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Home-based Interventions to Lower Neonatal Mortality Rates in Developing Countries

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HOME-BASED INTERVENTIONS TO LOWER NEONATAL MORTALITY
RATES IN DEVELOPING COUNTRIES

by

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A thesis submitted in partial fulfillment of the requirements
for the Honors in the Major Program in Nursing
in the College of Nursing
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Abstract

Aim: To evaluate Home-based interventions to lower neonatal mortality rates in developing countries.

Background: A developing country is a country that is lacking in the services and facilities enjoyed by people in developed countries, such as personally owned automobiles and homes with indoor plumbing and water-carried sewage disposal systems. The difference in resources compared to developed regions, has been evident to the correlation in the increased neonatal mortality rates.

Method: An electronic, systematic review of four databases were used to retrieve 209 articles initially, later filtered to 42 articles utilized in this review. The following databases used are as listed: CINAHL Plus with Full Text; APA PsycInfo; Cochrane Database of Systematic Reviews; and MEDLINE. Articles had to solely refer to developing regions and neonatal mortality.

Key Issues: Developing countries continue to report the highest neonatal mortality rates. The leading etiologies for increased neonatal mortality rates (NMR) differ in these regions compared to developed countries. Causes and factors must be understood to allow for the appropriate interventions to be implemented in the plan of care.

Conclusions: Home-based interventions and community care have shown to significantly aid in the reduction of neonatal mortality rates in developing countries. Evidence based studies have also concluded that interventions are often presented in packages. Packages targeting individual households with home-based intervention; packages improving communities with health workers; and packages aiming to strengthen the trust between facilities and communities via referrals and recommendations.

Keywords: Developing countries, home-based, neonatal mortality.

Dedication

To my family, I have never been so proud to be called an Etienne. Claudine, you are the most iconic and bravest women ever to exist. Thank you for sacrificing your identity so your children could find their own sense of oneness. To my sisters Claudia, Tchenneeca, and Naica, I would not be here without your advice and reassurance. To those who are family without needing to be bloodline, thank you for your support and honest opinions. To my chair, Mrs. Donna Breit, you have been the best mentor a student could ask for. You are an example of the aftermath of hard work and dedication.

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Introduction

Neonatal mortality refers to the number of neonatal deaths per 1000 live births within the first 28 days of life for a newborn with forty percent of all childhood deaths globally occurring in the neonatal period (Martin et al., 2014). According to the United Nations Children's Fund (UNICEF), the highest neonatal mortality rates in 2018 were seen among developing countries, such as Pakistan at 4.2%, the Central African Republic at 4.12%, and South Sudan at 4%. Early neonatal survival is influenced by various factors including prenatal care, maternal health, neonatal nutrition, available community resources, political climate, and general caregiving practices during the first month of life. Combined, they are all crucial to lowering neonatal mortality rates. Developing countries worldwide are practicing neonatal interventions at health care facilities to prevent and treat infection, respiratory distress syndrome, and other leading causes of death in the neonatal populations (Muhe et al., 2019). An equally important consideration in lowering the neonatal mortality rate is exploring home-based neonatal care (Davanzo, R., 2004). Modifications to accepted traditional reproductive and newborn care practices could further positive neonatal outcomes.

Background

Neonatal Mortality Rate (NMR)

According to the Centers for Disease Control and Prevention (CDC), infant mortality is the death of an infant before the first birthday. It represents the number of infant deaths for every 1,000 live births (2019). Although it is a component of the infant mortality rate, the neonatal mortality rate (NMR) has its own narrowed definition. Neonatal mortality (NM) is the probability that a child born in a specific year or period will die during the first 28 completed days of life, expressed per 1000 live births (WHO, n.d). It can further be divided into early and late neonatal deaths. Early neonatal deaths occur during the first seven days of life, and late neonatal deaths occur after the 7th day, but before the 28th day of life (WHO, n.d). They are reported via two main methods: data from civil registrations and data from household surveys. Information from civil registration provided annual data that accounts for the total number of neonatal deaths from all live births recorded by health care facilities. In comparison, data from household surveys are calculated from a women's complete obstetric and gynecologic history in addition to each child's full birth history in a household (WHO, n.d).

The neonatal period represents the most vulnerable time for a child's survival. In 2016, 2.6 million deaths, or roughly 46% of all under-five deaths, occurred during this period. This translates to 7000 newborn deaths every day (WHO, n.d). Low- and middle-income countries continue to be over-represented, with approximately 98% of all perinatal and neonatal deaths (Waldemar et al., 2019). Dr. Waldemar and colleagues noted that neonatal mortality is about 50 times higher in low- and middle-income countries compared to high-income countries (2019). Without an improvement in evidence-based neonatal care interventions

during this high-risk time period, this rate will continue to rise, most notably in developing countries.

Developing Countries

A developed country is a country whose citizens have, on average: a sufficient income to ensure comfortable living, access to a wide range of publicly provided resources, and privately funded health, education, social welfare, housing, transport, commercial and industrial sectors, as well as state-supported defense and security services. A developing country is a country lacking in the services and facilities enjoyed by people in developed countries, such as personally owned automobiles and homes with indoor plumbing and water-carried sewage disposal systems (Last & Porta, 2018). Often interchangeable are the terms “Developing Countries, Low-income country, and Low-middle income country.” Countries such as Sudan, India, Pakistan, Central African Republic, and Haiti, are classified as developing countries based on four criteria: (1) per capita income; (2) economic and social structure; (3) social conditions; and (4) the prevailing level of economic and political freedom (Sanford & Sandhu, 2002). Additionally, there is a focus on social determinants measured in many terms, including educational and health criteria.

