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Where technology does not go: specialised neonatal care in resource-poor and conflict-affected contexts

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Setting: Although neonatal mortality is gradually decreasing worldwide, 98% of neonatal deaths occur in low- and middle-income countries, where hospital care for sick and premature neonates is often unavailable. Médecins Sans Frontières Operational Centre Brussels (MSF-OCB) managed eight specialised neonatal care units (SNCUs) at district level in low-resource and conflict-affected settings in seven countries.

Objective: To assess the performance of the MSF SNCU model across different settings in Africa and Southern Asia, and to describe the set-up of eight SNCUs, neonate characteristics and clinical outcomes among neonates from 2012 to 2015.

Design: Multicentric descriptive study.

Results: The MSF SNCU model was characterised by an absence of high-tech equipment and an emphasis on dedicated nursing and medical care. Focus was on the management of hypothermia, hypoglycaemia, feeding support and early identification/treatment of infection. Overall, 11 970 neonates were admitted, 41% of whom had low birthweight (<2500 g). The main diagnoses were low birthweight, asphyxia and neonatal infections. Overall mortality was 17%, with consistency across the sites. Chances of survival increased with higher birthweight.

Conclusion: The standardised SNCU model was implemented across different contexts and showed in-patient outcomes within acceptable limits. Low-tech medical care for sick and premature neonates can and should be implemented at district hospital level in low-resource settings.

Over the past decades, there has been remarkable progress in reducing childhood mortality: between 1990 and 2015, a 58% reduction in post-neonatal, under-five mortality was reported, while neonatal deaths had decreased by 47%.[1] In 2015, there were 2.7 million neonatal deaths worldwide, of which 98% occurred in low- and middle-income countries.[1] Further reductions in neonatal mortality in high-burden countries are contingent on addressing socio-economic determinants of health and strengthening the continuum of care during pregnancy, delivery and the postnatal period.[2,3] Another element in the reduction of neonatal mortality is providing essential medical care for sick and premature neonates at health facilities.

Medical care for neonates worldwide is provided in very different types of facilities. Highly specialised neonatal intensive care units (NICUs) are available in high-income and some middle-income countries; these offer high-technology care, including mechanical ventilation and incubators. Conversely, specialised neonatal care units (SNCUs) are characterised by the absence of high-tech equipment, but have dedicated nursing staff and offer supportive care such as feeding assistance and some low-tech treatments such as oxygen and phototherapy. In most low-income countries, even this level of care is not available for sick and/or premature babies.[4] There are descriptions of SNCUs and outcomes of their patients in resource-limited, but mostly stable, settings.[5–8]

Around 2009, Médecins Sans Frontières Operational Centre Brussels (MSF-OCB), an international non-governmental organisation providing humanitarian aid and free medical assistance to populations in distress, started offering specialised neonatal care in resource-limited settings, and has increased this activity over time. MSF-managed SNCUs are integrated into district or regional hospitals: some are located in conflict settings, and most operate in remote areas where no other supporting health actors are present. The set-up of these units has been described in detail elsewhere.[9,10] Despite the differences in contexts, the care package offered is similar across all SNCUs. Patient management is carried out in accordance to standardised MSF-OCB neonatal guidelines, and paediatric guidance is provided by the MSF Headquarters. Patient data are collected and managed using a standardised e-database, allowing comparisons across sites.

The present study aimed to assess, for the first time, whether this standard package of specialised neonatal care, implemented in different settings in sub-Saharan Africa and Southern Asia and integrated into different types of hospitals, performed equally well across the different contexts. Specific objectives were to describe 1) the set-up of the SNCU, 2) clinical and demographic characteristics of admitted neonates per birthweight category, and 3) facility exit outcomes per birthweight category and SNCU.

STUDY POPULATION, DESIGN AND METHODS

Study design

This was a multicentric descriptive study of eight MSF SNCUs in resource-limited settings.

