5-2018

# A Systematic Review: Infant and Maternal Mortality and Morbidity in Developing Countries

Michayla Evans
*Oral Roberts University*

Jamie Jeemon
*Oral Roberts University*

Christiana Strysko
*Oral Roberts University*

Lauren Toole
*Oral Roberts University*

Patricia Catts, RN, PhD
*Oral Roberts University*

# A SYSTEMATIC REVIEW: INFANT AND MATERNAL MORTALITY AND MORBIDITY IN DEVELOPING COUNTRIES

Michayla Evans, Jamie Jeemon, Christiana Strysko, Lauren Toole

Edited by Dr. Patricia Catts, RN, PhD

A senior research paper submitted in partial fulfillment

of the requirements for the degree of

Bachelor of Science in Nursing

Anna Vaughn College of Nursing

Oral Roberts University

May 2018

**Acknowledgments**

First and foremost, we would like to thank our Father in heaven for giving us the strength and inspiration to complete this paper. We would also like to thank our mentor, Dr. Patricia Catts for her patience, guidance, and wisdom throughout this entire process. We couldn't have done it without her. Lastly, we would like to thank our incredibly supportive family and friends for encouraging us throughout this year-long process.

## Abstract

Maternal and infant morbidity and mortality rates are high within developing nations. The World Health Organization reports 800 women die daily due to pregnancy and labor complications (Maternal mortality, 2016). These complications are related to a wide variety of perinatal problems including preeclampsia and prolonged labor. Infant morbidity and mortality are related to infections, asphyxia, and low birthweight (Newborns: reducing mortality, 2016). The purpose of this systematic review was to research current literature to answer the question: "What are the nursing interventions to decrease maternal and infant morbidity and mortality in developing countries?". This systematic research review included a sample size of 31 articles, 15 of which reflected maternal morbidity and mortality, and 16 of which reflected infant morbidity and mortality. The analytical method utilized in this study was data extraction. The results of this study include a variety of interventions that focus primarily on preeclampsia, prolonged labor, low-birth weight, and natal infection. The interventions that target these issues include pharmacological treatments, implementation of education programs, administration of supplements, and the utilization of monitoring devices. The implications of these findings conclude that there is still a need for further interventional research to decrease maternal and infant morbidity and mortality in developing countries. These results reflect an imperative demand for further research and healthcare personnel willing to implement necessary interventions.


*Keywords:* maternal, infant, morbidity and mortality, interventions, developing nations, preeclampsia, prolonged labor, low-birth weight, and natal infections.

# A Systematic Review: Infant and Maternal Mortality and Morbidity in Developing Countries

Maternal and infant mortality rates in developing countries are exceptionally high compared to developed nations. According to the World Health Organization, around 800 women die daily due to complications during both pregnancy and labor (Maternal Mortality, 2016). Most of the complications these women experience during pregnancy and labor are preventable with known or available resources and precautions. It has been found that 99% of mortality in pregnant women occurs within developing countries. Infection, preeclampsia, bleeding, and abortions, are the major causes for around 75% of maternal complications. The risk of these complications are greater in pregnant women with HIV and malaria (Maternal Mortality, 2016).

Due to a lack of maternal care, resources, and education in developing nations, infant mortality rates are high. Often, the majority of infant death occurs within the first month of life. According to the World Health Organization, around 45% of deaths occur in newborns and infants. The main cause of infant mortality, around 80%, is due to infection, asphyxia, and low birth weight. The statistics often fluctuate, but have seen to increase around 4% within the last six years (Newborns: Reducing mortality, 2016).

The death of an infant is a life alternating experience that affects the mother, family, and community. In many cultures, the status of a woman is tied to her fertility. For example, in the traditional Nepalese culture it is a disgrace for a woman not to have children (Adhikari, 2010). In some African cultures, infant death may be considered a product of bewitchment (Fottrell, 2011).

The death of an infant may leave the family stricken with grief, and they may experience higher levels of depression (Rogers, 2005). The death of a mother can also have equally devastating effects, particularly if the mother leaves behind the infant and other children. A father or guardian may experience caregiver role strain (Doenges, 2010) in addition to grief after the loss of a significant other.

Nurses have the skills and knowledge to influence rates of maternal and infant mortality by implementing education regarding hygiene, the spread of infection, importance of prenatal health checks, and nutrition. The mission of the nurse is to improve health for all people physically, emotionally and spiritually whether it be providing teaching to a teenage mother about how to properly breastfeed a child or providing support for grieving family members in the event of an infant and maternal death. The key to prevention of infant and maternal mortality rates is understanding the four main contributors which include preeclampsia, prolonged labor, low birth weight and natal infection.

## Background

From a global perspective, infant and maternal morbidity and mortality in developing countries is a largely preventable problem. Many of the contributing factors to infant and maternal morbidity and mortality are related to perinatal complications such as preeclampsia, prolonged labor, low birth weight, and natal infection.

### Preeclampsia

Preeclampsia is a major contributor to infant and maternal mortality worldwide. According to the World Health Organization, approximately 10% of all maternal deaths in Africa and Asia, and 25% of maternal deaths in Latin America, are associated with

preeclampsia (WHO, 2017). Preeclampsia is an idiopathic condition that causes severely high maternal blood pressure and proteinuria during pregnancy. Over the past 50 years, preeclampsia-related mortality rates have dropped significantly in developed countries as a result of the implementation of life-saving interventions. In contrast, preeclampsia-related maternal deaths have been on the rise in developing countries (Ghulmiyyah, 2012). Currently, many risk factors contribute to the steady rise of preeclampsia in developing countries.

Risk factors of preeclampsia include obesity, multiple pregnancies, age (>40), chronic hypertension, severe anemia, and family history (Bilano, 2014). These risk factors may be a result of genetics, dietary practices, or socioeconomic status, particularly if the mother does not have access to adequate nutrition. In poverty-stricken areas of the world, lifestyle contributes to preeclampsia due to a high fat, high sodium diet (Bilano, 2014). Additionally, if mothers are severely anemic, their risk for preeclampsia increases 3.6 times (Ali, 2011). A study conducted in Sudan identified that uneducated women in Sudan have an increased incidence of preeclampsia related to anemia (Ali, 2011). Once a pregnant mother is preeclamptic, this exponentially increases their risk for adverse effects on the mother and the fetus.

Preeclampsia is a precursor to many serious complications such as eclampsia, HELLP (hemolysis, elevated liver enzymes, and low platelet count) syndrome, placental abruption, or maternal and fetal death (WHO, 2017). Preeclampsia has multiorgan system effects that include hematologic, hepatic, renal, and cardiovascular systems. One of the most common complications of preeclampsia is eclampsia, a seizure state that is the result of a spike in blood pressure. This seizure state may result in broken bones,

aspiration, or head trauma, and may be followed by a period of unconsciousness. The primary impact of eclampsia on the fetus is the disruption of blood flow to the placenta, leaving the fetus oxygen-deprived, with devastating effects including preterm birth or stillbirth (Cosmi, 2011). Additionally, HELLP syndrome may have adverse effects on the fetus, such as intrauterine growth restriction and placental abruption. The maternal mortality rate in HELLP Syndrome is 1.1%, and fetal morbidity and mortality rates range from 10-60% depending on gestation and early treatment (Martin, 2006). Adverse effects of HELLP syndrome on the mother include pulmonary edema, acute renal failure, and ruptured liver hematomas leading to hemorrhage (Martin, 2006). The majority of these adverse effects are preventable if barriers to healthcare are overcome and pregnant mothers receive adequate prenatal care.

In order to prevent maternal and fetal mortality and morbidity in relation to preeclampsia, measures must be taken to overcome barriers of care for the mother and fetus. These barriers can prove to be challenging, particularly if they involve cultural practices; however, it is imperative that healthcare professionals such as nurses identify women at risk and initiate appropriate care for these women (Osungbade, 2011). Once these women are identified, additional measures may be taken to educate, treat, and monitor health to maximize maternal and fetal outcomes. This paper will identify effective measures to treat and prevent maternal preeclampsia. Another major complication that could adversely affect the mother in addition to preeclampsia is prolonged labor.

**Prolonged Labor**

Prolonged labor is one of the most common factors in maternal and infant mortality in developing nations. A woman in labor for 12 hours or more is considered to be in prolonged labor (Khanal, Karkee, Lee, & Binns, 2016). About three to six percent of women experience obstructed labor during childbirth. One of the leading causes of prolonged labor in developing nations is cephalopelvic disproportion (Maaloe et al., 2011).

When a fetus is larger than the pelvic diameters of the mother, cephalopelvic disproportion resulting leads to prolonged labor, obstructed labor, necrosis of maternal soft tissue, fistulas, and damage to the fetal skull and central nervous system (London et al., 2017).Teenage women are more likely to develop unusual complications include cephalopelvic disproportion representing 10% of all births worldwide (Shaikh et al., 2012). Developing nations, such as Southeast Asia and areas of Africa, commonly have child marriage. There are laws to prevent child brides; however, in many rural areas, the rules are not enforced. With girls being forced to marry older men resulting in impregnation. Their bodies have not fully grown and are not developing enough to endure pregnancy and childbirth. Girls under the age of 18 have an increased risk of prolonged labor, but the complications increase more greatly for girls under the age of 16 years old (Armstrong, 2014).

Nutrition influences the outcome of pregnancy in child bride's who are still in developmental formation. Often, many girls come from impoverished communities and their parents force them into arranged marriage because they are struggling financially.

Girls that come from low socioeconomic backgrounds are often malnourished, so their bodies do not meet their maximum growth potential (Shaikh et al., 2012).