Significance

Understanding the causes and factors contributing to neonatal death is necessary to identify interventions to reduce NMR (Muhe et al., 2019). Innovative practices aiming to lower the neonatal mortality rate in developing nations must be adopted. Through the identification and understanding of the practices contributing to neonatal mortality, modifications to traditional care giving need to be implemented in a culturally sensitive manner. Additionally, these interventions must be deemed sustainable in developing countries with marginal resources to see a lasting impact. Leading local and national health care providers are collaborating to allow for ease of access between facility-based care and home or community-based interventions to improve neonatal outcomes. Due to the differences in the level of technological development, resources, advanced therapies, and cultural backgrounds, interventions may differ in the health care facilities compared to home care in developing countries.

Health Care Facility Interventions

Evidence-based interventions to aid in the reduction of NMR in developing nations include but are not limited to hospital-based kangaroo care, application of continued distending pressure to the lungs for respiratory distress syndrome, delayed cord clamping (Rubens et al., 2010); bubble Continuous Positive Airway Pressure (CPAP) (Martin et al., 2014); and continuous Kangaroo Mother Care (iKMC) (WHO Immediate KMC Study Group, 2020). Kangaroo mother care is a low-cost method of maintaining neonatal thermoregulation. Intermittent KMC is only given to the newborn when a mother visits her infant who is still being nursed in an incubator. Whereas continuous KMC allows the mother to provide KMC all the time, both day and night. Any KMC applied after stabilizing the neonate has been shown to

reduce mortality by 40% among hospitalized neonates with a birth weight of less than 2 kg (WHO Immediate KMC Study Group, 2020). However, hospital-based neonatal care is not available for most neonates in developing countries due to inaccessibility and cost. In this instance, more cost-effective care and interventions must be implemented. Home-based interventions are proven to be more effective for lowering neonatal mortality rates in developing regions, especially when combined with timely hospital care if needed (Hoque et al., 2018). Hoque et al. also discovered that developing a functional partnership between health care facilities and communities led to sustainable improvements in neonatal outcomes (2018).

Home-based Interventions

Evidence-based interventions found to be effective in low-resource nations are often intertwined with the nation's community limitations. It is essential to note that in a number of studies, the terms "Home-based" and "Community care" were used interchangeably. Davanzo, R. (2004) found that in countries with minimal resources and adverse conditions, it is generally less arduous to implement preventive measures or simple selected therapeutic interventions to a population of healthy or near-healthy newborn babies than to implement technologically sophisticated, high-cost measures that seek to cure severely ill newborn infants. Therefore, adaptable home and community-based interventions are being introduced to supplant and accompany health care facility techniques. These interventions aim to reduce NMR at the home or community-based level. A study by Shukla et al. (2019) shows a decrease in neonatal mortality for low- and middle-income countries by applying simple neonatal resuscitation (NR) guidelines such as immediate drying, stimulation, maintaining an open airway, and bag-mask ventilation, in comparison to the current standard care.

Problem

Neonatal mortality remains a significant contributor to death among children younger than five years of age in developing countries (Adetola et al., 2010). Studies conducted in developing countries have discovered the leading causes of neonatal mortality include sepsis or infection, asphyxia or respiratory distress syndrome, low-birth weight, prematurity, malnutrition, and less common vertical transmission of infections and hypothermia. Adetola et al. (2010) reported the leading causes of neonatal deaths in Ibadan, Nigeria with a NMR of 32.1 per 1000 live births to be severe perinatal/neonatal asphyxia (79.4%), low birth weight (55.9%), and infections (41.2%). In Uganda, perinatal/neonatal asphyxia was proven as the leading cause of neonatal death (Atukunda & Conecker, 2017). In a study researching over 7000 pregnancies from six developing countries, the leading cause of neonatal death was prematurity, accounting for 69% (Kibria et al., 2018). Although causation may differ per country, developing countries together exhibit increased neonatal mortality rates from these combined etiologies.

Purpose

The primary purpose of this literature review is to evaluate home-based interventions practiced in developing countries to lower neonatal mortality rates. In addition, this review will also (1) bring awareness to the leading causes of neonatal mortality rates in developing countries; and (2) review standards of care and interventions practiced by facility and community healthcare attendants in developing countries to reduce neonatal mortality rates.

Method

An electronic, systematic review of four databases were used to retrieve 206 articles initially. The following databases used are as listed: CINAHL Plus with Full Text; APA PsycInfo; Cochrane Database of Systematic Reviews; and MEDLINE. Searched key terms include: (neonat* OR newborn*) AND developing countr* or "developing nation*" or "third world" or "low income" countr* OR (MH "Developing Countries") OR (MH "Low and Middle-Income Countries") OR low-resource countr* OR low-income countr*) AND (mortalit* OR death*) AND (prevent* OR intervention* OR program* OR educat* OR teach* OR visit*) AND (home-based OR "home based" OR "home care" OR "home visit*" OR home-visit*). Additional inclusions were favoring the English language. The initial 206 articles were reduced to 169 when duplications were taken into account. Articles were excluded if they individually referred to infant mortality without the distinction of neonatal mortality, if they included developed regions or countries, if not originally in English, and if the article was a commentary abstract. After careful abstract review, 42 articles were to be reviewed.

