# Original Research Paper

## Paediatrics

## STUDY OF POST NEONATAL UNDER FIVE MORTALITY PATTERN: A CROSS SECTIONAL STUDY IN CHILDREN ADMITTED TO A TERTIARY CARE CENTER

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**ABSTRACT**
**INTRODUCTION-** Analysis of causes of deaths of children of 1-60 months would not only inform about the medical causes of deaths but also tells about the regional variability. There was no data regarding under five mortality in recent years from central India region. To improve the National health, we will need to analyse the causes of mortality and their determinants in different regions of India for the effective cause specific treatment to be given to the patients at an early stage and further strengthen the strategies.
**OBJECTIVES-** To assess the causes of mortality of children in the age group of 1-60 months admitted to a tertiary care centre, to know the mortality rate of Central India and analyse in comparison to available mortality data.
**MATERIAL AND METHODS:** This single centre retrospective observational study was undertaken in Government Medical College, Akola. The study population included deaths of all children of 1- 60 months who were admitted in PICU in this tertiary care hospital from January 2015 to January 2018.
**RESULTS-** The mortality risk was 13 deaths per 1000 admissions. There was significantly higher number of deaths during infancy (54.8% n=109 ) with increased risk of death in female children. The percentage of death was higher among patients residing in rural area, overcrowded surroundings, maternal education less than 12th std, partially and unimmunized and moderate and severe malnourished children. Our study showed that 66% of deaths occurred due to Septicaemic shock, ARI and Central nervous system infections
**CONCLUSION-** Detailed analysis of the data from western Vidarbha and comparison with available mortality data will help strengthening of information and hence improvement of health care strategies.

**KEYWORDS :** Child mortality, post neonatal mortality, causes of death.

## INTRODUCTION:

In India, child mortality has always been a matter of concern. According to Million Death study, Lancet, 2017, India will need to hasten decline in the Under 5 Mortality rates in order to meet the 2030 Sustainable development goals[1]. The latest under-five-mortality rate of our country was reported to be 43 and 39 in the year 2016 and 2018 respectively, which is a significant achievement as against the mortality of 88 per 1000 live births in the year 2000. Under five mortality Rate is the best indicator of social and economic progress and for the achievement of a country towards highest standard of living. Also, there are wide regional (Intrastate) and Interstate variations in the causes of under- five- mortality. For instance,[2] Mortality rate from ARI in central India (20.9) was four times more than that in South (4.1) and deaths due to diarrhoeal disease in Central India (17.7) was 3 times more than West India (4.1). Since no recent data is available regarding mortality from central India, to study the epidemiology of deaths in our region, which is representative of Central India, we undertook this retrospective observational research in GMC, Akola.

In the busy tertiary care centre most of the emphasis is on diagnosis and management and analysis about these deaths is totally left out. Most of the child deaths result from many social, cultural and medical factors. However, it is seen that there are three factors which play a very important role while seeking health care, which are delay in deciding to seek adequate medical help, delay in reaching a health facility and operational inadequacies in the health care facilities. Thus, there is a need to find out the cause of death not only in the community but also in the facility where the death occurs. To improve the National health, we will need to analyse the causes of mortality and their determinants in different regions of India for the effective cause specific treatment to be given to the patients at an early stage. A complete data and study on causes and diagnosis of patients admitted in a tertiary care centre and died in last 3 years would detail the loopholes of preventive strategies as well as it would help us to strengthen the gaps during management of illness.

## AIMS AND OBJECTIVES:

This study aims to assess the causes of mortality of children in the age group of 1-60 months admitted to a tertiary care centre, to know the mortality rate of Central India and analyse in comparison to available mortality data. Age distribution, Sex distribution, exact cause and system-wise cause of mortality, time distribution of deaths after admission, regional distribution, and other detailed information would gain more insight and hence, improve further management of patients.

## MATERIAL AND METHODS:

This single centre retrospective observational study was undertaken in Government Medical College, Akola. The study population included deaths of all children of 1- 60 months who were admitted in PICU in this tertiary care hospital from January 2015 to January 2018. The study was approved by the Institutional Ethics Committee. There was no data regarding under five mortality in recent years from central india region.

For the data collection of study, case records of subjects were analysed to obtain causes of death. The neonates (<=28day) admitted to neonatal care unit were excluded from the study because most of the time exact cause of death is multifactorial. Data of patients with undetermined diagnosis in cases referred for post-mortem examination and deaths in children occurred in departments other than pediatric medicine were excluded from the study. Data was collected retrospectively on a pre-structured proforma from online and official records maintained in a Medical Record Department and was entered on a Microsoft Excel sheet and analysed using Google forms. Data regarding personal Information was kept confidential.