Women and girls with cephalopelvic disproportion are likely to need an operative delivery. A report from WHO, discovered that cesarean section was necessary in 90% of obstructive labor, and additional study found that only 4% of women delivered naturally under these circumstances (Shaikh et al., 2012). Studies have shown 19% of women in rural areas have a chance of having prolonged labor compared to 11% of mothers living in urban areas (Khanal et al., 2016). If a woman does not have a cesarean section it increases her and her baby's risk for complications. Women experience many complications from untreated prolonged labor such as obstetric fistulas, postpartum hemorrhaging, uterine rupture, puerperal sepsis, and death (Maaloe et al., 2011).

Obstetric fistulas of bladder, vagina, and rectum are a difficult and life altering conditions women develop from prolonged labor. According to Wall, over 3.5 million women are suffering from fistulas in developing nations such as Africa and Asia. New cases of fistulas are rising every year ranging from 50,000 to 130,000 (Wall, 2012). Complications include urethral infections, amenorrhea, shortening of the vagina, and neurological injuries like foot drop.

Many fetal complications result from prolonged labor including fetal death. One third of stillbirths occurs because there was a lack of obstetric care with stillbirths being 50 times more likely to occur in developing nations compared to developed nations (Cowgill et al., 2015). Sadly, traumatic labors can cause stillbirth, cerebral palsy, or other hypoxic related morbidity.

Early pregnancy, poor nutrition and pelvic defect in developing countries result in cephalopelvic disproportion and obstructed or prolonged labor. Lack of health care including cesarean section make these families are risk for fistulas, stillborn infants, and neurological deficits in children. Nurses have the opportunity to improve and prevent prolonged labor in women. Through education, nurses can inform mothers and their societies on cultural stigmas such as cesarean delivery. Interventions are needed to decrease and prevent complications experienced by a mother due to prolonged labor. Another contributor to infant mortality and morbidity is low birth weight.

**Low Birth Weight Newborns**

Complications arise from prenatal and birthing issues in developing nations. One of these issues for the baby is LBW. The phenomena of low birth weight (LBW) infants has a significant impact on the maternal and child care of developing countries. The prevalence of LBW newborns is 15.5% worldwide, estimating 20.6 million infants being born each year, and 96.5% in developing countries (WHO, 2004). Half are born in South Central Asia, 15% in sub- Saharan Africa, and 10% in Central and South America (WHO, 2004). A LBW infant is defined as a newborn weighing less than 2,500 grams (WHO, 2004). The risk of infant death decreases as the weight of the newborn increases, with LBW infants being 20 times more likely to die (Gaiva, Fujimore, & Sato, 2014; WHO, 2004). These newborns have a decreased chance of a full quality of life, and even survival.

The lifestyle, nutrition, culture, and health of the mother plays a significant role in affecting pregnancy outcomes, particularly the weight of the child. Maternal education and low socioeconomic status, as well as use of alcohol, smoking, and drug use will

negatively impact the birth weight (WHO, 2004). The mother living an impoverished lifestyle may have malnourishment, predisposing her to deliver a LBW infant (WHO, 2004). Maternal health factors that increase the risk of LBW infants include infections, sexually transmitted diseases, diabetes, and hypertension (WHO,2004).

Cultural influences, including early marriage and childbearing predisposes the mother to deliver a LBW infant (Hockenberry, Wilson, & Rodgers, 2012). Many of the women who are participating in early marriage are still adolescents (Hockenberry, Wilson, & Rodgers, 2012). Adolescents have not reached the full developmental stage in order to take care of an infant. They may have reached sexual maturity, but they have not reached full physical, cognitive, and emotional maturity (Hockenberry, Wilson, & Rodgers, 2012). In a study done in Cuiaba, Brazil, a third of LBW infants were delivered by teenage mothers (Gaiva, Fujimore, & Sato, 2014).

Delivery of a LBW infant can be closely tied to preterm labor where an infant is born before 37 weeks of gestation (WHO, 2004). When infants are born early, they do not have sufficient time to develop and gain weight in the uterus, as the majority of weight is gained during the last stage of the pregnancy. Another factor, related to LBW delivery is intrauterine growth restriction defined as fetal development less than the standard growth possible for an infant because of genetic or environmental factors (Murki & Sharma, 2014). This condition develops when the infant does not grow well in the uterus because of complications with the placenta, the mother's health, or birth defects ( "Low Birth," 2016). The risk factors that precipitate preterm labor and IUGR are poor health of the mother, poor nutrition during pregnancy, use of drugs and alcohol, and multiple pregnancies (American Pregnancy Association, 2017). The risk factors that

cause preterm labor and IUGR in the mother ultimately affect the infant's physical and mental development.

A mother being diagnosed with malaria during pregnancy can result in the delivery of a low birth weight child (Guyatt & Snow, 2004). It is estimated in areas of Africa where malaria is prevalent, approximately 19% of infant LBWs are due to malaria and 6% of infant death are due to LBW caused by malaria. These statistics reveal that around 100,000 infant deaths each year could be due to LBW caused by malaria during pregnancy (Guyatt & Snow, 2004).

LBW infants are at risk for not reaching full developmental potential. Short- term complications of LBW include a difficult time eating, gaining weight, staying warm, having adequate oxygen levels, and fighting infections. Long- term complications can include cerebral palsy, blindness, and deafness (Berry & Holloway, 2017). Studies in Guatemala have demonstrated lower cognitive scores at age two and three years in LBW infants. Chinese LBW infants demonstrated greater behavioral problems in adolescence than infants born with normal birthweight (Walker et al., 2007).

Complications of LBW can be prevented if mothers have access to basic interventions for prenatal care. It is important to identify lifestyle habits, quality of life, and nutritional interventions so that mothers can resolve this preventable problem, and potentially save the lives of millions of babies living in developing nations.

**Natal Infections**

Another major cause of infant morbidity and mortality in developing nations is the prevalence of infection. Around 35% of neonatal death is the result of an infection, with common conditions including diarrhea, malaria, pneumonia, and tetanus (Joshi,

2013). According to the United Nations Children's Fund, although infant morbidity and mortality in some areas of developing nations is decreasing, Sub-Saharan Africa and Southern Asia's infant morbidity and mortality rates remain high, mainly due to infections (You, Hug, Ejdemyr & Beise, 2015). The rationale for the existence of consistent infection rates could include a number of reasons, some dependent upon cultural practices, unavailable resources, lack of healthcare providers or education, insufficient sanitary practices, and more (Joshi, 2013).

Recent research has found that a mother's susceptibility to puerperal infections due to environmental exposure to bacteria and pathogens have seen to increase infant risk of infection and potential morbidity or mortality (Bellizzi, Bassat, Ali, Sobel & Temmerman, 2017). Cultural and environmental risks such as the birthing environment, lack of resources and hygiene practices, are related to puerperal infections and increase the probability of infectious pathogens being transmitted to the infant during perinatal periods (Bellizzi, Bassat, Ali, Sobel & Temmerman, 2017).

Malaria during pregnancy, may cause low birth weight in an infant. This results in inadequate placental development, decreasing the nutritional and oxygenation supply, leaving the infant at greater risk for infection (Lloyd-Nyunia, 2011). Prenatal infections affect the fetus, but also health care environments and birth attendant practices increase the risks as well.

Poor hygiene practices of birth attendants, such as inadequate hand washing, contribute to the risk for the development of infant infection (Joshi, 2013). It was reported that the continuous unsanitary practice of birth attendants in Nepal ultimately results in putting infants at higher risk for developing infection. In the Nepalese culture, it

is common for deliveries to be within a home setting, counting for around 63% of childbirths (Joshi, 2013). The concern with deliveries in the home environment is due to the cleanliness, or lack thereof, of the birthplace as well as the way the umbilical cord is handled (Joshi, 2013). In Nepal, there is a cultural practice of covering the umbilical cord stump with traditional oils and spices, which is associated with tetanus and sepsis in neonates (Joshi, 2013). It is notable that both within the home and healthcare setting, infection is a high risk.

The environmental risk of contaminated water supply, food, and environment due to the practice of open defecation has also been reported. Infant exposure to bacteria, parasites, and viruses from contaminated sources is a leading cause of infection (Bulled, Singer & Dillingham, 2014). Around 72% of child mortality caused by diarrhea occurs in children 2 years and younger within developing nations, Asia and Africa being major regions (Bulled, Singer & Dillingham, 2014). Complications from such infectious sources lead to infant morbidity and possible mortality (Bulled, Singer & Dillingham, 2014).

Aspiration pneumonia is a common infectious complication found in neonates of developing nations. Aspiration pneumonia commonly occurs due to tetanus infection, which stems from improper umbilical cord care. It also is a result of lack of maternal immunizations (Alhaji, Bello, Elechi, Akuhwa, Bukar & Ibrahim, 2013).

Infants in developing countries have a high risk of developing infections through both perinatal and environmental sources. These include cultural practices, lack of education, lack of resources and sanitation, and more. Infant morbidity and mortality from infections can be prevented and rates decreased through education and early

interventions provided through the frontline health care providers, particularly a trained nurse.

## Significance

The day of birth is a glorious occasion, but it also marks a day that significantly threatens the life of the child and mother, especially in developing nations. Mother and newborn are vulnerable to injury and risk of death.

Women in developing countries have little or no prenatal care or labor support. Preeclampsia and birthing trauma can result in loss of ability to work, damage to reproductive organs and potential death. Social consequences could occur if her fertility is lost. This can leave a family grieving and struggling.

