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RESEARCH ARTICLE

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Building referral mechanisms for neonatal care in humanitarian emergency settings: A systematic review

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Abstract

Aim: During humanitarian emergencies, women and children are particularly vulnerable to health complications and neonatal mortality rates have been shown to rise. Additionally, health cluster partners face challenges in coordinating referrals, both between communities and camps to health facilities and across different levels of health facilities. The purpose of this review was to identify the primary referral needs of neonates during humanitarian emergencies, current gaps and barriers, and effective mechanisms for overcoming these barriers.

Methods: A systematic review was performed using four electronic databases (CINAHL, EMBASE, Medline, and Scopus) between June and August 2019 (PROSPERO registration number CRD42019127705). Title, abstract, and full text screening were conducted following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses. The target population was neonates born during humanitarian emergencies. Studies from high-income countries and

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prior to 1991 were excluded. The STROBE checklist was used to assess for risk of bias.

Results: A total of 11 articles were included in the analysis; these were mainly cross-sectional, field-based studies. The primary needs identified were referrals from homes to health facilities before and during labour, and inter-facility referrals after labour to more specialised services. Some of the main barriers included a lack of roads and infrastructure for transport, staff shortages—especially among more specialised services, and a lack of knowledge among patients for self-referral. Mechanisms for addressing these needs and gaps included providing training for community healthcare workers (CHWs) or traditional birth attendants to identify and address antenatal and post-natal complications; education programmes for pregnant women during the antenatal period; and establishing ambulance services in partnership with local Non-Governmental Organizations.

Conclusion: This review benefited from a strong consensus among selected studies but was limited in the quality of data and types of data that were reported. Based on the above findings, the following recommendations were compiled:

- Focus on local capacity-building programmes to address programmes acutely.
- Recruit CHWs to raise awareness of neonatal complications among pregnant women.
- Upskill CHWs to provide timely, appropriate and quality care during humanitarian emergencies.

KEYWORDS
humanitarian emergencies, low and middle-income countries, neonatal care, referral mechanisms

Highlights

- Establishment of sustainable local capacity-building programmes and interventions needs to be tailored around the unique needs of different populations and settings
- Upscaling of community healthcare workers to raise awareness and reduce the burden on health care facilities within humanitarian emergency settings

- Adequate and continued training of health care workers to provide timely, contextualised and quality care during humanitarian emergencies.
- Focus on evaluating interventions through case-control studies, pre- and post-studies, or randomised control trials.

1 | BACKGROUND

Humanitarian emergencies, whether acute or chronic, disproportionately affect women and children, particularly neonates at <28 days of age.[1] The early days of a child's life represents a critical period for neonatal survival. Among the estimated 2.5 million annual neonatal deaths, 36% occur within the first 24 h following birth, and approximately 73% occur within the first week.[2] Neonates in emergency settings, such as natural disasters or conflict, are often at the greatest risk of mortality[2] due to poor access and availability of healthcare services, competition for resources, and the breakdown of traditional practices, such as new-born thermal care and skin care.[1,3–6] The three main causes of neonatal mortality, often exacerbated in emergency settings, are prematurity and the related state of low birth weight, severe neonatal infections (such as sepsis, pneumonia and diarrhoea), and intrapartum related complications that occur during labour and birth.[3,7]

Internally displaced persons (IDPs) and refugees, whether residing in camps or elsewhere, present specific and unique healthcare needs regarding neonatal care. These needs generally stem from a breakdown in health infrastructure, crowding caused by population movement, and concerns for staff and patient safety.[3,8] Local governments, Non-Governmental Organizations (NGOs), and multilateral bodies such as the World Health Organization (WHO) often face communication and organisational challenges in coordinating referrals from communities and camps to health facilities, and between different levels of health facilities to facilitate timely and adequate access to services.[3]

There are few guidelines for building referral mechanisms for neonates in emergency settings.[3] To address this, UNICEF, WHO and Save the Children recently developed a field manual about neonatal health in humanitarian settings; the manual describes the hierarchy for set-up of maternal and new-born services from community to hospital level, and includes a supply manual for humanitarian workers to catalogue essential items and pre-package them as kits.[3] Apart from this manual however, there is an absence of published literature on setting up an efficient referral network between various service levels and adequately managing emergency transportation.[3]

The aim of this systematic review was to identify literature pertaining to neonatal referrals in humanitarian settings, in order to determine gaps in the existing evidence and to provide a basis for the development of multi-sectoral, sustainable, and adaptable interventions to improve the health and care of mothers and neonates in emergency settings.

2 | METHODS

2.1 | Protocol and registration

The protocol for this systematic review was registered in the PROSPERO prospective register of systematic reviews under registration number CRD42019127705 in March 2019 (https://www.crd.york.ac.uk/prospero/display_record.php?RecordID=127705).

2.2 | Eligibility criteria

This systematic review included the following types of study designs: qualitative and quantitative studies, including randomised control trials, case-control studies, and observational studies. Commentaries, opinion editorials, and

other non-scientific studies were excluded. Only studies in English, published between 1991 and August 2019 were included.

