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Newborn Health Status and Update: A Three Years' Experience at Level II Care in Bangladesh

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Abstract

District level healthcare serves as a nexus between community and district level facilities. To identify the main causes of neonatal morbidity and mortality was carried out at the Special Care Newborn Unit (SCANU) of the Department of Paediatrics, 250 bedded General Hospital, Tangail for a period of 3 years from January 2017 to December 2019. A total of 3745 neonates were included in this cohort. The ratio of male and female neonates was 1.5:1. Most of the babies were born outside in this hospital. Around 70% newborn were admitted within 24 hours of life. Most of the newborn were premature (62%). Among the premature baby, kangaroo mother care was provided 38%. Among all admitted patients, average 62.6% (56% to 70%) were discharged to home, average 7.3%, (6% to 10%) admitted newborn were referred to higher Centre, average eight point three percent (8.3%) left hospital against medical advice and death occurred twenty-point six percent (20.6%). There were 914 neonatal deaths during the three-year period. The neonatal mortality rate was 24.4%. Prematurity/low birthweight and its complication (43.3%), Birth asphyxia (30%), sepsis/meningitis (19%), congenital anomalies (5%) were the major direct causes of death. Prematurity/low birthweight and its complication was the single largest category of cause of death in the neonatal period. Outcome of newborn was improving substantially, but neonatal sepsis is a great threat to sustain and improving health status. Challenges regarding infrastructure, skills, working settings all need to be addressed and upgraded to ensure effective coverage of newborn status.

Keywords: Newborn; Health status; Bangladesh

Introduction

The number of child deaths worldwide has declined markedly in recent decades, largely through interventions to lower mortality after the first month of life. The mortality rate among children under-5 years of age has fallen globally by almost 50% (from 90 deaths per 1 000 live births in 1990 to 48 deaths per 1000 live births in 2012), but the neonatal mortality rate decreased only 37% (from 33 deaths per 1 000 live births to 21 deaths per 1 000 live births) over the same period and represented 44% of the total child mortality [1]. Annually, 15 million babies are born prematurely (20) and 32.4 million with a weight below the tenth percentile for their gestational age [2]; 10 million do not breathe at birth, of which 6 million require basic neonatal resuscitation (bag and mask ventilation) [3]. Bangladesh has made impressive progress in improving maternal and child health status during MDG Period, now the challenge remains to enhance the momentum of successes to achieve targets of Sustainable Development Goals. The under-5 mortality

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rate has declined gradually over the last 2 decades. The global annual average rate of reduction in neonatal mortality since 1990 has been 2.0%, lower than that of maternal mortality (2.6%) and under-5-year old mortality (2.9%) [1]. However, the decline has slowed noticeable last couple of year. Also, infant and neonatal mortality have remained stable (stagnant) during this period. Most newborn deaths occur in low- and middle-income countries. Two thirds of all neonatal mortality are reported from 12 countries, six of which are in sub-Saharan Africa. The neonatal mortality rate is 30 deaths per 1,000 live births; it accounts for 67% of all under-5 deaths whereas infant mortality rate is 38 deaths per 1,000 live births, Under-5 mortality 45 deaths per 1,000 live births and the child mortality rate is 7 deaths per 1,000 children [4]. It has been estimated that about 70% of neonatal deaths could be prevented if proven interventions are implemented effectively with high coverage [3]. It was further estimated that health facility-based interventions can reduce neonatal mortality by 23-50% in different settings. Facility-based newborn care, thus, has a significant potential for improving the survival of newborns [3]. More than 80% of all newborn deaths result from three preventable and treatable conditions – complications due to prematurity, intrapartum-related deaths (including birth asphyxia) and neonatal infections. Cost-effective, proven interventions exist to prevent and treat each main cause [5]. The updated classification of level of Neonatal care consists of basic care (level I), specialty care (leveII), and subspecialty intensive care (leveIII, level IV) [6]. There was also designing the special newborn care units (SCANUs) at district level or level II care, newborn stabilization units (NSUs) at the first referral units or level I care, and newborn care corners (NBCCs) at all active delivery points in a district [7,8]. Provision of level II care or Special Care Newborn Units (SCANUs) reduce the stagnant NMR across the world especially in this sub-continent. Within 1 year of functioning, there had been a reduction in neonatal mortality rate among admitted cases by 4-40% across the SCANUs. Adherence of the staff to guidelines and protocols, aseptic measures followed in the units were the key determinants of the performance of a unit. However, a reversal of trend in the decline has been observed in some units in the second year of its functioning. Quality care of SCANU also directly depends on adequate number of functional equipment and drugs. SCANU or secondary level care can impact facility-based NMR by providing a good network of functional newborn care corners (NCC) at every site of delivery, neonatal stabilization units (NSU) at primary level, and neonatal intensive care units (NICU) at tertiary level is essential to reduce NMR at the population level. This study was to evaluate newborn health status and current challenges at Special Care Newborn Unit (SCANU) in level II care hospital.

