

RESEARCH ARTICLE

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Context matters: a systematic review of neonatal care in humanitarian emergencies

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Abstract

Background: Of the 15 countries with the highest neonatal mortality rates, 13 are characterised by conflict and political instability. Despite well-documented evidence of best practice interventions for neonatal survival, it remains less clear on how these practices are implemented in humanitarian emergency settings.

Objective: To conduct a systematic review of published and grey literature on the implementation strategies and challenges in addressing neonatal care in humanitarian emergencies.

Methods: A systematic literature search was conducted in SCOPUS, MEDLINE, Web of Science, CINAHL and Global Health for studies published between 1 January 2003 and 30 June 2018. Additionally, websites of organisations actively working in humanitarian emergencies were searched. Interventions were reviewed against the existing essential newborn care framework according to the standards outlined in the *Newborn Health in Humanitarian Settings Field Guide*.

Results: Twenty-one studies were identified: eight reporting on conflict and refugee settings, nine followed natural disasters and four discussed multiple emergency settings. Few studies addressed all the components of essential newborn care outlined in the field guide regardless of the emergency type. The review of literature demonstrated challenges in addressing essential newborn care identified in all humanitarian settings including the lack of adequate equipment, financing, and trained staff. Implementation strategies identified included quality improvement training for staff, the development of evacuation procedures, integrating with local and government resources and generating spaces in health facilities specifically for newborn care.

Conclusions: The requirements and initiatives needed to deliver essential newborn care in humanitarian settings are highly variable and context dependent. Given the diversity of factors needing to be addressed by the field guide, more research should be directed towards the adaptability of the implementation strategies to differing emergency contexts.

Trial registration: PROSPERO registration ID: [CRD42018098824](https://www.crd42018098824)

Keywords: Neonatal mortality, Humanitarian emergency, Health priorities, Political instability, Conflict, Natural disaster, Essential newborn care

Background

State of the world's newborns

Every year, an estimated one million newborn babies

take their first and last breaths on the day they are born (UNICEF 2018). The neonatal period refers to the first 28 days of a child's life and is a period of extreme vulnerability (WHO 2018). The global neonatal mortality rate (NMR) has been steadily declining from 37 to 18 deaths per 1000 live births between 1990 and 2018 (UNICEF, WHO, WBG, UN 2018). However, the average annual rate of reduction in neonatal mortality is lower than

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the annual rate in reduction in mortality amongst children aged 1–59 months: 2.6% for neonates compared to 3.6% for the 1–59-month age group (UNICEF, WHO, WBG, UN 2018). As a result of the lower annual rate of reduction in mortality, neonatal mortality equates to a 47% share in all under five deaths, increasing from 40% in 1990 (UNICEF, WHO, WBG, UN 2018). The top 15 countries with the highest neonatal mortality rates occur in low- and middle-income countries (LMIC) (Table 1); these neonatal deaths are attributable to three main preventable causes: preterm birth complications (35%), intrapartum-related complications (24%), and sepsis (15%) (UNICEF, WHO, WBG, UN 2018; WHO, MCEE 2016).

Neonatal health in humanitarian emergencies

Of the 15 countries with the highest NMR, 13 are characterised by fragility, conflict, and violence (The World Bank Group 2017). Humanitarian emergencies are the result of armed conflict, natural disasters, food insecurity, and other crises that affect large populations (Humanitarian Coalition 2018). These emergencies are often characterised by excessive mortality, insecurity, and large population displacement, both within and across

countries (Humanitarian Coalition 2018). In these contexts, the provision of essential newborn care has proven particularly challenging (UNICEF 2018; Save the Children, UNICEF 2015; UNICEF, WHO 2017).

Programmes to provide newborn care in humanitarian emergencies have been informed by two main field guides that provide technical and programmatic guidance. The first and earliest guide developed in 1999 is the *Inter-Agency Field Manual on Reproductive Health in Humanitarian Settings* developed by the Inter-Agency Working Group on Reproductive Health in Crisis (IAWG 2010). This field guide addresses newborn care in tandem with maternal care as a component of the Minimum Initial Services Package (MISP). The MISP outlines priorities in addressing the reproductive health needs of a population at the onset of an emergency with an emphasis on primary health care facility and hospital levels of care. The five components of the MISP are the identification of an agent to lead the implementation, prevention of sexual violence, reduction in HIV transmission, prevention of maternal and infant mortality, and the integration of reproductive health services into primary care (IAWG 2010). Whilst the provision of critical newborn services is a part of the MISP, evaluations of the MISP and improved neonatal data has resulted in a call for greater focus on specific interventions to address the disproportionately high numbers of newborn deaths (Casey 2015; Save the Children, UNICEF 2015).

In response to this, and the emerging evidence base on effective newborn care interventions, a second companion guide was developed: *Newborn Health in Humanitarian Settings Field Guide* (Save the Children, UNICEF 2015). This field guide is a compilation and summary of the World Health Organization (WHO) standards of care for neonatal health with additional guidance and indicators on how to provide neonatal services in humanitarian settings (UNICEF, WHO 2017). Informed by strategies of the *Every Newborn Action Plan* (UNICEF, WHO 2014), the field guide outlines several critical components of Essential Newborn Care (ENC) addressing household, facility and hospital levels of care. The components of ENC represent evidence-based interventions for the basic care required for a newborn in any setting; they include thermal care, infection prevention, initiation of breathing, feeding support, delayed umbilical cord clamping, monitoring, and postnatal care (Save the Children, UNICEF 2015; UNICEF, WHO 2014). Two thirds of newborn deaths are preventable with the adequate provision of ENC at birth and during the first month of life (Lawn et al. 2014).

Table 1 Top 15 countries in 2018 with the highest neonatal mortality rates. Countries listed with an asterisk have been identified as a 'fragile and conflict situation' by the World Bank Group in the 2018 financial year

Countries with the highest newborn mortality rates in 2018	Newborn mortality rate (deaths per 1000 live births)
Pakistan*	42
Central African Republic*	41
South Sudan*	40
Somalia*	38
Afghanistan*	37
Guinea-Bissau*	37
Nigeria*	36
Lesotho	35
Chad*	34
Côte d'Ivoire*	34
Mali*	33
Mauritania	33
Sierra Leone*	33
Djibouti*	32
Comoros*	32

Data expressed as deaths per 1000 live births. Data sources: UN Inter-agency Group for Child Mortality Estimation. Levels and Trends in Child Mortality Report 2019. [Childmortality.org](http://childmortality.org). Accessed on 23 October 2018. The World Bank Group. Harmonized List of Fragile Situations FY18. <http://pubdocs.worldbank.org/en/189701503418416651/FY18FCSLIST-Final-July-2017.pdf>. Accessed on 3 March 2021

Research agenda

Whilst these field guides exist (IAWG 2010; Save the Children, UNICEF 2015) highlighting the importance of addressing neonatal survival in humanitarian settings, it is less clear on how to implement the interventions presented in these field guides into practice. Few published studies exist on addressing neonatal care in humanitarian emergencies or the requirements of developing policies for implementing ENC programmes in these particular contexts. This directs the research question towards forming an understanding of what the implementation strategies and challenges are to addressing neonatal care in humanitarian settings. The aim of this study is to systematically synthesise and appraise published and grey literature on effective neonatal health interventions in a range of humanitarian emergency settings. New strategies must be developed to assist organisations and governments in responding to humanitarian emergencies, thus ensuring priority neonatal interventions are effective and address contextual challenges. On current trends, 60 countries will not reach the Sustainable Development Goal (SDG) neonatal mortality target of 12 deaths per 1000 live births by 2030 (UNICEF, WHO, WBG, UN 2018). This topic of research underscores the importance and necessity of addressing neonatal care during humanitarian emergencies if we are to significantly reduce NMR trends worldwide.