Setting

General setting

The countries where MSF works are often coping with manmade or natural disasters and have poor health

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TABLE 1 Specific characteristics of eight MSF specialised neonatal care units

Project site, country	Project setting	Beds in neonatal unit *n*	Referral strategy
Khost, Afghanistan	MSF private comprehensive emergency obstetric and neonatal care stand-alone hospital Chronic armed conflict Catchment area ≈538 000 people (Neonatal data December 2012–December 2015)	14	Once the bed capacity was exceeded, sick and premature babies were referred to the MoH district hospital Occasional referral of neonates with surgical conditions to the tertiary hospital in the capital
Timurgara, Lower Dir District, Pakistan	MSF-supported MoH district hospital Post conflict Catchment area ≈1 120 000 (Neonatal data April 2014–December 2015)	10	Neonates who were severely sick could be referred to the tertiary care hospital (3–4 h driving distance)
Bangui, Central African Republic	MSF-supported inner-city health centre Civil war Catchment area ≈800 000 (Neonatal data January 2015–December 2015)	30	Neonates with surgical conditions were referred to the university hospital
Bangassou, Mbomou Prefecture, Central African Republic	MSF-supported regional hospital Civil war Catchment area ≈142 000 (Neonatal data January 2015–December 2015)	17	No referral options
Gondama Referral Center, Bo District, Sierra Leone	MSF private paediatric and obstetric referral hospital Secure post-conflict setting Catchment area ≈600 000 (Neonatal data January 2012–October 2014)	12–17	Neonates with surgical conditions were referred to a private, non-profit hospital in the capital
Guidan Roumdji, Maradi Region, Niger	MSF-supported MoH district hospital Secure but remote setting Catchment area ≈500 000 (Neonatal data January 2012–November 2015)	28	Neonates with surgical conditions were referred to the regional hospital
Masisi, North Kivu, Democratic Republic of Congo	MSF-supported MoH district hospital Chronic armed conflict Catchment area ≈377 000 (Neonatal data January 2012–December 2014)	10–15	Neonates with surgical conditions were referred to the regional hospital
Kabezi Rural, Bujumbura Province, Burundi	MSF-supported district hospital Post conflict and remote setting Catchment area ≈458 000 (Neonatal data January 2012–August 2013)	12–17	Neonates with certain surgical conditions were referred to a tertiary hospital in the capital if space was available

MSF = Médecins Sans Frontières; MoH = Ministry of Health.

indicators. MSF also often provides health care in remote areas, where national health systems struggle most and where no other medical actors are present. Whereas in the past emphasis on mother-and-child health activities was placed on maternal survival and reducing post-neonatal mortality, neonatal health has received increased attention in recent years, and SNCUs have been set up progressively.

Specific settings

The eight study SNCUs were integrated into district or regional hospitals that were run or supported by MSF. They were situated in seven different countries in either acute or chronic conflict or in a post-conflict situation. Afghanistan and Pakistan have been suffering from chronic conflict of varying intensity for many decades. Burundi and Sierra Leone have a history of civil war that has strongly affected their health systems. Central African Republic is in its fourth year of overt civil war, and North Kivu, in Democratic Republic of Congo, also remains a site of open conflict. The Niger programme was the only one not confronted by conflict, but it was situated in an extremely remote and completely underserved region. More details are provided in Table 1.

Low-tech specialised neonatal care unit

An SNCU is a separate unit where sick and/or preterm neonates (aged 0–28 days) receive specialised medical care. The medical staff consists of skilled, trained non-specialised nurses and medical doctors. Some of the units have a paediatrician who is intermittently present. None of the eight neonatal units have continuous positive airway pressure (CPAP), invasive mechanical ventilation, electronic monitoring, surfactant therapy or incubators. Some of the units accept

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TABLE 2 General characteristics of MSF specialised neonatal care units

Setting	Care units that provide care for sick and preterm neonates with nurses who are dedicated to that unit All units were adjacent to comprehensive emergency obstetric and neonatal care centres. MSF ran or supported all but one (Guidam Roumdji, Niger) maternity departments. MSF assured patient care free of any charge, adequate human resources, capacity building and supplies of drugs and medical materials. Delivery room staff were trained in neonatal resuscitation according to the Helping Babies Breathe algorithm. In case of preterm labour, maternal antenatal steroids were administered. Maternal antibiotics were administered in case of risk factors for infection or manifest infection Surgical services for neonates were not routinely available
Human resources	General nurses, nurse assistants and medical doctors striving for the following ratios: 1 nurse: 5–10 patients day and night 1 nurse assistant: 5–10 patients day and night 1 physician: 20 patients during the day, on call at night Intermittent presence of a paediatrician in some units
Diagnostics	Haemoglobin, glycaemia, malaria rapid tests, syphilis rapid tests White blood cell counts with differential and inflammatory biomarkers (such as C-reactive protein) not routinely available. HIV rapid tests were available for testing mothers. Provider-initiated HIV testing in the delivery room of previously untested mothers was performed in some of the African contexts with different timelines of implementation
Monitoring	Pulse oxymeters
Oxygen	Oxygen concentrators; oxygen is administered by mask or nasal prongs
Warming devices	Warming mattresses, radiant heaters Kangaroo mother care/skin-to-skin care was integrated in all units
Fluid management	Intravenous fluids Alternative feeding methods, such as nasogastric tube feeding, double-suctioning, cup and spoon feeding
Treatment of infection	Intravenous antibiotics: ampicillin, gentamycin, cefotaxime, ceftriaxone, metronidazole, cloxacilline
Treatment of convulsions	Phenobarbital
Treatment of apnoea	Caffeine
Treatment of anaemia	Blood transfusions, iron by mouth
Resuscitation	Bag and mask ventilation, cardiac compression, adrenaline
Treatment guidelines	MSF-OCB neonatal guidelines

