


Profile of Neonatal Mortality in dr. M. Haulussy Regional Hospital, Indonesia

Marischa Tita Thiono,[1] Masayu Ramadhani Polanunu[2]

[1]General Practitioner, [2]Pediatrician, dr. M. Haulussy Regional Hospital, Ambon, Indonesia

ABSTRACT

Background: The infant mortality rate (IMR) is one of the indicators commonly used to determine overall public welfare. This study aims to look deeper into the profile of neonatal mortality in Maluku region, particularly at dr. M. Haulussy Regional Hospital. **Methods**: This study was conducted on the neonatal population in the neonatal intensive care unit (NICU) of dr. M.Haulussy Regional Hospital DR M Haulussy from January 1, 2022, to August 31, 2023. A total of 34 neonates met the inclusion criteria. **Results**: The main factors causing neonatal death were respiratory failure/asphyxia, LBW, and sepsis with the percentage of 25.6%, 24.4%, and 22.2% respectively. **Conclusion**: The most common factors of neonatal mortality in this sample population were respiratory failure/asphyxia, LBW/BBLR/BBLT, and sepsis.

Keywords: Asphyxia, mortality, neonatal death.

ABSTRAK

Latar belakang: Angka kematian bayi (AKB) merupakan salah satu indikator yang lazim digunakan untuk menentukan derajat kesehatan masyarakat. Penelitian ini dibuat untuk melihat lebih dalam profil kematian neonatal di wilayah Maluku, khususnya di RSUD dr. M. Haulussy. **Metode**: Penelitian ini dilakukan pada populasi neonatus di ruang *neonatal intensive care unit* (NICU) RSUD dr. M. Haulussy mulai 1 Januari 2022 sampai 31 Agustus 2023. Didapatkan 34 neonatus yang memenuhi kriteria inklusi. **Hasil**: Faktor utama penyebab kematian neonatus adalah gagal napas/asfiksia, BBLR, dan sepsis dengan presentase berturut-turut sebesar 25,6%, 24,4%, dan 22,2%. **Simpulan**: Faktor yang paling umum dari kematian neonatal pada populasi sampel ini adalah gagal napas/asfiksia, BBLR/BBLR/BBLT, dan sepsis. **Marischa Tita Thiono, Masayu Ramadhani Polanunu. Profil Kematian Neonatus di RSUD dr. M. Haulussy, Indonesia.**

Kata Kunci: Asfiksia, mortalitas, kematian neonates.

INTRODUCTION

Quality of life plays an important role in world growth and development. Sustainable development goals (SDGs) were designed to ensure a healthy life and promote welfare for all people of all ages, including efforts to reduce the infant mortality rate (IMR) with targets to decrease the neonatal mortality rate to at least 12 per 1,000 live births and IMR to 25 per 1,000 live births.[1] IMR is a value that measures the number of deaths of babies (under 1 year old) per 1,000 live births in one year; it is one of the indicators commonly used to determine overall public welfare at provincial and national levels. Neonates are defined as babies aged 0-28 days. Neonatal deaths are divided into early neonatal deaths and late neonatal deaths. Early neonatal death is defined as the death of a baby born alive within 7 days of birth. Late neonatal death is defined as the death of a baby who is born alive after 7 days or before 29 days.[2]

IMR in Maluku in 2020 was 29.82 per 1,000 live births. The highest IMR was found in East Seram, with a 39.67 per 1,000 live birth.[3] It is higher than the Indonesian national average (16.85 per 1,000 live births) and higher than the SDGs target of 12 per 1,000 live births.[3]

Risk factors for neonatal death can be divided into risk factors from the mother and the neonate itself. Risk factors for mothers include maternal age <20 years or >35 years, parity, interval between pregnancies <2 years, and complications during pregnancy, childbirth, and postpartum. This can cause poor fetal growth and problems during labor (prolonged labor and postpartum bleeding). Risk factors for neonates include prematurity/Low Birth Weight (LBW), asphyxia, sepsis/pneumonia, tetanus, diarrhea, and congenital abnormalities.[2] Early detection of high-risk factors in mothers and neonates will greatly assist rapid and appropriate monitoring and treatment. The goal of the anticipatory approach and active intervention is to prevent disease development and progression and reduce disability and death in high-risk neonates.[2]