The primary target population was neonates, specifically infants who are under 28 days old; while the secondary target population were mothers and humanitarian actors. Studies from high-income countries, as defined by countries whose economies have a Gross National Income per capita of $12,376 as outlined by the World Bank,[9] were not included due to significant differences in resource availability.

2.3 | Definitions

To guide this systematic review, the following definitions were used:

- *Referral mechanisms*: In the context of resource-poor settings, patients are referred via three pathways: household identification and self-referral to a primary care facility, community identification by a community healthcare worker (CHW) and referral to a primary care facility, and inter-facility referral via identification from an initiating facility to a receiving facility.[10,11] These pathways are depicted below in Figure 1.
- *Humanitarian emergency*: Humanitarian emergencies were defined as events caused by conflict, war or civil disturbance, natural disasters, food insecurity or other crises that affect large civilian populations and result in significant excess mortality.[12] In this study, settings were either post-conflict (countries emerging from war) or among displaced populations.

2.4 | Search strategy

A systematic search strategy (see Appendix 1 for expanded strategy) was run using the search stems Neonates AND Emergency AND Referral AND Health Services, on the following electronic databases: Current Nursing and Allied Health Literature, Embase, Medline and Scopus. The search was conducted from the date of the database inception until August 2019.

2.5 | Screening and selection process

Before the selection process, duplicates and studies published prior to 1991 were removed. The selection process was conducted in two stages; the title and abstract screening stage, and the full-text screening stage. In the first stage, two reviewers (HH and KM) independently screened the title and abstract of identified citations for eligibility. In the second stage, full texts that were judged as potentially eligible by at least one reviewer were screened by the two reviewers (HH and KM) independently using the same eligibility criteria.

2.6 | Data extraction process

Data was collected in a data extraction table in Excel and included the following information: publication date and study authors, study design, study country, the setting (rural or urban), the population type (refugee, IDPs, or host

FIGURE 1 Referral pathways in low-resource settings.

population), humanitarian crises type (natural disaster or war), if a referral pathway is present, the type of referral pathway (if present), and measurement outcomes. This was piloted by SR and any changes required during the data extraction process were added in iteratively afterwards.

2.7 | Risk of bias assessment

Risk of bias was assessed using the STROBE checklist for observational studies[13]; due to the inherent difficulties of conducting research in humanitarian studies, the threshold for including studies was set at 50% of criteria met.

2.8 | Data synthesis

This review was guided by three overarching research questions or areas of interest:

1) What are the primary referral needs of newborns during humanitarian emergencies?
2) What are the primary barriers to referrals of newborns during humanitarian emergencies?
3) What are the primary mechanisms to optimise referrals that have been put in place to address the above barriers for newborns during humanitarian emergencies?

Results from the data extraction process were entered into a table and stratified based on the above three research questions: (1) Referral Needs; (2) Barriers to Referrals; and (3) Mechanisms to Address Referral Needs. Findings from each of these outcomes were synthesised thematically using a methodology described by Thomas and Harden where emergent themes in the findings were grouped together into *descriptive themes*.[14] From these *descriptive themes* were used to infer higher *analytical themes* which would encompass multiple *descriptive themes* under one umbrella.

Due to the anticipated high heterogeneity in data collected from diverse cross-sectional methods, a meta-analysis was not conducted. In instances where a study presented quantitative data, these findings were used to compliment and support the *analytical themes* derived from the thematic analysis.

3 | RESULTS

3.1 | Study selection

Figure 2 depicts the Preferred Reporting Items for Systematic Reviews and Meta-Analyses flow diagram. Out of 9125 articles obtained as a result of the systematic search on electronic databases, 5791 were eligible for title and abstract screening following removal of duplicates and studies published before 1991. A total of 121 articles were selected for full-text screening, and 11 were ultimately included in the analysis of this review (see Table 1).

3.2 | Study methods

The majority of studies identified through this systematic review used mixed methods (55%, $n = 6$), with five (45%) employing a cross-sectional design, and a single study with a pre- and post-design. Of these studies, three (27%) studies collected quantitative data, two (18%) utilised a cross-sectional design, and one employed a retrospective design. Only two (18%) studies were qualitative, both using a cross-sectional design.