Review of Literature

Search Results

Initial searched vital terms included: low-income, middle-income, third world, developing countries, OR developing nations. Other key terms included: mortality or death, home-based, home care, OR home visit. The following four databases used were: CINAHL Plus with Full Text; APA PsycInfo; Cochrane Database of Systematic Reviews; and MEDLINE. A total of 206 articles underwent a title and abstract review.

Inclusion and Exclusion Criteria

A total of 169 articles underwent a title and abstract review out of the initial 206. Inclusion criteria included: written in English, peer-reviewed, academic journal articles researching home-based or community interventions in developing countries to lower neonatal mortality rates. 127 total articles were further excluded due to the following reason(s): 11 articles were not researched initially in English instead were initially in Portuguese, French, Swedish, Turkish, or Korean; 29 articles were excluded for individually studying postpartum effects, maternal health, or prenatal care; 57 articles were excluded for focusing on infant mortality rate, infancy, or infancy- adult care. The remaining 30 articles did not specifically discuss the neonatal process, neonatal interventions, community health, or home-based interventions and, therefore, were also eliminated. A total of 42 articles remained for evidence review.

Synthesis and Analysis of Literature

Of the remaining 42 articles that were reviewed, eight met the inclusion criteria and data methods to support the evidence table. The studies took place primarily in four countries: Pakistan, Bangladesh, Ghana, and India. With the exception of the systemic review by Gogia and colleagues (2011) which alluded to studies from a variety of locations, research was primarily conducted in South-Southeast Asia with 11 trials, and one trial each in Greece and in Gambia. The study methods and levels of evidence were diversified; according to the Melnyk levels of evidence (2015), one article placed at level I, composed as a systematic review and meta-analysis of controlled trials. Three cluster-randomized controlled trials placed at level II, two observational cohort studies placed a level III, and one participatory rapid appraisal design study placed a level VI. All articles were analyzed to evaluate level of evidence using the Melnyk and Fineout-Overholt criteria (see *Appendix A*) (Melnyk & Fineout-Overholt, 2015).

Discussion of Findings

Home and Community-Based Interventions

After careful evaluation, it has been concluded that home and community-based interventions for low middle-income communities were commonly implemented in packages or bundles rather than individual interventions. When an individual intervention was being studied, it was often accompanied by an essential package. If the intervention consisted of home visitations, it would be introduced as a packaged set of visits consisting of different time intervals for prenatal and postnatal interventions. To assess the effect of the timing of first postnatal home visit by community health workers on neonatal mortality, Baqui and partners provided an intervention package that measured the effects of postnatal visits one day, three days, and seven days or more post birth (2008). The study consisted of a control group that did not receive any type of intervention other than what was customarily provided and an intervention group that participated in the intervention data collection, both with and without randomization. Of the remaining six studies reviewed, each had two intervention groups and a control group. Of the intervention groups each received standard care packages highlighting birth preparedness, with the second intervention group, receiving an added intervention package which varied from study to study. There is no uniformity in the exact definition of home-based care, therefore several studies often overlap home-based and community-based interventions in their packages. Overall, the main emphasis of home-based newborn care focused on the prevention, promotion, and curative services provided to the newborn as well as their mothers at home. Ashok Dutta (2009) alluded to Damstadt's definition of home-based care as family oriented and community-oriented services

that support self-care, including the adoption of improved care practices and appropriate care seeking behaviors for life threatening illnesses. It also involved community mobilization and the empowerment of individuals and communities to demand quality services to respond to their unique needs. Whether individualized or clustered, the interventions aimed to lower NMR.

Availability

Interventions available were dependent on the type of intervention, whether packaged as home visitations by trained community health workers or community education sessions, facilitating learning through participation. An essential neonatal intervention package consisted of written materials and supplies to provide safer standard newborn care related to birth preparedness, clean delivery and cord care, thermal care including early skin-to-skin contact, breastfeeding promotion, and danger sign recognition (Kumar et al., 2008). Other researchers focused on healthy newborn practices and education rather than supplies. This included content on improving care-giver recognition of life-threatening neonatal problems, teaching caregivers how to identify signs of severe neonatal illnesses and how to better communicate with community health workers for a referral to a health facility if required.

Home-based interventions such as postnatal visits fell under two categories: visitations during specific time intervals such as the first, third, and seventh-day post birth (Baqui et al., 2008; Baqui et al., 2009) or the total number of visits made during the neonatal period (Bang et al., 2005). Bang et al. implemented the highest number of home visits to be reported thus far with an average of 8-12 during the neonatal period. Additionally, while providing these visits, there was an increased awareness of the special needs of low birth weight and preterm neonates. This practice yielded a result of 62% decrease in NMR. The trial by Baqui et al. (2009), with the

least number of visits, reported the least reduction in NMR. However, in the remaining trial excluding Bang et al. and Baqui et al. (2009), the number of home visits they provided were inconsistent (Gogia et al., 2011). Therefore, it was concluded by Gogia et al. that the ideal time for the first postnatal visit for maximum impact was during the first two days of life (2011).