Methods

This review follows the PRISMA guidelines for the accurate reporting of systematic reviews and as per these guidelines the protocol for this systematic review has been registered with PROSPERO (ID: CRD42018098824). Ethical approval was not required for this review as data is publicly available.

Inclusion and exclusion criteria

English only articles from 1 January 2003 to 30 June 2018 were included in the study. This specific date range corresponds with the release of *The Lancet Neonatal Survival Series* (The Lancet Neonatal Survival Steering Team 2005) which signified a push for neonatal survival to become a global priority. Studies were included if they referred to specific interventions, programmes, health system factors and enabling environment that addressed neonatal survival in humanitarian settings. Included within the search criteria was any global humanitarian setting including armed conflict, natural disasters, food insecurity, refugee and internally displaced settings. The term 'neonate' was defined as a live birth up to 28 days as per WHO guidelines and so reference to infants (28 days to 1 year) or stillbirths were excluded from this review

(UNICEF, WHO 2014). Additionally, papers with no specific health intervention and/or outcome (e.g. research protocol, baseline data) were excluded.

Information sources and data search

A systematic literature search was conducted in SCOPUS, MEDLINE, Web of Science, CINAHL and Global Health, and the grey literature database Informit. Through a snowballing technique, organisations known for their work in humanitarian emergencies were identified and their websites searched for relevant literature using a simplified search strategy to broaden the catchment. Organisations searched included Save the Children, WHO, International Committee of the Red Cross, United Nations Population Fund, United Nations International Children's Fund, The Inter-Agency Working Group, Médecins Sans Frontières and the Centre for International Emergency, Disaster and Refugee Studies. A comprehensive search strategy was developed through a combination of medical subject heading (MESH) and non-MESH terms and adapted for each database through Boolean operators. The search included term variations of newborn and neonate, mortality and interventions as well as different types of humanitarian emergencies and natural disasters (Additional file 1). The term 'infant' was included in the search strategy as historically literature referred to newborns as infants before a distinction was made between the two age time periods and databases including MEDLINE still categorise MeSH terms under 'Infant, Newborn'. Terms related to pregnancy and childbirth were not included in this study as the specific focus of the research is on the neonatal period.

Screening, selection and extraction

The search strategy was applied to all databases and the citations were imported into Covidence software, which allowed access by both reviewers. Following duplicate removal, title and abstract screening was conducted through the inclusion and exclusion criteria. Subsequently, full-text screening of selected publications was conducted to ensure they met the inclusion criteria. All screening was performed by the first reviewer with a second reviewer consulted for areas of uncertainty. Data was extracted through an Excel template that highlighted key variables for each of the studies (country and type of emergency; population; level of care, i.e. household, community, and hospital; ENC component/s identified; strengths and challenges; outcomes; study type; limitations and quality assessment). The final included studies underwent critical appraisal to determine the risk of bias, overall quality and strength in which conclusions could be

drawn. For this review, National Institute for Health Care Excellence (NICE) and Effective Public Health Practice Project (EPHPP) were used to assess the quality of qualitative and quantitative studies respectively. For systematic reviews and mixed methods studies, Critical Appraisal Skills Programme (CASP) checklists were utilised.

