Descriptive Epidemiology of Neonatal Mortality in Gowa District 2015

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ABSTRACT
The aim of this study is to describe epidemiology of neonatal mortality in Gowa district 2015. The study type was an observational descriptive study. The population for this study was all neonatal deaths had recorded in Gowa district health office in 2015. Meanwhile, the sample sizes were 77 neonatal death cases. The point coordinates were determined by using geographic positioning system (GPS) and exported into geographic information system (GIS). The result showed neonatal death cases occurred by maternal characteristics with received antenatal care visit (ANC) $\geq$ 4visits (71.2%), 2 times of tetanus toxoid (TT) vaccination (81.9%) and birth attendance by midwife (85.7%). Based on infant characteristics occurred based on parity 1 (51.9%), gestational age < 37 weeks (64.9%), birth weight < 2500 gram (54.2%). The main cause of neonatal mortality was asphyxia neonatorum (45.5%). The neonatal mortality was occurred at health centres (46.8%) and hospital (57. 1%).The average distance from respondent house to the hospital respectively 19. 41 km and 19.94 km. Most of neonatal mortality occurred in September with total of 12.52/1000 live births. The number of midwives should be increasing to reduce neonatal mortality.

CCS Concepts
• **Social and professional topics → User characteristics**

Keywords
Descriptive; epidemiology; neonatal death; GIS

1. INTRODUCTION
Neonatal is period that infant adapted new environment from intrauterine life to extra-uterine life [1,2]. Each year, more than 4 million infants were died within first 4 weeks of their life, while 3 million deaths occurred in early neonatal period [3]. The

neonatal mortality was reduced from 4.7 million in 1990 to 2.8 million in 2013 [4]. Higher risk in neonatal mortality in developing countries than developed countries. There were 40% of neonatal mortality occurred in central Asia sub-regional [3].

In Indonesia, East Kalimantan had recorded lowest of neonatal mortality of 12 per 1000 live births [5]. Meanwhile, neonatal mortality cases were decreased from 820 cases in 2012 to 762 cases in 2014 in South Sulawesi. Gowa district was among largest contributor to neonatal mortality in South Sulawesi province. The number of neonatal mortality cases has increased 48 cases (3.95 per 1000 live births) to 80 cases (8.11 per 1000 live births) [6].

Few studies had been done to find out factors lead to neonatal mortality. The studies were conducted in Gaza strip and Iran indicated prematurity was risk factor for neonatal mortality [7,8]. In additions, low birth weight (LBW) and asphyxia also risk factors for neonatal mortality [9,10]. The LBW is very susceptible to health problems such as hypothermia. Meanwhile, healthcare services and incomplete antenatal care also contributed to neonatal mortality [11,12].

The studies showed risk factors for neonatal mortality had influenced neonatal factors, maternal factors, health care and socioeconomic factors. However, there is a limitation on geographical description with GIS application on neonatal mortality. This study was aimed to describe epidemiology of neonatal mortality in Gowa district 2015.

2. METHODOLOGY
2.1 Study Type
This study was used observational research with descriptive design. All independent and dependent variables were systematically explored in both general and special data. This study also used GIS method and mapping with using GPS.

2.2 Location and Time
This study was conducted from February to March 2016 in Gowa district.

2.3 Population and Sample
In this study, the population were all neonatal mortality cases had recorded in Gowa district Health Office by 2015. The number of neonatal mortality had recorded in Gowa district Health Office in 2015 was 87 cases. The samples in this study was 77 cases by non probability sampling method. The criteria for being respondents

included residing in Gowa district in 2015 and willing to be respondent in this district.

2.4 Data Processing and Data Analysis

Data analysis was performed by using Microsoft Excel 2010, SPSS program version 16, Quantum GIS 2.14.1. The univariate analysis was done for general description by using frequency distribution table. The geographical distribution was represented by QGIS.

3. RESULT AND DISCUSSION

3.1 Univariate Analysis

Based on Table 1, 52 respondents (71.2%) had more than 4 ANC visits and only 21 respondents (28.8%) had less than 4 ANC visits during their pregnancy.

Table 1. Distribution of respondent based on frequency of ANC visits in Gowa district 2015.