Materials and Methods

This hospital based cross sectional study was carried out into this Special Care Newborn Unit (SCANU) of Department of Pediatrics, at 250 bedded general hospital Tangail, Bangladesh, for a period of 3 year from January 2017 to December 2019. All neonates admitted into SCANU were included in this study. Patients who were transferred to SCANU for resuscitation and those who were improved and died within six hours excluded in this study.

Special Care Newborn Unit (SCANU) provides care to Newborns that are moderately ill with problems that are expected to resolve rapidly**.** This SCANU combined advanced technology and trained health care professionals to provide specialized care for the babies. This Special care Newborn unit (SCANU) of Improving Effective coverage of Maternal, Neonatal and Child health Service to Reduce Preventable Child Death (IECMNCH) project, under Department of Pediatrics is implementing through Government which is technically supported by UNICEF. There are 20 bedded in this SCANU. There were recommended 50-55 square feet per bed available for baby care.

The equipment's were donated by the UNICEF during the initial phase of setting up. In the due course of time, the responsibility of maintenance and repair of equipment got transferred to the local government. Most of major equipment's have crossed their average a shelf life (average 6 years) beyond which they need replacement. There was not an adequate number of functional baby warmers and phototherapy units during this period of time. All healthcare professional like doctors, nurses and word boy were doing their duties according to departmental policy (Table 1).

All Newborn initially admitted into neonatal ward, then transferred to SCANU if patient became deteriorating which was assessed by medical officer or consultant under pediatric department.

Data were recorded from medical record section of hospital where regularly updated by trained medical officer and senior stuff nurse. At the SCANU all diseases were diagnosed by Neonatologist and Pediatrician through clinical examination and also with investigation support. Permission was taken by hospital authority.

Results

A total of 3745 neonates were included in this cohort. The ratio of male and female neonates was 1.5:1. Most of the babies were born outside in this hospital. Around 70% newborn were admitted within 24 hours of life. Most of the newborn were premature (62%). Figure 3 showed, among the premature and low birth baby, Kangaroo Mother Care (KMC) was provided average 38%, ranging from (18% to 54%). Among all admitted patients, average 62.6%

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(56% to 70%) were discharged to home, Average seven percent (7.3%), ranging 6 to 10% admitted newborn were referred to higher Centre, eight percent (8.3%), ranging from 8% to 9% left hospital against medical advice and death occurred twenty-point six percent (20.6%), ranging from 14% to 25% [Figure 4] There were 914 neonatal deaths during the three-year period. The neonatal mortality rate was 24.4%. Prematurity/low birth weight and its complication (43.3%), Birth asphyxia (30%), sepsis/meningitis (19%), congenital anomalies (5%) were the major direct causes of death [Figure 5]. Prematurity/low birth weight and its complication was the single largest category of cause of death in the neonatal period.

Table 1: Distribution of patients of three-year bed maintenance.

	2017	2018	2019
Total Bed	20	20	20
Functioning Bed(average)	17-18	15-16	41913
Available local Engineer	Nil	Nil	Nil
*Maintenance of Equipment	Satisfactory	Not satisfactory	Not satisfactory
Bed occupancy rate	0.84	0.91	0.748
Number of doctors	2	4	3
Doctor: patient	0.048611111	0.045138889	0.045833333
Number of nurses	10	10	10
Nurse: patient	1:2.5	0.00072338	0.00072338
Number of ward boy	3	4	2
Number of aya	4	3	3
Satisfactory = Maintenance within 3-6 months Non-satisfactory= Maintenance more than 4-6 months			