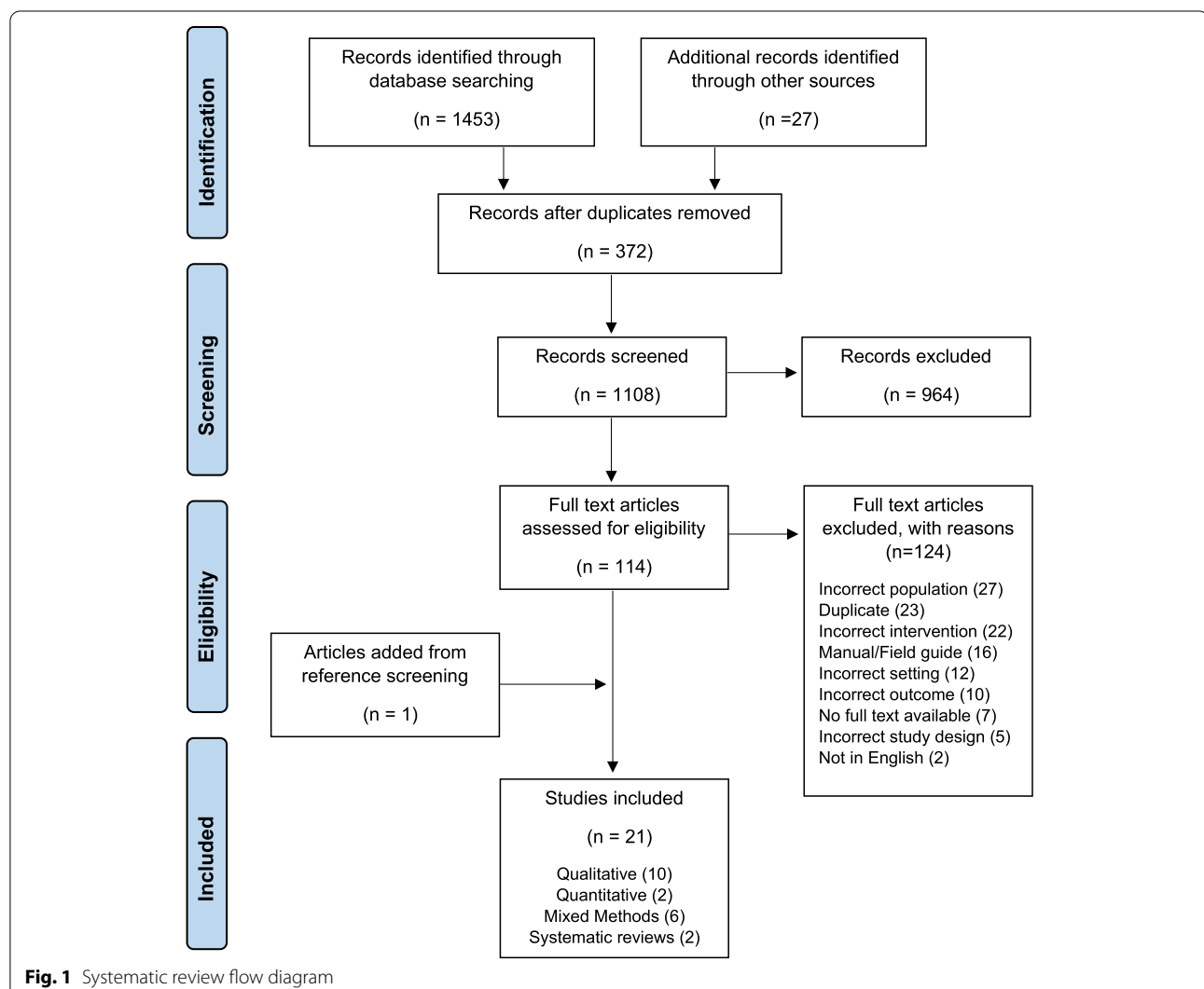
Results

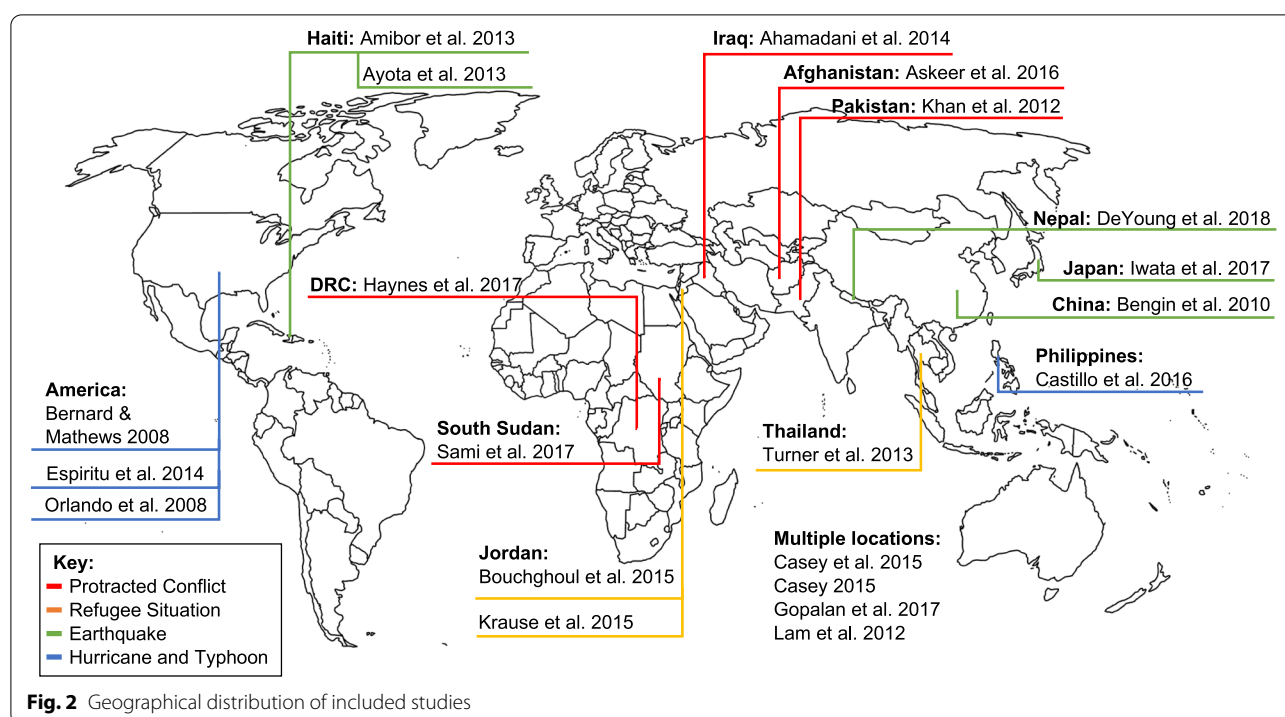
The search strategy yielded 1108 papers after duplicates were removed. Following title and abstract screening, 144 papers met the inclusion criteria and were submitted for full-text review; 20 papers met the inclusion criteria. Of the 124 papers excluded, 16 were excluded because they were logistical and field guides. These field guides and the 20 included papers' references were screened for additional papers, which

yielded one additional paper (Fig. 1). Overall, 21 studies were included in the analysis (ten qualitative, three quantitative, six mixed methods, and two systematic reviews).

Study characteristics

Sixteen of the 21 included studies were in LMIC and the remaining five described high-income countries (Fig. 2). Five studies described conflict settings in Iraq (Ahmadi et al. 2014), Afghanistan (Akseer et al. 2016), Pakistan (Khan et al. 2012), South Sudan (Sami et al. 2017), and The Democratic Republic of the Congo (Hynes et al. 2017). Additionally, three studies described newborn interventions in refugee settings in Thailand (Turner et al. 2013) and Jordan (Bouchghoul et al. 2015; Krause et al. 2015). Nine studies followed newborn care in natural disasters including five on earthquakes in Haiti (Amibor 2013; Ayota et al. 2013), China (Bengin et al. 2010), Japan





(Iwata et al. 2017), and Nepal (DeYoung et al. 2018). The remaining four addressed typhoons and hurricanes in the Philippines (Casillo et al. 2016) and the USA respectively (Bernard and Mathews 2008; Espiritu et al. 2014; Orlando et al. 2008). Finally, four articles described multiple settings and emergency types (Casey 2015; Casey et al. 2015; Gopalan et al. 2017; Lam et al. 2012). Table 2 describes a review of all the studies including information gathered from the analysis and quality appraisal.

Country context and type of emergency play a significant role in influencing the timing, level of preparedness, governance, and community factors that impact on service delivery during a humanitarian emergency. This review will comment on the specific humanitarian emergency types that were addressed in the included studies and how this impacted on neonatal care. Following this, the review will address the overall implementation strategies and challenges in providing ENC in humanitarian settings.

Earthquakes

Five studies reported on the complexities of newborn care following earthquakes: three in LMIC (Amibor 2013; Ayota et al. 2013; DeYoung et al. 2018) and two in high-income settings (Bengin et al. 2010; Iwata et al. 2017). Four out of the five included studies commented only on one ENC component, breastfeeding, and discussed the complexities of supporting breastfeeding women. Strategies presented in these studies included developing a space for women to breastfeed during the crisis (Amibor

2013; Ayota et al. 2013; DeYoung et al. 2018) and the promotion of accurate breastfeeding information to reduce misconceptions about breastfeeding and unregulated formula distribution (Ayota et al. 2013; Bengin et al. 2010; DeYoung et al. 2018). The remaining study by Iwata et al. (Iwata et al. 2017) was a descriptive editorial of a neonatal intensive care unit evacuation following an earthquake in Japan.

Following an earthquake in Haiti, Ayota et al. (Ayota et al. 2013) outlined the effectiveness of establishing 193 baby tents over five cities that reached 180,399 infant-mother pairs and 53,503 pregnant women. Over a 29-month period, the baby tents promoted safe breastfeeding environments and allowed for the registration, assessment, and referral of sick newborns and were an avenue to give culturally appropriate health promotional messages and psychosocial support (Ayota et al. 2013). A qualitative study by DeYoung et al. (DeYoung et al. 2018) in Nepal of a similar baby tent programme identified facilitators and barriers to breastfeeding for Nepalese women post-disaster. The study showed that the baby tents generated a sense of community amongst women, providing greater comfort for new mothers and pregnant women (DeYoung et al. 2018). Additionally the study revealed that the Nepalese women felt a sense of abandonment and worried for their safety after the baby tents were discontinued as humanitarian groups left (DeYoung et al. 2018).

An editorial by Bengin et al. (Bengin et al. 2010) in China additionally described newborn feeding patterns

Table 2 Summary of articles included in the analysis and quality grade

Author and year	Setting and emergency	Level of care	Study type	Intervention summary	Key findings	ENC	Quality grade
Ahamadani et al. (2014)	Iraq; Protracted Conflict	Hospital	Mixed methods Qualitative: Interviews Focus groups Observations Quantitative: Secondary data analysis of newborn outcomes	Field based needs assessment of 300 bed Birt Al-Huda Maternity ward and teaching hospital	Challenges - Limited supply of ENC equipment (newborn resuscitation masks, infection prevention), staffing and documentation of labour and newborns Strengths - Large financing of \$226 million in health with 28.5% to maternal and neonatal health - Increased phone towers - Increased SBA and facility births Challenges - Only postnatal marker is early breast feeding - Variations in coverage of SBAs and antenatal care over wealth quintiles	- Thermal care - Infection prevention - Resuscitation - Breastfeeding - Postnatal checks	Moderate - Limited to hospital settings and staff - Higher mortality may be seen as a result of serving higher risk referral patients
Alseer et al. (2016)	Afghanistan; Protracted Conflict	Hospital	Secondary data analysis of 11 nationally representative surveys from 2003 to 2013	Implementation of Basic Package of Health Services in 2003 addressing quality, cost effectiveness, equity, and community involvement with one in several components in Maternal and Newborn Health		N/A	Moderate - Data limited in the amount of reliable information available at provincial and population level - Multivariate analysis could be subject to ecological fallacy and over interpretation
Amibor (2013)	Haiti; Earthquake	Hospital	Secondary data analysis	Assessment of child and maternal health situation prior to earthquake and effects after the disaster	Strengths - Government led initiatives for free obstetric care prior to earthquake Challenges - Prior to earthquake 50% of women had access to services and 77% of population lived under the poverty line - Delay of 4 months in MISP establishment at subnational level - Insufficient and strained resources with multiple international organisations working in disunity	MISP (EmONC)	Moderate - Data collection and analysis methodology not appropriately described

