International Journal of Community Medicine and Public Health
Dwivedi K et al. Int J Community Med Public Health. 2017 Jul;4(7):2389-2394
http://www.ijcmph.com
pISSN 2394-6032 | eISSN 2394-6040

DOI: http://dx.doi.org/10.18203/2394-6040.ijcmph20172829

Original Research Article

Survival outcome of neonates admitted at government and private neonatal intensive care units of Allahabad, India

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Received: 26 April 2017
Accepted: 24 May 2017

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ABSTRACT

Background: The early neonatal period (birth to 7 days of life) is the most critical period of life. Usually, the lower the infant mortality, the greater of it is concentrated in neonatal period. The present study was carried out with the objectives to study the profile of sick neonates & compare their survival outcome admitted in Government and Private NICUs of Allahabad.
Methods: The cross-sectional study was conducted in the NICUs of Government & Private sector of comparable admission rates in Allahabad. The study was time bound conducted from September 2015-August 2016. The data were collected from the medical records of the admitted neonates.
Results: There were a total of 1442 neonates admitted during the given time frame in both the Government and Private NICUs and 1409 were included in the study. The Government NICU had 63.21% admissions within 24 hour of birth more than Private NICUs (55.03%). The Private NICU had 36.58% neonates admitted within 1-7 day while Government sector had 29.88%. The Government NICU had 69.01% rural patients while Private NICU had 67.98% urban patients. The Government NICU received 57.63% outborn babies while Private NICU had more inborn babies (67.22%). The profile of sick neonates according to age at the time of admission, mode of admission and community in Government and Private NICUs differed significantly ($p<0.05$) while gender, gestational age and weight were not significantly different.
Conclusions: The Government NICU had a survival outcome of 70.91% while Private NICU had 86.73% which was statistically significant.

Keywords: Survival outcome, Government and Private NICUs, Allahabad

INTRODUCTION

One of the key determinants of a country's development is the status of child survival which otherwise depends upon the chances of a newborn to survive beyond infancy. Survival of a newborn during the first week of life is determined by the stresses of intrauterine life and birth process as well as by the adjustment to a new environment, nutrition and infection. Therefore, the early neonatal period (birth to 7 days of life) is the most critical period of life. [1]

Between 1990 and 2015, the number of deaths in children under five worldwide declined from 12.7 million in 1990 to almost 6 million in 2015 as against the target of United Nations Millenium Development Goal-4 (MDG-4) of two third reduction.[2]

The fall in neonatal mortality is considerably less than that in post-neonatal & childhood mortality particularly middle & low income countries.[1] Almost half of Under-5 deaths occur in infancy. Of the infant deaths, about two third occur in neonatal period. One third of all neonatal

deaths occur on the first day of life, almost half within three days and nearly three quarters within the first week of life.[3]

The neonatal mortality in western countries has declined largely due to awareness, improvement in obstetric and NICU facilities as well as advances in the diagnosis and treatment.[4]

The newborn health challenge faced by India is bigger than any other country. A child's risk of death in the first four week of life is nearly fifteen times greater than any other time before his/her first birthday. Around 1.2 million neonates in India die each year which accounts for 25% of all neonatal deaths in the world.

India has the largest number of births and newborn deaths in the world, with NMR of 28/1000 live births in 2015. Usually, the lower the infant mortality, the greater of it is concentrated in neonatal period.[5]

Two third of newborn deaths are due to infection, prematurity and asphyxia which are preventable.[6] The causes of neonatal deaths in India according to a statistical report are preterm birth (35%), birth asphyxia (20%), pneumonia (16%), sepsis (15%), malformations (9%), diarrhoea (2%), others (3%).[7]

There is no single solution to save lives of a newborn. The underlying factors such as illiteracy, socioeconomic deprivation, traditional beliefs and gender bias that profoundly affect maternal and neonatal deaths are complex and relatively resistant to change in the short-term. Although solutions to these problems are sought, short term improvements in emergency obstetric and neonatal health services may save many newborn lives.[8]

It has been estimated that preventable neonatal deaths can be decreased by at least 50% through implementation and scale-up of educational interventions that include neonatal resuscitation and other essential elements of basic newborn care. The packages with the greatest impact on neonatal mortality (in decreasing order) include: Care during Labour and Childbirth, Care of Small and Sick newborn, Care of Healthy Newborn especially in the first week, and Immediate Newborn care.[9] Sick & premature newborn requiring specialised hospital care dies because facilities and skills required for Neonatal Intensive Care Unit (NICU) are usually unavailable.[10]

The four large states of India viz. Uttar Pradesh, Bihar, Madhya Pradesh and Rajasthan together account for more than half of country's neonatal mortality, which accounts for about 14% of global newborn deaths.[9] The largest state, Uttar Pradesh accounts for a quarter of all newborn deaths in India and 8% worldwide.[11] The majority of districts (27%) in UP have an NMR between 50 and 59, 24% districts having NMR between 40 and 49, 21% districts between 30 and 39. [12]

It is thus imperative to learn from experiences of different facilities in diverse settings in the context of facility based neonatal interventions. Some hospitals tend to treat higher risk patients and as a result are more likely to have higher mortality rates. Comparing the quality of care is tricky.