WHO (2016) reports that many neonates (about 75%) will die within the first week of life and 25% to 45% of those death deaths will occur in the first 24 hours of the newborn's life. Lack of prenatal care, maternal complications, and gestational influences can result in preterm labor and low birth weight infants. In addition, a variety of infections can leave an infant ill and debilitated, and these vulnerable newborns are at risk for lifetime consequences including physical, mental and developmental morbidities. Developing societies do not have resources to properly care, and their cultural beliefs may also influence the outcomes for these babies. Poor quality of life, societal rejection, and abandonment result from lack of adequate childbearing healthcare.

Nurses are on the frontlines of patient care in developing countries, with indigenous midwives providing antenatal care and education. The shortage and unavailability of these trained healthcare personnel results in increased childbearing risks and complications for mother and baby. In order to disrupt the cycle of infant and

maternal morbidity and mortality, it is pivotal that nurses implement available and basic life-altering interventions to prevent lasting negative impacts. Nurses have the ability to be a catalyst to promote change and healing for the individual, the family, and the community.

## Problem

In developing nations, childbearing women often have cultural practices and lack of prenatal care, education, and health care resources. These contribute to maternal complications of preeclampsia and prolonged labor and increase the risks for maternal morbidity and mortality. Similarly, infants are exposed to environmental and cultural practices that increase risk for low birth weight and infection, resulting in morbidity and mortality. Lack of education for health care providers and families as well as lack of appropriate medical resources plays a role in contributing to these health concerns in these nations. Nurses are frontline primary health care providers who can provide education and assist in obtaining appropriate resources to reduce these risks and increase access to basic care. Therefore the question this research seeks to answer is: What are the nursing interventions that decrease maternal and infant morbidity and mortality in developing countries?

Therefore the purpose of this systematic research review is to describe nursing interventions to decrease maternal and infant morbidity and mortality in developing countries. Nurses can be a valuable resource to provide education, nutrition, and counseling to maximize patient outcomes. The benefits of these interventions are decreased maternal and infant complications such as prolonged labor, preeclampsia, low birth weight, and infant infection.

## Definition of Variables

This systematic research review identifies multiple variables that require definition. The independent variable is nursing interventions, and the dependent variables are maternal and infant morbidity and mortality.

The definition of a nursing intervention is, "any treatment based upon clinical judgment and knowledge that a nurse performs to enhance patient outcomes" (Bulechec & Dochterman, 2008, p. xxi). Interventions focus on preventing, resolving, controlling the problem, and assisting with activities of daily living (ADL's) and are utilized to monitor health status, promote optimum health, and independence (Alfaro-LeFevre, 2010).

For the purpose of this study, maternal mortality will be defined as "the death of a woman during pregnancy or within one year of the end of the pregnancy" (CDC, 2017, para.1), related to health complications that arise during this frame of time, either related or unrelated to the pregnancy (WHO, 2017). Maternal morbidity is defined as unanticipated outcomes of laboring mothers that may result in any physical or mental disability that is correlated directly or indirectly to prenatal, antenatal or postnatal processes (CDC 2017; Koblinksy, 2012). Complications that may result in maternal mortality and morbidity include fistulas, vaginal hematomas, and additional negative outcomes related specifically to prolonged labor and preeclampsia.

This study, as an outcome, is examining the dependent variable of infant morbidity and mortality. Infant morbidity can be defined as the conditions of declined health developing overtime, such as illness or disease, that can result in mortality (Child Health USA, 2013). A synopsis from the National Health and Medical Research Council

defined perinatal morbidity as an antagonistic outcome that impacts the infant during pregnancy or up to the first month of life (NHMRC, 2009). According to the CDC, infant mortality can be defined as the end of life of an infant prior to twelve months of age (Infant Mortality, 2016). Infant mortality could be a result of common complications such as hypoxia due to prematurity, diarrhea related to infections, and more. Both independent and dependent variables will be further observed in order to answer the question of this systematic review.

## Methodology

This systematic research review was conducted from February, 2016 through August, 2017. The databases searched included PubMed, Medline, WHO, CINAHL, EBSCO, BioMed Central, NCBI, JSTOR,URMC Health Encyclopedia, UNICEF, GAVI, Science Direct, US National Library of Medicine, Consumer Health Complete, SAGE, BioMed Research International, Academic Search Complete and Google Scholar. The time frame and the databases utilized offers the widest range of available literature on the topic, which addresses our specific topic in its entirety. The searches were initiated using the key terms infant, maternal, mortality, morbidity, developing countries, developing nations, preeclampsia, nursing, health care in third world countries, birth resources, pregnancy complications, culture, rural, prevention of infant infection, antenatal care, treatment, diarrhea, Africa, women, prolonged labor, cephalopelvic disproportion, fistulas, third world countries, Nepal, death, problems, low birth weight, low birth weight interventions, and IUGR. The terms were used singly and in combination to provide the greatest number of hits possible that could potentially answer the research question.

Additionally, librarian services were used to expand the pool of articles available with each search.

The combination of searches yielded 3,499,636 hits. The articles resulting from the searches were first scanned by title. If the title appeared promising, the abstracts were scanned for appropriate content. Articles that appeared to offer information relevant to our topic were scanned in full. Articles that met the above criteria and were saved were then critiqued for quality, rigor, and the ability to answer the research question. Other inclusion criteria were articles published between 2010 and 2017 (with several outlying articles published earlier than 2010), english articles, full text articles, and articles focused on maternal and infant populations. The total number of articles that appeared to answer the research question and were deemed adequate to be part of the sample was 32, 16 focusing on maternal mortality and morbidity, and 16 focusing on infant mortality and morbidity.

## Findings

This systematic research review was comprised of 31 studies. The date ranges for this group of studies include studies from 2010 and 2017. These articles within this time frame reflected to most appropriate information that was relevant to our research topic. There were 15 quantitative studies (Al-Omrani et al., 2013; Chhapola & Brar, 2015; Choulagai et al., 2013; Dolo et al., 2012; Ekanen et al., 2012; Amini et al., 2011; Farhoudi, et al., 2016; Groom, 2017; Iszatt, Nieuwenhuijsen, Bennett, & Toledano, 2014; Kiondo et al., 2014; Koldewijn et al., 2009; Lund et al., 2014; Mazumder et al., 2010; Mirzakhani et al., 2016; Maaloe et al., 2012; Neu et al., 1997; Prado et al., 2016; Ricketts, Murray, & Schwalberg, 2005; Sanyal et al., 2014; Shields et al., 2017; Sori et

al., 2016;Tukur et al., 2012; Yisma et al., 2013), 11 qualitative studies (Ansar, Ibrahim & Shankar, 2012; Sotunsa et al., 2016; Tran et. al., 2014; VanderEnde et al., 2014 ), and 5 systematic review with narrative synthesis (Newnham et al., 2014; Pathirana, Nkambule & Black, 2015; Schramm & Clowse, 2014; Sukhato et. al., 2015; Trivedi, 2011). The level of evidence represented in these tables include levels II, III and IV, 4 articles being level II, 20 articles being level III, and 7 articles being level IV. The following tables summarizes the pertinent information from the sample of research studies.

Nine articles identified interventions for preeclampsia with three focusing on anticoagulant therapy and pharmaceutical interventions, three focusing on educational programs for healthcare personnel, and three focusing on supplementation interventions. Those found to be most effective included the administration of low-dose aspirin to women with comorbidities prior to 16 weeks of gestation, education of healthcare personnel, the utilization of Magnesium Sulfate for severe preeclampsia/eclampsia, and administration of antihypertensive medication to pregnant women with hypertension (Shields et al., 2017). Articles and interventions are summarized in the table below.

Table 1

*Summarized Findings for Preeclampsia Interventions*

| **Author/Year** | **Type of Study/Level of Evidence** | **Sample Size** | **Results/Findings** |
|---|---|---|---|
| Dolo et al. (2016) | Retrospective Quantitative Study (III) | *435* | Education of midwives in life-saving perinatal procedures<br>Training healthcare workers in perinatal care In low-resource settings<br>Financial incentive to train medical personnel on perinatal care |

| Author/Year | Type of Study/Level of Evidence | Sample Size | Results/Findings |
|---|---|---|---|
| Groom (2017) | Retrospective Quantitative Study (III) | 149 | The use of enoxaparin between 6 and 16 weeks of pregnancy |
| Kiondo et al. (2014) | Retrospective Quantitative Study (III) | 932 | Vitamin C supplements during the second trimester |
| Mirzakhani et al. (2016) | Retrospective Quantitative Study (III) | 881 | Vitamin D supplementation<br>Vitamin D supplementations after 10 weeks of gestation<br>Vitamin D supplementation to women of childbearing age prior to pregnancy |
| Schramm & Clowse (2014) | Systematic Research Review (IV) | 45 | Low-dose aspirin administration to pregnant mothers with preexisting morbidities prior to 16 weeks of gestation |
| Shields et al. (2017) | Retrospective Quantitative Study (III) | 2,034 | Administration of antihypertensives for perinatal hypertension<br>Administration of Magnesium Sulfate if blood pressure remains dangerously elevated<br>Postpartum monitoring for recurrence of maternal hypertension |
| Sotunsa et al. (2016) | Retrospective Quantitative Study (III) | 220 | Community involvement in perinatal care<br>Addressing education deficits in preeclampsia management in low-income communities |
| Trivedi (2011) | Systematic Research Review (IV) | 63 | Low dose aspirin administration to high-risk pregnancies with preexisting risk factors for preeclampsia |
| Tukur et al.(2012) | Retrospective Quantitative (III) | 1,045 | Administration of magnesium sulfate for severe preeclampsia/eclampsia<br>Training of healthcare workers on appropriate administration of magnesium sulfate, and proper monitoring for toxicity |

Six subjects were found to identify interventions for prolonged labor. Interventions include use of partograph, education, and training for healthcare professionals. There are four other effective interventions in developing countries such as, using include fluid and electrolyte replacement, cesarean section, providing transportation costs, and using skilled birth attendants. These results are summarized in Table 2 below.