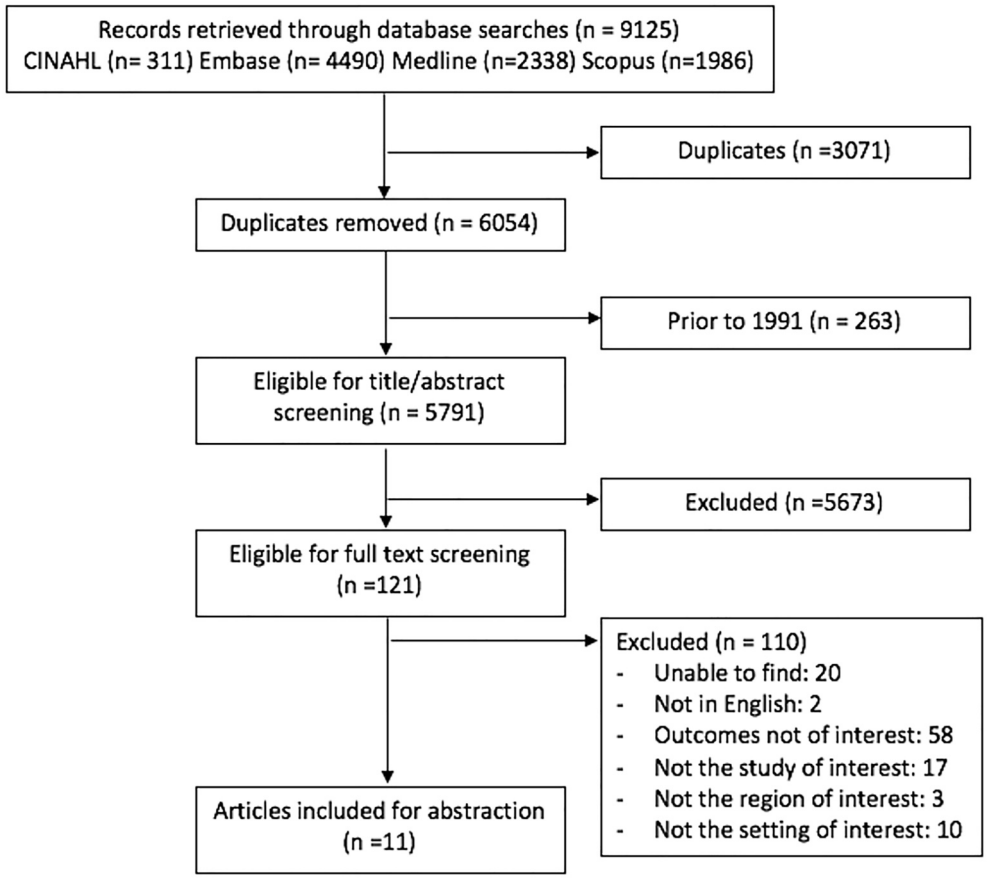

FIGURE 2 Preferred Reporting Items for Systematic Reviews and Meta-Analyses flow diagram.

TABLE 1 Characteristics of included studies in the systematic review.

Study	Methods	Country	Emergency setting
Lam et al.[1]	Mixed methods, cross-sectional	Multiple countries (34)	Multiple
Ameh et al.[15]	Mixed methods, cross-sectional	Iraq	Post-conflict
Che Chi et al.[16]	Qualitative, cross-sectional	Burundi and Northern Uganda	Post-conflict
Fehling et al.[17]	Qualitative, cross-sectional	South Sudan	Post-conflict
Bender et al.[18]	Quantitative, cross-sectional	Kosovo	Post-conflict
Newbrander et al.[19]	Mixed-methods, cross-sectional	Afghanistan	Post-conflict
Lagrou et al.[20]	Quantitative, retrospective	Afghanistan	Post-conflict
Sami et al.[21]	Mixed methods, cross-sectional	South Sudan	Post-conflict
Purdin et al.[22]	Mixed-methods, cross-sectional	Pakistan	Displaced population
Howard et al.[23]	Quantitative, cross-sectional	Guinea	Post-conflict
Mullany et al.[24]	Mixed-methods, pre- and post	Burma (now Myanmar)	Post-conflict

3.3 | Countries, setting and population

The selected studies represented a wide-range of countries, including five from Sub-Saharan Africa (two from South Sudan, and one each from Burundi, Guinea, and Northern Uganda); four from the Middle-East Region (two in Afghanistan, and one each in Pakistan and Iraq); one from Burma (now Myanmar) in South East Asia, one from Kosovo in Europe, and one which was a general cross-sectional survey sent to humanitarian emergency workers across 34 countries.

Nearly all studies (82%, *n* = 9) were conducted in post-conflict humanitarian emergency settings, with only one study conducted in a complex humanitarian emergency setting (among Afghan refugees in Pakistan), and another study conducted among multiple settings. The majority of studies (64%, *n* = 7) explored neonatal referral mechanisms among the countries' own citizens, with two exploring this among IDPs, and two among refugees.

3.4 | Risk of bias assessment

Of the 11 included studies, three (27%) met all the criteria of the STROBE checklist, five (45%) met 75%–99% of the criteria, and three (27%) met 50%–75% of the criteria. A summary of the risk of bias assessments is included in Table 2 below.

4 | THEMATIC FINDINGS

Findings from the included studies are split broadly along *Referral Needs*, *Referral Barriers*, and *Interventions to Improve Referrals*. Findings from each outcome of interest are grouped thematically by findings which emerged from the literature.