The present study was carried out with the following objectives:

1. To study the profile of sick neonates admitted in Government and Private NICUs of Allahabad.
2. To compare the survival outcome of the sick neonates at the time of discharge between Government & Private NICUs.

METHODS

The present study was a cross-sectional study. The study was conducted in the NICUs of Government & Private sector. There is the only NICU (Sarojini Naidu Children Hospital, SNCH) in Government sector attached to MLN Medical College, Allahabad in urban Allahabad and three private NICUs of comparable standards as of Government NICU. Out of the three, one was selected for the study which had similar admission rates as that of SNCH. This was a time bound study from September 2015-August 2016. The sick neonates admitted during the study period were studied in both the Government and Private NICUs. There were a total of 1,442 neonates in the study period, out of which 1,409 neonates were included. The remaining 33 neonates were excluded as their diagnosis was not clear.

In the beginning, the permission of NICU In-charge of the respective hospitals was obtained to analyze the medical records, maintaining the confidentiality. The ethical clearance was taken from institutional ethical committee.

The information on neonates included the age of the newborn (in days), gender, community, mode of admission, gestational age, weight at the time of admission and outcome at the time of discharge. After obtaining the consent, the pre-designed and pre-tested questionnaire was filled from medical records.

Outcome

Good: The neonates who were alive and improved at the time of discharge were assumed to have good outcome.

Poor: The neonates who died or left the hospital against medical advice (LAMA) or referred were considered poor.

Null hypothesis

There is no difference between the survival outcome of Government and Private Newborn Intensive Care Units.

Statistical analysis

The collected data were entered in the Microsoft excel data sheet and analyzed using statistical software, SPSS Version 18.0. Z test of proportion was used to test the difference in the outcome of different variables under study between the Government and Private NICUs. The logistic regression model was applied and the strength of association was assessed by calculating the adjusted odds ratio. P value less than 0.05 were considered as significant.

RESULTS

In the Government sector, majority 476 (63.21%) of the neonates were admitted within 24 hour of their birth. Two hundred and twenty five neonates (29.88%) were 1-7 days old at the time of admission followed by 52 neonates (6.92%) who were >7 days old. In Private sector, majority 361 (55.03%) of the neonates were admitted within 24 hour of birth followed by 240 (36.58%) neonates who were 1-7 days old. Fifty five neonates (8.38%) were admitted at more than 7 days of birth. The difference in the admission pattern in different age groups across both the government and private set-ups was statistically significant (p<0.05). In Government sector, the males constituted 55.64% (419) while the females made up 44.35% (334). In Private sector, the males 336 (51.21%) predominated over females 320 (48.78%). The gender distribution across both the sectors was statistically insignificant (p>0.05). It was seen that in the Government sector, majority 482 (69.01%) were from rural areas while 271 (35.98%) were from urban areas. However, in the Private sector, majority 446 (67.98%) belonged to urban areas and only 210 (32.01%) were from rural areas. The community wise distribution among both the sectors was statistically significant (p<0.05) (Table 1).

Table 1: Profile of the sick neonates admitted in government and private NICUs.

	Government NICU		Private NICU		
	N=753%		N=656%		P value
A. Age at admission					
Within 24 hour	476	63.21	361	55.03	<0.05
1-7 days	225	29.88	240	36.58	<0.05
>7 days	52	6.90	55	8.38	>0.05
B. Gender					
Male	419	55.64	336	51.21	>0.05
Female	334	44.35	320	48.78	>0.05
C. Community					
Rural	482	69.01	210	32.01	<0.05
Urban	271	35.98	446	67.98	<0.05
D. Mode of admission					
Inborn	319	42.36	441	67.22	<0.05
Out-born	434	57.63	215	32.77	<0.05
E. Gestational Age					
Term	509	67.59	426	64.93	>0.05
Pre-term	244	32.40	230	35.06	>0.05
F. Weight at the time of admission					
Normal	450	59.76	401	61.12	>0.05
Low	303	40.23	255	38.87	>0.05

Table 2: Comparison of survival outcomes of sick neonates according to facility type.