Djajakusli, *et al*, (2017) found 101 (12.5%) neonatal deaths from 807 births in a period of 6 months at dr. Soetomo Regional Hospital. Neonatal deaths were mostly in BBL ≥2500 g, male, single, appropriate to gestational age, and maternal age 20-25 years, and the clinical conditions were mostly respiratory failure, sepsis, heart failure, and congenital abnormalities.[4] Sulawati, *et al,* (2021) at Ciawi

Alamat Korespondensi *email: thionoichaaa96@gmail.com , mrp2906@gmail.com*

Regional Hospital found 57 deaths from 1,270 neonates treated during a period of 12 months; mostly in males (61.4%), with a birth weight <2,500 grams (68.42%), appropriate to gestational age (77.19%), premature (56.14%), and single births (89.47%), with the mother's age being 20-35 years (43.86%).[5] This research was to analyze the profile of neonatal deaths in the Maluku region, especially at dr. M. Haulussy Regional Hospital.

METHODS

The research was conducted on 310 neonates treated in the Neonatal Intensive Care Unit (NICU) at dr. M. Haulussy Regional Hospital from January 1, 2022, to August 31, 2023. The inclusion criteria were age 0-28 days and declared dead by a doctor. The exclusion criteria is dead on arrival at the hospital (DOA). Data collection was from medical records from dr. M.Haulussy Regional Hospital. A total of 34 neonatal deaths were registered. Data was classified into groups of early and late neonatal deaths. Neonatal deaths (deaths among live births during the first 28 completed days of life) are subdivided into early neonatal deaths, occurring during the first 7 days of life, and late neonatal deaths, occurring after the 7th day but before the 28th completed day of life. Gestation is the period of time between conception and birth. Pre-term is less than 37 weeks, post-term is 42 weeks or more. A term birth has been defined as between 37 and 42 weeks and describes the optimal timing for a good outcome for the mother and baby. Fetal growth is assessed by anthropometric measurements of body weight, length, and circumference (head, chest, and abdomen). The Apgar score is a scoring system to assess newborns after one minute and five minutes.

RESULTS

Data from a total of 34 (11% from a total of 310 inpatient population) neonates consisting of 25 early neonatal deaths and 9 late neonatal deaths was analyzed. Most cases were male (79%), single births (88%), and spontaneous births (62%); pre-term gestational age (62%), normal fetal growth (76%), normal birth weight >2.5 kg (35%), and born in dr. M. Haulussy Regional Hospital (38%) **(Table 1).** APGAR scores in the first 1 minute were quite evenly distributed; the highest was at a score of 7-9 (29%), and the APGAR score in the first 5 minutes was 7-9 (47%).

Table 1. Characteristics of subjects.

Characteristics Variable	N	%
Gender		
Male	27	79
Female	7	21
Birth		
Single	30	88
Twin	4	12
Labor		
Spontaneous	21	62
Sectio caesarea	13	38
Gestational Age		
Pre-term	21	62
Aterm	13	38
Post-term	0	0
Fetal Growth		
Normal fetal growth	26	76
Restricted fetal growth	6	18
Fetal overgrowth	2	6
Birth Weight		
Normal birth weight (BW >2,500)	12	35
Low birth weight (LBW; BW 1,500-2,500)	9	27
Very low birth weight (VLBW; BW 1-1,500)	10	29
Extremely low birth weight (ELBW; BW <1,000)	3	9
Place of Birth		
dr. M. Haulussy Regional Hospital	13	38
Other hospitals	10	29,5
Midwife	1	3
Home	10	29,5
APGAR Score (1 minute)		
1-3	9	26
4-6	7	21
7-9	10	29
Unknown	8	24
APGAR Score (5 minute)		
1-3	5	15
4-6	5	15
7-9	16	47
Unknown	8	23


Comorbidities and complications during pregnancy and birth were registered in 31 out of 34 mothers. Comorbidities in mothers include hypertension (23%), DM (15%), anemia (15%), and HIV (15%). Complications during pregnancy and birth in mothers include premature rupture of membranes (28%), meconeal amniotic fluid (25%), fetal distress (16%), and pre-eclampsia (13%). The majority of neonates who died used BPJS as a source of funding (74%) and had never had antenatal care (50%).