Table 2 (continued)

Author and year	Setting and emergency	Level of care	Study type	Intervention summary	Key findings	ENC	Quality grade
Ayota et al. (2013)	Haiti; Earthquake	Community	Qualitative	Assessment of impact of baby tents programme implemented by UNICEF and Haiti health ministry to promote and sustain optimal feeding and provide counselling Established 193 baby tents in 5 cities with 180,499 infant-mother pairs and 53,503 pregnant women over—29-month timeline	<p>Strengths</p> <ul style="list-style-type: none"> - Ability to register and assess mother/infant pairs and pregnant mothers and refer sick infants - Ability to give culturally appropriate health promotional messages and information specifically about infant formula, psychosocial support <p>Challenges</p> <ul style="list-style-type: none"> - Limited trained workforce - High displacement with lack of social cohesion made it difficult to ensure community participation - Difficult integration with health centres 	<ul style="list-style-type: none"> - Breastfeeding - Postnatal checks 	Strong
Bengin et al. (2010)	China; Earthquake	Hospital	Letter to the Editor	Description of Infant Feeding patterns in Emergency	<p>Challenges</p> <ul style="list-style-type: none"> - Delayed feeding due to increased caesarean deliveries to 87% (from 80%) to reduce uncertainty around time of birth. Of 31 post-partum mothers, 14.8% initiated breastfeeding in 1h. - Reduced feeding education and policy resultant unregulated distribution of formula free in hospital for newborns - Mothers felt they were unable to produce milk because they could not feed themselves 	Breastfeeding	Weak - Subject to high publication bias

Table 2 (continued)

Author and year	Setting and emergency	Level of care	Study type	Intervention summary	Key findings	ENC	Quality grade
Bouchghoul et al. (2015)	Jordan; Refugee Camp	Community	Prospective observational study over 6 months	Experience of NGO Gynécologie Sans Frontières obstetric care unit in Syrian Refugee Camp from Sept 2012 to Feb 2013. 3255 Antenatal consultations made	<p>Strengths</p> <ul style="list-style-type: none"> - Partnerships with other NGOs and integration into local health system - Separate tent for immediate care for women and newborns with postnatal checks arranged after 3 days <p>Challenges</p> <ul style="list-style-type: none"> - Monitoring SGA babies using Caucasian growth charts (produced an overestimate) - High-risk pregnancies being referred to hospital outside the camp with no communication between camp and hospital (language and availability) resulting in loss in follow up 	<ul style="list-style-type: none"> - Thermal care - Resuscitation - Breastfeeding - Monitoring - Postnatal checks 	Strong
Bernard and Mathews (2008)	America; Hurricane	Hospital	Descriptive account	Evacuation of NICU following Hurricane Katrina	<p>Strengths</p> <ul style="list-style-type: none"> - Use of instant warming pads for thermoregulation - Early relocation of NICU to an area with emergency power - Sending babies with full paper medical records <p>Challenges</p> <ul style="list-style-type: none"> - Decision to shelter family and pets of employees increased hospital capacity and strained resources - Difficulty identifying receiving hospitals for NICU babies - Transport of babies for evacuation to the roof (no elevators), ventilator transport units did not fit in transport trucks - Loss of communication, water, food, and sewer services and threat of looters - Unable to follow up babies once evacuated 	<ul style="list-style-type: none"> - Thermal care - Resuscitation 	Weak <ul style="list-style-type: none"> - Subject to recall bias and sensationalised events

Table 2 (continued)

Author and year	Setting and emergency	Level of care	Study type	Intervention summary	Key findings	ENC	Quality grade
Casey et al. (2015)	Multiple Regions; Refugee Camps	Hospital Community	Cross-sectional mixed methods 63 purposively sampled HF; 28 in Burkina Faso, 25 in DRC, 9 in South Sudan	Study explored the availability and quality of, and access barriers to RH services in three humanitarian settings in Burkina Faso, Democratic Republic of the Congo (DRC), and South Sudan. These settings represented a mix of camp and non-camp settings for HF	<p>Strengths</p> <ul style="list-style-type: none"> - Community engagement linked to increased health seeking behaviour - Community leaders reported positive experiences with RH services; many were aware it was free and the advantage of delivering in a facility <p>Challenges</p> <ul style="list-style-type: none"> - Inconsistency with self-reported provision of RH and availability of supplies and trained staff to deliver them - All facilities lacked training in newborn infection management and lack of supplies for resuscitation; 66.7% did not have resuscitation masks in DRC and 80% lacked corticosteroids in Burkina Faso - Non-camp facilities did not have a functioning referral system. - Poor commodity security and supply chain management 	MISP (EmONC)	Strong - Potential impact on data quality due to multiple translations from local language to English
Casey (2015)	Multiple Regions; Multiple Types	Hospital Community	Systematic review	Evaluation of RH programmes. 7/36 papers included evaluated maternal and newborn health programmes	<p>Strengths</p> <ul style="list-style-type: none"> - CHW and TBA training in ENC strengthened connection to formal services; training of traditional birth attendants in ENC in Liberia showed improved knowledge from pre-post training - Opportunity to train refugees and internally displaced person health workers to increase coverage and continuity of care <p>Challenges</p> <ul style="list-style-type: none"> - Similar challenges across all settings including need for highly trained health workers for RH services, need for updated competency-based training particularly for EmONC 	MISP (EmONC)	Strong - Restriction to quantitative methods and papers published in English

Table 2 (continued)

Author and year	Setting and emergency	Level of care	Study type	Intervention summary	Key findings	ENC	Quality grade
Casillo et al. (2016)	Philippines; Typhoon	Hospital Community	Cohort study 56 HF underwent baseline assessments 16–22 weeks of typhoon landfall with training conducted at 1 and 3 months	Quality improvement training for staff in Essential Intrapartum and Newborn Care with pre-/post- assessments.	Strengths <ul style="list-style-type: none"> - Increase in KMC to 94% post training, increase in newborn bags and masks for resuscitation from 9 to 88%, and skills in breastfeeding initiation from 50 to 86% - Overall significant increase in service provider skills and facility equipment 	<ul style="list-style-type: none"> - Thermal care - Breastfeeding - Resuscitation 	Moderate <ul style="list-style-type: none"> - Limited discussion of analysis methods
DeYoung et al. (2018)	Nepal; Earthquake	Community	Prospective cross-sectional mixed methods design	Identified perceptions of Nepalese women and barriers/facilitators to breastfeeding	Strengths <ul style="list-style-type: none"> - Government-led health messaging 5 days after earthquake about formula distribution (ended up banned) and debunked myths about breastfeeding - Mother-infant tents, also generated a sense of community amongst women (from the same caste) - Involving grandmothers and other members in post-disaster feeding practices Challenges <ul style="list-style-type: none"> - 6 months post-earthquake baby tents were gone due to humanitarian groups leaving - Senses of abandonment and worry for safety once NGOs left - Perceptions varying across ethnic groups and perceived low milk supply 	Breastfeeding	Strong <ul style="list-style-type: none"> - Potential impact on data quality due to multiple translations from local language to English

Table 2 (continued)