MSF = Médecins Sans Frontières; HIV = human immunodeficiency virus; MSF-OCB = MSF-Operational Centre Brussels.

only neonates born in the same facility, whereas others accept neonates born in other health facilities or coming from their homes. The general characteristics of these units are described in Table 2.

Patient population

All neonates admitted and registered in the eight MSF SNCUs between 2012 and 2015 were included in the study. The neonates were divided into four groups according to birthweight: normal birthweight (≥2500 g), low birthweight (LBW, 1500–2499 g), very LBW (VLBW, 1000–1499 g) and extremely LBW (ELBW, <1000 g).

Data variables, data collection and source of data

The variables collected on the neonates included sex, place of birth, resuscitation at birth, main diagnosis and outcomes (cured, left against medical advice, non-respondent and referral) by birthweight category and facility. Gestational age was not routinely assessed. Apgar scores at delivery were assessed, but were deemed unreliable. The principal diagnosis was assigned by the clinician at facility exit.

Data were single-entered from the patient files into the standardised Excel-based routine database (Microsoft, Redmond, WA, USA) by trained data encoders. Data inconsistencies were observed over the different study sites. As this is not abnormal when using routinely collected data, the data were cleaned by the researchers, as inconsistencies could not be cross-checked with the original patient files.

The following corrections were applied:

- Patients for whom the principal investigator observed clinically impossible differences between birthweight and weight at exit were re-classified as 'birthweight not recorded'.
- Neonates with a birthweight of <1500 g who had been classified as 'discharged cured' were scrutinised by the principal investigator for accuracy: the outcome was reclassified as 'discharged with poor prognosis' when length of stay and/or weight gain were considered insufficient to offer a realistic chance of survival. Neonates classified as non-respondent by the discharging clinician were also grouped into this category.
- Low birthweight superseded other diagnoses in the ELBW and VLBW groups. However, in the VLBW group, if in case of death the principal diagnosis was the same as the recorded cause of death, this remained the principal diagnosis. Asphyxia superseded other diagnoses in case of low Apgar scores in combination with provided resuscitation.

Altogether, 1.5% of the total principal diagnoses, 1.4% of the outcomes and 0.4% of the birthweights were corrected.

Data analysis and statistics

Data were extracted from the site-specific neonatal databases and imported into EpiData, version 3.1 (EpiData Association, Odense, Denmark). Analysis was performed using EpiData Analysis software, version 2.2.2.183.

Ethics

Permission for the study was obtained through different Memoranda of Understanding between MSF and the Ministries of Health of the respective countries. The study fulfilled the exemption criteria set by the MSF Ethics Review Board (ERB), Geneva, Switzerland, for a posteriori analyses of routinely collected data, and thus did not require MSF-ERB review. The Ethics Advisory Group of the International Union Against Tuberculosis and Lung Disease, Paris, France, also approved the study.

TABLE 3 Number of neonates admitted according to birthweight class to specialised neonatal care units in eight resource-limited settings, 2012–2015