ANC visit frequency	n	%
<4 times	21	28.8
≥4 times	52	71.2
Total	73	100.0

Source: Primary data, 2016

The spreading of neonatal mortality cases based on ANC visit frequency in Gowa district 2015 in Figure 1.
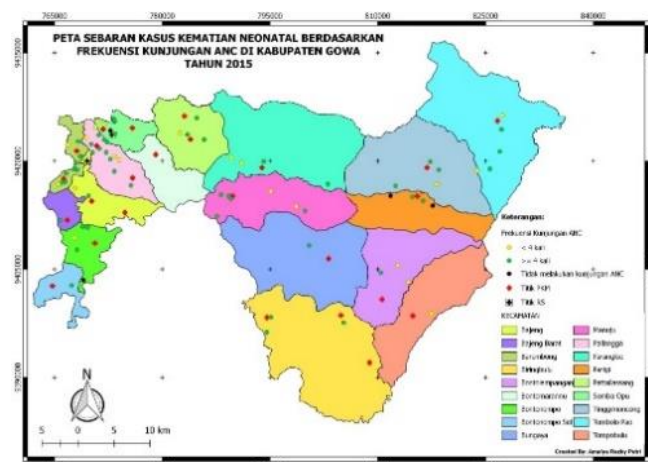

Figure 1. Coverage map of neonatal mortality cases based on ANC visits in Gowa district 2015.

Based on Table 2, There were 59 respondents had 2 times of TT vaccination and 13 respondents had only once vaccination

Table 2. Distribution of respondent based TT vaccination in Gowa district 2015.

TT vaccination	n	%
1	13	18.1
2	59	81.9
Total	72	100.0

Source: Primary data, 2016

Figure 2 had described spreading of neonatal mortality based on TT vaccination during their pregnancy period.
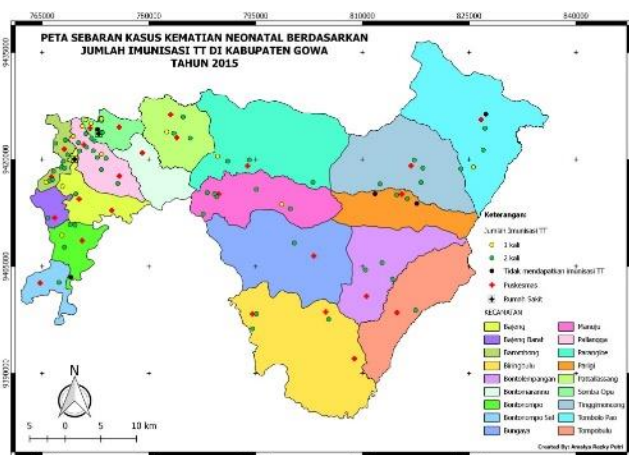

Figure 2. Coverage map of neonatal mortality cases based on TT vaccination in Gowa district 2015.

Based on Table 3, most birth attendances were midwives, 66 respondents (85.7%) and 3 respondents (3.9%) had no birth attendants. Meanwhile, Figure 3 showed spreading of neonatal mortality cases based on birth attendances in Gowa district in 2015.

Table 3. Distribution of respondents based on birth attendance in Gowa district 2015.

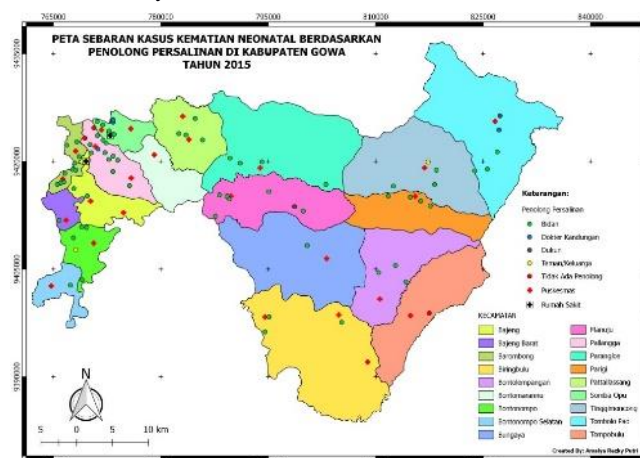| Birth attendant	n	%
Obstetricians	4	5.2
Midwives	66	85.7
Traditional healer	2	2.6
Friend/family	2	2.6
No birth attendance	3	3.9
Total	77	100.0

Source: Primary data, 2016

Figure 3. Coverage map of neonatal mortality cases based on birth attendances in Gowa district 2015.