Table 2 shows a comparison of clinical condition; 11 (32%) neonates experienced asphyxia at birth, and 10 (40%) neonates experienced early death. Meanwhile, 7 (21%) neonates received resuscitation; the majority also experienced early death (6%-24%). The APGAR score was mostly 7-9, with 10 (38%) deaths in the first 1-minute APGAR and 16 (62%) in the first 5-minute APGAR. While the APGAR score provides a quick assessment of a newborn's overall condition at birth, it may not fully capture underlying health issues or complications that could lead to mortality. Additionally, the presence of asphyxia at birth in a significant portion of the neonates suggests potential oxygen deprivation, which can have lasting effects on vital organ function despite initial resuscitation efforts. Furthermore, the correlation between receiving resuscitation and subsequent early death raises questions about the effectiveness of the resuscitative measures employed or the severity of underlying conditions. These findings underscore the complexity of neonatal care and the need for comprehensive evaluation and intervention strategies beyond the initial APGAR assessment to improve outcomes and prevent early mortality in newborns.[8] However, apart from the data trend towards APGAR scores of 7-9, early neonatal deaths were more likely to occur in scores of 1-3 in the first 1 minute of APGAR (40%).

The conditions or the causes of neonatal death are described in **Table 3**. Most cause of neonate death was respiratory failure in 23 cases (68%), followed by the low to very low weight group in 22 cases (65%), sepsis in 20 cases (59%), respiratory distress syndrome in 8 cases (24%), pneumonia and congenital abnormalities in 5 cases each (15%), and other complications.

Characteristics Variable	N	%
Maternal Comorbidities		
Hypertension	3	23
Diabetes mellitus	2	15
Malnutrition	1	8
Anemia	2	15
Hepatitis B	1	8
HIV	2	15
Cyst	1	8
Syphilis	1	8
Complications		
Eclampsia	1	3
Pre-eclampsia	4	13
PROM (premature rupture of membranes)	9	28
Oligohydramnios	2	6
Placenta previa	2	6
Solutio placenta	1	3
Fetal distress	5	16
Meconeal amniotic fluid	8	25
Funding		
BPJS	25	74
Private	9	26
ANC		
Never	17	50
<4x	14	41
>4x	3	9

Abbreviations: HIV: Human immunodeficiency virus; ANC: Antenatal care.

Table 2. Comparison of infant clinical conditions.

Variable	Early Neonatal Death (n %)	Late Neonatal Death (n %)	N	%
Asphyxia	10 (40)	1 (11)	11	32
Resuscitation	6 (24)	1 (11)	7	21
APGAR 1 minute				
1–3	8 (40)	1 (17)	9	35
4–6	5 (25)	2 (33)	7	27
7–9	7 (35)	3 (50)	10	38
APGAR 5 minute				
1–3	4 (20)	1 (17)	5	19
4–6	4 (20)	1 (17)	5	19
7–9	12 (60)	4 (67)	16	62

DISCUSSION

This research was conducted at dr. M. Haulussy Regional Hospital used hospital medical record data from January 1, 2022, to August 31, 2023. From the 310 babies born during that period, 34 (11%) babies died in less than 28 days, 25 (8%) cases were early neonatal deaths, and 9 (3%) cases were late neonatal deaths.

Neonatal deaths were more common in males (27 cases - 79%). This finding is in accordance with Sulawati, *et al*, (2021), who found that gender is a risk factor for neonatal death. Sulawati, *et al,* (2021), related to gender and congenital diseases, as well as complications during care, found that male neonates have a higher risk of developing bronchopulmonary dysplasia/chronic lung disease (BPD/CLD), respiratory distress syndrome, and neonatal sepsis; male neonates had 4 times greater risk of sepsis than female neonates. Sepsis can be caused by several factors, such as the newborn's immature immune system, low phagocytic white blood cells, decreased cytokine production, and immature humoral immunity.[5]

The high mortality rate in male neonates is because the XY chromosome is more susceptible to X-linked recessive disorders than the XX chromosome.[6] If one X chromosome in a female baby is disrupted, it will be compensated by another X chromosome, while there is no replacement chromosome in a male baby. In addition, sex hormones have pathological and physiological effects on the immune system. Male hormones appear to hamper the maturation of T and B lymphocytes, the two major components of the immune system.[6] Therefore, females have a more active and stronger immune response than males.