Author and year	Setting and emergency	Level of care	Study type	Intervention summary	Key findings	ENC	Quality grade
Espritu et al. (2014)	America; Hurricane Sandy	Hospital	Descriptive account	Evacuation of 21 infants from NICU following Hurricane Sandy	<p>Strengths</p> <ul style="list-style-type: none"> - Use of warming pads and swaddling for thermoregulation - Discharging of stable infants early and high-risk patients were relocated to other hospitals - Development of a central command with a stepped-up response approach with large staffing capacity - Prioritising neonates for evacuation by acuity, degree of respiratory support and equipment <p>Challenges</p> <ul style="list-style-type: none"> - Finding alternate hospitals for relocation (differing protocols, acceptance procedures, and capacity data) - Communication and transport coordination - Unable to follow up babies once evacuated 	Thermal care	Weak <ul style="list-style-type: none"> - Subject to high publication bias
Gopalan et al. (2017)	Multiple Regions; Protracted Conflict	Hospital Community	Systematic review	Review of Maternal and Newborn health service usage and determinants in Fragile/ conflict affected states in Asia and Middle East: Afghanistan, Myanmar, Nepal, The Palestinian Territories, Syria, Timor-Leste, Yemen	<p>Strengths</p> <ul style="list-style-type: none"> - Implementing targeted policy approaches to improve coordination of aid and planning to target vulnerable populations - Presence of female CHW increased possibility of receiving SBA - Addressing demand (lack of awareness, money, transport) and supply side (delivery of RH services) <p>Challenges</p> <ul style="list-style-type: none"> - Inequities across wealth quintiles with access and usage of services 	<ul style="list-style-type: none"> - Thermal care - Breastfeeding - MISP (EmONC) 	Strong <ul style="list-style-type: none"> - Limited study availability with good methodological design - Findings are primarily ungeneralisable

Table 2 (continued)

Author and year	Setting and emergency	Level of care	Study type	Intervention summary	Key findings	ENC	Quality grade
Hynes et al. (2017)	The Democratic Republic of Congo; Protracted Conflict	Community	Quasi-experimental design 12 HF split into two groups. Both received standard training intervention and one group received an enhanced quality improvement methodology	Participatory quality improvement intervention (12 days training in ENC run by NGO) for facility-based maternal and newborn care with baseline/end line data of 9 months	<p>Strengths</p> <ul style="list-style-type: none"> - Enhanced intervention group showed a greater rate of change than the control group for ENC (OR: 49.62, 95% CI: 2.79–888.28), and achieved 100% ENC completion at end line. - End vs Baseline OR=2.44 (1.28–4.66) both groups showed increase coverage of ENC - Success in QI methodology is ownership process by those who know health system best - Improve care through improved logistics of work (e.g. pairing matrons with low literacy with partners who could assist filling out forms) - Reinforcing clinical training through visual posters, notice boards, and continued practical training - Post training HF staff felt empowered to identify problems and develop solutions <p>Challenges</p> <ul style="list-style-type: none"> - Scheduling of regular supervisory sessions due to access and security - High staff turnover places stress on need to build existing supervisory systems 	<p>ENC</p> <ul style="list-style-type: none"> - Clean cord care - Infection prevention - Monitoring 	<p>Moderate</p> <ul style="list-style-type: none"> - Only HF receiving programme support by NGO were included in the study - Selection bias in interviews - Because the enhanced intervention group 100% ENC delivery at end line, simplified GET model without controlling for socio-demographic variables resulted in very wide confidence intervals

Table 2 (continued)

Author and year	Setting and emergency	Level of care	Study type	Intervention summary	Key findings	ENC	Quality grade
Iwata et al. (2017)	Japan; Earthquake	Hospital	Descriptive account	Evacuation of 38 newborns from NICU	Strengths <ul style="list-style-type: none">- Development of NICU online directory allowed for inter-hospital communication (developed after 2001 earthquake)- Prioritisation of newborns for evacuation time and location by immaturity, respiratory support and vascular routes Challenges <ul style="list-style-type: none">- No cooperation with national disaster medical assistance team- Difficulty keeping infants warm due to outside temperature- Limited supply of ENC equipment	<ul style="list-style-type: none">- Thermal care- Resuscitation	Weak Subject to high publication bias

Table 2 (continued)

Author and year	Setting and emergency	Level of care	Study type	Intervention summary	Key findings	ENC	Quality grade
Khan et al. (2012)	Pakistan; Protracted Conflict	Community	Evaluation , Secondary data from national reports, assessments, programme reviews and peer-reviewed literature	Examination of changes in newborn survival between 2000 and 2013; mortality coverage and health system factors	<p>Strengths</p> <ul style="list-style-type: none"> - Development of newborn resuscitation protocols in labour rooms and hospital centres - Home visits conducted by CHW, coupled with intervention packages and health promotion materials significantly reduced NMR - Utilisation of IMNCI with emphasis on recognition and referral over curative care - General socio-economic changes over time including increased female literacy and decreased fertility rates coupled with policy changes and CHW programme (Lady Health Workers) and increased funding <p>Challenges</p> <ul style="list-style-type: none"> - Uptake of KMC poses significant challenges in cultural traditions and family practices - Refusal to refer from financial/religious/cultural difficulties - Large coverage disparities between wealth quintiles and urban/rural - Low medical human resources 	<ul style="list-style-type: none"> - Thermal care - Resuscitation - Breastfeeding - Monitoring - Postnatal checks 	Strong - no discussion of limitations in paper

Table 2 (continued)

Author and year	Setting and emergency	Level of care	Study type	Intervention summary	Key findings	ENC	Quality grade
Krause et al. (2015)	Jordan; Refugee Camp	Hospital	Formative evaluation using mixed methods (key informant interviews, HF assessments, Focus groups)	Evaluation on the status of MISP implementation in refugee camps in Jordan: Zaatri Camp (refugee camp; 15 RH services) and Irbid City (non-camp refugee site; 6 RH services)	<p>Strengths</p> <ul style="list-style-type: none"> - Reporting from key informants that ministry of health and WHO protocols, and funds were available for MISP response - 75% reported RH medical kits were available and adequate for response <p>Challenges</p> <ul style="list-style-type: none"> - Interviews with staff, all were but one was aware of MISP and nearly half new all five MISP principles - RH response in urban areas was lagging behind camp co-ordination - All groups reported clean delivery kits were not delivered to women as it was thought it would encourage home deliveries 	MISP (EmONC)	Strong

Table 2 (continued)

Author and year	Setting and emergency	Level of care	Study type	Intervention summary	Key findings	ENC	Quality grade
Lam et al. (2012)	Multiple Regions; Protracted Conflict	Community	Web-based survey	Survey of 56 humanitarian workers from 27 organisations (NGO/United Nations / Government) and newborn care practices	Strengths <ul style="list-style-type: none">- 62.5% reported having policies and guidelines (66.7%) on maternal health and very few on neonatal health- 72.9% reported routinely collecting data- Task shifting, home-to-hospital linkages and NGO partnerships ensured continuity and access to care for women- 80.4% immediate drying and wrapping of newborn- 73.3% maternal skin-skin contact 1–2h after birth.- 62.5% newborn resuscitation with bag and mask- 87.5% promoted breastfeeding within an hour. 83.3% provided postnatal care including home visits (65.2%).- 73.2% promoted KMC Challenges <ul style="list-style-type: none">- Greater emphasis on maternal interventions- 36.7% reported training on newborn care- Referral systems limited, newborns <1.5kg are not eligible for referral too high risk.- 53.6% promoted 6–24-h delay of bathing newborn for hypothermia prevention.46.4% promotion of newborn care kits with 39.3% providing the kits. Only 55% promoted nothing harmful applied to cord with 48.2% promoting the use of disinfectant on cord- Most common barriers to care included insufficient funds (63.3%), staffing (51%), and medical supplies (44.9%)	All components	Moderate <ul style="list-style-type: none">- Respondents indicated that type and breadth of care changed dependant on the setting- Limited by respondent driven sampling- Overall small sample size and potential for bias that could have overestimated newborn care services in emergency settings

Table 2 (continued)