Based on Table 4, Most of respondents had parity 2-3, 59 respondents (33.8%) and 11 respondents (14.3%) had parity more than 4.

Table 4. Distribution of respondent based parity in Gowa district 2015.

Parity	n	%
1	40	51.9
2-3	59	33.8
≥4	11	14.3
Total	77	100.0

Source: Primary data, 2016

Figure 4 was described spreading of neonatal mortality cases based on parity in Gowa district 2015.
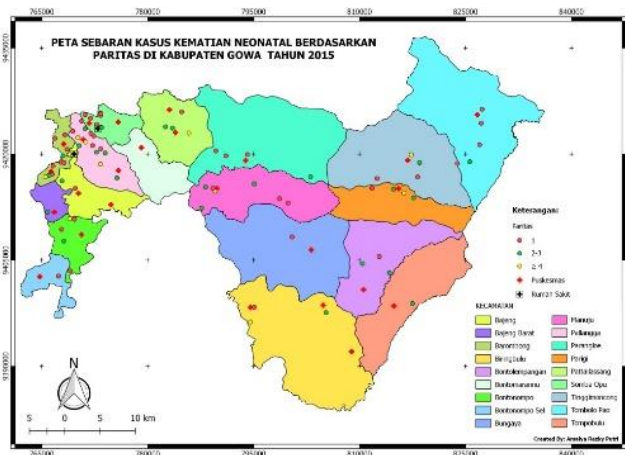

Figure 4. Coverage map of neonatal mortality cases based on parity in Gowa district 2015.

Based on Table 5, There were 50 respondents (64.9%) were pregnant less than 37 weeks and 27 respondents (35.1%) were pregnant more than 37 weeks.

Table 5. Distribution of respondent based gestational age in Gowa district 2015.

Gestational age	n	%
< 37 weeks	50	64.9
≥37 weeks	27	35.1
Total	77	100.0

Source: Primary data, 2016

Figure 5 had described the spreading of neonatal mortality cases based on gestational age in Gowa district in 2015.

Figure 5. Coverage map of neonatal mortality cases based on gestational age in Gowa district 2015.

Based on Table 6, More than half of respondents (54.2%) had birth weight lower than 2500 gram and 33 respondents had birth weight more than 2500 gram.

Table 6. Distribution of respondent based birth weight in Gowa district 2015.

Birth weight	n	%
< 2500 gram	39	64.9
≥2500 gram	33	45.8
Total	72	100.0

Source: Primary data, 2016

Figure 6 showed spreading of neonatal mortality cases based on birth weight in Gowa district.

Figure 6. Coverage map of neonatal mortality cases based on birth weight in Gowa district 2015.

Based on Table 7, Most of neonatal mortality was asphyxia neonatorum, 35 cases (45.5%) and 2 cases (2.6%) had recorded was due to neonatal tetanus.

Table 7. Distribution of respondents based on death causes in Gowa district 2015.

Death causes	n	%
Low birth weight	26	33.8
Asphyxia neonatorum	35	45.5
Congenital abnormalities	8	10.4
Neonatal sepsis	6	7.8
Neonatal tetanus	2	2.6
Total	77	100.0

Source: Primary data, 2016

Figure 7 was described spreading of neonatal mortality cases based on death causes in Gowa district.

Figure 7. Coverage map of neonatal mortality cases based on death causes in Gowa district 2015.

Based on Table 8, Most of respondents had birth delivery in Puskesmas or auxiliary public health center (Pustu) (46.8%) and only 1 respondent (1.3%) had attended at maternity hospital.

Figure 8 had described spreading of neonatal mortality cases based on birth places in Gowa district.

Table 8. Distribution of respondents based on birth place in Gowa district 2015.

