

Mortality in newborns referred to tertiary hospital: An introspection

Kailash Chandra Aggarwal¹, Ratan Gupta¹, Shobha Sharma¹, Rachna Sehgal¹,
Manas Pratim Roy¹

¹Department of Pediatrics, Safdarjung Hospital, New Delhi, India

ABSTRACT

Background: India is one of the largest contributors in the pool of neonatal death in the world. However, there are inadequate data on newborns referred to tertiary care centers. The present study aimed to find out predictors of mortality among newborns delivered elsewhere and admitted in a tertiary hospital in New Delhi between February and September 2014. **Materials and Methods:** Hospital data for were retrieved and analyzed for determining predictors for mortality of the newborns. Time of admission, referral and presenting clinical features were considered. **Results:** Out of 1496 newborns included in the study, there were 300 deaths. About 43% deaths took place in first 24 hours of life. Asphyxia and low birth weight were the main causes of death in early neonatal period, whereas sepsis had maximum contribution in deaths during late neonatal period. Severe hypothermia, severe respiratory distress, admission within first 24 hours of life, absence of health personnel during transport and referral from any hospital had significant correlation with mortality. **Conclusions:** There is need for ensure thermoregulation, respiratory sufficiency and presence of health personnel during transport.

Keywords: Mortality, New Delhi, Newborn, Referral, Tertiary hospital

Introduction

Every year 4 million newborn deaths occur in the world, out of which one-fourth are contributed by India.^[1] The Millennium Development Goals call for reduction of mortality by two-third by 2015, in comparison to the figure in 1990. However, last few years have witnessed a tardy decline of neonatal mortality rate (NMR) in India (from 52/1000 in 1990 to 29/1000 in 2013).^[2] Almost 70% of all infant deaths occur within the first 28 days of life. This is the most valuable yet neglected time in terms of intervention as neonates tend to lose focus between programs intended for children and maternal health.^[2,3]

Different national programs were introduced to curb neonatal as well as infant mortality. Integrated Management of Neonatal and Childhood Illness (IMNCI), Janani Shishu Suraksha Karyakram, Rashtriya Bal Suraksha Karyakram are few of them. Still, inadequate maternal and newborn care, lack of quality care,

overdependence on higher health care centers and overlooked adolescence are few of factors that compelled Government of India to adopt the concept of continuum of care recently, as emphasized in Reproductive, Maternal, Newborn, Child and Adolescent Health (RMNCH + A) strategy.^[4]

New Delhi, being the capital, is equipped with a few state of the art tertiary hospitals that cater not only to Delhi, but extend their services to neighboring states like Haryana, UP, MP, and even Bihar. Considering the fact that a significant chunk of neonates brought to these hospitals die, it is important to further investigate the death of these babies to have a clear understanding of the situation and to subsequently reduce mortality in this particular group of patients.^[5] Primary care physicians have the major role to play in this settings. They need to understand that it is indeed necessary to refer sick children to a higher center for appropriate management but stabilizing them before transport is of prime importance to get maximal benefit out of these referrals. In this perspective, the present study is undertaken to identify the predictors of morbidity and mortality among extramural babies admitted in such a tertiary care hospital.

Access this article online

Quick Response Code:



Website:
www.jfmpc.com

DOI:
10.4103/2249-4863.161348

Address for correspondence: Dr. Manas Pratim Roy,
154, H N Road By lane, P.O. and Dist. - Cooch Behar,
West Bengal - 736 101, India.
E-mail: manas_proy@yahoo.co.in

Objectives

To study predictors of mortality of extramural neonates admitted in a tertiary care hospital at New Delhi between February and September 2014.

Materials and Methods

This was a descriptive hospital record-based study, based on records collected for official purposes. Neonates delivered elsewhere and admitted in wards (extramural) were included. All newborns delivered in the hospital and admitted in the nursery (intramural) within the specified period were excluded.

Statistical analysis

Among different variables, age, gender, weight on admission, duration of hospital stay, major causes of death and referral history were considered. Continuous variables were analyzed using percentage, mean, standard deviation. Categorical variables were analyzed using Chi-square test. A *P* value <0.05 was considered significant.

Results

A total of 1496 extramural babies were admitted within the specified time period. Sex ratio was 692 females per 1000 males. Sixty-two percent babies were referred from different hospitals (22% from Govt. Hospitals and 40% from private ones). Only 10.5% babies were transported in ambulances provided by hospitals. One third of the babies were referred without any referral note. There was no prior communication in any of the referred cases, not even in the case of babies transported on bag and tube ventilation.