4.1 | Primary referral needs

A total of eight (73%) studies reported on primary referral needs. Referral needs pertained to neonates specifically[18,21] or children under 2 years old,[19] as well as mothers during the pre-partum[20,22,23] and birth[15,16,20] period. It should be noted that studies consistently cited high levels of infant and maternal mortality rates *generally* among their populations of interest, with Lam and colleagues (who administered surveys to multiple countries) stating that '*few*

TABLE 2 Risk of bias assessment.[a]

Study	Score
Lam et al.[1]	100% (23/23)
Ameh et al.[15]	82% (18/22)
Che Chi et al.[16]	100% (22/22)
Fehling et al.[17]	57% (13/23)
Bender et al.[18]	73% (16/22)
Newbrander et al.[19]	91% (20/22)
Lagrou et al.[20]	95% (22/23)
Sami et al.[21]	83% (19/23)
Purdin et al.[22]	57% (13/23)
Howard et al.[23]	77% (17/22)
Mullany et al.[24]	100% (23/23)

[a]The denominator differs among articles as one pertains specifically to quantitative data.

TABLE 3 Primary referral needs identified in included studies.

Author	Stage	Primary referral needs
Ameh et al.[15]	Birth	Blood transfusions, caesarean section, eclampsia
Che Chi et al.[16]	Birth	Blood transfusion, caesarean section
Bender et al.[18]	Neonates	Hypothermia, respiratory distress, infections, and hypoglycemia
Newbrander et al.[19]	Neonates	Respiratory infections, diarrhoea, and fever
Lagrou et al.[20]	Pre-partum/birth	Antenatal screening and management of abortion
Sami et al.[21]	Neonates	Infections, advanced resuscitation, and labour complications
Purdin et al.[22]	Pre-partum	Lack of prenatal screening
Howard et al.[23]	Pre-partum	Lack of prenatal screening

mortality surveys in emergency settings accurately capture rates and causes of death in the neonatal period'.[1] A summary of these primary needs is included in Table 3.

Among neonates, a study undertaken in Kosovo found the greatest number of referrals to higher-level facilities involved hypothermia, respiratory distress syndromes, infections and hypoglycemia.[18] The frequent referral of neonates for infections was consistent with a study from South Sudan, which also found that neonates were most often referred outside of refugee camps for severe infections, in addition to advanced resuscitation and to treat complications from labour.[21] A study from Afghanistan among children under 2 years old, which included neonates, found a higher incidence of referrals to higher-level facilities for acute respiratory infections, diarrhoea, and fever, with parents more likely to seek a referral for fever when compared to acute respiratory infections and diarrhoea.[19]

Apart from the need of referrals for specific neonatal conditions, delays in care seeking are a significant barrier to timely health care seeking and compliance with referral orders. Among mothers in the pre-partum period, one study found a need for education among pregnant Afghan refugees in Pakistan, stating that a lack of knowledge acted as a barrier towards seeking out health services for complications.[22] This was supported by a study from Guinea which found that low maternal health knowledge can negatively affect access to needed care.[23] Additionally, one study hypothesised that the high number of stillborn births seen at a Médecins Sans Frontières run emergency obstetric and newborn care hospital in Afghanistan was likely due to low coverage of antenatal care and therefore the ability for CHWs to identify and refer patients from the community to referral facilities.[20]

Since maternal and neonatal complications often co-exist, timely maternal referrals may circumvent possible complications for neonates. During birth, mothers were most commonly referred for blood transfusions and caesarean sections[15,16,20]; these findings were generally consistent across all studies in the rural areas of Iraq, Afghanistan and Burundi. Indeed, maternal deaths during birth were most often due to haemorrhage (accounting for 40% of all maternal deaths in one study[21] and 29% of all maternal deaths in another[15]) and obstructed labour (17% of all maternal deaths among two studies[15,20]). Additional causes of mortality included eclampsia (40% of all deaths as per Ameh et al.[15]) and complications from unsafe abortions (38% in one study[20]).

Although there were no studies which directly assessed referral needs among mothers in post-partum, Lagrou et al. highlighted that the low number of women admitted to hospital with post-partum sepsis compared to what is expected based on the literature, likely indicated poor identification and referral to the hospital for sepsis complications and treatment.[20]

4.2 | Referral barriers

A total of 10 studies reported on referral barriers. The majority of referral barriers identified through this systematic review stemmed from insecurity for both patients and staff in the humanitarian emergency setting. The most

TABLE 4 Referral needs identified in included studies.