Sulawati, *et al*, (2021)[5] result is in line with this research. Based on birth weight, birth weight <2.5 kg (65%) has a greater percentage compared to birth weight >2.5 kg (35%). Neonates with LBW are 20-30 times more likely to die during the neonatal period compared to neonates with normal weight. Neonates with LBW are generally caused by malnutrition during pregnancy. This state of malnutrition will normally continue during the growth period, which will then cause the neonates to be more susceptible to infection.[7]

Based on the 1-minute APGAR scores, risk factor for neonatal death is a score <3. This shows that neonatal death can be caused by asphyxia. Asphyxia is a condition of disruption in oxygen intake. Asphyxia causes progressive hypoxia due to CO_2 accumulation and acidosis; if prolonged, it will cause brain damage and even death.[8] Maternal and fetal factors can influence asphyxia. Fetal factors include umbilical cord entanglement, short umbilical cord, umbilical cord prolapse, prolonged second stage of labor or obstructed labor, premature babies, twins, shoulder dystocia, vacuum extraction, congenital abnormalities, and meconal amniotic fluid. While maternal factors include pre-eclampsia and eclampsia, abnormal bleeding (placenta previa or placental abruption, fever during labor, infections, and post-term pregnancy (serotinus).[9]

This study found that single baby delivery had a greater percentage of neonatal deaths (88%) than twin delivery (12%). Hantoushzadeh, *et al*, (2023) mentioned several contributing factors to the lower mortality rate observed in twins compared to singletons.[10] Twins are often delivered earlier, which may prevent intrauterine death in the last weeks of gestation. Additionally, twin fetuses may undergo accelerated pulmonary maturation, reducing the risk of respiratory complications. Specific guidelines for managing high-risk and twin pregnancies, play a crucial role in improving outcomes. Antenatal corticosteroid administration, more frequent in twins due to their increased risk of preterm birth, further reduces the risk of short-term respiratory complications.[10]

This study found a greater percentage of neonatal deaths in mothers with comorbidities: hypertension, diabetes mellitus, and anemia. Microvascular diseases such as hypertension may worsen maternal conditions and cause preeclampsia. Diabetes mellitus in pregnant women will also increase the risk of other diseases, such as hypertension and preeclampsia. Diabetes mother may cause congenital abnormalities associated with glycemic profile during fertilization.[4] Anemia in pregnancy is a global problem, with an estimated 32 million pregnant women experiencing it. Low Hb levels due to anemia during pregnancy can last until delivery. Anemia, with low Hb levels will result in hypoxia in the fetus. Hypoxia will stimulate corticotropin secretion, which affects placental development and reduces blood perfusion to the fetus.[11] Pregnant women with anemia have a 9x higher risk of LBW births than mothers without anemia.[11]

Complications during labor include eclampsia, pre-eclampsia, PROM (premature rupture of membranes), oligohydramnios, placenta previa, solution placenta, fetal distress, and meconeal amniotic fluids. The neonatal mortality rate among mothers who experienced premature rupture of membranes reached 28%.[12] Premature rupture of membranes had a 10-fold

Table 3. Causes of neonatal death.

Variable	Early Neonatal Death (n %)	Late Neonatal Death (n %)	N	%
Respiratory Failure	19 (76)	4 (44)	23	68
LBW/VLBW/ELBW	19 (76)	3 (33)	22	65
Sepsis	14 (56)	6 (67)	20	59
RDS	8 (32)	-	8	24
Pneumonia	3 (12)	2 (22)	5	15
Congenital abnormalities	2 (8)	3 (33)	5	15
Heart defects	1 (4)	2 (22)	3	9
MAS	2 (8)	-	2	6
Tetanus Neonatorum	1 (4)	-	1	3
Bleeding	-	1 (11)	1	3

Abbreviations: LBW: Low birth weight; VLBW: Very low birth weight; ELBW: Extremely low birth weight); RDS: Respiratory distress syndrome; MAS: Meconium aspiration syndrome.


increased risk of neonatal sepsis. Rupture of amniotic fluid for more than 12 hours will cause placentitis and amnionitis. The fetus can also become infected through inhalation of septic liquor, causing congenital pneumonia and septicemia. Intranatal infections can also occur through direct contact with infected vagina, for example blennorrhea. Infection during delivery can also occur through the use of non-sterile tools, procedures or due to cross-infection, for example, neonatal tetanus, omphalitis, etc. This complication is associated with premature rupture of the membranes, giving rise to chorioamnionitis, which can lead to sepsis.[13] Meconeal amniotic fluids are also a risk factor for neonatal death, 25% neonatal deaths were related to meconeal amniotic fluids. The presence of meconeal amniotic fluids and sepsis increases the risk of neonatal death by 2.5 fold.[14]

Mothers who had never had ANC had the highest incidence of neonatal deaths (50%) compared to pregnant women who had ANC <4 and >4 times (41% and 9% respectively). This is in line with research by Azizah and Handayani (2017) that pregnant women with ANC visits <4 times have a 9.3 times higher risk of experiencing neonatal death compared to mothers with ANC visits ≥ 4 times.[15]

It is necessary to increase health efforts to control the risk of neonatal death, including quality antenatal care, ensuring the availability of health services, ensuring deliveries by health workers in health facilities, strengthening the referral network system, ensuring the availability of resources (human resources/facilities/equipment/drugs), increasing competency and training, as well as surveillance of maternal and neonatal death cases.