There were 300 deaths among admitted babies (64% male). The mortality rate was higher in males (22%) than females (18%). Overall, neonatal mortality was 20%. Among them, the fatality rate among newborns admitted in the early neonatal period was 24% and that in late neonatal period was 13%. More than 40% deaths occurred within the first 24 hours of life and 74% within first week.

Table 1 suggests the presence of few selected features in referred newborns. Survival rate was higher when health personnel have accompanied neonates. When neonates referred from other places were analyzed, it was seen that one fifth of the babies from government set up have been referred with some health personnel, whereas this figure is mere 7% in the case of private ones. The relationships between mortality and severe hypothermia, severe respiratory distress, admission within first 24 hours of life, absence of health personnel during transport, admission during night and referral from any hospital were significant.

Table 2 compares the relative contribution of low birth weight, asphyxia and sepsis to death in early and late neonatal period. As evident from the table, the proportion of death due to sepsis

Table 1: Comparison of outcome of extramural neonates admitted in a tertiary hospital in New Delhi, 2014

Findings	Survived	Expired	<i>P</i> value
	(n=1196) (%)	(n=300) (%)	
Admission within 24 hours of life	223 (19)	128 (43)	0
Male gender	693 (58)	191 (64)	0.071
Severe hypothermia	350 (29)	111 (37)	0.009
Hypoglycemia	210 (18)	57 (19)	0.560
Severe respiratory distress	164 (13)	61 (20)	0.004
Presence of shock	296 (33)	89 (30)	0.081
Child coming between 9 p.m. and 6 a.m.	320 (27)	98 (33)	0.041
Absence of accompanying health personnel	1070 (88)	282 (94)	0.017
Referred by any hospital	719 (78)	206 (69)	0.006

Table 2: Distribution of causes of death among extramural neonates in early and late neonatal period in a tertiary hospital in New Delhi, 2014

Cause	Early Neonatal Death (n=221) (%)	Late Neonatal Death (n=79) (%)
	Low birth weight	46 (20)
Asphyxia	74 (33)	7 (9)
Sepsis	78 (36)	53 (70)
Others	23 (10)	14 (18)

Chi-square=36.249, df=3, *P*<0.0001

jumped to 70% in late neonatal period from 36% in early neonatal period. The association between cause and timing of neonatal death was significant. As evident, 60% of deaths occurred within the first 24 hours of admission. Only an additional 15% of deaths occurred in next 24 hours after admission.

Discussion

As most of the deaths in infancy take place within first 28 days, emphasis on neonatal care is very much required in today's perspective when achieving MDG 4 seems to be a distant dream for India. Although based on hospital records, the present study provides insight into neonatal health in a tertiary care hospital. Fact, being one of the major referral points in New Delhi, this hospital caters to high risk neonates referred from its wide catchment area. This could be the reason for witnessing higher mortality in a well-equipped set-up.

Use of ambulance for referral was much lower than what was observed by another hospital in Delhi.^[5] In Haryana, successful use of ambulance has been associated with a rise of institutional delivery.^[6] Similarly, for reducing death among transported newborns, transport in a well-equipped ambulance could play a vital role. A few relevant points in this regard have been mentioned by previous studies. One such point is prior communication to NICU/SNCU although rarely practiced.^[5,7]

The overall mortality rate was 20% in our study, which is similar to Kumar *et al.*, and lower than other observations focused on transported neonates.^[5,8-10] Being a tertiary center, this hospital is equipped with better manpower and equipments which are not

available at referring ones. That could be the reason for better survival than previous findings.

In our study, 43% babies die within the first 24 hours of life and when first week of life was considered, the proportion shot to 74%. This figure is consistent with the range noted by Lawn *et al.*^[1] As ante and intra natal complications could increase the chance for early neonatal death, strengthening these aspects of care along with effective resuscitation are the need of the hour.^[11] A study from rural India emphasized on improving health-seeking behavior and enhancing link between community and health care providers.^[12] In terms of difference between time of admission at hospital and death, most of the deaths occurred within 24 hours. The findings of previous studies supported similar view.^[13,14] This also stressed on ensuring the quality during intra and early post partum period.

Previous data suggested that sepsis is responsible for a major chunk of death in late neonatal period.^[12,15,16] Our findings are consistent with that. Environmental exposure and home deliveries could be responsible for that.^[17] Adequate anticipation, early diagnosis and treatment, practice of giving antibiotic in selected cases before referral could reduce the risk of death due to sepsis in extramural babies. A prospective study assessing relationship between transported newborns and sepsis could be helpful in this setting.