Project location and country	Birthweight					
	ELBW <1000 g *n* (%)	VLBW 1000–1499 g *n* (%)	LBW 1500–2499 g *n* (%)	Normal ⩾2500 g *n* (%)	Not recorded *n* (%)	Total *n*
Total	192 (2)	944 (8)	3678 (31)	6934 (58)	222 (2)	11 970
Khost, Afghanistan	66 (2)	275 (9)	1044 (35)	1611 (53)	18 (1)	3014
Timurgara, Pakistan	24 (2)	147 (11)	450 (32)	708 (51)	65 (5)	1394
Bangui, CAR	36 (3)	108 (8)	336 (25)	879 (64)	8 (1)	1367
Bangassou, CAR	4 (1)	18 (6)	91 (31)	174 (60)	2 (1)	289
Bo, Sierra Leone	11 (1)	106 (6)	456 (28)	1045 (64)	23 (1)	1641
Guidan Roumdji, Niger	20 (1)	127 (7)	645 (33)	1089 (56)	53 (3)	1934
Masisi, DRC	9 (1)	99 (6)	421 (25)	1149 (68)	4 (<1)	1682
Kabezi, Burundi	22 (3)	64 (10)	235 (36)	279 (43)	49 (8)	649

ELBW = extremely low birthweight; VLBW = very low birthweight; LBW = low birthweight; CAR = Central African Republic; DRC = Democratic Republic of Congo.

RESULTS

Admissions and birthweight

Between 2012 and 2015, 11 970 neonates were admitted across the eight SNCUs. Of all neonates, 31% were LBW (1500–2499 g). VLBW babies (1000–1499 g) comprised 8% of the admissions and ELBW babies (<1000 g) comprised 2% of admissions. VLBW babies represented 12% of all hospitalisation days, and ELBW babies represented 1% of all hospitalisation days. All centres showed a similar trend in weight class distribution, except for the VLBW and ELBW babies, who were slightly overrepresented in Kabezi and slightly underrepresented in Bangassou, Bo and Masisi (Table 3).

Clinical and demographic characteristics

Clinical and demographic characteristics of the admitted neonates are shown in Table 4. The majority (75%) of the admitted neonates were born in the same MSF facility where the SNCU was located, 11% were born in other health structures and 12% were born at home. The proportion of neonates born outside the facility was smaller in the group of ELBW babies.

Resuscitation information was not recorded for 24% of all cases. Of all neonates with resuscitation information, 23% had received resuscitation at delivery and only 2% had received advanced resuscitation, including cardiac massage and/or adrenaline.

The most common principal diagnoses were prematurity/LBW (27%), neonatal infections (21%) and asphyxia (19%). Around half of the neonates had a secondary diagnosis recorded following the same tendency as the first diagnosis (data not shown).

Facility exit outcomes

The majority (70%) of the patients were discharged cured, and 17% died. Other adverse outcomes accounted for less than 6% of all exits, and 7% of patients were referred to other hospitals (Table 5). Survival increased with higher birthweight; there were almost no survivors among ELBW babies (2%). Among VLBW babies, 18% were discharged cured, and among LBW babies survival increased to 70%. Of all babies with a normal birthweight, 80% were discharged cured.

As shown in Table 6, facility exit outcomes were similar across the different settings, except for referrals, which were high in Afghanistan due to limited bed space and the availability of a provincial level referral structure. In sub-Saharan African countries, very few neonates were referred elsewhere.

DISCUSSION

This study describes for the first time the implementation and outcomes of MSF-managed SNCUs across different resource-limited contexts with varying levels of conflict and adversity. Care was provided following the same model, with dedicated trained staff and only low-tech medical care, over eight different sites. Across all centres, outcomes were within acceptable limits, underscoring the feasibility of the implementation of such low-tech SNCUs, regardless of context.

Model of care

In countries where MSF works, SNCUs do not often exist at district level. Care for sick and premature neonates is commonly restricted to NICUs at tertiary-level hospitals. The MSF model of care shifts the emphasis from high-tech approaches to basic quality nursing and medical care. First, it emphasises the basic principles of prevention and management of hypothermia, taking into account that this intervention reduces neonatal mortality and morbidity.[11,12] Techniques used for prevention and treatment of hypothermia include skin-to-skin care and thermal mattresses.[13,14] Second, greater focus is placed on the prevention and management of hypoglycaemia, known to lead to neurological sequelae if left untreated.[15] Feeding support for sick and preterm infants is provided by alternative feeding methods (i.e., spoon or tube feeding) and provision of intravenous fluids when indicated.[16] Another focus of attention is the early recognition of the often non-specific signs of neonatal sepsis and rapid initiation of antibiotic treatment, taking into account the risk of rapid deterioration and high case fatality rate.[17]

There are, however, limits to the level of care that could be provided in SNCUs, in particular for most ELBW and VLBW neonates, who would have needed referral to an NICU where assisted ventilation could be provided. These referral options were, however, almost non-existent, which meant that neonates in need of ventilation support stayed in our SNCU. This contributed to the intra-hospital mortality.