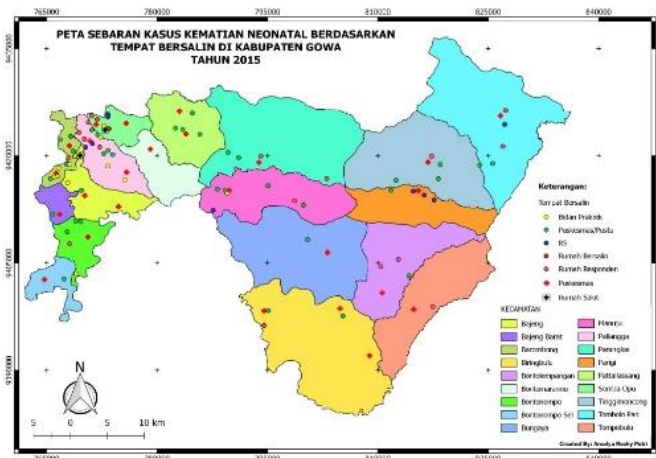| Birth place	n	%
House	19	24.7
Hospital	9	11.7
Maternity hospital	1	1.3
Community health center (Puskesmas)/ auxiliary public health center (Pustu)	36	46.8
Midwives practice	12	15.6
Total	77	100.0

Source: Primary data, 2016

Figure 8. Coverage map of neonatal mortality cases based on birth places in Gowa district 2015.

Based on Table 9, Most neonatal mortality occurred in hospital were 44 respondents (57.1%) and lowest neonatal mortality occurred at midwives practice, 4 respondents (5.2%).

Table 9. Distribution of respondents based on neonatal mortality location in Gowa district 2015.

Neonatal mortality location	n	%
House	13	16.9
Hospital	44	57.1
Puskesmas/Pustu	16	20.8
Midwives practice	4	5.2
Total	77	100.0

Source: Primary data, 2016

Figure 9 had described spreading of neonatal mortality based on neonatal mortality location in Gowa district.
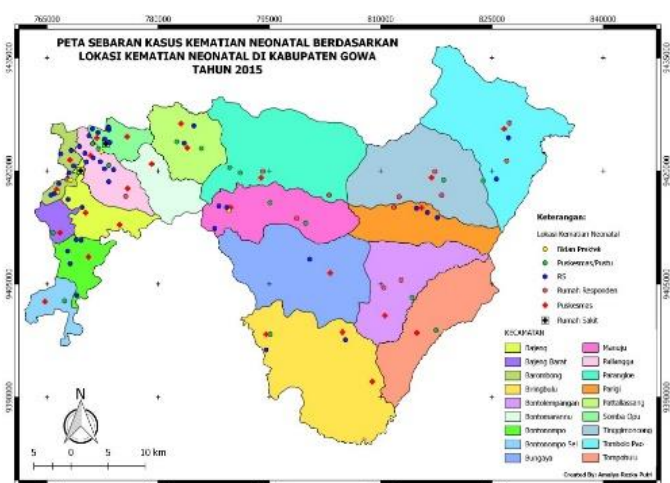

Figure 9. Coverage map of neonatal mortality cases based on neonatal mortality location in Gowa district 2015

Based on Table 10, The minimum distance for respondents to reach Syed Yusuf and Thalia Irham hospitals were 0.53 km and 1.15 km. Meanwhile, longest distance from respondent's house to hospital were 54.45 km and 58.12 km. The average distance for both hospitals were 19.41 km and 19.94 km.

Table 10. Distribution of respondents based on distance to hospital in Gowa district 2015

Hospital	n	Distance (km)				
		Min	Max	Median	Mean	SD
Syekh Yusuf	77	0.53	54.45	13.27	19.41	17.23
Thalia Irham		1.15	58.12	12.42	19.94	18.51

Source: Primary data, 2016

Figure 10 showed distribution of respondents by time (months) of neonatal mortality in Gowa district. The time is months of neonatal mortality which obtained from Puskesmas or hospital. Highest neonatal mortality rate occurred in September at 12.52 per 1000 live births and lowest neonatal mortality occurred in December at 2.10 per 1000 live births.
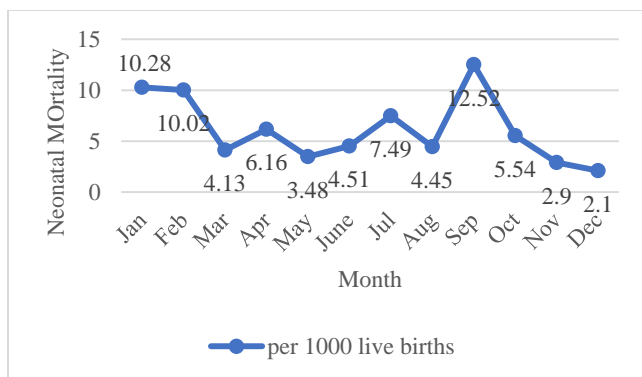
Figure 10. Distribution of respondents based on neonatal mortality time in Gowa district 2015.