The presence of accompanying health personnel during transport was important. In 12% cases, health personnel were sent along with the babies. This serious gap in neonatal care is in accordance with previous studies.^[5,9] The presence of hypoglycemia and hypothermia in considerable number of newborns during admission and role of these factors in mortality has been emphasized earlier.^[18] Our study although revealed the presence of severe hypothermia in a significant proportion of transported newborns, it could not find the same for hypoglycemia. A previous study also could not find any significant relationship with hypoglycemia.^[10]

However, it is surprising that babies coming directly from home have better survival than those coming from hospitals. This was probably due to the fact that hospitals were referring newborns at the eleventh hour or they are not stabilizing neonates before referral. Recent evidences suggest that peripheral hospitals do not intimate before referral to higher centre.^[19] Delay in provision of care to sick newborn has been attributed to referral between health facilities.^[20,21] Lack of capacity in managing serious illness and emergencies in private as well as peripheral public hospitals has been indicated earlier for higher death in tertiary centers.^[22,23] Algorithm followed in IMNCI for management of sick neonates is to be widely circulated and refresher courses are to be arranged for the physicians. The present study again lays stress on the fact that standing at the receiving end of delayed referral, tertiary centers could do little.^[20] There is a clear need to strengthen primary health care providers. No doubt, this poses a great challenge as private sector is mostly unorganized and “one

size fits all” approach is not possible because of different local circumstances.^[24]

This adds to the presence of severe hypothermia and severe respiratory distress at admission to precipitate in higher neonatal deaths.^[10,19] Previous research has suggested children with extreme values in body temperature and respiration at referring point might have similar extreme values at arrival at higher centers, thus stressing on prior stabilization.^[25] Our findings are also in the same direction, suggesting importance of prior stabilization before referral, underscored repeatedly in the past.^[25-27] Stabilization of newborn, along with advices for maintaining airways and thermoregulation by Kangaroo Mother Care during transport form such a framework which could improve the immediate outcome after admission. Ensuring vital parameters before and during transport is probably the weakest link in neonatal health scenario of our country.

Strength and limitations

Being a hospital record-based study, the present paper suffers from different limitations. Standardization of case definition was one of them. As the diagnoses were made by different doctors at different time, lack of uniformity and subjective variation might have compromised the quality of data. Still, it focuses on neonatal death in tertiary care level in the country and thus indicates the need of prospective research in this regard to provide more accurate data for the policy makers. While most studies in neonatal health focused on community-based verbal autopsy or accuracy of diagnosis by front-line health workers, the present one stood among those few researches which concentrate on outcome of neonates admitted in tertiary care hospital. In the absence of a neonatal registry in the country, this paper, keeping primary care level doctors as its audience, provides a platform for designing similar analysis at similar level of hospitals.

Conclusion

Neonatal death is a proxy for evaluating national programs aimed at infants. The present study suggests major causes of mortality among referred newborns. Before referral and during transport, Kangaroo Mother Care should be encouraged along with a constant watch for respiratory sufficiency. Accompanying health worker, familiar with IMNCI, during referral would be helpful in this regard. This message should trickle down to the peripheral health centers. Without active support from primary care physicians working at grass root level, neonatal mortality at tertiary centers could not be reduced. Stabilization prior to referral could go a long distance in curbing down deaths among newborns, thus paving way for improved neonatal health outcomes.

References

1. Lawn JE, Cousens S, Zupan J; Lancet Neonatal Survival Steering Team. 4 million neonatal deaths: When? Where? Why? *Lancet* 2005;365:891-900.