Outcome	Good	Poor	Total	P value
Government	534 (70.91%)	219 (29.08%)	753	<0.05
Private	569 (86.73%)	87 (13.26%)	656	

It can be observed that out of 753 neonates in Government setting, majority 434 (57.63%) were out-born and the inborn newborns were 319 (42.36%) only. In contrast to this, the inborn neonates 441 (67.22%) outnumbered the out-born babies 215 (32.77%) in Private sector. The difference in the mode of admission in both the groups was significantly different (p<0.05).

In the Government setting, it was seen that the term neonates constituted 509 (67.59%) while the pre-term babies were 244 (32.40%). In the Private sector also, the term neonates 426 (64.93%) were more than pre-term neonates 230 (35.06%). The difference in gestational age across the two groups was statistically insignificant (p>0.05). In Government setting, 450 (59.76%) neonates had normal weight at the time of admission while 303

(40.23%) babies had low weight for their age. In Private sector also, similar distribution was observed. The babies with normal weight for age were 401 (61.12%) while low weight babies constituted 255 (38.87%). The difference across the two groups was statistically insignificant (p>0.05).

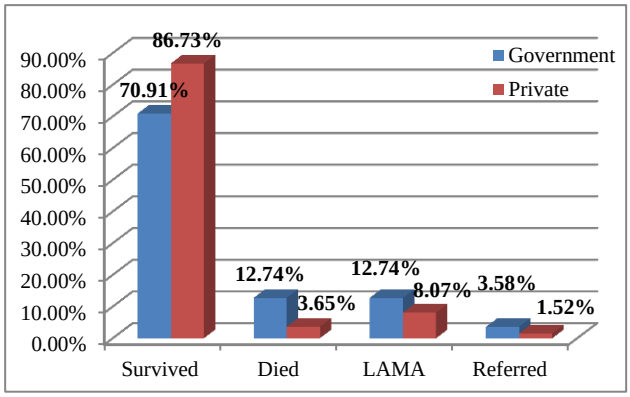

Figure 1: Comparison of survival outcome between government and private sector.

The Private NICU had a better survival percentage (86.73%), less deaths (3.65%), less LAMA (8.07%) and less referrals (1.52%) as compared to Government NICU (Figure 1).

The outcome was different between the Government and Private NICUs which was statistically significant. The logistic regression model was applied to minimize the confounding effects and assess the survival outcome with respect to facility type and other variables under study. The outcome was 2.7 times better in Private NICU than Government NICU (Table 3).

On regressing, it was found that the survival outcome differed significantly with the facility type, age at admission, gestational age and mode of admission.

The outcome was better in neonates admitted within 1-7 days of birth than those admitted within 24 hour of birth. The effect of gender and community on survival outcome was not significant statistically. The outcome was better in term and the inborn neonates as compared to preterm and outborn babies.

Table 3: Logistic regression model on variables under study in terms of survival outcome of sick neonates.

Variables	Total	Good outcome	Poor outcome	Adjusted odds	95% CI	P value
Facility type						
Government	753	534	219	1	1.991-3.844	0.000
Private	656	569	87	2.767		
Gender						
Male	755	610	145	1	0.644-1.134	0.276
Female	654	493	161	0.854		
Age at admission						
<1 day	837	634	203	1	1.121-3.637	0.019
1-7 days	465	378	87	2.019	0.835-2.862	0.165
>7days	107	91	16	1.546		
Community						
Rural	692	486	206	1	0.823-1.552	0.448
Urban	717	617	100	1.130		
Gestational age						
Term	935	794	141	1	0.239-0.430	0.00
Preterm	474	309	165	0.321		
Mode of admission						
Inborn	760	669	91	1	0.262-0.489	0.00
Outborn	649	434	215	0.358		

DISCUSSION

The study was unique in its kind that it was conducted in both Government and Private NICUs of urban Allahabad. The profile of sick neonates admitted in both NICUs were studied and the outcome was then compared. In the present study, majority 837 (59.4%) of the sick neonates were admitted within 24 hour of birth followed by 465 neonates (33%) who were admitted within 7 days of birth. Rest 107 (7.6%) neonates were admitted after a week of birth. When observed separately in Government and Private NICU, it was found that in Government NICU, 476 (63.21%) were admitted within 24 hour of birth, 225 (29.88%) within 7 days of birth and 52 (6.90%) neonates after 7 days of birth. In Private NICU, 361 (55.03%) were admitted within 24 hour of birth, 240 (36.58%) within 7 days of birth and 55 (8.38%) after 7 days of birth. Ali et al found that the higher proportion (51.3%) of neonates was admitted within first 24 hour.[13] Butt et al reported 45.3% admissions in first 6 hour of life.[14] Seyal et al in a study in neonatal unit of Sir Gangaram Hospital, Lahore observed that 67.9%

admissions were within first 24 hour of life.[15] However, Begum et al reported 81.30% admissions within first 24 hour of life.[16] The higher proportion of admissions within 24 hour followed by 1-7 days may be due to the higher vulnerability of sick neonates within 24 hour of birth. The proportion of patients admitted after 7 days of life declined in both the sectors. Majority of the admitted neonates were males followed by females in both Government (55.64%) and Private NICU (51.21%). The reason could be because the females are physiologically stronger than males to resist the changes.