Table 2

*Summarized Findings for Prolonged Labor Interventions*

| **Author/Year** | **Type of Study/Level of Evidence** | **Sample Size** | **Results/Findings** |
|---|---|---|---|
| Choulagai, (2013) | Cross-Sectional Quantitative Study (III) | 3,030 | Services of skilled birth attendants (SBA) help decrease maternal death among developing nations.<br>Surveys in Nepal and Bangladesh discover that education and the utilization of delivery services create "positive results.<br>Providing women with transportation costs and having necessary transportation for mothers' increases the use of SBA during pregnancy. |
| Ekanem, (2012) | Cross- Sectional Quantitative Study (III) | 95 | Fluid and electrolytes such as potassium should be given to<br>decrease fluid and electrolyte imbalances during prolonged labor to prevent further complications.<br>It is necessary for women to be educated on the identification of prolonged labor and its complications to prevent its recurrence.<br>The use of Partographs among health care professionals has shown a significant decrease of prolonged births. |
| Maaloe, (2012) | Descriptive Study (III) | 200 | Caesarean Sections can be necessary intervention for women in prolonged labor. However, there is a need for more realistic and evidence-based guidelines during labor to minimize risks during labor.<br>Training for health care professionals on emergency caesarean section is crucial and importance of simple interventions such as the use of vacuum extraction, ARM, and oxytocin safely.<br>A partograph helps women track the progression of labor and assists personnelwith timely interventions. |

| Author/Year | Type of Study/Level of Evidence | Sample Size | Results/Findings |
|---|---|---|---|
| Sanyal, (2014) | Prospective Observational Study (III) | 500 | The use of a partograph reduces labor under 12 hours.<br>It also helps detect abnormalities found in cephalopelic disproportion and helps helping mothers deliver by cesarean section.<br>It helps predict the progression of labor as well as help timely interventions be done.<br>The use of the partograph helps significantly drop the rate of stillborn births. |
| VanderEnde, (2014) | Qualitative Study (IV) | 100 | It is an important intervention to know how to assess and recognize if a mother is in delayed labor and for health care workers to respond to this complication. |
| Yisma, (2013) | Cross sectional Quantitative Study (III) | 183 | Partograph is a intervention that identifies the progression and monitoring of labor, detects the health of the mother and fetus, prolonged labor, and prevents complications. |

Eight articles were analyzed and nine interventions were identified for LBW infants which included enhanced coagulation to remove DBP (Iszatt, Nieuwenhuijsen, Bennett, & Toledano, 2014), the utilization of progesterone, cervical cerclage, (Newnham et al., 2014), education through Prenatal Plus Program (Ricketts, Murray, & Schwalberg, 2005), and the use of psychosocial interventions (Sukhato et. al., 2015). Preventing low birth was closely tied to preventing preterm labor. Postnatal interventions that were found to produce positive effects for the infant were the use of olive oil in breast milk (Amini et al., 2011), education through infant behavioral and intervention program (IBAIP) (Koldewijn et al., 2009), the utilization of enteral glutamine supplementation (Neu et al., 1997), and low cost multifunctional infant incubator (Tran et. al., 2014). These results are summarized in Table 3 below.

Table 3

*Summarized Findings for Low Birth Weight Interventions*

| Author/Year | Type of Study/Level of Evidence | Sample Size | Results/Findings |
|---|---|---|---|
| Amini, 2011 | Quantitative/ (II) | *2,337* | The use of olive oil in breast milk<br>Caused the child to gain weight |
| Iszatt, 2014 | Quantitative/ (II) | 443,555 | Enhanced coagulation (EC) of four treatment works to remove disinfection by-product (DBP)<br>Reduction in LBW rates |
| Koldewijn, 2009 | Quantitative/ (III) | 176 | The use of education through IBAIP (infant behavioral and intervention program)<br>Involves supporting the parents and building Parent child relationship.<br>Depending on the child's behavior, the a interventionist provides suggestions to encourage and support their child.<br>To adjust the environment for the child's need.<br>Parents were given detailed information about their child's developmental steps. |
| Neu, 1997 | Quantitative/ (II) | 68 | Enteral glutamine supplementation.<br>Reduced the risk of infection.<br>Did not affect the child's weight. |
| Newnham, 2014 | Systematic Research Review (IV) | 431,878 | Progesterone use, cervical cerclage<br>Decreased chance of preterm labor. |
| Ricketts, 2005 | Quantitative/ (III) | 3569 | Education through Prenatal Plus Program<br>Counseling about smoking prevention.<br>Counseled by a mental health professional.<br>Counseled by a dietitian.<br>Decreased rates of LBW. |
| Sukhato, 2015 | Systematic Review with Narrative Synthesis/ (IV) | 1307 | Psychosocial interventions.<br>To improve knowledge of maternal and fetal health in teenage pregnant women.<br>Enhance social support from their families and friends.<br>Facilitate their access to health care services and resources.<br>Reduced the risk of LBW. |
| Tran, 2014 | Qualitative/ (II) | 1 | Low cost multifunctional infant incubator<br>Maintained adequate temp. for vulnerable lbw infants.<br>Helps prevents morbidities and death of LBW child. |

Eight articles revealed interventions that were found to be effective in reducing infant risk of morbidity and mortality from infection. Two major categories were identified: education and supplementation. Interventions identified include six on education and three related to supplementation. Results are summarized below.

Table 4

*Summarized Findings for Natal Infections*

| Author/Year | Type of Study/Level of Evidence | Sample Size | Results/Findings |
|---|---|---|---|
| Al-Omrani et al. (2013) | Quantitative Study (III) | 100 | Zinc plus IVF administration in children between 3 mo.-2 years of age for acute diarrhea<br>Zinc sulfate tablet administration of 10mg for infant <6 mo. for acute diarrhea, 20 mg for infant >6 mo.<br>Zinc sulfate table administration of 20 mg for >6 mo. |
| Ansari, Ibrahim, & Shankar (2012) | Qualitative (IV) | 630 | Oral rehydration solution given to infants experiencing diarrhea<br>Education on importance of breast feeding during infant experiencing diarrhea<br>Education on importance of hand washing after defecation<br>Education on safe water use |
| Chhapola & Brar (2015) | Quantitative (III) | 2 doctors, 2 nurses, and one paramedical worker each shift within a 15 mo. Period | Education training for 30 min sessions 2x per week on the importance of compliance to hand hygiene (HH)<br>Audit and feedback through continuous monitoring of HH compliance<br>Compliance of HH from healthcare workers<br>Nosocomial sepsis of neonates was seen to drop 22% post-intervention |
| Farhoudi et al. (2016) | Quantitative (III) | 255 | Education to health care workers of World Health Organization's (WHO) HH improvement strategy<br>Infection prevention and control booklet given to newly employed nurses along with post-examination on the material<br>Billboards and posters dedicated to infection prevention |
| Lund et al. (2014) | Quantitative Study (III) | 2,250 | Automated short messaging service (SMS) system implementation for mothers in order to provide two-way communication between mother and health care providers on antenatal care and visits<br>Referrals by HCW's for consultations of higher levels of care given via SMS |

| Author/Year | Type of Study/Level of Evidence | Sample Size | Results/Findings |
|---|---|---|---|
| Mazumder et al. (2010) | Quantitative (III) | 60,000 | Training HCW's on WHO guidelines and importance of ORS and zinc administration in infants with diarrhea |
| Pathirana, Nkambule, & Black (2015) | Systemic Review (IV) | 38 | Education and training of higher level managers on existing monitoring tools for district immunization plans<br>Education on importance of delivery in a health care facility<br>HCW's providing education to mothers on pre-natal and post-natal visits to receive mother and infant vaccinations |
| Prado et al. (2016) | Quantitative (III) | 3,220 | Lipid based nutrition supplements along with malaria and diarrheal treatment in order to improve infant developmental scores |

## Discussion

Perinatal management to prevent morbidities and mortalities can prove to be a challenging issue, particularly in developing countries and low-resource settings. Because of the critical nature of maternal and infant morbidity and mortality, it is vital that lifesaving interventions are explored and implemented in a low-cost, culturally appropriate way. Unfortunately, there is very little literature targeted towards this issue in developing countries, so many interventions are not cost-effective or culturally feasible. However, for the sake of this paper, each intervention that has been proven to successfully decrease maternal and infant morbidity and mortality related to preeclampsia, prolonged labor, low-birth weight, and infection will be addressed.

### Preeclampsia Interventions

The administration of antihypertensive medication is effective if administered to women who have uncontrolled hypertension (Shields et al., 2017). This intervention requires frequent monitoring of blood pressure to monitor effectiveness of the drug

(Shields et al., 2017). In developing countries, the availability of antihypertensive medication and blood pressure monitoring devices can be a barrier to care. This intervention is only feasible if healthcare workers are trained to monitor appropriately and implement protocol, and if the necessary drugs and equipment are available.

The implementation of education programs for midwives, nurses, and other healthcare personnel in low-resource settings has decreased maternal morbidity and mortality, and has empowered local and community-based professionals to inspire the way to provide culturally congruent care for women with preeclampsia (Sotunsa et al., 2016; Dolo et al., 2016). Education includes training on life-saving perinatal procedures and recognition of signs and symptoms of pregnancy complications such as preeclampsia. This intervention is not only feasible, but it is essential that individuals within the community are trained to provide care and to create a foundation on which to build a healthcare system in low-resource settings.

