mortality rate was significantly higher among males.

Acute respiratory infection and diarrheal diseases accounted for 45% of all infant deaths (*Table II*). Prematurity, birth asphyxia and low birth weight were the main causes for death in the neonatal period whereas acute respiratory infections (ARI) and diarrheal diseases were the main causes in the post neonatal period.

The IMR was 24.2, 41.7 and 118.6 per 1000 live births among Hindus, Christians and Muslims, respectively. Mortality rates decreased with increasing levels of education of the mother, the values being 29.8

TABLE I—Infant Mortality Rates (per 1000 LB) by Age and Sex

Period	Male		Female		Total	
	No.	Rate	No.	Rate	No.	Rate
Early neonatal	27	6.5	29	7.2	56	6.8
Late neonatal	12	2.9	9	2.2	21	2.6
Neonatal	39	9.3	38	9.5	77	9.4
Post-neonatal	88	21.1	57	14.2	145	17.7
Infant	127	30.4	95	23.7	222	27.1
Perinatal	45	10.8	44	11.0	89	10.9

TABLE II—Causes of Death in Neonatal and Post neonatal Periods

Cause	Neonatal		Post neonatal		Infant	
	% (n = 79)	Rank	% (n = 143)	Rank	% (n = 222)	Rank
1. ARI	8.8	4	33.6	1	24.8	1
2. Diarrhea	2.5	7	30.1	2	20.3	2
3. Prematurity	22.8	1	0.7	9	9.0	3
4. Fever	5.1	5	9.8	3	8.1	4
5. Birth asphyxia	17.7	2	—	—	6.3	5
6. Low birth weight	15.2	3	0.7	9	5.8	6
7. Measles	—	—	7.7	4	4.9	7
8. Congenital anomalies	8.8	4	1.4	8	4.1	8
9. Meningitis/encephalitis	1.2	8	5.6	5	4.1	8
10. Malnutrition	—	—	4.1	6	2.7	9
11. Accident	—	—	2.8	7	1.8	10
12. Tetanus	3.8	6	—	—	1.4	11
13. Neonatal jaundice	3.8	6	—	—	1.4	11
14. Milk aspiration	2.5	7	—	—	0.9	12
15. Not known	7.8	—	2.8	—	4.4	—

Note: Some of the causes are general in nature and may not reflect the actual cause of death since a detailed verbal autopsy was not done.

27.7, 22.5 and 6.1 per 1000 live births among illiterate, primary and middle, high school, and college educated groups of mothers, respectively. The rates also decreased steadily with increasing family income (Table III).

Most deaths were in the first order births (46%); the proportion decreasing with higher birth order, 26, 15 and 13% for birth orders 2, 3 and 4 and above, respectively. Of the 222 infant deaths 120 (54.5%) were of infants born to multiparous

TABLE III—*Infant Mortality by Monthly Family Income*

Income (Rs.)	Total births	Infant deaths	IMR/ 1000 LB
0-400	4712	152	32.2
401-800	1877	43	22.9
801-1200	762	18	23.6
1201-1600	505	7	13.8
> 1600	349	2	5.7
Total	8185	222	27.1

women. Regarding birth spacing and infant deaths it was found that 61% of the deaths were among babies born with a spacing less than twenty-four months. The IMR in relation to spacing and birth order could not be calculated as the information on spacing was available only for the children who died.

Discussion

Pondicherry has reported low rates of infant mortality as compared to the estimated Indian figure of 96 per 1000 live births (LB) for 1986. The IMR found in the study (27.1/1000 LB) was lower than the one reported by the Government of Pondicherry *i.e.*, 34.5/1000 LB(3). Mortality rates in community based studies are known to be lower than hospital rates(7-9). The IMR was higher among Muslims. Available literature, however, shows conflicting results with higher rates reported for Muslims by Khan(10) in Uttar Pradesh and Bhattacharjee(11) and lower rates by Omran and Standley(12) and Ramanujam(13) in Tamil Nadu. The present study was only descriptive. Hence, reasons for the high rates among Muslims were not investigated.