Author	Referral gap	Context
Lam et al.[1]	Staff, supply chains	Survey sent to humanitarian emergency workers across 34 countries
Ameh et al.[15]	Transport, staff	Exploratory study across 8 governorates in Iraq
Che Chi et al.[16]	Transport, staff, coordination	Qualitative case study conducted in Burundi and Northern Uganda
Fehling et al.[17]	Transport, staff, supply chains, patient	Needs assessment conducted in South Sudan
Bender et al.[18]	Transport, supply chains	Simulated field study in Kosovo
Newbrander et al.[19]	Transport, patient	Cross-section survey conducted across 5 districts of Afghanistan
Lagrou et al.[20]	Transport, coordination	Cross-sectional study in a maternity hospital in Afghanistan
Sami et al.[21]	Transport, patient	Mixed methods case study in South Sudan
Purdin et al.[22]	Transport	Retrospective analysis of an intervention among Afghan refugees in Pakistan
Howard et al.[23]	Patient	Cross-sectional survey of female refugees in Guinea

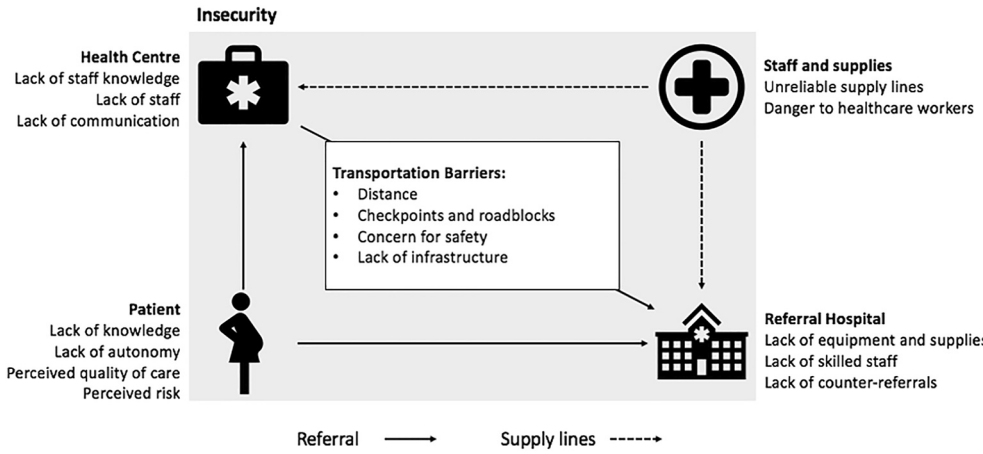

FIGURE 3 Primary referral barriers for mothers and neonates in humanitarian emergencies.

frequently cited barrier by eight studies were related to a lack of transportation, including poor infrastructure,[15–21] concerns for safety,[15,16,21] a lack of health infrastructure such as ambulances[15,16,22] and the presence of checkpoints and roadblocks.[15,16] Insecurity also caused a lack of qualified staff, who at times were unable to identify referral needs[16,17] or address referral needs[1,16,17]; as well as an unreliable supply chains, which caused a lack of equipment and supplies at health facilities.[1,17,18] Communication and coordination between health facilities were also cited as a barrier.[16,20] Finally, patient-level barriers, including a lack of knowledge, scepticism towards quality of care, and lack of autonomy, was also cited.[17,19,21,23] A summary of these referral barriers is included in Table 4, and the relationship between these different factors is presented in Figure 3.

4.2.1 | Transportation

Barriers most frequently stemmed from issues related to transportation.[1,15–21] The primary reason for this was due to with poor quality infrastructure, which included poor roads and long distances to health facilities. These factors

would often prevent patients from travelling to health facilities, as they would be unable to access them[1,19–21] or pay for the transportation required for travel.[17,19,20]

Poor transportation infrastructure also acted as a barrier for establishing ambulance services. This was compounded either by the presence of checkpoints and roadblocks, which would increase transportation time between health facilities,[16,21] or the danger posed to ambulance drivers who risked being shot in conflict affected regions.[15] Concerning the former, Bender and Kennally found that in Kosovo, ambulance services did not have the proper equipment required to support neonates who had been referred over long distances.[18] Concerns for safet. also extended to patients themselves; for example, Ameh et al. from Iraq found that most checkpoints closed at 18.00 h, making travel to the hospital during the evening and night almost impossible for pregnant women who had been referred.[15] For these reasons, the doctors interviewed in the study expressed that many more women were choosing to deliver via an elective Caesarean, thereby increasing the number of Caesarean sections being performed at the hospitals compared to before the war.

4.2.2 | Staff and supply

Insecurity further contributed to a lack of staff; this was most often due to high rates of turnover,[16,21] staff fleeing due to conflict,[16] or being unable to access health facilities themselves due to issues around transportation.[15] This created two primary issues relating to the neonatal referral system: (1) a lack of staff who could properly identify complications among pregnant women and neonates and refer them, for example, as seen in refugee camps in South Sudan[17]; and (2) a lack of qualified staff who could address referral needs, including inadequate emergency obstetric and neonatal care staff in rural areas of Burundi,[16] a lack of midwives, general practitioners and gynaecologists in Northern Uganda generally,[16] and a lack of skilled birth attendants in refugee camps in South Sudan.[17,21]

Insecurity also created unreliable supply chains, preventing proper access to vital equipment and supplies for addressing referral needs. This finding was cited across multiple settings in one study from Lam et al.[1] again in South Sudan, where maternal, neonatal and child health basic supplies were found to frequently run out for 1 year or more at a time,[17] and in Kosovo, where there was a lack of equipment during transportation.[18]