Supplementation of Vitamin C to pregnant women, regardless of the gestation period, did not reduce the risk of preeclampsia (Kiondo et al., 2014). Supplementation of Vitamin D prior to 10 weeks of gestation has proven to successfully reduce the risk of preeclampsia in pregnant mothers, in addition to supplementation prior to pregnancy (Mirzakhani, 2016). This intervention is even more effective if the mother has had sufficient levels of vitamin D prior to pregnancy. This intervention would be most effective if implemented in areas where vitamin D deficiency is common, such as areas with colder climates.

The administration of magnesium sulfate for severe preeclampsia/eclampsia significantly reduces maternal morbidity and mortality (Tukur, et al., 2012), and has been

identified as one of the essential lifesaving measures for women who are severely preeclamptic or eclamptic. This intervention is feasible to implement in developing countries because it is low-cost and can be administered quickly in emergent situations. The barriers to the utilization of this intervention is availability of the drug in rural, low-resource settings, and the availability of trained healthcare personnel who have the skills to correctly administer the drug appropriately.

Anticoagulation therapy as an intervention for preeclampsia includes low-dose aspirin and enoxaparin (Schramm & Clowse, 2014; Groom, 2017). Low-dose aspirin therapy introduced to pregnant mothers with preexisting morbidities such as hypertension, and other risk factors such as positive family history of underlying vascular disease has effectively reduced the risk of preeclampsia by 21% ( Schramm & Clowse, 2014; Trivedi 2011). Enoxaparin administration to pregnant women regardless of gestation period was not effective in the treatment and prevention of preeclampsia (Groom, 2017).

**Prolonged Labor Interventions**

Interventions for prolonged labor can categorized as access to care, education, prenatal interventions, and intrapartum care. By providing access to care and providing education to women they are able to get the help they need to prevent prolonged labor and its negative outcomes. An effective intervention for a mother in developing countries to avoid prolonged labor was access to a skilled birth attendant (SBA) and in antenatal care. According to WHO, an SBA can be any healthcare professional such as a midwife, doctor, or a nurse that has the knowledge on how to manage critical pregnancies and the care of the mother and child before, during, and after childbirth. The services provided

are limited in many developing areas, however, if there is access to medical care it is hard for women to find transportation to these services. One study found that educating women on the dangers of pregnancy and providing them with the fees for transportation can give them contact with these services. This gateway to care ultimately decreases pregnancy complications reducing prolonged labor (Choulagai et al., 2013).

Intrapartum interventions such as administration of fluid and electrolytes were found to reduce prolonged labor complications. The purpose was expressed as to help decrease complications such as hyperkalemia and dehydration associated with prolonged labor (Ekanem et al., 2012).

Another intrapartum intervention is implementing the use of a partograph a tool that can detect and monitor abnormalities through a graph during labor such (Sanyal et al., 2014). During prolonged labor, the partograph is essential for the fetal and maternal wellbeing. According to WHO, this device improves labor and prevents maternal and fetal morbidity and mortality in developing nations by evaluating labor and preventing prolonged labor from occurring. One study revealed reduced labor by 12 hours. It can detect abnormalities such as cephalopelvic disproportion, which allows healthcare professionals to know early if they need to perform a cesarean section (Sanyal et al., 2014).

**Low Birth Weight Interventions**

Educational services are one of the primary prenatal interventions found effective to decrease low birth weight infants. It is vital vulnerable communities have basic understanding of the risk factors (smoking, mental illnesses, dietary deficit) in order to reduce the incidences of a low birth weight infant. Evidence suggests a positive impact

on teenage pregnant mothers when psychosocial interventions are aimed at "improving knowledge, enhancing social relationships, and facilitating their access to health care resources"(Sukhato et. al., 2015). Education through counseling by a nurse directly visiting the homes of mothers was found to be effective to decrease low birth weight and inexpensive intervention to implement in these developing areas.

Progesterone use and cervical cerclage decreased preterm labor and therefore decrease the occurrence of a low birth weight infant. Though these interventions are highly effective, they would not be practical in these developing areas due to expense and the lack of availability of trained healthcare professionals who are able to perform this procedure, and other needed resources.

Enhanced coagulation to remove DBP (disinfection by-product) in treatment of drinking water lowered the incidence of low birth weight infants. This process works if public drinking water is treated. The decrease in chloroform concentrations were associated with significant reduction in very low birth weight infants (Iszatt, Nieuwenhuijsen, Bennett, & Toledano, 2014). However, this intervention is not feasible due to lack of clean water or centralized system to treat.

A successful postnatal intervention in low birth weight infants is the addition of olive oil in breast milk (Amini et al., 2011). Use of human milk fortifiers is found to be effective would be effective in developing countries but expensive. This is why the intervention of addition to olive oil is extremely useful. Since the mother needs to maintain breastfeeding, there needs to be a way of adding the olive oil supplement into the breast milk. A possible method to implement this intervention would be to provide

mothers with hand pumps to express milk and use to mix with olive, which is effective for weight gain and practical.

Glutamine supplementation was not found effective for LBW infants, but it did reduce the incidence of sepsis in infants. LBW infants who did not receive glutamine supplementation were 3.8 times more likely to get sepsis compared to the infants who received it (Neu et al., 1997). Glutamine supplementation and enteral feedings may not be feasible in developing countries due to the expense and lack of resources and trained personnel.

A thermodynamically advanced low-cost incubator suitable for operation in a low-resource environment has been found effective for thermoregulation in low birth weight infants, and improves weight gain (Tran, 2014). By having this low cost incubator with mosquito screens was found to prevent infections and other illness from the susceptible infant. This intervention is extremely feasible in developing areas due to its low cost.

The interventions used in Infant Behavior Assessment and Intervention Program (IBAIP) were found to be effective in supporting the parents after having low birth weight child. IBAIP, are feasible to implement in developing areas through education by skilled individuals. This intervention does not decrease low birth weight infants, but it is effective in decreasing morbidities that may result in the future.

**Natal Infection Interventions**

Although limited, fortunately, there are interventions found to be effective in developing nations that have demonstrated positive results in the health of and survival of

infants that are susceptible to infections in developing nations. These include education and supplementation.

Hand hygiene (HH) performed by healthcare workers (HCW) was identified as an effective intervention in developing nations to decrease natal infection. Beginning with an understanding from HCW's as to why non-compliance exists and why HH compliance is necessary will motivate towards change. HH compliance of HCW's will increase prior to patient contact, between patient contact, and after patient contact after educational interventions, while decreasing infant infection (Chhapola & Brar, 2015). Providing simple preventative technique and education will provide both awareness and encourage compliance (Farhoudi et al., 2016). These interventions work because they are standard practice; therefore it is not surprising it lowered the risk of infant infection (Chhapola & Brar, 2015; Farhoudi et al., 2016). Also, educational sessions on proper HH practice are cost-effective and have proven to be vital in the promotion of infant health and decreasing the rate of infection.

Another educational intervention includes the distribution of automated short message services (SMS) system to mothers with available devices. This provides a two-way communication between mothers and health care providers. In Africa alone, there are greater than 600 million mobile consumers, providing an advantageous use of these devices for women and infant health care (Lund et al., 2014). Appointment reminders, simple health education, and referrals sent via SMS, increased routine antenatal visits, skilled delivery attendances, and postnatal visits. SMS reminders have the potential to decrease infant risk of infection through prevention and education. A messaging system

with postnatal appointment reminders, along with referrals, will improve maternal awareness and infant health (Lund et al., 2014).

Maternal education on proper ways to prepare oral rehydration solution (ORS) with safe water use and appropriate doses was effective to reduce infant infection. Educational sessions to mothers on how to care for a child with diarrhea, explanations of hygiene importance, breast-feeding, HH after defecation, and signs and symptoms of dehydration, improved mother's knowledge on how to tend to her infant and reduce infection risk (Ansari, Ibrahim & Shankar, 2012).

Lastly, vaccinations for pregnant women are vital in order to protect both the mother's health and the newborn's health from avoidable illnesses. An increase in awareness and knowledge to mothers and HCW's through educational outreach services in rural communities and antenatal care assisted in adherence to immunization regimen, thereby preventing infection of the infant such as neonatal tetanus (Pathirana et al., 2015). Mothers, who receive necessary vaccinations, then have the ability to transfer protective antibodies to the infant through placenta and through breast milk, therefore preventing potential natal infection. The education portion of this intervention is beneficial, but due to immunization cost and other barriers, this intervention is may not be feasible in all contexts.

Administration of Zinc (Zn) plus intravenous fluids (IVF) to children 3 mo-2 years of age is found to be effective in infants experiencing acute diarrheal episodes. It is also effective for a mother to breast feed in addition to Zn+IVF during acute diarrheal episodes (Al-Omrani et al., 2013). Due to the rapid decrease of necessary electrolytes and essential minerals during acute and chronic episodes of diarrhea, the implementation of

zinc therapy is effective to decrease morbidity and mortality of natal infection (Al-Omrani et al., 2013). Zn has also been proven to be effective along with oral rehydration solution (ORS) in infants experiencing acute diarrhea. This researcher is unfamiliar with the cost of ORS and IVF replenishment; therefore it is unclear if this intervention will be cost-effective and is dependent upon the income of the client (Mazumder et al., 2010).

Lastly, when an infant is experiencing infection, the administration of small-quantity lipid-based nutrient supplements (SQ-LNS's), anti-diarrheal medication, and anti-malarial medication, benefits the infant's physical, mental, and social development. Poor nutrition, plus infection has the ability to decrease appropriate developmental marks. The administration of SQ-LNS's was found to decrease infection by increasing nutritional health, however it is not widely available and not suggested to be implemented due to financial and societal barriers (Prado et al., 2016).