We believe that within this model of care, neonatal outcomes can be further improved with more consistent implementation of skin-to-skin care, better and continued training of nursing and medical staff and closer supervision, and strengthening of intra-partum interventions, such as maternal steroids for preterm labour, and basic newborn resuscitation techniques.

TABLE 4 Clinical and demographic characteristics of neonates in eight specialised neonatal care units in resource-limited settings combined and stratified by birthweight, 2012–2015

	Birthweight					
Characteristics	ELBW <1000 g *n* (%)	VLBW 1000–1499 g *n* (%)	LBW 1500–2499 g *n* (%)	Normal ⩾2500 g *n* (%)	Not recorded *n* (%)	Total *n* (%)
Total	192	944	3678	6934	222	11970
Sex						
Male	91 (47)	459 (49)	1921 (52)	4092 (59)	101 (45)	6664 (56)
Female	99 (52)	481 (51)	1737 (47)	2802 (40)	77 (35)	5196 (43)
Not recorded	2 (1)	4 (<1)	20 (1)	40 (1)	44 (20)	110 (1)
Place of delivery						
MSF facility	165 (86)	725 (77)	2737 (74)	5191 (75)	158 (71)	8976 (75)
Other health structure	12 (6)	116 (12)	397 (11)	743 (11)	23 (10)	1291 (11)
Home	15 (8)	93 (10)	490 (13)	855 (12)	19 (9)	1472 (12)
Not recorded	0	10 (1)	51 (1)	145 (2)	22 (10)	231 (2)
Resuscitation at delivery						
None	103 (54)	594 (63)	2267 (62)	3719 (54)	85 (38)	6768 (57)
Bag and mask ventilation	54 (28)	158 (17)	577 (16)	1318 (19)	35 (16)	2142 (18)
Cardiac massage/ adrenaline	8 (4)	16 (2)	38 (1)	139 (2)	7 (3)	208 (2)
Not recorded	27 (14)	176 (19)	796 (22)	1758 (25)	95 (43)	2852 (24)
Principal diagnosis						
Prematurity/low birth weight	192 (100)	831 (88)	1561 (42)	582 (8)	72 (32)	3238 (27)
Asphyxia	0	24 (3)	534 (15)	1710 (25)	39 (18)	2307 (19)
Neonatal infections	0	50 (5)	665 (18)	1679 (24)	60 (27)	2454 (21)
Congenital infections (TORCH)	0	5 (1)	68 (2)	260 (4)	2 (1)	335 (3)
Congenital malformations	0	3 (<1)	91 (2)	190 (3)	8 (4)	292 (2)
Neonatal tetanus	0	0	2 (<1)	12 (<1)	0	14 (<1)
Antibiotic prophylaxis	0	0	9 (<1)	45 (1)	5 (2)	59 (<1)
Other*	0	31 (3)	663 (18)	2339 (34)	32 (14)	3065 (26)
Not recorded	0	0	58 (2)	70 (1)	4 (2)	132 (1)

*Includes skin infection, omphalitis, congenital malaria, jaundice.
ELBW = extremely low birthweight; VLBW = very low birthweight; LBW = low birthweight; MSF = Médecins Sans Frontières; TORCH = toxoplasmosis, other (syphilis, varicella zoster virus, parvovirus B19), rubella, cytomegalovirus, herpes simplex virus.

TABLE 5 Facility exit outcomes of neonates in eight specialised neonatal care units in resource-limited settings combined according to weight class, 2012–2015

	Birthweight					
Outcome	ELBW <1000 g *n* (%)	VLBW 1000–1499 g *n* (%)	LBW 1500–2499 g *n* (%)	Normal ⩾2500 g *n* (%)	Not recorded *n* (%)	Total *n*
Total	192	944	3678	6934	222	11970
Cured	3 (2)	170 (18)	2560 (70)	5517 (80)	135 (61)	8385 (70)
Adverse outcomes						
Died	154 (80)	468 (50)	638 (17)	756 (11)	28 (13)	2044 (17)
Discharged against medical advice	2 (1)	72 (8)	173 (5)	207 (3)	4 (2)	458 (4)
Discharged with poor prognosis*	5 (3)	87 (10)	31 (1)	15 (<1)	0	138 (1)
Referred	22 (11)	124 (13)	238 (6)	393 (6)	7 (3)	784 (7)
Not recorded	6 (3)	23 (2)	38 (1)	46 (1)	48 (22)	161 (1)

*Discharged alive but hospitalised for too short a time or with too little weight gain for survival.
ELBW = extremely low birthweight; VLBW = very low birthweight; LBW = low birthweight.