4.2.3 | Coordination

Coordination between healthcare facilities was less frequently cited by two studies as a barrier to effective referrals. However, Chi et al. found a lack of telecommunications systems in Northern Uganda made it difficult to coordinate ambulances, as well as a lack of counter-referrals or feedback between referring facilities in Burundi prevented tracking on the effectiveness or success rate of referrals.[16] These findings were supported by a study in a hospital in Afghanistan, where an increase in the number of non-complicated deliveries in the hospital was thought to be due to poor coordination of the referral system as cases were referred to the hospital instead of local health facilities.[20]

4.2.4 | Patient behaviour

There were a few studies which identified patient behaviour as a barrier towards effective self-referrals and CHWs referrals to primary health centres. Primarily, a lack of maternal health knowledge among patients was thought to prevent healthcare seeking behaviours for complications.[21,23] Additionally, patients often doubted the quality of services available at the referral facility, however the reasons for this doubt among patients were not explained due to the level of detail provided by the studies.[19,21] Finally, two studies indicated that the decision to seek healthcare was not entirely the decision of the mother and was instead decided by the male head of household, thereby preventing health seeking behaviour and causing delayed presentation and referrals.[17,21]

4.3 | Interventions to improve referrals

The referral mechanisms identified in this systematic review tended to address three overarching problems: transportation needs, deficiencies in staff skills, and patient behaviours. Interventions applied a range of mechanisms, including policy-level interventions, service-level interventions, community-level interventions, and blended complex interventions. A summary of these interventions is included in Table 5.

4.3.1 | Transportation interventions

There were four interventions identified through the systematic review which aimed to address transportation needs.[15,16,21,24] These were at various levels of implementation and are not easily compared to one another. The first intervention was suggested to address the risk of ambulance drivers and other medical professionals from being shot in Iraq. It involved issuing new Identity Cards to doctors in 2008 to carry firearms to protect themselves.[15] In both Northern Uganda and Burundi, NGOs provided referral support by providing ambulances or operational funds for ambulances; in Burundi, this was partially supported by a system of community financing for ambulance services.[16] The cross-sectional study found mixed results for its effectiveness, with some respondents finding the programme to be uncoordinated and inconsistent in funding, while others thought it was a 'step in the right direction'.[16]

An additional study from South Sudan evaluated a package of facility- and community-based neonatal interventions implemented in a displaced persons camp in South Sudan.[21] The study emphasised how the introduction of a pictorial referral form enabled neonates delivered through complicated deliveries to be referred outside of the camp; as many workers in the camp were illiterate, the gateman was able to look at the referral form and accept the patient.

Finally, a Mobile Obstetric Medics Project in Burma (now Myanmar) aimed to address transportation referral barriers by providing health services directly to the pregnant mothers and neonates through the establishment of a three-tiered system of CHWs. This traditional birth attendants (TBAs) to deliver a set of primary care services (such as conducting normal deliveries and ensuring hygienic practices were followed), CHWs, who provided more complex services (such as intramuscular antibiotics for sepsis and provision of misoprostol for prevention of postpartum

TABLE 5 Referral mechanisms and their effectiveness.

Author	Gap	Description	Evaluation method
Ameh et al.[15]	Transportation	Issue ID cards to medical staff with a license to carry fire-arms	Not evaluated
Che Chi et al.[16]	Transportation	Multi-sectoral funding and support for ambulance services	Qualitative case-studies
Fehling et al.[17]	Staff	Pictorial training package for pre-existing TBAs and other CHWs	Not evaluated
Newbrander et al.[19]	Patient	Tiered healthcare workers providing referral slips to patients	Cross-sectional survey
Sami et al.[21]	Transportation	Pictorial reference forms for referrals outside of the camp	Mixed methods case-study
Purdin et al.[22]	Patient	Patient education through antenatal visits from CHWs	Cross-sectional study
Howard et al.[23]	Patient	Patient education through antenatal visits from CHWs	Quantitative cross-sectional study
Mullany et al.[24]	Transportation	Obstetric services delivered via a three-tiered health system of CHWs	Mixed methods, pre- and post-study

Abbreviations: CHWs, community healthcare workers; TBAs, traditional birth attendants.

haemorrhage), and Maternal Health Workers who oversaw the work of the TBAs and CHWs; this effectively reduced the need for transportation mechanisms to transfer patients from one health facility to another. The study found that the pilot project was associated with a substantial increase in a number of essential maternal health services compared to before, including pre-antenatal interventions (71.8% compared to 39.3% baseline), assistance during labour (48.7% compared to 5.1% baseline), and postnatal care visits (69.8% compared to 33.7% baseline).[24]

4.3.2 | Staff skills

There was only one intervention identified through the systematic review which aimed to address deficiencies in staff skills.[17] This intervention was undertaken in South Sudan refugee camps and aimed to upskill pre-existing Front-line Health Workers (FHW) (which included TBAs and CHWs) who were already working in the area; this was done through a training package which emphasised prevention, early identification, early referrals, and community-based interventions for emergencies. Notably, pictorial action-based checklists were developed to address high levels of illiteracy among FHW and enable them to identify problems early and refer patients accordingly. This study only described the development of this intervention and did not provide data on its effectiveness.