Author and year	Setting and emergency	Level of care	Study type	Intervention summary	Key findings	ENC	Quality grade
Orlando et al. (2008)	America; Hurricane	Hospital	Descriptive account	Evacuation of 121 neonates in NICU following Hurricane Katrina	Strengths <ul style="list-style-type: none">- Attention to basic needs: thermoregulation, fluids, and hydration- Knowledge of equipment, supplies, and emergency procedures- Keeping weekly summaries of infants allowed for a swifter relocation and triage of infants- Shorter staffing shifts and assigned roles/duties Challenges <ul style="list-style-type: none">- Transport out of affected region was not a part of disaster plan—need for regional-level plan with communication systems- Size/weight of incubators permitted aircraft use- Emergency shelters did not accept pregnant women > 34 weeks and so an influx to hospital of pregnant women before the storm	N/A	Weak <ul style="list-style-type: none">- Subject to recall bias and sensationalised events

Table 2 (continued)

Author and year	Setting and emergency	Level of care	Study type	Intervention summary	Key findings	ENC	Quality grade
Sami et al. (2017)	South Sudan; Protracted Conflict	Hospital Community	Mixed methods Pre/post knowledge tests and interviews	Description of health workers knowledge and attitudes (pre and post 2 day training session) towards newborn health interventions based off the newborn health field guide	<p>Strengths</p> <ul style="list-style-type: none"> - Short practical based training period with supervised follow ups after training increased confidence - Awareness of benefits of early breastfeeding increased - Weighing newborn, providing a birth notification and delaying first bath gained importance amongst providers after receiving training - Integrating counselling mothers on newborn danger signs into existing CHW work <p>Challenges</p> <ul style="list-style-type: none"> - Mothers resistance to exclusive breastfeeding, breast milk expression and prolonged skin contact (KMC) lowered health workers intention to promote these practices - Hesitation in delayed cord clamping because "blood is still moving in the cord so there may be risk of MTCT of infection" - Obstacles for ENC: (1) perceived difficulty of neonatal care and additional time (taken away from mothers) and (2) organisational barriers; lack of newborn-specific referral protocols, resources, supervision and ongoing training, lack of hospital space 	All components	Strong

Table 2 (continued)

Author and year	Setting and emergency	Level of care	Study type	Intervention summary	Key findings	ENC	Quality grade
Turner et al. (2013)	Thailand: Refugee Camp	Hospital	Retrospective descriptive study Interviews and secondary data analysis	Development of a Special Care Baby Unit, January 2008 to December 2013, 952 infants were admitted into the unit	Strengths - NMR decreased in this period from 21.8 to 10.7 per 1000 live births (51% decline) - Development of a mnemonic MACHO (milk, antibiotics, cord care, heat and oxygen) to remember ENC components - Reorganisation of staff with the development of a specific team and hospital area for newborn care - Annual re-trainings conducted with the creation of locally appropriate standardised charts for admissions and care recordings Challenges - Before guidelines were developed, care depended on parental willingness to help newborn survive	All components	Strong

following an earthquake event. The editorial commented on how an increased number of caesarean deliveries from 62 to 87%, to reduce uncertainty around the timing of birth, resulted in delayed breastfeeding with only 14.8% of post-partum mothers initiating breastfeeding within the hour (Bengin et al. 2010). Delayed breastfeeding can raise health concerns, as breast milk is vital for the growth and development of the immune system and the provision of basic nutrition for neonates (UNICEF, WHO 2014). All three studies on breastfeeding highlighted common misconceptions about breastfeeding including the inability to produce milk due to stress and the negative impact of unregulated infant formula (Ayota et al. 2013; Bengin et al. 2010; DeYoung et al. 2018).

A secondary data analysis study in Haiti conducted by Amibor (Amibor 2013) assessed the child and maternal health situation pre- and post-earthquake. Indicators specifically focused on the implementation of MISP, which was not established until four months after the earthquake. This led to an uncoordinated response from multiple humanitarian organisations and the government with insufficient and strained resources for newborn care (Amibor 2013).

Hurricanes

The timing of an event and level of preparedness can lead to a coordinated pre-disaster response. This is a unique characteristic of meteorological events (e.g. hurricanes and typhoons) and in some cases geophysical events (e.g. earthquakes and tsunamis), whereby pre-warning of the event can lead to greater governance and coordination of the response (WHO 2008). In the hurricane and earthquake events described by four included studies, the provision of ENC was defined by pre-disaster preparation responses, prioritising ENC components such as respiratory support, and the establishment of an integrated stepped-up emergency response plan (Iwata et al. 2017; Bernard and Mathews 2008; Espiritu et al. 2014; Orlando et al. 2008; Casey et al. 2015; Gopalan et al. 2017; Lam et al. 2012; Lawn et al. 2016; Froen et al. 2016; Culver et al. 2017; WHO 2020; Ban 2015; WHO 2008; Wise and Darmstadt 2015a).

All four descriptive studies commented on the evacuation of hospital neonatal intensive care units (NICU) during hurricane events in the United States of America (Bernard and Mathews 2008; Espiritu et al. 2014; Orlando et al. 2008) and an earthquake event in Japan (Iwata et al. 2017). All studies cited similar challenges to addressing neonatal care including supply shortages such as oxygen tanks and thermoregulation warming pads, as well as difficulties locating receiving hospitals due to the breakdown of Information Communications Technology (i.e. lack of internet

and phone services). Two studies described the prioritisation of newborns based on immaturity, respiratory support, and vascular access which determined how far and when the newborn was to be evacuated, and allowed greater efficiency in resource allocation (Iwata et al. 2017; Espiritu et al. 2014). NICUs described in hurricane events in America noted pre-disaster responses leading up to the hurricane's land-fall including discharging stable newborns, relocating high-risk patients to other hospitals, increasing staffing capacity, and re-checking equipment and supplies (Bernard and Mathews 2008; Espiritu et al. 2014; Orlando et al. 2008). All studies identified a hospital level stepped-up emergency response plan and highlighted the need to develop a multi-sector integrated response plan, both regionally and nationally, to assist in the swiftness of evacuation procedures for future incidents (Orlando et al. 2008).

Refugee settings

In contrast to natural disaster settings, the ENC provision in refugee settings described in the included studies primarily depended on three factors: integration with local host-country health systems for the establishment of referral pathways, the number of trained staff to deliver ENC, and whether refugees were based in camp versus non-camp settings (Turner et al. 2013; Bouchghoul et al. 2015; Krause et al. 2015; Casey et al. 2015).

A cross-sectional mixed methods study by Casey et al. (Casey et al. 2015) explored the quality and availability of services for camp- and non-camp-based refugees and found that all health workers at the facilities lacked training in newborn infection management and supplies for newborn resuscitation. In Burkina Faso, one out of four camp health facilities (25%) and two out of 21 non-camp health facilities (10%) had basic ENC available (Casey et al. 2015). Non-camp health facilities also lacked functioning referral systems, identifying an advantage for the coordination of neonatal care within a camp setting (Casey et al. 2015). The advantage for neonatal care co-ordination in the camp setting was further highlighted in the evaluation of reproductive health services in Jordanian refugee camps whereby reproductive services in urban areas were lagging behind those coordinated in the camp setting, which resulted in higher neonatal mortality rates outside the camp compared to within the refugee camp (Krause et al. 2015).

An observational study of an obstetric unit in a Syrian refugee camp in Jordan by Bouchghoul et al. (Bouchghoul et al. 2015) identified the need for partnerships and integration into local host-country health systems. The study acknowledged difficulties with following up

high-risk pregnancies and sick newborns that were being referred to an outside camp hospital, because there was no communication between these two facilities (Bouchghoul et al. 2015).

Protracted conflict

All seven studies that described protracted conflict events in LMIC identified the reliance on task shifting and community health worker (CHW) networks to deliver ENC (Ahamadani et al. 2014; Akseer et al. 2016; Khan et al. 2012; Sami et al. 2017; Hynes et al. 2017; Gopalan et al. 2017; Lam et al. 2012). Khan et al. (Khan et al. 2012) commented on how increased government policy and funding into CHW programmes for child and maternal health in Pakistan has helped to address workforce shortage and increase coverage of ENC in low wealth quintiles and hard to reach areas. The authors reported that CHW programmes were particularly important in Pakistan because foreign assistance for ENC were only concentrated in a few provinces and large or capital cities (Khan et al. 2012).