2. PHFI, AIIMS, and SC - State of India's Newborns (SOIN) 2014- a report. In: Zodpey S, Paul VK, editors. Public Health Foundation of India. New Delhi, India: All India Institute of Medical Sciences and Save the Children; 2014.
3. Tinker A, ten Hoope-Bender P, Azfar S, Bustreo F, Bell R. A continuum of care to save newborn lives. *Lancet* 2005;365:822-5.
4. Govt. of India. A strategic approach to reproductive, maternal, newborn, child and adolescent health (RMNCH + A) in India: For healthy mother and child. New Delhi: Ministry of Health and Family Welfare, Government of India; 2013.
5. Narang M, Kaushik JS, Sharma AK, Faridi MM. Predictors of mortality among the neonates transported to referral centre in Delhi, India. *Indian J Public Health* 2013;57:100-4.
6. Prinja S, Jeet G, Kaur M, Aggarwal AK, Manchanda N, Kumar R. Impact of referral transport system on Institutional Deliveries in Haryana, India. *Indian J Med Res* 2014;139:883-91.
7. National Neonatology Forum. NNF clinical practice guidelines. Available from: <http://www.nnfpublishing.org> [Last accessed on 2014 Nov 19].
8. Rakholia R, Rawat V, Bano M, Singh G. Neonatal morbidity and mortality of sick newborns admitted in a teaching hospital of Uttarakhand. *CHRISMED J Health Res* 2014;1:228-34.
9. Dalal E, Vishal G, Solanki D. Study on neonatal transport at tertiary care centre. *Int J Sci Res* 2013;2:289-92.
10. Buch PM, Makwana AM, Chudasama RK, Doshi SK. Status of newborn transport in periphery and risk factors of neonatal mortality among referred newborns. *J Phram Biomed Sci* 2012;16. Available from: http://www.jpbms.info/index.php?option=com_docman&task=doc_download&gid=414&Itemid=48. [Last accessed on 2016 Mar 16].
11. Jehan I, Harris H, Salat S, Zeb A, Mobeen N, Pasha O, *et al*. Neonatal mortality, risk factors and causes: A prospective population-based cohort study in urban Pakistan. *Bull World Health Organ* 2009;87:130-8.
12. Baqui AH, Darmstadt GL, Williams EK, Kumar V, Kiran TU, Panwar D, *et al*. Rates, timing and causes of neonatal deaths in rural India: Implications for neonatal health programmes. *Bull World Health Organ* 2006;84:706-13.
13. Indian Council of Medical Research. NNPD network. National neonatal perinatal database. Human Reproduction Research centre Network. Report 2002-2003. New Delhi: Indian Council of Medical Research; 2005. p. 24-37. Available from: <http://www.newbornwhocc.org> [Last accessed on 2014 Oct 31].
14. Mmbaga BT, Lie RT, Olomi R, Mahande MJ, Kavale G, Daltveit AK. Cause-specific neonatal mortality in a neonatal care unit in Northern Tanzania: A registry based cohort study. *BMC Pediatr* 2012;12:116.
15. Kumar M, Paul VK, Kapoor SK, Anand K, Deoraria AK. Neonatal Outcomes at a Sub-district Hospital in North India. *J Trop Pediatr* 2002;48:43-6.
16. Bang AT, Paul VK, Reddy HM, Baitule SB. Why do neonates die in rural Gadchiroli, India? (Part I): Primary causes of death assigned by neonatologist based on prospectively observed records. *J Perinatol* 2005;25(Suppl 1):S29-34.
17. Bhutta ZA, Darmdasdt GL, Hasan BS, Haws RA. Community based intervention for improving perinatal and neonatal health outcomes in developing countries: A review of the evidence. *Paediatr* 2005;115:519-617.
18. Goldsmith G, Rabasa C, Rodreguez S, Aguirre Y, Valdes M, Pretz D, *et al*. Risk factors associated to clinical deterioration during the transport of sick newborn infants. *Arch Argent Pediatr* 2013;110:304-9.
19. Sehgal A, Roy MS, Dubey NK, Jyothi MC. Factors contributing to outcome in newborns delivered out of Hospital and referred to a teaching Institution. *Indian Pediatr* 2001;38:1289-94.
20. Bapat U, Alcock G, More NS, Das S, Joshi W, Osrin D. Stillbirths and newborn deaths in slum settlements in Mumbai, India: A prospective verbal autopsy study. *BMC Pregnancy Childbirth* 2012;12:39.
21. Bojalil R, Kirkwood BR, Bobak M, Guiscafre H. The relative contribution of case management and inadequate care-seeking behaviour to childhood deaths from diarrhoea and acute respiratory infections in Hidalgo, Mexico. *Trop Med Int Health* 2007;12:1545-52.
22. Das J, Hammer J, Leonard K. The quality of medical advice in low-income countries. *J Econ Perspect* 2008;22:93-114.
23. Jashnani KD, Rupani AB, Wani RJ. Maternal mortality: An autopsy audit. *J Postgrad Med* 2009;55:12-6.
24. Zoysa I, Bhandari N, Akhtari N, Bhan MK. Careseeking for illness in young infants in an urban slum in India. *Soc Sci Med* 1998;47:2101-11.
25. Meberg A, Hansen TWR. Neonatal transports-risks and opportunities. *Open J Pediatr* 2011;1:45-50.
26. Hoque M, Haaq S, Islam R. Causes of neonatal admissions and death at rural hospital in Kwazulunatal, South Africa. *South Afr J Epidemiol Infect* 2011;26:27-9.
27. Kumar PP, Kumar CD, Shaik F, Yadav S, Dusa S, Venkatlakshmi A. Transported neonates by a specialist team - How STABLE are they. *Indian J Pediatr* 2011;78:860-2.

How to cite this article: Aggarwal KC, Gupta R, Sharma S, Sehgal R, Roy MP. Mortality in newborns referred to tertiary hospital: An introspection. *J Family Med Prim Care* 2015;4:435-8.

Source of Support: Nil. **Conflict of Interest:** None declared.