Community-based interventions including participation of villages, parents, and health workers fell under two categories: community packaging aimed to lower NMR with the involvement of maternal education via clustered or individual classes, or packaging aimed to lower NMR with direct impact on newborn care with community/village health workers. Jokhio et al. researched an intervention to facilitate care based on the available infrastructure, low-cost, and sustainability (2005). This approach allowed for the researcher to evaluate the community and its resources prior to implementing any new practices. Resulting in a 29% reduction in NMR, the intervention permitted for the community's traditional birth attendants to collaborate with lady health workers (LHWs). In doing so, traditional birth attendants were trained and issued disposable delivery kits. Additionally, LHWs linked traditional birth attendants with established services and documented processes and outcomes.

A community intervention may have also been chosen to not focus exclusively on changing the traditional practices implemented by locals in caring for their newborns, rather it may highlight the importance of changing or modifying the beliefs of long held generational practices. Kumar et al. researched the correlation between community-based behaviour change, management and neonatal mortality in Shivgarh, Uttar Pradesh, India (2008). By designing an intervention sought to combine an evidence-driven intervention with community participation and ownership, it was hypothesized that behavior change would impact the practices

implemented yielding a reduction in NMR. This resulted in a 54% reduction in NMR with the essential packaging and a 52% decrease with essential package plus use of a liquid crystal hypothermia indicator known as ThermoSpot. However, ThermoSpot was not aimed to lower NMR, rather to increase awareness of hypothermia (Kumar et al., 2008).

Kirkwood et al. via a cluster randomized study, implemented the intervention of Newhints zones (2013). Newhints were zones dedicated to receiving an intervention package called the “Newhints.” The package included community interventions by having Newhints zones with trained workers to identify pregnant women in the community, while also implementing home care by providing two home visits during pregnancy and three in the first week of the newborn’s life to promote essential newborn-care practices, monitor weight, assess babies for danger signs, and refer as necessary. The Newhints achieved an overall 8% reduction in NMR. To further provide a relationship between home and community, an initial approach was taken in several of the packages that included education of danger signs and referral of ill newborns to more equipped facilities if necessary (Kumar et al., 2008). Although included in the packages, some were hesitant pursue the referrals. Aware of the noncompliance, Baqui et al. not only referred but also treated minor illnesses in the community or the newborn’s home (2009). One unique approach by Waiswa et al. was to have a community health worker design the home-based intervention package so that linkage was made to facilities and messages between the facilities and home care could be better delivered (2012).

Workers training.

The term “community health worker” included any village or community-based health worker or volunteer, or an auxiliary health professional working in the community. Some

villages had very specific cultural titles such as a *dai* who are untrained birth attendants in the Haripur district of Pakistan (Khadduri et al., 2008). Through the actions of these community health workers, whether a volunteer or paid worker, who have obtained a modest training, and with program coverage including home visitation on the first two days of life, evidence-based practice revealed there was a significant decrease in NMR. The result of this community-based intervention was more evident in communities with the highest NMR (Gogia et al., 2011). Community health workers (CHWs), village health workers (VHWs), village health teams (VHTs), Lady Health Workers (LHWs), or community-based surveillance volunteers (CBSVs) training varied per study alongside worker to patient ratios. The lesser number of home visitation days may be more feasible for smaller villages and therefore could be seen as a benefit in being able to effectively implement the program though variability in training may be a limitation, in that the lack of training may have negatively impacted NMR. Some researchers argued that the worker training needed to solely focus on essential needs. This included identifying pregnant women in the community and identifying at risk newborns. Therefore, the number of days of training reflected no correlation to the degree of effectiveness. However, to maximize effectiveness, Kirkwood et al. trained the CBSVs in phases to allow time for processing and translation if necessary.

In the Newhills zones, each zone was assigned at least one CBSVs, totaling to over 400 CBSVs trained; training lasted 9 days, divided into phases over 8 months (2013). Baqui et al. on the other hand, also provided a three-day refresher training course midway through implementation in addition to the six weeks of training initially received (2009). Worker training was also divided into cognitive and practical aspects; meaning some training was completed via

lectures or meetings, some via hands on practice, and others using the combination of both. Baqui et al. (2009) workers' training included skills for communicating behaviour change, providing essential newborn care, assessing and managing sick neonates, as well as hands-on clinical training in a tertiary level hospital. Overall, the research showed the training of workers varied between 3 to 36 days and was a combination of both theoretical as well as practical aspects. It has also discovered that the ratio of health worker to population ranged from 1: 500 up to 1:4000; and the duration of the interventions ranged between 14-84 months (Gogia et al., 2011).

Birth places.