Two studies identified cultural perceptions about motherhood as challenges for health workers when promoting newborn care. In studies conducted in South Sudan (Sami et al. 2017) and Pakistan (Khan et al. 2012), mothers were particularly opposed to kangaroo mother care interventions for thermal care due to religious traditions and family cultural practices. Particularly in the South Sudan study by Sami et al. (Sami et al. 2017) that interviewed health workers post an ENC training intervention, the health workers found it difficult to convince mothers to allow for delayed cord clamping because it was incorrectly perceived that the blood still moving in the cord could result in mother-to-child transmission of an infection.

Implementation strategies for addressing ENC

The primary strategies for addressing ENC to improve neonatal survival included the provision of separate areas in health facilities for neonatal care, training specific health worker teams to address neonatal care, increasing government financing, and up skilling/task shifting to community health workers (CHW) with training in ENC. Quality improvement training for health workers was found to be the most effective with a quasi-experimental study in The Democratic Republic of the Congo reporting a 2.4-fold increase in coverage of ENC (OR = 2.44 95% C.I. 1.28–4.66) after a 12 day enhanced ENC training intervention compared to health facilities who received standard training in neonatal care (Hynes et al. 2017). Similar success occurred in South Sudan (Sami et al. 2017) and after a typhoon in the Philippines (Casillo et al. 2016) with pre-/post- interviews and assessments

showing increased awareness and confidence of identifying and carrying out ENC, and increased facility equipment in both settings.

A retrospective descriptive study at the Maela refugee camp on the Thailand-Myanmar border identified that the creation of separate newborn areas in the health facility, employing a specific staffing team for newborn care during labour and delivery, creating locally appropriate standardised newborn guidelines, and conducting annual retraining led to a reduction of the NMR by 51% over five years: 21.8 to 10.7 per 1000 live births (Turner et al. 2013). The creation of a dedicated team to address newborn care around the time of birth was similarly shown to increase the likelihood of newborn survival in Jordanian refugee camps (Bouchghoul et al. 2015).

Leveraging CHW programmes was identified in several studies as being critical to delivering ENC to mothers in communities. The presence and training of CHW in ENC increased the possibility of a mother having a facility-based birth, strengthened the connection to formal services, and provided continuity of care, especially settings characterised by protracted or prolonged conflict (Casey 2015; Khan et al. 2012; Sami et al. 2017; Gopalan et al. 2017).

Challenges for addressing ENC

All 21 studies identified two main challenges in addressing neonatal care regardless of emergency type and location: lack of appropriate and adequate equipment for ENC and limited staff knowledge of ENC components. In the 16 LMIC studies included, the initiation of breastfeeding was often noted as the only intervention routinely provided for neonatal care. In these settings, neonatal care was cited as being difficult to establish because of the perceived additional time and technical capacity required to deliver ENC (Casey 2015; Sami et al. 2017).

A systematic review evaluating reproductive health programmes in humanitarian emergencies by Casey (Casey 2015) identified similar challenges across all LMIC settings including the need to train health workers, procure equipment for ENC, and update competency based training particularly for emergency newborn and obstetric care. Comparable challenges were also recognised in the included studies in Iraq (Ahamadani et al. 2014), South Sudan (Sami et al. 2017), Jordan (Bouchghoul et al. 2015; Krause et al. 2015), and The Democratic Republic of the Congo (Hynes et al. 2017). Additionally, these studies identified inequitable coverage of skilled birth attendants and access to health facilities across wealth quintiles, which impacted on the delivery of ENC.

The lack of knowledge of ENC components also extended to humanitarian workers. Lam et al. (Lam

et al. 2012) utilised a web-based survey to understand newborn care practices for 56 humanitarian workers across 27 organisations involved in humanitarian emergencies. Almost two thirds (62.5%) of survey respondents reported having policies and guidelines on maternal health, and only 36.7% reported having training and guidelines for newborn care (Lam et al. 2012). In addition, none of the surveyed organisations implemented all ENC interventions with some components more commonly utilised over others. For example, the promotion of the immediate drying of the newborn (80.4%), resuscitation (62.5%), breastfeeding promotion within 1 h (87.5%), and kangaroo mother care (73.2%) contrast with the levels of provision of umbilical cord disinfectant (48.2%) and newborn care kit provision (39.3%) (Lam et al. 2012). Furthermore, 91.8% of staff surveyed expressed the desire for training on the management of neonatal complications (Lam et al. 2012).

Discussion

To the authors' knowledge, this is the first review to systematically synthesise and appraise current literature on strategies to support the implementation of ENC interventions in a range of humanitarian emergency settings. The 21 articles included in this review were analysed against ENC components as they form the standard protocol for care as outlined in the *Newborn Care in Humanitarian Settings Field Guide* (Save the Children, UNICEF 2015).

Limitations

There are several limitations associated with this review. The first being the small number of articles that met the inclusion criteria, with the majority being of weak to moderate quality. Critical appraisal of each of the articles identified 12 out of the 21 included articles lacked methodological rigour including small sample sizes and, publication and recall bias, which resulted in weak to moderate quality ratings. Further to this, many humanitarian organisations do not tend to publish the results of programmes implemented in humanitarian settings, and so the articles included in this review are not representative of the breadth of ENC programmes implemented. Secondly, this review was limited by the strict search and inclusion criteria to the neonatal period only, which could result in a number of articles missed due to neonatal and maternal health historically placed together in earlier humanitarian programming under the MISP. Neonatal services are a component in a continuum of care for sexual and reproductive health, and there are synergies in care required for the mother and baby during the peripartum period. It is notable however that across the included studies there were gaps in ENC in settings

where maternal health services were in place, which supports the need for greater attention to those strategies designed to scale up ENC interventions. Limiting the inclusion criteria to the neonatal period may also have excluded studies reporting on programmes designed to prevent stillbirths; only four out of the 21 included studies mentioned strategies to prevent stillbirths (Ahmadani et al. 2014; Khan et al. 2012; Turner et al. 2013; Bouchghoul et al. 2015). Furthermore, our review of the literature was constrained by the fact that just four studies included neonatal mortality as an outcome measure in their results. There is a risk that without reported outcome measures the promising strategies to improve neonatal care described in this review may result in increased crude coverage of ENC interventions without good evidence that this will translate into improved outcomes (Marsh et al. 2020). Finally, the inclusion of English only articles could have impacted on the number of articles included in this review.

Challenges in addressing newborn care in humanitarian settings

In humanitarian emergencies, the disruption of health services and systems place women and neonates at a greater vulnerability to excessive mortality and morbidity compared to non-emergency settings. LMICs are often disproportionately affected by humanitarian emergencies, with the occurrence of an emergency often exacerbating an already under-resourced health system within the country (Culver et al. 2017). Addressing the existing gaps in the provision of ENC interventions in humanitarian settings provides an opportunity for significant gains in newborn survival. These gaps in ENC provision are not exclusive to humanitarian settings and are also well documented across many LMICs (The Lancet Neonatal Survival Steering Team 2005). However, this review has identified particular challenges of delivering ENC within differing humanitarian emergency contexts.