It was observed that the Government NICU had more 482 (69.01%) patients from rural than urban 271 (35.98%) areas and in Private NICU the urban patients were more 446 (67.98%) than rural 210 (32.01%) areas. Salve et al studied the morbidity pattern of neonates admitted a tertiary care hospital, Dr. S.C. Government Medical College, Nanded, Maharashtra and observed that the 76% neonates were from rural areas and only 24% from urban areas.[17] The difference in the Government and Private NICU could be due to the affordability issues. However, the Private NICU was visited more by people from the urban areas. The patients received in Government NICU usually were cases referred from PHCs or CHCs in Government NICU, while Private NICUs had more urban patients as urban people are more aware and vigilant of the complications. The out-born 434 (57.63%) were more than inborn 319 (42.36%) in Government NICU. In Private NICU, the inborn babies were more 441 (67.22%) than outborn 215 (32.77%). This difference in modes of admission could be due to the different health care sectors. The Government NICU had more outborn babies as it is a tertiary health care and receives more referrals from peripheral facilities. Also, the rural population availed services more than urban community in Government set up, and the patients were outborn and are referred in cases of emergencies in Government sector. While most (67.22%) of the babies were inborn in Private sector and were immediately shifted to NICU as the need arrived. Rakholia et al studied the demographic profile and morbidity-mortality pattern at sick newborn care unit (SNCU), Uttarakhand and observed that the outborn neonates (53.54%) outnumbered the inborn ones (46.46%).[18] It was noted that there was a similar pattern of distribution according to the gestational age of neonates and the difference was insignificant.

The neonatal survival outcome at the time of discharge was assessed. It was observed that the outcome was significantly different in both the centres. The outcome was good in 70.91% cases of Government NICU while in Private NICUs it was 86.73%. The death was 12.74% in Government hospital while it was 3.65% in Private hospital. The LAMA was 12.74% in Government while 8.07% in Private hospital. The referral was higher (3.58%) in Government than Private NICU (1.52%).

The Government NICU is a tertiary level referral hospital and receives referrals from peripheral health centres so the neonates admitted are quite seriously morbid and critical. Despite the best possible efforts, such neonates do not improve and dies. This could be the factor for higher mortality in Government NICU. On the other hand, the Private NICU has more cases from urban areas and therefore the time to reach the hospital is less. Also, the inborn neonates were more in Private hospital, therefore the urgent interventions could be performed at the earliest. This could be the reason for lesser deaths than Government NICU.

The LAMA and referrals were also recorded to be higher in Government NICU than Private NICU. The referral was made in Government NICU for complicated medical and surgical disorders like Rh incompatibility, congenital heart defects, neural tube defects etc. In Private NICU, less referral was reported because many serious cases got referred from OPD directly without getting admitted in NICU. So the true referral could not be assessed. Begum et al at Sir Salimullah Medical College and Mitford Hospital, Dhaka, Bangladesh, the survival was 70.4% and 13.7% LAMA which is comparable to the findings of Government NICU of the present study.[16] Butt et al studied the pattern of neonatal admissions in Neonatal Unit of Services hospital, Lahore and reported 75.03% survival at the time of discharge.[14]

They reported 20.98% deaths and 3.99% LAMA.

CONCLUSION

It can be concluded that the profile of sick neonates admitted in Government and Private NICU varied significantly in terms of age at admission, community and mode of admission. The outcome was significantly poor with the admissions within 24 hour of birth, outborn, preterm and government sector. The private NICU had a better survival outcome of sick neonates than Government NICU. The outcome was good in 70.91% cases of Government NICU while in Private NICU, it was 86.73%.

Recommendations

The transportation facility should not merely be provided but also to be ensured the presence, at peripheries to reduce the time gap in reaching NICU and acting quickly in golden times of the sick neonates. The peripheral health facilities should be strengthened to tackle with the life saving measures and provide necessary pre-referral treatment.

ACKNOWLEDGEMENTS

We would like to thank Dean, Smt. Kashibai Navale Medical College and General Hospital, Narhe, Pune.

Funding: From UNICEF
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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Cite this article as: Dwivedi K, Prakash S, Parveen K, Shaikh S. Survival outcome of neonates admitted at government and private neonatal intensive care units of Allahabad, India. Int J Community Med Public Health 2017;4:2389-94.