The significance of home and community-based neonatal care in developing countries reigns credible due to the impact low to middle developed countries have on the national neonatal mortality rate and due to the differences between their birthing beliefs, rituals, and practices compared to developed countries. Due to lack of infrastructure, the majority of births take place at home in developing countries, therefore villagers do not have the luxury of well-equipped birthing spaces. Two-thirds (66%) of births take place at home (44% in urban areas versus 75% in rural areas) (Khadduri et al., 2008) and many of these newborns die at home while being cared by mothers, relatives, and traditional birth attendants (Dutta, A., 2009). Most neonatal deaths occur at home in low resource settings against a backdrop of poverty, unskilled home deliveries, suboptimum care-seeking, and weak health systems (Kumar et al., 2008). Home interventions are targeted at the maternal and newborns level to help ensure survival and lower the risk of complications. Whereas community interventions are focusing on education and health promotion to lessen future complications and lower NMR per community, both aiming to

result in an overall reduction in the national NMR. Emerging evidence suggests that a substantial reduction in neonatal mortality can be achieved with simple, low-cost interventions within family and community settings (Kumar et al., 2008). Therefore, it remains essential for neonates in developing regions to receive home and community-based care with regard to community traditions, belief systems, and sociocultural behaviors of the villages.

Literacy and Cultural Influences

The implementation of an intervention is highly influenced by understanding what the intervention encompasses. For home and community-based interventions, literacy in terms of language barriers, maternal literacy, and cultural beliefs that may interfere with the implementation of the interventions is of utmost importance. The community studies performed included the community workers, however these workers were often trained by outsiders, allowing for much variation in the actual training content. Therefore, effectiveness was influenced by workers' competency and comprehension of the interventions. It may be assumed that all researchers ensured understanding, however only Kirkwood et al. (2013) documented the evaluation. It was documented that surveillance fieldworkers read an information sheet and consent form to the women in their local language(s) and assessed their understanding. The lack of evaluation of comprehension allowed room for error and misinterpretation.

Maternal literacy.

For the purpose of these interventions, maternal literacy is referring to the level of knowledge within the household pertaining to safe newborn care practices. Several of the intervention packages referred to maternal literacy, in which they focused on evaluating the amount of information currently known and later aimed to amplify or modify the knowledge to

supplant it with a more beneficial approach. Literacy was also influenced by the maternal support system. Therefore, to maximize behavioral changes, studies had to target the household as a team. Individual behaviours were influenced by collective behaviours and social norms, and sustained by a complex, multilevel network of relationships within the community. Kumar et al. therefore developed a multilevel strategy targeting community stakeholders, newborn stakeholders, and households with immediate support groups (2008).

Although the findings illustrate some beneficial practices, evidence-based practice has concluded that many reported practices from developing communities have a negative impact on NMR (Khadduri et al., 2008). Baqui et al. (2009) reported very poor knowledge regarding newborn care practices among pregnant mothers, especially in rural areas. Only 7% pregnant women received any information regarding clean cord care from health professionals; similarly, 5% women received information on thermal care and breastfeeding. In a study evaluating household knowledge and practices of newborn and maternal health in Haripur district, Pakistan, Khadduri et al. assessed maternal literacy on specific practices such as clean delivery, cord care, early breastfeeding, delayed bathing, and more. The team proceeded to measure current knowledge and compare it to the household practices which were found to influence NMR. An example of a practice in the Haripur district of Pakistan was the use of a chicken feather to place a paste made of fried onions or mustard oil to the cord stump immediately after birth (2008), placing the newborn as an increased risk of infection. Even though the importance of clean cord care was supported by evidence there was resistance to changing this long-standing traditional practice that has been followed over many generations.

Timely and immediate neonatal home care is crucial to NMR due to influence over negative consequences of infection, hypothermia, and malnutrition. In the study by Khadduri et al. it was noted the lack of literacy on the necessity of immediate drying and delayed bathing of newborns in the Haripur district. Most *dais* leave babies unattended, sometimes on the floor or the ground, until the placenta has been delivered. Additionally, a common practice is to bathe the newborn 1-2 hours post-delivery with warm water and soap. Both of these practices, leaving the newborn unattended and early bathing places the newborn at risk for hypothermia (2008). In aiming to increase awareness of the relationship of hypothermia on NMR, Kumar et al. included a liquid crystal hypothermia indicator called a ThermoSpot, which resulted in the reduction of NMR to 52% in Shivgarh, Uttar Pradesh, India (2008).

In addition to drying and bathing, the crucial benefits of colostrum was taught. Colostrum being the first form of milk secreted from the mammary glands after giving birth contains powerful immune-boosting properties safeguarding against future infections and diseases while promoting the growth of good gut bacteria (Bailey, 2018). There is a lack of knowledge on the benefits of early breast feeding in these communities, and the information disseminated was often from noncredible resources such as television, radio, and uninformed lady health workers, proven to be inaccurate (Khadduri et al., 2008). Most mothers do in fact breastfeed their newborns, but initiation within one hour of birth, feeding colostrum, and exclusive breastfeeding for four or more months are not common. Upon further investigation, it was discovered that most households and health workers believed colostrum can kill the baby because it is “dense, dirty, old milk stored in the breast for nine months” (Khadduri et al., 2008). It was perceived by Khadduri et al. that this belief and subsequent practice would not be receptive to change. In

conclusion, knowledge practice gaps are highly present in developing communities, which is affecting the increasing numbers in NMR. The long-term solutions can only be achieved by improving the literacy rate and empowerment of mothers (Dutta, A., 2009).