Interventions were found that decrease morbidity and mortality of mothers and infants. Usefullness of some were limited due to lack of resources and trained personnel. However, basic interventions including education, hygiene, proper fluid and electrolytes replacement and supplementation contrbutes to positive outcomes.

## Implications

Interventions that were found to be effective to decrease infant morbidity and mortality can be implemented in nursing education and practice. Future research is warranted due to gaps in knowledge and lack of current evidence supporting nursing practice.

**Educational Implications**

Because of the critical nature of maternal and infant mortality and morbidity, it is imperative that a wide variety of appropriate interventions are considered and taught to nursing trainees to maximize patient outcomes. Additionally, it is important that healthcare professionals understand the importance of prioritization of effective interventions and that evidence-based practice is being taught and implemented.

Instruction programs for midwives on lifesaving perinatal procedures to reduce the occurrence of preeclampsia require the development of a culturally appropriate curriculum that is at the midwives' level of understanding. This program may include multiple dimensions of learning such as lecture material presented by a professional health educator and/or interactive scenarios depicting potential perinatal crises. Additionally, the amount of information retained by the midwives must be measured to ensure the success of the instruction program by implementing standardized testing and testing by observation.

The implementation of anticoagulation therapy and pharmacological therapies in relation to nursing education requires training nursing students on information regarding drug side effects, desired effects, and contraindications. This information should be integrated into nursing school curriculum, and should be an available resource on every hospital unit. This information must be presented in the language that is most widely spoken among the healthcare workers. Healthcare personnel must be educated on the correct way to administer the drug, and how to monitor the subsequent effects. This can be accomplished by including workshops in hospital orientations that present the

necessary information, and provide a controlled environment in which to assess the worker's knowledge of the intervention.

Prolonged labor is a worldwide epidemic, so it is important for nurses to know the impact it has on women. It is vital for nursing students in their basic nursing training to be trained as midwives. During this training, there should be implementation on proper screenings and interventions for prolonged labor. The prenatal training should educate nursing students in risks for prolonged labor and criteria of a regular hospital birth.

Education for prevention of low birth weight infants during prenatal phase of pregnancy includes cessation of smoking, a nutritional diet, and treating mental issues. The nurse can visit these mothers in their villages, and counsel about these risk factors. The nurse can train the indigenous health care provider to give appropriate health advice. Pamphlets can be developed, however, it is unlikely the individuals can read.

Education during the postnatal phase of pregnancy is as essential as prenatally. It is crucial the parents receive education about how to properly care for this vulnerable infant, such as the IBAIP. Nurses can go into the communities and educate parents of LBW infants.

Educating the indigenous nurses and health care workers in developing nations on appropriate hand hygiene, vaccinations, and sanitation practices is vital to decrease infant infection. Providing health care systems and communities with an educational awareness of proper treatment and the positive effect of Zn therapy and ORS in infants experiencing acute or chronic diarrhea may be fundamental in eventual expansion or in availability to necessary resources. Basic nursing education, hospital orientation, and monthly in-services would be effective in promoting these interventions. These implications are

feasible and necessary in providing the nurses at the frontlines of care with proper knowledge on how to provide quality practice and decrease the risk of infant infection.

**Implications for Practice**

This research revealed effective interventions to integrate into practice. In developing countries, practicing nurses could partake in a program where they record, monitor, and teach patients the importance of prenatal care. The nurses in these developing countries can create an assessment tool to see if a woman is at risk for prolonged labor. Since there is a lack of access to care, it would be important for nurses to go into rural and isolated communities to do prenatal screenings. Nurses can create a "prolonged labor day" to raise awareness and educate risk on the issue of prolonged labor. Nurses involved in the care of mothers would help bring realistic, cost effective, and practical interventions to communities where prolonged labor exists.

Two effective postnatal interventions were identified in the care of LBW infants the use of olive oil and a low-cost incubator. The nurse caring for the LBW infant can add olive oil in expressed breast milk. Checking the availability of this product in the local stores of these areas would be necessary. Since olive oil is inexpensive, governments of these developing nations can distribute olive oil to areas where it is scarce. Supplemental olive oil to be executed, mothers need to be educated about the positive effects of olive oil in a low birth weight infant. As previously mentioned, professional health care providers can inform the health care personnel in the areas for these individuals to communicate this information to their communities.

A low-cost incubator can be included in the care of a LBW infant. The government in these areas should be lobbied to take initiative to create and distribute

these incubators to developing areas. Another approach is assembling a team to go out to these regions, and train individuals in these communities in how to create these low-cost incubators. Nurses should bring awareness of the appropriate use of this equipment.

To decrease natal infection in practice, nurses should be required to review posters, ensure systems are in place for promoting HH compliance (i.e. supplies, orientated, posters, in-services, etc.), and create education materials for families on hygiene, immunizations, and supplementation. It would be of importance to provide educational sessions for the hospitals on proper ways of hand hygiene and sanitary practices, while requiring staff to demonstrate correct application after the session.

Another intervention nurses can implement to decrease natal infection is a message reminder system for mothers. This will increase antenatal and postnatal visits and also remind mothers of the importance of creating an immunization record for both mother and infant. Lastly, distribution of pictorial packets on the use of electrolytes and mineral supplements and when to use them with infants experiencing diarrheal episodes will be of benefit to both the health care system and new mothers.

**Implications for Future Research**

This field of research has proven to be lacking in information pertaining to the subject of maternal and infant morbidity and mortality. The implication of the information pertaining to preeclampsia, prolonged labor, low birthweight and infection on future research will be discussed further in this section.

Future research regarding most effective interventions in the prevention of preeclampsia is needed to develop culturally competent interventions for individuals in

developing countries. The advancement of culturally sensitive interventions requires meticulous ground-level research in the geographic area of interest.

Specific research implications reveal a need for identifying characteristics of prolonged labor. The research studies on this particular topic are vague and limited on how to practically treat and prevent prolong labor among mothers. There also a demand for developing countries to conduct more research on successful interventions that decrease prolonged labor. Additionally, it would be advantageous to conduct a study on spiritual and mental interventions for women who go through these complications, which would provide a more holistic approach to mother in prolonged labor.

Little research is available on specific populations of low birth weight infants. Post-delivery interventions, for example, the use of low-cost incubators, need to be further tested in the field and analyzed for outcomes. There needs to be more research done on affordable and practical interventions that can be done during the prenatal phase other than just education. More research needs to be done on other accessible sources of nutrition that a low birth weight infant can receive to gain weight.

Little research tests methods on vital interventions that decrease infant infection. It would be beneficial for future researchers to implement live studies in order to obtain a comprehensive representation of identified interventions and their effect in decreasing infant infection. To ensure that previous studies and systematic reviews are valid and effective, further research is necessary.

## Strengths and Limitations

This study reveals many strengths and limitations on the research of infant and maternal mortality and morbidity in developing countries. The strengths identified in this

research process include the assistance of an experienced nursing research mentor, the utilization of research articles pertaining to the population, the authors' interest in the topic selection, and the advantage of completion within a two-semester time frame. Limitations of this study include limited high level studies pertaining to the specific subjects, inadequate experience of researchers, integration of the four topics discussed, and lack of details of interventions identified in article subjects. Also, multiple class commitments concurrent with research paper with limited time to focus on the research alone.

## Recommendations

Recommendations regarding the reproduction of this study include the utilization of a larger research sample including more articles from developing countries and a greater variety of articles reflecting a higher level of evidence. Due to the lack of research available, it is pivotal that the researcher continues to review current information for appropriate interventions. For a more comprehensive study, more time for research collection and analysis with fewer interruptions is necessary. Additionally, the implementation of a live research study would provide better quality data on interventions available. Lastly, to reduce bias, the utilization of a wider variety of databases should be conducted.

## Conclusion

The purpose of this study was to synthesize evidence regarding interventions to decrease maternal and infant morbidity and mortality in developing countries. Based on the research reviewed in this study, there was underwhelming evidence related to this subject, which resulted in few pertinent findings. Although few, the most relevant results

identified pertaining to maternal morbidity and mortality include the utilization of pharmacological interventions, skilled birth attendants, and available monitoring devices. Interventional research results relevant to infant morbidity and mortality include the provision of supplements and the application of educational services to health care personnel, mothers, and the community. The evidence is sparse and lacking in high level studies and evidence to address the needs of infants and mothers worldwide. In order to address this problem, it is pivotal that healthcare professionals stand in the gap for these vulnerable populations by continuing the pursuit of interventions to promote wellness.

# References

Adhikari, R. (2010). Demographic, socio-economic, and cultural factors affecting fertility differentials in Nepal. *Biomed Central Medical Center Pregnancy and Childbirth*, *10*19. doi:10.1186/1471-2393-10-19

Alexander, G. R., & Korenbrot, C. C. (1995). The role of prenatal care in preventing low birth weight. *The Future of Children*, *5*(1), 103-120.

Alhaji, M. A., Bello, M. A., Elechi, H. A., Akuhwa, R. T., Bukar, F. .., & Ibrahim, H. A. (2013). A review of neonatal tetanus in University of Maiduguri Teaching Hospital, North-eastern Nigeria. *Nigerian Medical Journal*, *54*(6), 398-401. doi:10.4103/0300-1652.126294

Alfaro-LeFevre, R. (2010). Applying Nursing Process: A Tool for Critical Thinking. Wolters Kluwer Health/Lippincott, Williams & Wilkins.