TABLE 6 Facility-based exit outcomes of neonates in specialised neonatal care units in eight resource-limited settings, 2012–2015

Project location, country	Cured *n* (%)	Adverse outcomes* *n* (%)	Referrals *n* (%)	Not recorded *n* (%)	Total *n*
Total	8 385 (70)	2 640 (22)	784 (7)	161 (1)	11 970
Khost, Afghanistan	1 871 (62)	629 (21)	512 (17)	2 (<1)	3 014
Timurgara, Pakistan	835 (60)	450 (32)	89 (6)	20 (1)	1 394
Bangui, CAR	1 033 (76)	229 (17)	63 (5)	42 (3)	1 367
Bangassou, CAR	229 (79)	52 (18)	3 (1)	5 (2)	289
Bo, Sierra Leone	1 238 (76)	380 (23)	16 (1)	7 (<1)	1 641
Guidan Roumdji, Niger	1 395 (72)	442 (23)	70 (4)	27 (1)	1 934
Masisi, DRC	1 321 (79)	349 (21)	10 (1)	2 (<1)	1 682
Kabezi, Burundi	463 (71)	109 (17)	21 (3)	56 (9)	649

*Death, discharge against medical advice, discharge with poor prognosis.
CAR = Central African Republic; DRC = Democratic Republic of Congo

Morbidity and mortality

The most common clinical diagnoses in this neonatal cohort were prematurity/LBW, neonatal infections and asphyxia. This distribution was found throughout the eight different SNCUs, and corresponds to descriptions in other settings. Overall, in-hospital mortality was 17%. This proportion is comparable with the scarce data from other SNCUs at district or regional level in low-resource settings. A Ugandan SNCU reported a mortality of 22%,[18] and a Tanzanian SNCU a mortality of 19%.[7] A group from India described how the creation of an SNCU, as opposed to treating neonates in the paediatric ward, in a West Bengal district hospital reduced intra-hospital neonatal mortality from 31% to 25% within 2 years.[19] SCNUs that are supported by other actors showed a reduction in intra-ward mortality: a Mozambican SNCU supported by Collegio Universitario Aspiranti Medici Missionari-Doctors for Africa brought mortality down from 26% to 13%,[8] and an MSF-managed SNCU in South Sudan (not included in this study), which excluded babies weighing <1250 g from admission, reported a reduction of mortality from 19% to 11% within 3 years.[10] Facility exit outcomes of neonatal units not only reflect the quality of nursing and medical care at the unit, they are also highly dependent on the patient population and on the quality of intrapartum and immediate post-partum interventions. A neonatal unit adjacent to a maternity unit offering comprehensive emergency obstetric care and acting as a referral centre for complicated deliveries will receive a high number of severely sick neonates. This was the case for all SNCUs included in this study.

Mortality and other adverse outcomes were highest in Timurgara, Pakistan, mostly due to a high proportion of discharges against medical advice, but possibly also due to unregulated oxytocin utilisation in the private sector.[20]

Discharge against medical advice

We observed a considerable number of children whose parents/care givers decided to leave the unit against medical advice, and a high number of VLBW children who were discharged before they could gain enough weight or attain clinical stability. In other studies in resource-poor settings, reasons for parents/care givers opting for discharge against medical advice have been found to be mainly financial;[21] however, in the context of the free health care provided by MSF, this needs to be better understood. Potential reasons for this occurring in our sites may be conflicting parental/care giver priorities (for example, the mother being expected to be at home to take care of the rest of the family), lack of space in units leading to a pressure to turn over beds rapidly, and a lack of training of the clinicians on the risks of early discharge. Further research is needed to fully understand this problem.