4.3.3 | Patient behaviour

There were three interventions identified through the systematic review which aimed to address patient behaviours.[19,22,23] Two of these programmes aimed to improve maternal health knowledge among pregnant women during prenatal care visits conducted by FHWs and CHWs; one was implemented among a refugee population in Pakistan,[22] and one was implemented among a refugee population in Guinea.[23] The programme implemented in Pakistan aimed to educate both pregnant women and their families, noting that male household members were often the decision makers.[22]

Both interventions arrived at contrasting results. Purdin found that the intervention implemented in Pakistan improved maternal and neonatal outcomes, such as case-fatality rates (102 per 100,000 in 2004, compared to 291 per 100,000 in 2000) and emergency obstetric and newborn care service utilisation (67.2% in 2007 compared to 4.8% in 1996).[22] As well as providing maternal health knowledge to improve self-referrals, the consistent presence of highly skilled staff, and their ability to identify potential problems, was considered an important factor in being able to refer patients to hospitals when needed.[22] Contrastingly, Howard found the intervention implemented in Guinea to be largely unsuccessful in improving maternal knowledge; this was considered to be due to higher number of educational workers serving a smaller population in Pakistan (1:300) compared to Guinea (1:1700).[23]

An additional study evaluated a three-tiered referral system implemented by the Ministry of Public Health in Afghanistan. This involved CHWs, who would assess sick children and refer them to either Basic Health Centres or District Hospitals.[19] Although compliance to referrals were found to be acceptable at 75%, the study also found a higher compliance to referrals among those who were given a referral slip (a physical piece of paper given to the patient indicating where and for what reason the patient needs to be referred) (90%) compared to those that were not given a referral slip (50%; $p = 0.277$).

5 | DISCUSSION

The included studies[1,15–24] highlight some of the primary needs, barriers, and facilitators towards building referral health care mechanisms in humanitarian emergency settings. Referral needs of mothers and new-borns were diverse but tended to stem from complications during birth; however, studies noted that these complications could

have potentially been identified during the antenatal period. This was also contingent on sufficient staff expertise or health-seeking behaviour on the part mother and/or family, which was often lacking.

Under this paradigm, complications requiring a referral were often identified during labour, and in turn required neonates or mothers to travel to a nearby care facility or hospital. However, travel to other facilities posed a significant barrier due to insecurity, poor infrastructure, or a lack of infrastructure. Ambulances and staff also need special orientation for transporting sick neonates, such as thermal care or oxygen.[18] In addition to this, receiving facilities have also been found to lack facilities for neonatal intensive care units or neonatal surgery.[7,25] These barriers were often difficult to overcome, and in cases where they were addressed, required significant resources and multisectoral action[16] or policy-level interventions.[15] Indeed, more feasible mechanisms often focused on strengthening local emergency obstetric and neonatal care capacity and expertise or working to improve patient knowledge.

In general, evidence from the included studies suggest that training CHWs to provide prenatal, antenatal, and postnatal care and creating a link between community healthcare and formal health care may build local capacity to address birth complications. This in turn reduces the strain on receiving referral facilities, given the shortages of skilled health care workers in humanitarian emergency settings. The evidence further suggests that promoting the use of these workers and providing antenatal and postnatal visits to both the mother and new-born, should be further evaluated as a potential intervention to improve new-born and maternal health.

Establishing community health facilities in all settings is not feasible, making the possibility of home visits by skilled birth attendants difficult. To compensate for this, women should be educated regarding warning signs in new-borns and how and where to seek timely care. By utilising both community and facility health workers, individual awareness of the danger signs of obstetric and neonatal complications can be improved to encourage appropriate and timely care seeking. In some instances, this awareness should be communicated to the family and not just the pregnant woman. The process building referral mechanisms should begin at the community level, with the objectives of providing home visits and raising awareness of danger signs during pregnancy and during the first critical 28 days of life.

Elements of the above model are echoed in similar guidelines and literature reviews on the same topic. Both United Nations High Commissioner for Refugee's Field Guide[3] and a review by Zeid et al.[26] advocate for increased local healthcare initiatives, including greater community accountability and autonomy,[26] as well as employing local healthcare workers.[3] While UNHCR guidelines outlined the importance of disseminating key healthcare messages to communities,[3] this systematic review identified three interventions which aimed to address patient knowledge and attitudes for improving healthcare seeking behaviour among pregnant women. As two of these interventions were found to have successful results, this may indicate that patient knowledge is a more important factor in improving neonatal outcomes than previously thought.