## STATISTICAL ANALYSIS:

Detailed Statistical analysis was applied to this data and compared to NFHS survey, Sample Registration System and other National Mortality Data.

## JUSTIFICATION FOR THE STUDY IN AKOLA

GMC, Akola has a high turnover of patients from more than five districts with detailed records of patients available on online software as well as record room. Since there is a wide variation in the causes of mortality in different regions of the country. This study will reflect the differences in the causes of child mortality in Western Vidarbha of Maharashtra in comparison to National mortality data.

## RESULTS AND OBSERVATIONS:

There were a total number of 15072 admissions into the paediatric ward of the hospital and deaths occurred in 199 children during this three year period. This equals to 13 deaths per 1000 admissions.

## AGE AND SEX WISE MORTALITY ANALYSIS:

Among the total admissions, majority belonged to 1-3 years age group (37%), but the mortality analysis (Table 1) showed that there was significantly higher number of deaths during infancy (54.8% n=109 ). With male and female admission ratio of 1.5:1, among the 199 children

expired, 108(54.3%) children were female and 91(45.7%) were male. The risk of death was found to be more in female children in comparison to male children in the present study

### Table 1 Age And Sex Wise Mortality Analysis:

| Age (in years)/ sex of patients | Percentage survival (n) | Percentage of deaths (n) |
|---|---|---|
| 1 month to < 12 months | 33.4% (n=5034) | 54.8% (n=109) |
| 1 year to < 3 years | 37% (n=5577) | 33.67% (n=67) |
| 3 years to < 5 years | 29.6% (n=4461) | 11.5% (n=23) |
| Male | 60.9% (n=9043) | 45.7% (n=91) |
| Female | 40.1% (n=6029) | 54.3% (n=108) |

### STUDY OF SOCIODEMOGRAPHIC PARAMETERS:

The analysis of various social and demographic factors, as shown in table 2, showed that the percentage of death was higher 75.9% (n=151) among patients residing in rural (taluka/village) area than in district. Overcrowding was seen in 64.32% (n=128) of patients died. Based on caste, the mortality rate in under-five children was high in Muslims (35.2%) followed by Buddhism (33.2%), Hindus (20.2%), Christian (1%) and others (10.4%). There was significantly less risk of death in patients who had mother with educational qualification of more than 12 th standard (9.5%). (p value<0.05)

### Table 2: Sociodemographic Parameters And Mortality Analysis

| Parameter | Death (n=199) No. (%) |
|---|---|
| Residence | |
| Urban | 48 (24.1%) |
| Rural | 151 (75.9%) |
| Overcrowding | |
| Present | 128 (64.3%) |
| No crowding | 71 (35.7%) |
| Religion | |
| Muslims | 70 (35.2%) |
| Buddism | 66 (33.2%) |
| Hindus | 40 (20.2%) |
| Christian | 2 (1%) |
| Maternal education status | |
| Passed HSC | 19 (9.5%) |
| Below HSC | 180 (90.5%) |

### ANALYSIS OF CLINICAL PARAMETERS:

The risk of mortality was significantly high among partially and non immunized children (62.3%) than the immunized group (37.7%). The under-five death rate was higher in moderate and severe malnourished children (67%) compared to those with normal nutrition (33%). 42.3% of deaths occurred in patients who were admitted after 7 days of illness. Among the 199 patients who died, deaths occurring within 12 hours of admission were found to be 43.7% (n=87) followed by 18.4% (n=37) deaths in those within 12 to < 24 hours and 17.6% (n=35) in those within 24 hours to 48 hours of admission. Total deaths were 28(14.1%) in time period of > 48 hours to less than or equal to five days. Least number [12(6%)] of deaths occurred in more than 5 days duration of stay in hospital.

In this study, most of the children admitted in the hospital ward from casualty were more in comparison to children admitted from OPD i.e. 135(68.9%) and 61(31.1%) respectively.