Poverty and Feasibility

Evidence-based practice has proven the benefits of home and community-based neonatal care in developing countries. However, there lacks enough evidence proving the feasibility of the implementation of these interventions. Studies have reported a one-third to two-thirds reduction in mortality among newborns after home-based care interventions. However, when translated into scaling up of home-based newborn care in the most severely affected districts of the country, the results were not as promising (Dutta, A., 2009). Therefore, identification of limiting factors and effective up scaling of the home-based packages will prove to be of enormous benefit in reducing NMR. Although many community health workers were volunteers, resulting in lower program cost, few studies did document a small monthly fee for services as well as materials. Kumar et al. (2008) documented a monthly fee of \$35-\$40 to the primary enablers of behaviour change, which was an estimation of 26 workers for research conducted over a period of several years. Due to the poverty level of these communities, one must question the level of effectiveness of the interventions without the benefit of researchers with a variety of resources and corporate funding. For maximum impact in the reduction of neonatal mortality in resource poor countries with weak primary care health systems, it is important to establish good outreach and home-based newborn care by improving home care practices and demand for skilled care at birth (Dutta, A., 2009).

India

The majority of the studies evaluated by the evidence table were conducted in different districts of India. India specifically, makes up over a quarter of the worldwide neonatal mortality rate. Every year, four million newborn deaths occur, in which nearly one-fourth take place in India (Dutta, A., 2009). As in many developing countries, there is a wide variation in NMR by districts or regions. For example, the state of Uttar Pradesh, India, accounts for a quarter of India's neonatal deaths and for 8% of the global NMR. It also shares similar sociocultural, demographic, and health system characteristics with other high-mortality Indian states and south Asian countries (Kumar et al., 2008). According to The World Bank, there are over 736 million people living in extreme poverty worldwide; of that population India, alongside four other countries, make up over half of that population (2020).

Limitations

In addition to health worker/patient ratio and limited location study districts, other limitations include but are not limited to sample size, randomization, and data collection. Home and community-based visitation interventions were impactful but only if the sample sizes and intervention coverage was large. Gogia et al. (2011) noted that community newborn care through home visitation with or without community mobilization and community participatory action and learning interventions decreased NMR, but the impact appears to be highest when baseline NMR are high and program coverage was over 50 percent. This raises the question of how smaller districts would benefit from home-based interventions, due to insufficient funding and lack of 50 percent or more coverage. Another limitation are the levels of evidence. The Melnyk levels of evidence table places randomized controlled trials (RCT) at the highest level of research

evidence to be obtained, giving it the credibility that other researchers must abide by. However, some may view the randomization of neonatal interventions such as the grouping neonates with no home visits and those with postnatal visits as unethical (Baqui et al., 2009). While it stipulates diversity to be evaluated, it may also rise to the credibility of the original research. Generally, a cluster-randomized controlled trial is considered the most valid design for studies of this nature, though it is not without methodological limitations and biases (Kumar et al., 2008).

Data collection is as important as the interventions themselves. Consequently, whomever is responsible for data collection has an influential impact on the final results. In studies funded by larger corporations, few documented the lack of influence the producers had on the study. Kirkwood et al. (2013) documented those funding the research had no role in data gathering, data analysis, or writing the reports, while others did not. This may have led to financial supporters influencing data collection and conclusions. Lastly, it could be inferred a possible conflict in workers gathering data. Baqui et al. (2009) noted that the workers who delivered the interventions also collected data on outcomes. One may note that while the workers aimed for honest results, questions may still rise due to an eagerness for positive results.

Implication for Research and Practice

Future studies are required to further understand the beliefs, attitudes, and perspectives of those involved in the birth process, and to document in more detail. Implementation of an intervention to a newborn who has no power to speak on their own behalf is completely dependent on the support system that surrounds such newborn. Therefore, qualitative research is needed to further evaluate the reasoning behind cultural beliefs, rituals, and traditionally accepted but harmful practices in newborn care. Home-based interventions would reign more

eventful once accompanied by household knowledge with improved maternal literacy, increased birth attendants training, and more community-facility linkage. Additionally, community interventions would be enhanced when supported by facility-based interventions to further impact neonatal mortality decline (Gogia et al., 2011).

More current research must be conducted to further evaluate the impact of home-based neonatal interventions on reducing neonatal mortality rate. As poverty levels increase and developing countries continue to carry the highest neonatal mortality rates, recent studies are required to further evaluate the feasibility of these interventions. As seen through this review of literature, home and community-based interventions has shown to be significant in the reduction of neonatal mortality. However, more research must be completed to assess behaviour changes, current practices, and more feasible interventions without the influence of corporate funding.

Summary and Conclusion

Home-based interventions and community care have shown to significantly aid in the reduction of neonatal mortality rates in developing countries. Evidence based studies such as the ones evaluated above, have also concluded that interventions are most effective when presented in packages. Packages targeting individual households with home-based intervention; packages improving communities with health workers; and packages aiming to strengthen the trust between facilities and communities via referrals and recommendations. With most neonates being born at home with or without skill attendants, interventions targeting the homes and the caretakers of these newborns remains crucial.