3.2 Overall Discussion

The result found 71.2% respondents had ANC visits more than 4 times and 28.8% of respondents had ANC visits less than 4 times. A study found pregnant women had ANC visit less than 4 times at risk of 7.3 times greater than pregnant women had ANC visits more than 4 times [13]. The ANC behavior had influenced by various factors. In Kenya, maternal education level, socioeconomic, transportation and distance to health facilities had influenced pregnant women in ANC visits [14]. The lack in health facilities also contributed in neonatal mortality. In additions, inappropriate neonatal care due to lack of maternal knowledge also increase risk in neonatal mortality [15].

In this study, 81.9% of respondents had TT vaccination for 2 times during their pregnancy period. This vaccination has prevented infants from tetanus neonatorum but not for other death causes included asphyxia neonatorum and LBW. The proper medical handling could reduce birth complications [16]. Most of birth attendances were midwives and lowest of birth attendances were traditional healer and friend or family members with 2.6%. In this study, most pregnant women are assisted by health workers in their birth delivery. The neonatal mortality had high risk in birth delivery with health workers than non-health workers [17].

Besides, 33.8% of respondents had parity of 2- 3 and 14.3 % of respondents had parity more than 4. The parity 2 or 3 is safest parity in maternal and perinatal mortality [18]. High parity more than 3 had high risk in maternal mortality rate. High parity could prevent by family planning. Some pregnancies at high parity are unplanned. Besides, repetitive pregnancy and childbirth also caused damage to blood vessels in uterine lining.

The result also showed 64.9% of respondents had gestational age less than 37 weeks and 35.1% of respondents had gestational age more than 37 weeks. In Kenya, premature infants had high risk in neonatal mortality shortly after birth [19]. Based on this study, 54.25% of respondents had LBW less than 2500 gram and 45.8% of respondents had birth weight more than 2500 gram. The LBW had high tendency toward in birth complications such as jaundice, hypoglycemia and hypothermia. In Cameroon, infants had LBW had 1.6 times greater risk in neonatal mortality than infants had normal birth weight [9].

Furthermore, the result found most common cause of neonatal mortality was neonatal asphyxia which was 45.5%. In Bangladesh, highest neonatal mortality cases were due to asphyxia neonatorum [20,21]. In additions, insufficient monitoring by health workers was among factors associated with asphyxia-induced mortality in South Africa [22].

There were 46.8% of respondents preferred Puskesmas or Pustu as their birth delivery and only 1.3% of respondents preferred birth delivery at maternity hospital. The factors in consideration of birth delivery place included budget, distance to health centers, health facilities, health services and environment.

The result showed most neonatal mortality cases occurred in the hospital and lowest neonatal mortality cases occurred in midwifery practices. The neonatal mortality occurred was due to late in access to health centers. The short distance from house to Syekh Yusuf Hospital and Thalia Irham Hospital were 0.53 km and 1.15 km and longest distance were 54.45 km and 58.13 km. In Malawi and Zambia, a study found distance to health care facilities with neonatal mortality [23].

4. CONCLUSION

In conclusions, the neonatal mortality cases occurred by maternal characteristics with received ANC ≥ 4visits (71.2%), 2 times of TT vaccination (81.9%) and birth attendance by midwife (85.7%). Based on infant characteristics occurred based on parity 1 (51.9%), gestational age < 37 weeks (64.9%), birth weight < 2500 gram (54.2%). The main cause of neonatal mortality was asphyxia neonatorum (45.5%). The neonatal mortality was occurred at health centres (46.8%) and hospital (57.1%). The average distance to the hospital respectively 19. 41 km and 19.94 km. Most of neonatal mortality occurred in September with total of 12.52/1000 live births. The number of midwives should be increasing to reduce neonatal mortality. Besides, Puskesmas should improve antenatal care quality, 24 hours delivery service and post-natal service in reducing neonatal mortality.