### Table 3: Clinical Parameters And Mortality Analysis

| Parameter | Death (n=199) No. (%) |
|---|---|
| Immunization | |
| Unimmunized | 124 (62.3%) |
| Immunized | 75 (37.7%) |
| Nutritional status | |
| MAM and SAM | 133 (67%) |
| Normal mourished | 66 (33%) |
| Duration between admission and death | |
| <12 hours | 87 (43.7%) |
| 12 to 24 hours | 37 (18.6%) |
| >24 hours to 48 hours | 35(17.6%) |
| 48 hours to 5 days | 28 (14.1%) |
| >5 days | 12 (6) |

### ETIOLOGICAL ANALYSIS OF MORTALITY:

Our study showed that 66% of deaths occurred due to Septicaemic shock, ARI and Central nervous system infections. Cardiogenic Shock, severe refractory anaemia, status epilepticus, congenital malformations, poisonings, acute renal failure, etc., were the other causes for deaths.
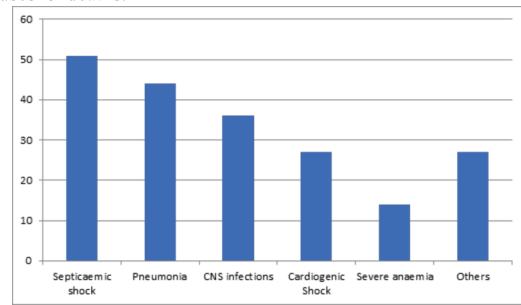


| Causes of death | n (%) |
|---|---|
| Septicaemic shock | 51 (25.8%) |
| ARI | 44 (22.1%) |
| CNS infections | 36 (18.1%) |
| Cardiogenic Shock | 14 (7.0%) |
| Severe anaemia | 27 (13.6%) |
| Others | 27 (13.6%) |

### DISCUSSION

There has been a great deal of information on socioeconomic and geographical disparity in Under Five Mortality in recent years[3]. Only a few studies, however, have examined that disparity at Indian state and district level[4]. Ram and colleagues[5] applied the state and district mortality-rate pattern, derived from a few nationally representative surveys, to the 2012 UN sex-specific birth and mortality totals; the researchers indirectly calculated that only 37% of 607 districts were on track to achieve Millennium Development Goal (MDG) number 4 of 38 deaths per 1000 live births among the under-fives by 2015, and only around another 37% after 2020. The SDG3 aims at 25 or fewer deaths per 1000 live births for U5MR. An analysis of NFHS survey 2015-2016 published in 2018 observed clear geographical pattern in U5FM across districts[6]. We have just a single study from districts of Maharashtra which studies the mortality pattern and various variables affecting the same[7]. No study is available from vidarbha which studies the pattern of death in this region.

The study conducted in our centre showed that the risk of mortality was 13 per 1000 admissions as against a study from east India done by Shukla et al.,[8] which showed the rate of 51 per 1000 admissions. This huge disparity could be due to increased availability of doctors at rural level and also availability of plenty of doctors in this region. Among the total admissions, maximum patients belonged to 1-3 years age group, but the mortality analysis showed that there was significantly higher number of deaths in the 1 month to 1 year age group, which is consistent with all the national and international literature and study available [10]. This could be due to the poor immune response and multifactorial etiology in this age group. As per 2015-2016 NFHS-4 data[6], with post neonatal mortality of 13.4, the risk of death was more in the age group of post neonates, a finding similar to the study by Dr D.M. Deenadayalan, Dr E. Theranirajan and Gulati P. [9]

In our study, the male and female admission ratio was 1.5:1, but among the 199 children expired, the risk of death was more in female children in comparison to male children. The NFHS survey[6] showed that though female Neonatal Mortality Rate is lower than male, a much-expected finding due to female's biological advantage observed in other countries of the world, this advantage reduces in U5MR. The female predominance in U5MR indicates potential discrimination against girl children in behavioral factors such as nutrition and healthcare in their early years of life, a factor that has been discussed in previous studies[10,11] on developing countries.

The analysis of various social and demographic factors showed that the percentage of death was higher among patients residing in rural area and those with overcrowded surroundings. The risk of spread of infections is more in overcrowded families. Also poor attention and neglect of mothers toward children in such families increases the risk. The association of rural residence, Joint family and backward class

with mortality was also seen in study conducted by Sarangi et al. In our study, mortality rate was high in Muslims, followed by Buddhist, Hindus, Christian and others. Maternal education above 12th std was associated with significantly less risk of death. (p value<0.05) This was similar to that observed by Sarangi et al (East india)[12] and Kabir et al (Bangladesh).  An educated mother is well aware about red flag signs of any disease and also tends to visit a doctor early.

The risk of mortality was significantly high among partially and unimmunized and moderate and severe malnourished children. Undernutrition including stunting, severe wasting, deficiencies of Vitamin A and zinc, and suboptimum breastfeeding is not presented as a direct cause of death in statistics, but has been found from other studies (Shukla et al)[8] and Park Textbook that it is an underlying cause in a third of deaths in children younger than five years.