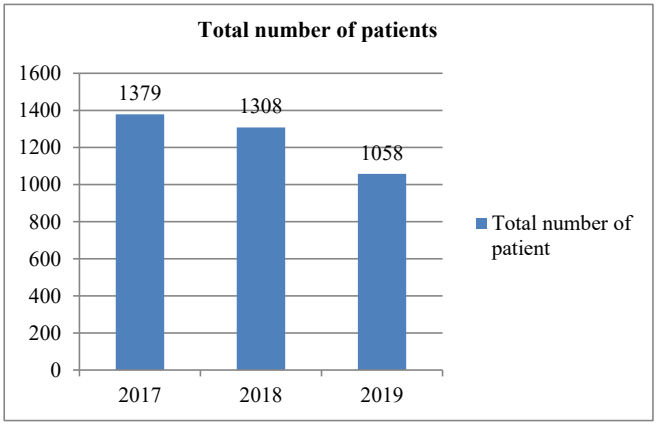

Figure 1: Number of patients admitted in last three years at SCANU.

Table 2: Profiles of admitted newborns to SCANUs in 3 years study period.

	2017	2018	2019
Number of patients	1379	1308	1058
Male: Female	2.527777778	2.527777778	2.609722222
Inborn: Out born	26:74	25.5:74.5	21.7:78.3
Term: Preterm	36:64	40:60	37:63
LBW: Normal birth weight	2.363888889	2.404861111	2.404861111
LBW:			
<1000g	42 (3%)	32 (2.4%)	21(2%)
1000-<1500g	248 (18%)	218 (17%)	142 (13%)
1500-<2500g	496 (36%)	496 (38%)	401 (38.5%)
2500-<4000g	579 (42%)	541 (41%)	480 (45%)
>4000g	14 (1%)	21 (1.6%)	17 (1.5%)
Gestational age:			
<28 weeks	28 (2%)	18(1.4%)	21 (2%)
28-32weeks	152 (11%)	179 (14%)	53(5%)
33-34 weeks	193 (14%)	232 (18%)	125 (12%)
35-<37weeks	524 (38%)	341 (26%)	410(39%)
37-42 weeks	483 (35%)	530(40%)	443(42%)
>42weeks		6(0.6%)	7 (1%)
Day of admission:			
0-24 hours	841 (61%)	995 (76%)	749(71%)
1-3 days	248 (18%)	89 (7%)	72 (7%)
3-7 days	138 (10%)	93(7%)	97 (9%)
7-28 days	152 (11%)	130 (10%)	101 (13%)
KMC (Kangaroo mother care)	141(18%)	313(42%)	305(54%)
Hospital stay(average)	4.2 days	5 days	5.2 days
Bed occupancy rate	73-99%	82-96%	62-83%

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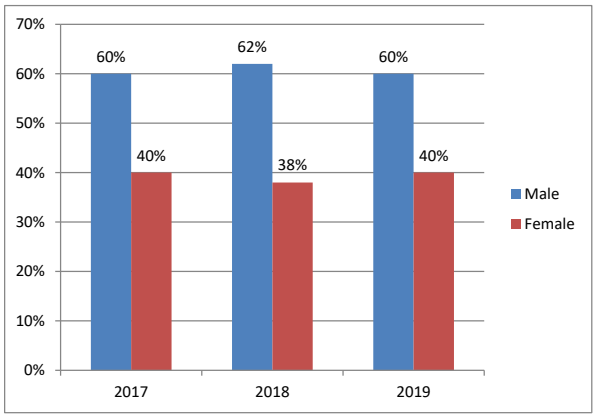

Figure 2: Gender distribution.

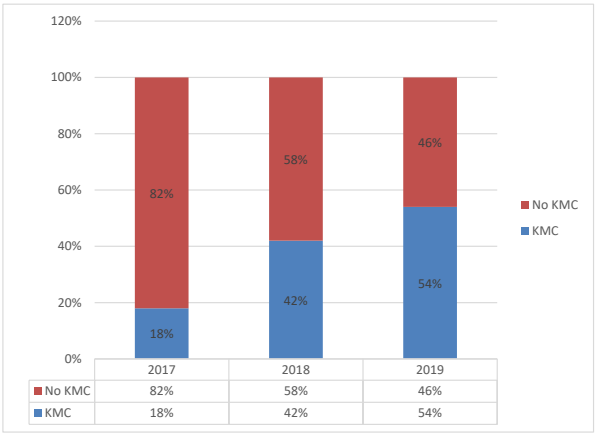

Figure 3: Kangaroo mother care.