Appendix A: “Rating System for Hierarchy of Evidence”

Classification	Criteria
Level I	Systematic review & meta-analysis of randomized controlled trials; clinical guidelines based on systematic reviews or meta-analyses
Level II	Evidence obtained from one or more randomized controlled trials
Level III	Evidence obtained from well-designed controlled trials (no randomization)
Level IV	Evidence from well-designed case-control and cohort studies (studies of prognosis)
Level V	Evidence from systematic reviews of descriptive and qualitative studies
Level VI	Evidence from a single descriptive or qualitative study
Level VII	Evidence from the opinion of authorities and/or reports of expert committees

(Melnyk & Fineout-Overholt, 2015)

Appendix B: Literature Evidence Table

Author(s) & year	Study Design	Purpose	Sample Size & Demographics	Study Intervention	Key Findings	Study Limitations
Bang <i>et al</i> 2005	Field Trial Cohort study Level III	Home-based Neonatal Care (HBNC) package that provides low-cost, primary neonatal care by using the human potential available in villages, and thereby, to reduce neonatal mortality and to improve neonatal health Hypothesis: develop an HBNC intervention package that will cover 75% of neonates in the intervention area, and 60% of neonates with Sepsis NMR will decrease by 25% and sepsis-specific NMR by 40% in three years Seasonal variation in NMR will decrease Increase survival of LBW and premature infants	763 neonates in 39 villages Rural Gadchiroli, India	HBNC packages includes but are not limited to: Health education prenatal and postnatal (individual and group) Attending delivery along with Traditional Birth Attendant (TBA) Repeated home visits (8-12) during neonatal period Newborn interventions: Vitamin K injection, early breast feeding and thermal care Early diagnosis of sick newborn: Sepsis and administration of antibiotics Home-based care of LBW or preterm neonate	The NMR decreased by 62% in the third year (1997 to 1998) and by 70% in 2001 to 2003. The sepsis-specific NMR decreased by 76% in 1997 to 1998 and by 90% in 2001 to 2003	Home-based neonatal care (HBNC) packages included other properties and were not limited to home visits by Village Health Worker's (VHWs), in which data needs to be adjusted.
Baqui <i>et al</i> 2008	Cluster-randomized controlled trial Level II	two service-delivery strategies—a homecare model and a community-	480, 000: In Sylhet district, 24 clusters (with a population of	Community based health care package through community health worker and	Neonatal mortality was reduced in the home-care arm by 34% during	Masking was not feasible, possible bias.

		<p>care model—to promote neonatal health in rural Bangladesh.</p> <p>It was postulated that both intervention strategies would result in a 40% reduction in the neonatal mortality rate versus that in the comparison arm.</p>	<p>about 20 000 each)</p> <p>Three rural sub-districts known as upazilas (analogous to counties or boroughs) Beanibazar, Zakiganj, and Kanaighat of the Sylhet district, Bangladesh</p>	<p>treatment of sepsis neonatal mortality.</p> <p>In the home-care arm, female community health workers (CHW) identified pregnant women, made two antenatal home visits to promote birth and newborn-care preparedness, made postnatal home visits to assess newborns on the first, third, and seventh days of birth, and referred or treated sick neonates.</p> <p>In the community care arm known as mobilizers (usually TBAs) identified pregnant women and encouraged them to attend immunity meetings, receive antenatal care seek care for serious illness in mothers and newborns.</p>	<p>the last 6 months versus that in the comparison arm. No mortality reduction was noted in the community-care arm</p>	<p>Sample size: All married women of reproductive age (15–49 years) were eligible to participate.</p> <p>CHW-Patient ratio: one per 4000 population</p>
<p>Baqui, <i>et al</i> 2009</p>	<p>Observational cohort study</p> <p>Level III</p>	<p>To assess the effect of the timing of first postnatal home visit by community health workers on neonatal mortality (NM)</p>	<p>9211 live births were included</p> <p>24 administrative units, each with a population of about 20 000</p> <p>Sylhet district, Bangladesh</p>	<p>In developing countries, especially where home delivery with unskilled attendants is common, postnatal home visits within the first two days of life by trained community health workers can significantly reduce neonatal mortality.</p> <p>Project for Advancing the Health of Newborns and Mothers (Projahnmo) Interventions:</p>	<p>Among infants who survived the first day of life, neonatal mortality was 67% lower in those who received a visit on day one than in those who received no visit</p> <p>For those infants who survived the first two days of life, receiving the first visit on</p>	<p>This assignment was not random.</p> <p>Workers who delivered the intervention also collected data on outcomes.</p> <p>First visit was delayed for many neonates.</p> <p>Parents who refused ‘referral’</p>