CONCLUSION

The most common factors of neonatal death in this sample population were respiratory failure/asphyxia, LBW/VLBW/ELBW, and sepsis.

REFERENCES

1. World Health Organization. Targets of sustainable development goal 3 [Internet]. 2023. Available from: https://www.who.int/europe/about-us/our-work/sustainable-development-goals/targets-of-sustainable-development-goal-3.
2. Umah SM. Determinan kematian neonatal di daerah rural Indonesia tahun 2008-2012 [Skripsi]. Jakarta: UIN Syarif Hidayatullah; 2014.
3. Badan Pusat Statistik. Long form sensus penduduk 2020. Jakarta: BPS; 2021.
4. Djajakusli S, Harianto A, Etika R, Utomo MT. Profil kematian neonatus di RSUD dr. Soetomo. Sari Pediatri 2017;18(6):474-80.
5. Sulawati I, Ascha DW, Limenco MB, Analdi V, Profit DS, Danyalson FP. Profil kematian neonatus di RSUD Ciawi. J Muara Medika dan Psikologi Klinis. 2021;1(2):155-60. DOI: 10.24912/jmmpk.v1i2.16404.
6. Pongou R. Why is infant mortality higher in boys than in girls? A new hypothesis based on preconception environment and evidence from a large sample of twins. Demography. 2013;50(2):421-44. DOI: 10.1007/s13524-012-0161-5.
7. Bisono EF, Oktrianadewi S, Pranoto B, Wijayati EW, Jayanti KD. Analisis deskriptif kematian neonatal di rumah sakit X kabupaten Kediri pada tahun 2018. Masokan Ilmu Sosial dan Pendidikan [Internet]. 2021;1(1):41-51.Available from: https://doi.org/10.34307/misp.v1i1.3.
8. Masitoh SM, Theresia EVK, Karningsih KK. Asfiksia faktor dominan penyebab kematian neonatal. J Ilmu Teknologi Kes [Internet]. 2014;1(2):163-68. Available from: https://ejurnal.poltekkesjakarta3.ac.id/index.php/jitek/article/view/154.
9. Mariyunani. Asuhan kegawatdaruratan dan penyulit pada neonatus. Jakarta: Trans Info Media; 2013.
10. Hantoushzadeh S, Mirnia K, Sadeghi HS, Sadeghimoghadam P, Aghaali M, Heidarzadeh M, et al. Neonatal mortality rate among twin and singleton births with the gestational age of 34-37 weeks: A population-based study. Clin J Obstet Gynecol. 2023;6:088-094. DOI: 10.29328/journal.cjog.1001134.
11. Aditianti A, Djaiman SPH. Pengaruh anemia ibu hamil terhadap berat bayi lahir rendah: Studi meta analisis beberapa negara tahun 2015 hingga 2019. J Kes Reproduksi. 2020;11(2):163-77. DOI: 10.58185/jkr.v11i2.19.
12. Azahrah SA. Hubungan lama terjadinya ketuban pecah dini dengan kejadian asfiksia pada bayi baru lahir di puskesmas Tanjung Karang kota Mataram Nusa Tenggara Barat. J Penelit Kajian Ilmiah Kes Politeknik Medica Farma Husada Mataram. 2020;6(2):248-53. DOI: 10.33651/jpkik.v6i2.157.
13. Andini N, Rohmawati L, Fikri E, Mardina B. The association between premature rupture of membranes (PROM) and preterm gestational age with neonatal sepsis: A systematic review and meta-analysis. Paediatr Indones. 2023;63(3):152-61. DOI: 10.14238/pi63.3.2023.152-61.
14. Utomo MT. Risk factors of neonatal sepsis: A preliminary study in Dr. Soetomo Hospital. Indon J Trop Infect Dis. 2010;1(1):23-6. DOI: 10.20473/ijtid.v1i1.3718.
15. Azizah I, Handayani O. Kematian neonatal di kabupaten Grobogan. Higeia [Internet]. 2017;1(4):72-85. Available from: https://journal.unnes.ac.id/sju/higeia/article/view/15917.