Ali, A. A., Rayis, D. A., Abdallah, T. M., Elbashir, M. I., & Adam, I. (2011). Severe anaemia is associated with a higher risk for preeclampsia and poor perinatal outcomes in Kassala hospital, eastern Sudan. *Bio Med Central Research Notes*, *4*(1), 311. doi:10.1186/1756-0500-4-311

Al-Omrani, A. A., Albahadle, A. J., & Al-Naimi, S. A. (2013). Zinc therapy in treatment of acute diarrhea in children less than two years. *Iraqi Journal Of Medical Sciences*, *11*(4), 348-352.

Al-Sulaiman, A. A., Bademosi, O. F., Ismail, H. M., Al-Quliti, K. W., Al-Shammary, S. F., Abumadini, M. S., & ... Magbool, G. M. (2003). Cerebral palsy in Saudi children. *Neurosciences* (Riyadh, Saudi Arabia), *8*(1), 26-29.

American Pregnancy Association. (2017). *IUGR; small for gestational age.* Retrieved From http://americanpregnancy.org/pregnancy-complications/intrauterine-growth-restriction

Ansari, M., Ibrahim, M. M., & Shankar, P. R. (2012). Mothers' knowledge, attitude and practice regarding diarrhea and its management in Morang Nepal: An interventional study. Tropical Journal of Pharmaceutical Research, *11*(5), 847-854. doi:10.4314/tjpr.v11i5.19

Amini, E., Shariat, M., Nayeri, F., Nili, F., Ebrahim, B., & Dalili, H. (2011). A randomized controlled clinical trial of olive oil added to human breast milk for weight gaining in very low birth weight infants. *Journal of Family & Reproductive Health*, *5*(3), 73-78.

Armstrong, Ukwuoma. *Child marriage in Nigeria: The health hazards and socio-legal Implications.* N.p.: Lulu Press Inc, 2014. Print.

Bellizzi, S., Bassat, Q., Ali, M. M., Sobel, H. L., & Temmerman, M. (2017). Effect of puerperal infections on early neonatal mortality: A secondary analysis of six demographic and health surveys. *PLoS ONE*, *12*(1), 1-9. doi:10.1371/journal.pone.0170856

Berry, J., & Holloway B. (2017). *Low Birth Weight*. Retrieved from https://www.urmcrochester.edu/encyclopedia/content.aspx?ContentTypeID=90&ContentID=P02382&redir=urmc.rochester.edu

Bilano, V. L., Ota, E., Ganchimeg, T., Mori, R., & Souza, J. P. (2014). Risk factors of pre-eclampsia/eclampsia and its adverse outcomes in low- and middle-income countries: A WHO secondary analysis. *Plos One*, *9*(3), 29-30. doi:10 .1371 /journal. pone.0091198

Boston Children's Hospital. (2016). *Low birth weight in newborns symptoms & causes*. Retrieved from http://www.childrenshospital.org/ conditions-and-treatments /conditions/low-birth weight-in-newborns/symptoms-and -causes

Bulechec, G. M., & Dochterman, J. M. (1992). *Nursing Interventions Classification*. Iowa Mosby.

Bulled, N., Singer, M., & Dillingham, R. (2014). The syndemics of childhood diarrhoea: a biosocial perspective on efforts to combat global inequities in diarrhoea-related morbidity and mortality. *Global Public Health*, *9*(7), 841-853. doi:10.1080/17441 692.2014.924022

Chhapola, V., & Brar, R. (2015). Impact of an educational intervention on hand hygiene compliance and infection rate in a developing country neonatal intensive care unit. *International Journal Of Nursing Practice*, *21*(5), 486-492. doi:10.1111/ ijn.122

Choulagai, B., Onta, S., Subedi, N., Mehata, S., Bhandari, G. P., Poudyal, A., & ... Krettek, A. (2013). Barriers to using skilled birth attendants' services in mid- and far-western Nepal: A cross-sectional study. *Bio Med Central International Health & Human Rights*, *13*(1), 49-67. doi:10.1186/1472-698X-13-49

Child Health USA 2013. (n.d.). Retrieved August 27, 2017, from https://mchb.hrsa.gov/ chusa13/perinatal-health-status-indicators/p/infant-morbidity.html

Cosmi, E., Fanelli, T., Visentin, S., Trevisanuto, D., & Zanardo, V. (2011). Consequences in infants that were intrauterine growth restricted. *Journal Of Pregnancy*, *2011 9*(7), 35-40. 364381.doi:10.1155/2011/364381

Cousins, S. (2016). Nepal hopes anti-child-marriage plan will make a difference. *Lancet (London, England)*, *387*(10035), 2279. doi:10.1016/S0140-6736(16)30713-9

Cowgill, K. D., Bishop, J., Norgaard, A. K., Rubens, C. E., & Gravett, M. G. (2015). Obstetric fistula in low-resource countries: An under-valued and under-studied problem—systematic review of its incidence, prevalence, and association with stillbirth. *Bio Med Central Pregnancy and Childbirth*, *15*(193). 45-50 doi:10.1186/s1 2884-015-0592-2

Doenges, M. E., Moorhouse, M. F. & Murr, A. C. (2010). *Nursing care plans: guidelines for individualizing client care across the life span.* Philadelphia: F.A. Davis Co.

Dolo, O., Clack, A., Gibson, H., Lewis, N., & Southall, D. P. (2016). Training of midwives in advanced obstetrics in Liberia. *Bulletin of the World Health Organization*, *94*(5), 383-387. doi:10.2471/BLT.15.160473

Farhoudi, F., Sanaei Dashti, A., Hoshangi Davani, M., Ghalebi, N., Sajadi, G., & Taghizadeh, R. (2016). Impact of WHO hand hygiene improvement program implementation: A quasi-experimental trial. *Biomed Research International*, *2016*1-7. doi:10.1155/2016/7026169

Fottrell, E., Tollman, S., Byass, P., Golooba-Mutebi, F., & Kahn, K. (2011). The epidemiology of ‘bewitchment’ as a lay-reported cause of death in rural South Africa. *Journal of Epidemiology and Community Health*, *66*(8), 704-709. doi: 10.1136/jech.2010.124305

Gaiva, M. M., Fujimori, E., & Sato, A. S. (2014). [Neonatal mortality in infants with low birth weight]. *Revista Da Escola De Enfermagem Da U S P*, *48*(5), 778-786.

Ghulmiyyah, L., & Sibai, B. (2012). Maternal mortality from preeclampsia/eclampsia. *Seminars in Perinatology*, *36*(1), 56-59. doi:10.1053/j.semperi.2011.09.011

Guyatt, H. L., & Snow, R. W. (2004). Impact of malaria during pregnancy on low birth weight in sub-saharan africa. *Clinical Microbiology Reviews*, *17*(4), 760–769. http://doi.org/10.1128/CMR.17.4.760-769.2004

Groom, K.M. (2017). Enoxaparin for the prevention of preeclampsia and intrauterine growth restriction in women with a history: A randomized trial. *American Journal of Obstetrics and Gynecology*, *216*(3), 296.

Hockenberry, M. J., Wilson, D. & Rodgers, C. C. (2012). *Wong's Essentials of Pediatric Nursing.* St. Louis, MO: Elsevier. (book)

I. Ekanem, E., Umoiyoho, A., & Inyang-Otu, A. (2012). Study of electrolyte changes in patients with prolonged labour in Ikot Ekpene, a rural community in Niger Delta Region of Nigeria. *International Scholarly Research Network Obstetrics and Gynecology*, *2012*(1),

Infant Mortality. (2016, September 28). Retrieved August 27, 2017, from https://www.cdc.gov/reproductivehealth/maternalinfanthealth/infantmortality.htm

Iszatt, N., Nieuwenhuijsen, M. J., Bennett, J. E., & Toledano, M. B. (2014). Trihalomethanes in public drinking water and stillbirth and low birth weight rates: An intervention study. *Environment International*, 73(6)434-439.doi :10.1016/j.envint.2014.08.006

Joshi, R., Sharma, S., & van Teijlingen, E. (2013). Improving neonatal health in Nepal: major challenges to achieving millennium development goal 4. *Health Science Journal, 7*(4), 247-257.

Khanal, V., Karkee, R., Lee, A. H., & Binns, C. W. (2016). Adverse obstetric symptoms and rural-urban difference in cesarean delivery in Rupandehi district, Western Nepal: A cohort study. *Reproductive Health, 13*(17) 12-16. doi:10.1186/s12978-016-0 128-x

Kiondo, P., Wamuyu-Maina, G., Wandabwa, J., Bimenya, G. S., Tumwesigye, N.M., & Okong, P. (2014). The effects of vitamin C supplementation on preeclampsia in mulago hospital, kampala, uganda: a randomized placebo controlled clinical trial. *Bio Med Central Pregnancy and Childbirth, 14*(1)

Koblinsky, M., Chowdhury, M. E., Moran, A., & Ronsmans, C. (2012). Maternal morbidity and disability and their consequences: Neglected agenda in maternal health. *Journal of Health, Population, and Nutrition, 30*(2), 124–130.

Koldewijn, K. K., Wassenaer, A.V., Wolf, M.J., Meijssen, D.M., Houtzager, B.H., Beelen, A.B. (2009).A neurobehavioral intervention and assessment program in very low birth weight infants: Outcome at 24 months. *The Journal of Pediatrics, 6*(1)15-22. doi:10.1016/j.jpeds.2009.09.009

Lloyd-Nyunia, N. (2011). Care of the low birthweight neonate in a developing country: A case study. *Neonatal, Paediatric & Child Health Nursing, 14(*1), 15-19.

London, M. L., Ladewig, P. W., Davidson, M. R., Ball, J. W. McGillis, R. C. & Cowen, K. J. (2017). *Maternal & Child Nursing Care*. Boston: Pearson Education, Inc.