Although this systematic review identified a sufficient number of studies to undertake a thematic review, there were notable gaps among the included studies. Primarily, there were no studies that were conducted in a natural disaster setting, indicating a significant gap in the literature for these types of humanitarian emergencies. Additionally, there was a lack of studies which focused on the post-partum period, with studies instead focusing on antenatal care, or referral needs during birth. Furthermore, despite the high quality of studies as per the Risk of Bias Assessment, there was a lack of robust research designs generally, with 10 employing a cross-sectional design, only one using a pre- and post-design, and none employing a randomised control trial design. This indicates a need for more robust studies to test the effectiveness of neonatal referral mechanism interventions.

5.1 | Strengths and limitations

To the best of our knowledge, this is the first study to systematically review the needs, barriers, and mechanisms in establishing referral mechanisms for neonates in humanitarian emergency settings. The included studies represent a diverse range of countries, indicating high generalisability across different contexts and cultures.

There were a few limitations to this review. Primarily, the search did not elicit any studies conducted in a natural disaster humanitarian emergency, likely due to the acute difficulties affiliated with this type of emergency. Therefore, these findings are not generalisable to referral mechanisms in natural disasters. Additionally, most of the studies including in this analysis were cross-sectional, and therefore more susceptible to bias and, in the case of evaluating interventions, unable to determine causality. For the latter, this creates notable limitations in that the intervention is only associated with positive or negative outcomes, and there will be limited conclusions that can be drawn regarding the overall effectiveness of the intervention. However, using the STROBE checklist, all included studies scored above 50%, with the majority scoring above 75% (n = 8). Finally, the included studies were conducted in a number of different countries and settings with diverse backgrounds and service pressures. Therefore, while some pressures are generalisable, some are not and hence findings may not be relevant to all humanitarian emergency settings.

6 | CONCLUSION

In order to build and improve referral health care systems in humanitarian emergency settings, it is necessary to assess the specific and unique needs and constrains of different refugee populations and settings. A review of current practices and programs is required to determine where gaps currently exist and develop multi-sectorial, sustainable and adaptable interventions to improve the health and care of mothers and neonates in emergency settings.

The studies included in this systematic review suggest that upscaling of CHWs to raise awareness and reduce the burden on health care facilities may contribute to short and long-term improvements in maternal and neonatal health within humanitarian emergency settings. These studies also highlighted how establishment of programs and interventions regarding maternal and neonatal health care should be in line with local needs and should build on resources and guidelines already in place. However, there was a notable gap in robust methodologies to evaluate these interventions, and future research should focus on evaluating these interventions through case-control studies, pre- and post-studies, or randomised control trials.

Building referral mechanisms requires adequate and continued training of health care workers of multiple facets—skilled birth attendants, CHWs, midwives, nurses and physicians, in order to provide timely, appropriate and quality maternal and neonatal care in humanitarian emergency settings. Continuous and targeted research is required as data is still lacking in these settings in order to improve and sustain both neonatal and maternal health care.

AUTHOR CONTRIBUTIONS

Spencer Rutherford, Nabila Zaka, Meghan A. Cupp, and Logan Manikam contributed to the conception and design of this review. Spencer Rutherford performed the searches. Kathryn Michaux and Hannah Hafezi conducted the title and abstract screening and the full-text screening. Spencer Rutherford performed the data abstraction. Spencer Rutherford, Maryan Naman, and Kathryn Michaux performed the writing of the manuscript. All authors contributed in the revision and approval of the final manuscript.

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CONFLICT OF INTEREST STATEMENT

There are no conflicts of interest to disclose.

DATA AVAILABILITY STATEMENT

All additional data related to this study can be accessed by contacting LM.

ETHICS STATEMENT

Not required.

CONSENT FOR PUBLICATION

Not applicable.

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APPENDIX 1 SEARCH STRATEGY EXAMPLE

PubMed Search Strategy:

1. (infant, newborn[MeSH] OR newborn* OR "new born" OR "new borns" OR "newly born" OR baby* ORbabies* OR prematureOR prematurity OR preterm OR "pre term" OR “low birth weight” OR "lowbirthweight" OR VLBW OR LBW OR infan* OR neonat*)
2. (war,disaster[MeSH] OR emergenc* OR “emergency medicine”OR “emergency medical services” OR“disaster medicine” OR “mass casualty incidents” OR “emergency responders” OR “medical missions”OR humanitarian OR“humanitarian crisis”OR“humanitarian crises”OR“humanitarian relief”OR“humanitarian response”OR“humanitarian agenc*”OR“disaster relief”OR“disaster plan”OR refugeeOR evacuee OR evacuated OR typhoon OR hurricane OR cyclone OR avalanche OR earthquake OR flood*OR landslide OR tsunami OR war* OR“armed conflict” OR “conflict zone”)
3. (referral and consultation[MeSH]OR refer* OR“refer* mechanism” OR “refer* pathway”OR refer*path way”OR consult* OR“consult* mechanism” OR “consult* pathway”OR “consult* path way”ORsignposting OR “sign posting”OR gatekeeping OR “gate keeping”)
4. (health services[MeSH]OR “health service”)