Neonatal Mortality Rate/Post-Neonatal Mortality Rate Ratio: Post neonatal deaths accounted for a majority of infant deaths (65%) than neonatal deaths (35%) in this study. This is on expected lines based on the factors influencing infant mortality. A similar finding was seen in this area in 1974(14) also and it appears, the IMR has come down. It is also a well known observation that as IMR falls the proportion of neonatal mortality takes a higher toll than post neonatal mortality. This point has been observed by other studies including one in the same region(15,16). In Pondicherry, though the IMR has fallen to a low level, the expected reversal NMR/PNMR ratio is yet to occur as still 45% of all infant deaths are due to ARI and diarrhea.

Difference in Mortality by Sex: In the present study the IMR among males (30.4/1000 LB) is higher than among females (23.7/1000 LB). A similar difference was also noted in the PNMR (21.1 and 14.2/1000 LB, respectively). However, it is to be noted that the neonatal mortality was almost the same, *viz.*, 9.3 and 9.5/1000 LB in males and females in this study. Low IMR among females in this region was also reported earlier(17). However, in places where IMR for females is higher than that for males, various reasons have been suggested like the value system and the social custom related to the care of babies and also perhaps female infanticide(13).

Cause of Death: Ascertaining the cause of infant death is difficult in India as most of the deaths are not medically certified; the all India figures for certification being 17% and for Pondicherry 39.2% in 1983(17). The present study has made an attempt at using a lay reporting system to obtain "cause of death". Local terms were used, *e.g.*, (i) a pale or blue newborn baby (Ncelambarichiruthal) which was unable to

breath normally and died was considered as birth asphyxia, and (ii) fever, cough, fast breathing, chest indrawing (Allu thookaradhu), and/or grunting (Dong gottaradhu) were considered as signs of pneumonia.

Of the 222 infant deaths, 26 (12%) were verified by the first author and it was found that the information provided by the Anganwadi worker was reliable. Only 3.1% of the deaths could not be classified. Kumar(18) compared the performance of various functionaries in recording infant deaths in Haryana. He reported that the Anganwadi worker reported 80% of the deaths compared to 53% by Auxillary Nurse Midwife, 42% by Community Health Guide and 29% by the Village Chowkidar (watchman). Some of the causes were reported as fever, malnutrition and jaundice and may be general in nature. As already stated, since a detailed verbal autopsy could not be done the information reflects the limitation of the lay reporting system. However, the study highlights the extent of information that can be collected.

There were no deaths due to diphtheria or pertussis. Coverage for DPT and Polio immunization was 96% each for the third dose in 1989(4). Although the overall mortality rate is low, ARI and diarrhea still account for 45% of all infant deaths and 63% of deaths in the post neonatal period. In fact 59.5% of infant deaths belonged to the "soft rock" classification of Bourgeois-Pichat(1), *i.e.*, the exogenous causes of death (external) which could be controlled by public health measures, immunization and antibiotics. The survey of causes of death (Rural) for 1986(6) classified infant deaths into ten specific causes. However, a comparison with the present study is not possible since the sample survey did not relate to the total live births and 21.5% of the deaths could not be classified. Again, in

that survey, diarrhea and neonatal tetanus were not identified as causes of death.

In Pondicherry, therefore, implementation of a vigorous programme for control of acute respiratory infections and diarrheal diseases could reduce the IMR even further, and bring it to very low levels. To evaluate the control measures taken it is also important to develop a system for reporting the cause of death as even after low levels of IMR are achieved this information would continue to direct programme strategies. New indices more sensitive to intervention strategies can also be developed(1). The ICDS programme having been established widely, the Anganwadi worker can be used effectively for a lay reporting supplementing the information from the health sector.

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