Lund, S., Nielsen, B. B., Hemed, M., Boas, I. M., Said, A., Said, K., & ... Rasch, V. (2014). Mobile phones improve antenatal care attendance in Zanzibar: A cluster randomized controlled trial. *Bio Med Central Pregnancy & Childbirth*, *14*(1), 1-19. doi:10.1186/1471-2393-14-29

Maaloe, N., Sorensen, B., Onesmo, R., Secher, N., & Bygbjerg, I. (2012). Prolonged labour as indication for emergency caesarean section: A quality assurance analysis by criterion-based audit at two Tanzanian rural hospitals. *International Journal of Obstetrics and Gynaecology*, *119*(5), 605-613.

Martin, J. N., Rose, C. H. & Briery, C. M. (2006). Understanding and managing HELLP syndrome: The integral role of aggressive glucocorticoids for mother and child. *American Journal of Obstetrics and Gynecology*, *195*(4), 914-934. doi:10.1016/j ajog.2005.08.044

Maternal mortality. (2016, November). Retrieved February 01, 2017, from http://www. who.int/mediacentre/factsheets/fs348/en/

Mazumder, S., Taneja, S., Bhandari, N., Dube, B., Agarwal, R. C., Mahalanabis, D., & …Black, R. E. (2010). Effectiveness of zinc supplementation plus oral rehydration salts for diarrhoea in infants aged less than 6 months in Haryana state, India. *Bulletin Of The World Health Organization*, *88*(10), 754-760.doi: 10.2471 BLT.10.075986

Mgaya, A. H., Kidanto, H. L. Nystrom, L., & Essén, B. (2016). Improving standards of care in obstructed labour: A criteria-based audit at a referral hospital in a low-resource setting in Tanzania. *Plos One, 11*(11), 1-17. doi:10.1371/journal.pone .01666 19

Mirzakhani, H., Litonjua, A.A., Meclerath, T.F., O'Connor, G., Lee-Parritz, A., Iverson, R.…Weiss, S.T. (2016). Early pregnancy vitamin D status and risk of preeclampsia. *Journal of Clinical Investigation, 126* (12), 4702-4715.

Murki, S. & Sharma, D. (2014). Intrauterine Growth Retardation: A review article. *Journal of Neonatal Biology,3*(135), 55-60. doi: 10.4172/2167-0897.1000135

Mwini-Nyaledzigbor, P. P., Agana, A. A., & Pilkington, F. B. (2013). Lived experiences of Ghanaian women with obstetric fistula. *Health Care For Women International, 34*(6), *440-460*. doi:10.1080/07399332.2012.755981

National Academy Press. (1985). *Preventing Low Birth.* Retrieved from http://www.nap .edu/catalog/511.html

Neu, J., Roig, J. C., Meetze, W. H., Veerman, M., Carter, C., Millsaps, M., & ... Auestad, N.(1997). Enteral glutamine supplementation for very low birth weight infants decreases morbidity. *The Journal Of Pediatrics, 131*(5), 691-699.

Newborns: Reducing mortality. (2016, January). Retrieved February 01, 2017, from http:// www.who.int/mediacentre/factsheets/fs333/en/

Newnham, J.P., Dickinson, J.E., Hart, R.J., Pennell, C.E., Arrese, C.A., Keelan, J.A. (2014). Strategies to prevent preterm birth. *Frontiers in Immunology, 6*(4), 19-21.doi:10.3389/fimmu.2014.00584

National Health and Medical Research Council. (2009, November 09). Perinatal Morbidity. Retrieved August 27, 2017, from https://www.nhmrc.gov.au/guideli nes publications/wh18

Osungbade, K. O., & Ige, O. K. (2011). Public health perspectives of preeclampsia in developing countries: implication for health system strengthening. *Journal of Pregnancy, 2011*, *1-6*. doi:10.1155/2011/481095

Pathirana, J., Nkambule, J., & Black, S. (2015). Determinants of maternal immunization in developing countries. *Vaccine, 33*(26), 2971-2977. doi:10.10 16/j.vaccine.201 5.04.070

Prado, E. L., Abbeddou, S., Jimenez, E. Y., Somé, J. W., Ouédraogo, Z. P., Vosti, S. A., & ... Ouédraogo, J. (2016). Lipid-based nutrient supplements plus malaria and diarrhea treatment increase infant development scores in a cluster-randomized trial in Burkina Faso. *Journal of Nutrition*, *146*(4), 814-822. doi:10.3945/jn.1 15.225524

Reproductive Health. (2017, July 07). Retrieved August 21, 2017, from https://www.cdc. gov/reproductivehealth/maternalinfanthealth/pregnancyrelatedmortality.htm

Ricketts, S. A., Murray, E. K., & Schwalberg, R. (2005). Reducing low birthweight by resolving risks: Results from Colorado's prenatal plus program. *American Journal of Public Health, 95*(11), 1952–1957. http://doi.org/10.2105/AJPH.2004.047068

Rogers, C. H. (2005). The effect of the death of a child on midlife mental and physical health: An exploration of risk and resilience factors. *Georgia State University*. Retrieved from: https://pdfs.semanticscholar.org/1a4a/63a4a25c6d46a0b065 491330262dc6a0e83d.pdf

Sanyal, U., Goswami, S., & Mukhopadhyay, P. (2014). The Role of Partograph in the Outcome of Spontaneous Labor. *Nepal Journal Of Obstetrics & Gynaecology*, *9*(1), 52-57.

Schramm, A. M., & Clowse, M.E. (2014). Aspirin for prevention of preeclampsia in lupus pregnancy. *Autoimmune Diseases, 12*(4), 1-8.

Shaikh, S. H., & Isran, B. (2012). Frequency of obstructed labor in teenage pregnancy. *Nepal Journal Of Obstetrics & Gynaecology, 7*(1), 37-40.

Shields, L.E., Wiesner, S., Klein, C., Pelletreau, B., & Hedriana, H. L. (2017). Early standardized treatment of critical blood pressure elevations is associated with a reduction in eclampsia and severe maternal morbidity. *American Journal of Obstetrics and Gynecology, 216* (4),15-20.

Sukhato, K., Wongrathanandha, C., Thakkinstian, A., Dellow, A., Horsuwansak, P., & Anothaisintawee, T. (2015). Efficacy of additional psychosocial intervention in reducing low birth weight and preterm birth in teenage pregnancy: A systematic review and meta-analysis. *Journal Of Adolescence, 4*(4), 106-116. doi:10.1016/j. adolescence.2015.07.013

Sotunsa, J.O., Vidler, M., Akeju, D.O., Osiberu, M.O, Orenuga, E.O., Oladapo, O.T.,…Dada, O.A. (2016). Community health workers' knowledge and practice in relation to preeclampsia in Ogun State, Nigeria: An essential bridge to maternal survival. *Reproductive Health, 13*(2), 16-30.

Tran, K.T., Gibson, A.G., Wong, D.W., Tilahun, D.T., Selock, N.S., Good, T.G., Ram, G.R.(2014). Designing a low-cost multifunctional infant incubator. *Journal of Laboratory Automation, 19*(3), 332 –337, doi: 10.1177/221106821453039

Trivedi, N. (2011). A meta-analysis of low-dose aspirin for prevention of preeclampsia. *Journal of Postgraduate Medicine, 57*(2), 91.

Tukur, J., B., Ishaku, S.M., Araoyinbo, I., Okereke, E., & Babatunde, A.O. (2012). Maternal and fetal outcomes after introduction of magnesium sulphate for treatment of preeclampsia and eclampsia in selected secondary facilities: A low-cost intervention. *Maternal and Child Health Journal, 17*(7), 1191-1198.

United Nations Children's Fund (UNICEF). (2007). Promoting the rights of children with disabilities. *UNICEF Innocenti Research Centre*. Retrieved from: http://www .un.org/esa/socdev/unyin/documents /children_disability_rights.pdf

VanderEnde, K. E., Moran, A. C., Leasure, K., Day, L. T., Afsana, K., Kalim, N., & ... Sibley, L. M. (2014). Recognition of and response to neonatal intrapartum-related complications in home-birth settings in bangladesh. *Journal of Health, Population & Nutrition*, *32*(3), 503-512.

Walker, S., Wachs, T., Gardner, J., Lazoff, B., Wasserman, G., Pollitt, E., & Carter, J.(2007). Child development: Risk factors for adverse outcomes in developing countries. *The Lancet*,*14*(2), 23-30. doi:10.1016/S0140-6736(07)60076-2

Wall, L. L. (2012). Overcoming phase one delays: The critical component of obstetric fistula prevention programs in resource-poor countries. *Bio Med Central Pregnancy & Childbirth*, *12*(1), 68-80. doi:10.1186/1471-2393-12-68

WHO: Maternal mortality. (2017). Retrieved August 21, 2017, from http://www.who.int/ media centre/factsheets/fs348/en/

WHO recommendations for prevention and treatment of pre-eclampsia and eclampsia. (n.d.). Retrieved February 16, 2017, from http://www.who.int/reproductivehe alth/publications/maternal_perinatal_health/9789241548335/en/

World Health Organization. (2004). *Low birth weight country, regional and global estimates*. Retrieved from https://www.unicef.org/publications/files/low_birth weight_from_EY.pdf

Yisma, E., Dessalegn, B., Astatkie, A., & Fesseha, N. (2013). Knowledge and utilization of partograph among obstetric care givers in public health institutions of Addis Ababa, Ethiopia. *Bio Medical Central Pregnancy and Childbirth*, *13*(1), 17.

You, D., Hug, L., Ejdemyr, S., & Beise, J. (2015, September). Levels & trends in child mortality. Retrieved April, 2017, from https://data.unicef.org/wp-content/uploa ds/2015/12/IGME-report-2015-child-mortality-final_236.pdf