Limitations

The study had some limitations. Assignment of clinical diagnoses was inconsistent across clinicians and sites. In some sites, no second or third diagnosis was recorded. The demographic and clinical information on the neonates that was captured in the database was limited. Only exit diagnoses were reported, precluding differentiation between morbidities existing at admission and morbidities acquired during hospital stay. Furthermore, outcomes were reported only at facility exit, and as no follow-up of discharged neonates was performed, no information was available about the further development of the discharged babies. A facility exit outcome is merely a proxy outcome among high-risk neonates, as neurological and other sequelae are common in babies with asphyxia and VLBW.[22] Neonates were followed up in only one single MSF project, and a scale-up of extended follow-up services is highly recommended.[23]

CONCLUSION

The SNCU model, using non-specialised medical staff at district level across several countries, was shown to be feasible and showed in-patient mortality rates within acceptable limits, which was consistent across the sites. Low-tech medical care for sick and premature neonates can and should be implemented at district hospital level in low-resource settings. We hope that this study will encourage other actors, especially ministries of health in low-resource countries, to set up similar SNCUs to reduce neonatal morbidity and mortality.

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Contexte : La mortalité néonatale diminue progressivement dans le monde, mais 98% des décès néonataux surviennent encore dans les pays à revenu faible et moyen, où les soins hospitaliers pour les nouveaux-nés malades et prématurés sont souvent indisponibles. Médecins Sans Frontières Centre d'Opérations Bruxelles (MSF-OCB) a géré huit unités spécialisées de soins néonataux (SNCU) au niveau du district dans des contextes de faibles ressources et affectés par des conflits dans sept pays.
Objectif : Evaluer la performance du modèle de MSF-SNCU dans différents contextes en Afrique et en Asie du Sud Est. Les objectifs ont été de décrire la mise en place des huit SNCU, les caractéristiques des nouveau-nés et les résultats cliniques de 2012 à 2015.
Schema : Etude descriptive multicentrique.
Résultats : Le modèle de MSF-SNCU a été caractérisé par l'absence de machines de haute technologie et l'accent mis sur des soins infirmiers dévoués et des soins médicaux. La prise en charge s'est concentrée sur la gestion de l'hypothermie, de l'hypoglycémie, du soutien à l'alimentation et de l'identification/du traitement précoces d'une infection. Dans l'ensemble, 11 970 nouveau-nés ont été admis, dont 41% ont eu un faible poids de naissance (<2500 g). Les principaux diagnostics ont été un faible poids de naissance, une hypoxie et des infections néonatales. La mortalité d'ensemble a été de 17%, similaire dans les différents sites. Les chances de survie ont augmenté parallèlement au poids de naissance.
Conclusion : Le modèle standardisé de SNCU a été mis en œuvre dans différents contextes et les résultats pour les nouveau-nés hospitalisés se sont avérés être dans des limites acceptables. Des soins médicaux de basse technologie pour les nouveau-nés malades et prématurés peuvent et doivent être mis en œuvre au niveau des hôpitaux de district dans les contextes de faibles ressources.

Marco de referencia: La mortalidad neonatal ha disminuido de manera gradual en todo el mundo, pero el 98% de las muertes neonatales ocurre en los países de bajos y medianos ingresos, que no suelen contar con una atención hospitalaria de los neonatos prematuros. El centro operativo de Bruselas de *Médecins Sans Frontières* (MSF-OCB) administra ocho unidades de atención neonatal especializada (SNCU) en entornos de bajos recursos y afectados por conflictos, a nivel distrital en siete países.
Objetivo: Evaluar el desempeño del modelo SNCU de MSF en diferentes entornos en África y el sureste asiático. Se describe la puesta en marcha de ocho unidades, las características de los neonatos y los desenlaces clínicos del 2012 al 2015.
Método: Fue este un estudio descriptivo multicéntrico.
Resultados: El modelo SNCU de MSF se caracterizó por la falta de dispositivos de alta tecnología y una prioridad atribuida a la prestación de atención médica y de enfermería por parte de profesionales dedicados. Se concedió un interés especial al manejo de la hipotermia, la hipoglucemia, el apoyo alimentario y la detección precoz y el tratamiento de las infecciones. Se ingresaron 11 970 neonatos, de los cuales el 41% consistió en lactantes con bajo peso al nacer (<2500 g). Los principales diagnósticos fueron bajo peso al nacer, asfixia perinatal e infecciones neonatales. En general, la mortalidad fue 17%, en proporción uniforme en todos los centros. Las probabilidades de supervivencia aumentaban con un mayor peso al nacer.
Conclusión: El modelo normalizado SNCU se introdujo en diferentes contextos y ofreció a los pacientes ingresados desenlaces dentro de límites aceptables. La atención médica de los neonatos prematuros y enfermos en plataformas de baja tecnología es viable y se debería introducir en los hospitales de nivel distrital de los entornos con bajos recursos.

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