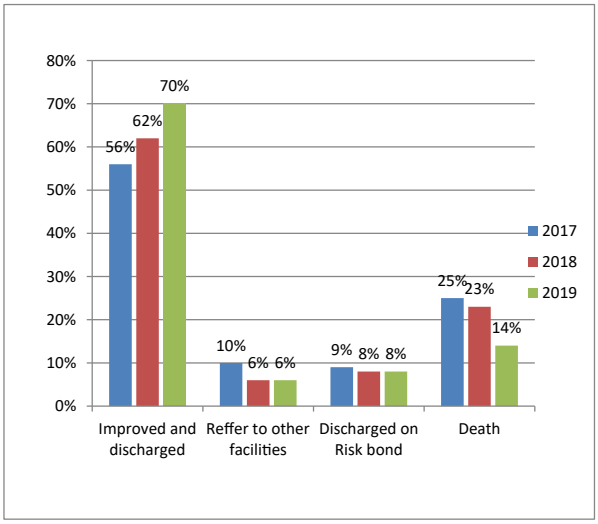

Figure 4: Outcome of Newborn admitted in SCANU.

Discussion

Though there was total number of admissions 3745 of neonate in this SCANU, it was <10% of total newborn admission in this hospital. Number of patients admitting in this SCANU was declining gradually. There were several

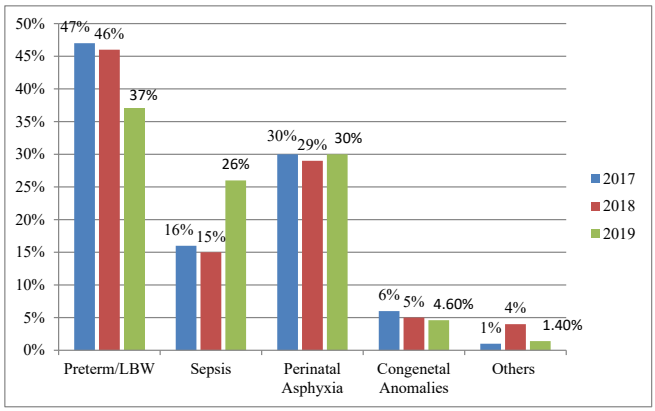

Figure 5: Proportional mortality rate of different diseases.

factors that affected the admission rates. Most important factors were trying to increase protocol-based treatment as well as non-functioning of radiant warmer and less response to equipment maintenance team. The total number of beds was 20. However, the requirement was far more than the number existing currently. The initial calculation of the number of beds was done based on the number of births at the time of setting up the unit. There are recommendations that at least 50 square feet per bed should be available for baby care and another 50 square feet bed for ancillary space [5]. Only two units complied with these recommendations. Initially nurses were posted here exclusively providing through UNICEF, later on supported by government of Bangladesh. Three (3) doctors were posted exclusively for the SCANUs. Occasionally doctors had to manage outdoor/indoor patients and had to attend to pediatric emergency duties, in addition to managing the SCANUs. There is a smaller number of nurses and doctors are providing services in this center. In the evaluation undertaken, bed occupancy rate ranged from 60% to 100%. The bed occupancy rate also indicated the burden on the service care since each baby requiring admission in the SCANU would need special attention. High bed occupancy resulted in sharing of beds by 2-3 babies in some instances. The reasons for low bed occupancy were related to increased dysfunction of radiant warmer and shortage of staff. Besides these, number of other parameters like average length of stay, proportion of babies requiring special care and proportion of low birth weight infants should also be considered for calculating bed strength per unit [9,10]. The average duration of stay in the surveyed units ranged from two days to 25 days (average 5 days). Shortage of basic equipment's and supplies such as resuscitation equipment (including warmer machine), oxygen delivery systems and feeding tubes contributed to poor perinatal care [11] (Table 1). An increase in the number of beds by 30-50% in the existing units can address much of the problem, though it will lead to a proportionate increase in infrastructure and resources and finally would add to the cost. This study finding is consistent with other studies [9,12]. Among the admitted patients, male female ratio was 3:2. Male