Maximum deaths occurred within 24 hours of admission and in patients with late referals (who were admitted after 7 days of illness). Most of the dead children were admitted in the hospital ward from casualty than in OPD. This itself shows that risk of mortality increases with delayed presentation, late referral, treatment from unqualified person, and severity of illness. Previous studies also suggest increased mortality due to unavailability of suitable medical access, poor transportation, or referral system in rural areas. To improve the referral system, the government of India introduced Janani Shishu Suraksha Karyakram (JSSK), a program that provides free transport in the form of emergency National ambulance service to higher hospital. Kilkari is an Interactive Voice Response (IVR) based mobile service that delivers time-sensitive audio messages (voice call) to educate mothers about child health and plan early  interventions to improve the health of child and prevents  deaths due to complications.

Our study showed that 66% of deaths occurred due to Septicaemic shock, ARI and Central nervous system infections. Although the WHO (2008)[14] reported that in developing countries diarrhea (19%), ARI (13%), measles (10%), and prematurity (10%) were considered as the cause of under-five children [15], the percentage of diarrheal death and its complications was negligible in our study. This might reflect a trend in the fall of diarrheal death in country.

Reliable information on causes of death is essential to the development of national and international health policies for prevention and control of disease and injury. Medically certified information is available for less than 30 % of the estimated 50.5 million deaths that occur each year worldwide. It is necessary to strengthen mortality data collection, only then effective interventions can be taken.

## CONCLUSIONS
- There is need to educate mother and families to bring their child to hospitals at early stages so that effective treatment can be provided before the worsening of symptoms. Strengthening of Information, Education and Communication activities so that the health services given are fully utilised.
- Preventive and social measures are already being taken by government to improve health conditions. But ignorance and social taboos weaken the link. Hence promotion of female education and gender equality may help bridging the gap.
- A fundamental and necessary function of health care system is to provide a sound referral system. It must be a two-way exchange of information and returning patients to those who referred them for follow-up care. It will ensure continuity of care and inspire confidence of the consumer in the system.

## REFERENCES
1. Millennium Development Goals India Country Report 2014.
2. Changes in cause-specific neonatal and 1–60-month child mortality in India from 2000 to 2015: a nationally representative survey: Million Death Study Collaborators.
3. IIPS, ORC-Macro. National Family Health Survey (NFHS-3), 2005–2006: India. Mumbai: International Institute for Population Sciences 2007.
4. Gupta AK, Ladusingh L, Borkotoky K. Spatial clustering and risk factors of infant mortality: district-level assessment of high-focus states in India. Genus. 2016; 72(1):1–17.
5. Ram U, Jha P, Ram F, Kumar K, Awasthi S, Shet A, et al. Neonatal, 1–59 month, and under-5 mortality in 597 Indian districts, 2001 to 2012: estimates from national demographic and mortality surveys. The Lancet Global Health. 2013;1(4):e219–26.
6. Bora JK, Saikia N. Neonatal and under-five mortality rate in Indian districts with reference to Sustainable Development Goal 3: An analysis of the National Family Health Survey of India (NFHS), 2015–2016. PLoS ONE 13(7): e0201125. https://doi.org/10.1371/journal.pone.0201125.
7. Godale L, Mulaje S. Mortality trend and pattern in tertiary care hospital of Solapur in Maharashtra. Indian J community Med 2013; 38:49-52.
8. Shukla S, Das Dilip. Post neonatal under five mortality – a hospital based study. IOSR Journal of Dental and Medical Sciences; Volume 14 Issue 2 Ver. VIII (Feb. 2015): 42-45.
9. Dr D.M. Deenadayalan, Dr E.Theranirajan. Mortality Pattern among Hospitalized Children (29 Days to 12 Years) At a Tertiary Care Hospital in South India.  JMSCR; Volume 05 Issue 03 March: 19362-68.
10. Raman TR. Epidemiology of under five malnutrition: Sex differential in health care and nutritional status (under five malnutrition). Medical Journal, Armed Forces India. 1998; 54(4):375.
11. Fledderjohann J, Agrawal S, Vellakkal S, Basu S, Campbell O, Doyle P, et al. Do girls have a nutritional disadvantage compared with boys? Statistical models of breastfeeding and food consumption inequalities among Indian siblings. PloS One. 2014;9(9):e107172. pmid:25229235.
12. Sarangi et al.  Mortality pattern of under-five children – a hospital-based cross-sectional study in a tertiary care hospital of india. Asian J Pharm Clin Res; Vol 10, Issue 9, 2017: 82-84.
13. M Kabir, Rafiquel chawdhury. Infant and child mortality levels and trends in Bangladesh. Journal of Biosocial science 1995; 27 (2): 179-192.
14. World Health Organization Data (2000-2016).