5. REFERENCES

[1] Ferreira Pinheiro, J. M. et al. (2015). Childcare in the neonatal period: evaluation of neonatal mortality reduction pact in Rio Grande do Norte. *Brazil.Ciencia & Saude Coletiv*a,21(1),243-252. doi:10.1590/141381232015211.09912014

[2] Doukkali, L. et al. (2016). Factors of neo-natal morbidity at the Provincial Hospital Centre of Missour. *Journal of Biosciences and Medicines,*4, 48-57. doi: 10.4236/jbm.2016.45005

[3] World Health Organization (2006). *Neonatal and Perinatal Mortality: Country, Regional and global estimates*. Retrieved from http://apps.who.int/iris/bitstream/10665/43444/1/9241563206_eng.pdf

[4] Oza, S. et al. (2015). Neonatal cause-of-death estimates for the early and late neonatal periods for 194 countries:2000-2013. *Bulletin World Health Organ,* 93, 19-28. doi: 10.2471/BLT.14.139790

[5] Kementerian Kesehatan Republik Indonesia. (2013). *Profil kesehatan Indonesia 2012*. Jakarta: Kementerian Kesehatan Republik Indonesia.

[6] Dinas Kesehatan Provinsi Sulawesi Selatan. (2015). *Profil kesehatan Sulawesi Selatan 2014*. Makassar:Dinas Kesehatan Provinsi Sulawesi Selatan.

[7] El Awour, I. et al. (2012). Determinants and risk factors of neonatal mortality in the Gaza Strip, Occupied Palestinian Territory: a case-control study. *The Lancet,* 380, S25-S26.

[8] Chaman, R. et al. (2014). Consanguinity and neonatal death: a nested case-control study. *Journal of Family and Reproductive Health*, 8, 189-193.

[9] Chiabi, A. et al. (2014). Risk factors for neonatal mortality at the Yaounde Gynaeco-Obstetric and Pediatric Hospital, Cameroon. *Iranian journal of Pediatrics*, 24, 393-400.

[10] Anggraini, A. et al. (2012). Faktor risiko kematian neonatus dengan penyakit membran hialin. *Sari Pediatri*, 15, 75-80.

[11] Yani, D. F. et al. (2013). Pelayanan kesehatan ibu dan kematian neonatal.*Kesmas: Jurnal Kesehatan Masyarat Nasional,* 7, 373-377.

[12] Masni et al. (2014). Faktor risiko kematian neonatal di Kabupaten Morowali provinsi Sulawesi Tengah.

[13] Abdullah, A. et al. (2015). Faktor risiko kematian neonatal di provinsi Nusa Tenggara Timur: a matched case-control study. *NTT: Australia Indonesia Partnership for Maternal and Neonatal Health*.

[14] Eijk, A. M. et al. (2006). Use of antenatal services and delivery care among women in rural western Kenya: a community based survey. *Reproductive Health, 6.*

[15] Ayaz, A. et al. (2010). Neonatal mortality and prevalence of practices for newborn care in a squatter settlement of Karachi, Pakistan: a cross-sectional study. *PLoS ONE,* 5, e13783.

[16] Kementerian Kesehatan Republik Indonesia. (2013). *Profil kesehatan Indonesia 2012.* Jakarta: Kementerian Kesehatan Republik Indonesia.

[17] Titaley, C. et al. (2012). Type of delivery attendant, place of delivery and risk of early neonatal mortality: analyses of 1994-2007 Indonesia demographic and health surveys. *Health Policy and Planning,* 27, 405-416.

[18] Wiknjosastro, H. (2007). *Ilmu kebidanan edisi ketiga.* Jakarta: Yayasan Bina Pustaka Sarwono Prawirohardjo.

[19] Yego, F. H. et al. (2014). A case-control study of risk factors for fetal and early neonatal deaths in a tertiary hospital in Kenya. *BMC Pregnancy Childbirth*, 14, 389. doi: 10.1186/s12884-014-0389-8

[20] Chowdhury, H. R. et al. (2010). Causes of neonatal deaths in a rural subdistrict of Bangladesh: Implications from intervention. *Journal of Health, Population, and Nutrition,* 28, 375-382.

[21] Owais, A. et al. 2013). Maternal and antenatal risk factors for stillbirths and neonatal mortality in rural Bangladesh: a case-control study. *PLoS ONE,* 8.

[22] Velaphi, S. et al. (2007). Avoidable factors and causes of neonatal deaths from perinatal asphyxia-hypoxia in South Africa: national perinatal survey. *Annals of Tropical Paediatrics,*27(2), 99-106.

[23] Lohela, T. J. et al. (2012). Distance to care, facility delivery and early neonatal mortality in Malawi and Zambia. *PLoS ONE,* 7, e52110.