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newborn are more vulnerable during the neonatal period, and biological survival of girls in the neonatal period [9,13]. Around three-fourth of admitting patient admitted outside from hospital. This is the only secondary level hospital in this district, home delivery rate in Bangladesh is a pertinent factor for this [14], and also developing private clinic here and there. Sridhar et al. [15] showed in their study where 71% neonates were inborn and rest was out born babies (28.29%). Most of the babies admitted with low birth weight. Normal to low birth weight ratio were 56.6:43.4. Majority of newborn admitted within 24 hours of life because of the transitional period from intrauterine to extra uterine life hence it could be explained [10,12]. Around 80% of total admission occurred with first week of life. Ike Elizabeth et al. [16] also found 90% patients were admitted within 7 days of life [13,16]. Another study reported that the first 24 hours are the most dangerous of a child's life that carry the highest risk of death [14,17]. Kangaroo mother care was given this study population. Among preterm and low-birth weight (<2000kg) newborns, the clinical efficacy and health benefits of KMC has been widely demonstrated in multiple settings [18,20]. However, implementation of KMC has been inconsistent across different health systems with several factors affecting its adoption, including availability of health workers and resources, absence of health worker training, and lack of government support [19,20]. In 2014, the World Health Assembly was endorsed Plan to envisages scaling up kangaroo mother care (KMC) to 50% of babies weighing under 2000 g by 2020, and to 75% by 2025 [21]. However, It was a new concept to familiarize gradually in these developing SCANU. KMC was given in this facility's and improving from 18% to 54% in last three years. Out of 3745 admitted patients, average 62.6% were discharged to home. Average seven percent (7.3%) admitted newborn were referred to higher Centre and eight percent (8.3%) left hospital against medical advice mostly due to financial causes. Among all admitted newborn, death occurred twenty-point six percent (20.6%). All the variables of newborn outcome are gradually getting better which signify improvement of quality of newborn care. There were four leading causes included; septicemia, prematurity and LBW, birth asphyxia and congenital anomalies which are largely consistent with the global pattern of neonatal mortality [11]. The proportion of death attributable to each cause varies from center to center. Prematurity and low birth weight and its complication is the leading cause of morbidity as well as mortality [17]. In this study, newborn mortality rate among preterm, low birth weight and its complications ranging from 37% to 47%. Low Birth weight was associated with preterm neonatal mortality was much higher incidence (34.6- 48.2%) has been reported others study in our country as well as from other countries [9,22]. Infections in newborn are the commonest cause of neonatal mortality along with Perinatal asphyxia and consequence of Prematurity & Low birth weight (LBW) in Bangladesh [23]. Newborn mortality related to sepsis was ranging from 15% to 26% in this study period which was increasing trends. This study finding is similar to that of other studies where 20% of all children born in developing countries developed an infection during the neonatal period and infectious diseases deaths [24,25]. In the present study, birth asphyxia related mortality was around 30%. It was consistent with other studies. Another study showed, perinatal asphyxia is the first leading cause of neonatal mortality that constitutes 34% followed by preterm birth (25%) [26]. Bangladesh demographic and health survey 2018 showed, birth asphyxia related mortality was 22% [14]. Another most important cause of newborn death is congenital anomalies which is account almost 5% in this study duration. WHO reported in 2004 where about 7% of all neonatal deaths were caused by Congenital anomalies [27]. BDHS 2018 proved the leading cause of infant death was due to congenital anomalies accounting for 12% of all neonatal deaths. The proportion of neonatal deaths due to congenital anomalies has been increasing as a result of reduction of mortality due to other causes as well as exposure to various etiologic agent and emphasis on increasing survey worldwide on its.

Conclusion

This study concluded that most of the admitted baby were premature and low birth weight. Therefore, the outcome of newborn health status was improving substantially. Though prematurity and its complications were the leading cause of mortality but septicemia is a great threat to control to improve newborn health. Special care newborn services are quality care of multifactorial origin. There are great challenges such as, insufficient infrastructure, inadequate skills, unfavorable working settings and, ineffective clinical supervision, and mentorship all need to be addressed and upgraded to ensure effective coverage of newborn status.

Recommendation

An active link of NCC, NSU and SCNU Could be rationalize admissions of sick newborns in appropriate units. Challenges should be made to have functional newborn care corners at every site of delivery. To improving newborn health status or reducing the number of neonatal deaths entail not just health/technical intervention but political assurance, uniform referral system, endure health programs combined with other socioeconomic development activities for the population that facilitate individual and community.

Data sharing statement

Data is available from the corresponding author upon reasonable request.

Publication Consent

We received proper patient written informed consent to participate in this study.

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Disclosure

The authors report no conflicts of interest in this work.

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