				Community-based maternal and neonatal interventions Home Care interventions and effect of timing	the second day was associated with a 64% lower neonatal mortality than in those who did not receive a visit. First postnatal visit between day 3-6 or on/after day 7 showed no impact on NMR.	received more postnatal visits vs. the scheduled 3 postnatal visits
Gogia, <i>et al.</i> 2011	Systematic review and meta-analysis of controlled trials. Level I	Assess community based neonatal care by community health workers (CHWs) on Neonatal Mortality Rate (NMR) in resource-limited settings	13 controlled trials; including 9 cluster randomized trials, 1 quasi randomized trial and 3 nonrandomized trials About 192000 births primarily from south-southeast Asia-11 trials; 1 trial from Greece; 1 trial from Gambia	Variation of interventions by CHW Home visits: number and timing of first postnatal visit Community mobilization Participatory learning: prenatal and newborn care	reduced neonatal mortality in resource-limited settings [RR=0.73 (0.65 to 0.83); P<0.0001]	ratio of health worker to population ranged from almost 1: 500 up to 1:4000. Number of visits Limited data on CHW education, compensation, and supervision
Jokhio, <i>et al.</i> 2005	Cluster-randomized controlled trial Level II	The intervention was designed to facilitate care based on the available infrastructure and to be low-cost and sustainable	19,557 eligible women total; 10,114 were recruited in the three intervention talukas, and 9443 in the four control talukas. Seven subdistricts (talukas) of a rural district in Pakistan	Traditional birth attendants were trained and issued disposable safe delivery kits. Lady Health Workers linked traditional birth attendants with established services and documented processes and outcomes. Obstetrical teams provided outreach	29% reduction perinatal mortality (as defined in this study as “stillbirths and live born babies who died with 28 days”).	Reduction in NMR were recorded; however, the primary outcome measures were perinatal and maternal mortality. It was difficult to see which intervention made the neonatal impact.

				clinics, minimum one visit, for antenatal care.		<p>The small number of clusters of very large size is a limitation of the trial design.</p> <p>The administrative and training costs of delivering alternative forms of care to a larger number of smaller geographic clusters were prohibitive, and the risk of contamination would have been increased.</p>
Khadduri <i>et al</i> 2008	<p>A Participatory Rapid Appraisal Design.</p> <p>43 semi-structured interviews (SSIs) and 34 focus group discussions among men, women of reproductive age and health service providers. 21 SSIs were added among new mothers, new fathers and <i>dai</i> (untrained birth attendants)</p> <p>Level VI</p>	To learn about household maternal and newborn health knowledge and practices to aid the design of newborn programming within Save the Children's Haripur Program	<p>The Participatory Rapid Appraisal took place in two predominantly rural areas of Haripur (Rehana and Khanpur) and one semi-urban area (Khalabat township)</p> <p>Haripur district, Pakistan</p>	A Participatory Rapid Appraisal designed to better understand and document RH knowledge and practices; two investigators analyzed the findings according to themes within six care types: antenatal, delivery, immediate newborn, routine postpartum, special maternal and special newborn.	Although the findings illustrate some beneficial practices, many reported practices are harmful to the newborn. These findings, consistent with the sparse existing data in Pakistan, inform program interventions for household-level behavioral change.	<p>Qualitative research is desperately needed to understand the perspectives of those involved in the birth process, and to document finer details of the process.</p>

<p>Kirkwood, <i>et al</i> 2013</p>	<p>Cluster randomized controlled trial Level II</p>	<p>The primary objectives were to assess the effect of the Newhints intervention on all-cause (all deaths that occur in first 28 days) NMR, and essential newborn-care practices including care-seeking.</p>	<p>98 zones in seven districts in the Brong Ahafo Region, Ghana. 49 zones were randomly assigned to the Newhints intervention with 8035 eligible participants. 49 to the control intervention with 8294 eligible participants</p>	<p>Newhints intervention package: Community-based Surveillance Volunteers (CBSV) were trained to identify pregnant women in their community and to make two home visits during pregnancy and three in the first week of life (Day 1, 3, and 7) to promote essential newborn-care practices, weigh and assess babies for danger signs, and refer as necessary. Newhints is an integrated intervention package, based on extensive formative research and developed and implemented in close collaboration with the district health management teams of the trial districts.</p>	<p>Newhints zones achieved an 8% reduction (95% CI -12 to 25; p=0.405) in overall NMR The RRs for post day 1 NMRs, particularly targeted by the intervention, were lower. The adjusted RR for post day 1 NMR for singletons corresponded to a 23% reduction in mortality rate. In the last 7 months of the trial, NMR reduction for all babies was 26% and for singletons 41% High compliance of referral by CBSV of sick babies: 86% to health facility; 73% to hospital.</p>	<p>Newhints would not be expected to have more than a small effect on day 1 NMR because it does not tackle deaths from birth asphyxia, an important cause of early deaths.</p>
<p>Kumar <i>et al</i> 2008</p>	<p>a cluster-randomized controlled trial level II</p>	<p>That a behavior change management approach that promoted interventions to prevent high-risk newborn care practices, targeted at multiple</p>	<p>39 village administrative units; 104,123 population size. Divided into 3 groups: controlled, essential package, and</p>	<p>Two intervention groups: 1-Behavior change management: interventions for newborn care including birth preparedness, clean delivery, cord care,</p>	<p>Neonatal mortality rate was reduced by 54% in the essential newborn-care intervention and by 52% in the essential newborn care</p>	<p>Although a cluster-randomized controlled trial is considered the most valid design for studies of this nature, it is not without</p>

		<p>stakeholders within communities, would lead to substantial behavioral modification and a reduction on neonatal mortality.</p>	<p>essential package plus ThermoSpot (13 lusters each).</p> <p>Shivgarh, Uttar Pradesh, India</p>	<p>thermal care, breast feeding, and danger sign recognition.</p> <p>2-Intervention package plus a focus on prevention of hypothermia, using ThermoSpot, aimed at modifying practices and environmental considerations.</p> <p>The intervention design sought to combine an evidence-driven intervention with community participation and ownership</p>	<p>plus ThermoSpot arm.</p>	<p>methodological limitations and biases.</p>
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