Gaps in the delivery of ENC

The findings in this review reflect diverse settings both geographically and by the type of emergency experienced. In almost all cases, lack of awareness and preparedness to deliver ENC components, equipment, and trained health workers were reported to be the main challenges in delivering ENC, impacting negatively on neonatal outcomes. The majority of studies identified the initiation of breastfeeding as the only routinely implemented intervention for newborn care, reflecting limitations in the quality, breadth, and consistency in the delivery of a comprehensive package of ENC interventions. Across all humanitarian emergency settings reported in our review, it was clear that all components of ENC needed to be translated

into practice and indicators for neonatal care routinely monitored. It is encouraging to see the recent release of guidelines by the WHO that bring a stronger focus on the provision of quality care in fragile and conflict affected settings, and it is hoped this will encourage more implementation research on how to meet this gap between knowledge and practice in humanitarian settings (WHO 2020). Incorporating neonatal care into country emergency response assessments, intervention packages, and monitoring indicators is a part of several national milestones in the *Reaching Every Newborn National Milestones Report* (UNICEF, WHO 2017). These milestones provide programmatic guidance and hold countries accountable to incorporating neonatal care in national plans as outlined in the *Sustainable Development Goals and The Global Strategy, 2016–2030* (Ban 2015). Furthermore, this review highlights that additional guidance and action is needed for disaster-prone areas, particularly in LMICs, to incorporate these neonatal indicators into humanitarian emergency response plans to ensure that every newborn is counted.

Context

The most widely used humanitarian emergency typology categorises emergencies by time and the level of response required at each phase of the emergency: pre-disaster, acute, long term, and recovery and mitigation (WHO 2008). The *Reproductive Health in Humanitarian Settings Field Guide* identifies the immediate responses that must take place in order to set up the MISP in the acute emergency response phase; however, this does not take into consideration different types and phases of the emergency being experienced. Similarly, the *Newborn Health in Humanitarian Settings Field Guide* does not address differing humanitarian emergency types and phases and how this might influence delivery and implementation of ENC. It is evident from the studies included in this review that the requirements and ability to address neonatal care alters in different emergency contexts, for instance, addressing newborn care in hurricane-prone America versus refugee camps in South Sudan.

Outside of the emergency typology, political and governance structures also play a significant contextual role in the ability to respond effectively to an emergency. To exemplify this, Wise and Darmstadt (Wise and Darmstadt 2015a) utilised Worldwide Governance Indicators to develop composite measures of political instability and governance within a country and established an inverse relationship between NMR and political stability ($r=-0.55$), and government effectiveness ($r=-0.77$). Whilst the relationship is complex, the study recognises the contribution of political instability and poor governance in shaping global NMR (Wise and Darmstadt 2015a).

The included studies in this review on earthquakes in Haiti and Nepal demonstrate how the effectiveness of a humanitarian response can deteriorate rapidly in the face of a weak health system and poor governance (Amibor 2013; Ayota et al. 2013; DeYoung et al. 2018). There is limited discussion and evaluation of strategies required to address political and governance requirements of implementing a national maternal and neonatal service in areas of crisis presented in the papers included in this review. Financing, supply chain infrastructure, policy, adequate staffing, and establishing a coordinated response system between national and international partners are all key aspects to be considered when responding to any crisis (IAWG 2010; Casey 2015). Adequate health service provision in areas of conflict or protracted crisis is in no doubt complex, but in many circumstances not impossible. Experiences of reducing maternal-to-child transmission of HIV in Zimbabwe, conducting mass child polio immunisation campaigns in Afghanistan, and Pakistan's lady health worker programme have in put forth the message that even in areas labelled as "fragile states" effective services can still be provided (Wise and Darmstadt 2015b; Hafeez et al. 2011).

Equitable coverage of maternal and newborn health services and quality health infrastructure is a common barrier for LMICs, especially those experiencing a crisis. Akseer et al. (Akseer et al. 2016) highlighted these issues in the protracted conflict setting of Afghanistan whereby promising public health policy at the national level was restricted by subnational disparities. This can be particularly prevalent for crises that are characterised by large population movement across borders, where refugee populations are not granted the same protections and access to services for example the Syrian refugee crisis in Turkey (Ekmekci 2017).

Localisation

The concept of localisation is a growing area of reform in the recent debate for improving the effectiveness of humanitarian aid at the 2016 *World Humanitarian Summit*. By localising a humanitarian response, international actors recognise, support, and strengthen leadership by local and national leaders in order to better address the affected populations, increase local accountability, and promote sustainable outcomes, such as increased training and capacity of local humanitarian responders (OECD 2017). Experiences of the baby tent programmes in Haiti (Ayota et al. 2013) and Nepal (DeYoung et al. 2018) highlighted the need for a localised response to strengthen local capacity and integration of programmes within existing health systems to ensure the continuation of programmes once international humanitarian actors leave.

Through the localisation movement, task shifting elements of health provision to CHWs have helped to decentralise healthcare and services and tackle workforce shortages at the primary healthcare level, particularly in LMICs (Callaghan et al. 2010). Several studies included in this review highlighted the effectiveness of training health workers and CHW in ENC to improve neonatal outcomes in humanitarian emergencies. In particular, the study by Khan et al. (Khan et al. 2012) described how CHW training in ENC increased care-seeking behaviour of women and their newborns, as well as providing continuity of care in an environment of intermittent and prolonged conflict.

The articles in this review identified the need for improved reporting by humanitarian organisations not just to quantify the mortality burden but also to assess and evaluate the impact of programmes in emergency settings to improve strategies to enhance neonatal survival. Furthermore, as localisation continues to grow as a concept in the humanitarian aid field, greater attention needs to be drawn to research and initiatives that can measure and monitor the impact of localising humanitarian responses.

Conclusion

The past two decades have seen an unprecedented increase in the number of people affected by humanitarian emergencies globally, with women and neonates particularly vulnerable (Chi et al. 2015). There is a clear correlation between countries experiencing humanitarian emergencies and high NMR, and the necessity for neonatal survival to be a higher priority within these countries (Wise and Darmstadt 2015b). The release of the *Newborn Health in Humanitarian Settings Field Guide* signified a push to address neonatal care as an independent component of reproductive health programming in humanitarian emergencies. The findings from this review have identified significant gaps in the quality, breadth, and consistency of ENC delivery in humanitarian settings and highlighted the need for further research to ensure neonatal interventions are effective and address contextual challenges. This review also highlights the need for humanitarian organisations and governments to increase reporting and evaluation of programmes in these settings, and to take an active role in the development and testing of field guides. In addition, it is recommended that new strategies are developed to ensure the *Newborn Health in Humanitarian Setting Field Guide* and its ENC components are integrated into the standard response protocols of humanitarian organisations. The neonatal period is a time of extreme vulnerability, especially during a humanitarian emergency. As such, the reduction in NMR trends globally towards the Sustainable Development Goal of 12 per 1000 live births cannot be achieved unless significant attention is drawn to

improve the effective coverage of newborn interventions in humanitarian emergency settings.

Abbreviations

CHW: Community health worker; C.I.: Confidence interval; ENC: Essential newborn care; EmONC: Emergency obstetric and newborn care; KMC: Kangaroo mother care; LMIC: Low-to-middle-income country; MISP: Minimum Initial Services Package; NICU: Neonatal intensive care unit; NGO: Non-governmental organisation; NMR: Neonatal mortality rate; OR: Odds ratio; SBA: Skilled birth attendant; SGA: Small-for-gestational age; UNICEF: United Nations International Children's Fund; WHO: World Health Organization.

Supplementary Information

The online version contains supplementary material available at <https://doi.org/10.1186/s41018-022-00121-2>.

Additional file 1. Search strategies

Acknowledgements

Dr. Arno Crous
Dr. Barney Frankish
Dr. Alexander Beath
Additional thanks to the peer review panel

Authors' contributions

SM contributed to the study conception, study design, and analysis and interpretation of the data. AM contributed to drafting and revision of the manuscript. All authors read and approved the final manuscript

Funding

No funding

Availability of data and materials

Not applicable as no datasets were generated or analysed during the current study

Declarations

Ethics approval and consent to participate

Ethical approval is not formally required for this report as the methodology of the systematic review is to collect, synthesise, and appraise data already available.

Consent for publication

Not applicable

Competing interests

The authors declare they have no competing interests.

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Received: 19 June 2020 Accepted: 17 May 2022

Published online: 02 June 2022

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