# FACTORS ASSOCIATED WITH NEONATAL MORTALITY IN NORTH OKKALAPA HOSPITAL, YANGON, MYANMAR

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**ABSTRACT:**

**Background:** While progress in reducing neonatal mortality has been made in the last decade, low-income countries still face challenges to achieve the Millennium Development Goals *(*MDGs). An estimated 450 newborns die every hour around the world and almost 99% of deaths occur in low and middle income countries. Neonatal mortality is an important health indicator for measuring the country health profile. The purpose of this paper is to identify the factors associated with neonatal mortality from delivery cases at North Okkalapa General Hospital (NOGH).

**Methods:** A retrospective patient record review was conducted at North Okkalapa General Hospital, Myanmar. The records of two thousand mothers who delivered at NOGH from January to December, 2014 were selected from the hospital records. Information concerning both mothers and babies was reviewed by using secondary data from the patient information recorded in the neonatal and obstetric wards. Chi-square analysis was used to establish the associated factors in a bivariate fashion. Logistic regression was used for multivariable analysis.

**Results:** During the study period, out of 2000 mothers 30 neonatal deaths were identified. When multiple regression models were applied, the odds of having neonatal deaths was higher in mothers with at least 4 births (grand multiparous mothers) (OR= 4.08; 95% CI: 1.17, 6.06), mothers with less than 4 antenatal (ANC) visits (8.8; 95% CI: 1.7, 43). Newborns with normal birth weight (OR=0.002, 95% CI: 0.00, 0.021) and baby with term delivery (OR=0.09; 95% CI: 0.010, 0.960) had lower risk than the preterm baby.

**Conclusion:** Public health interventions aiming at lowering neonatal mortality should address the extending of the maternal health care program where most of the factors can be prevented such as birth spacing, promoting micro and macro nutrition and access to regular and quality antenatal care which will significantly influence the interventions to reduce neonatal mortality.

**Keywords:** Neonatal mortality, Myanmar

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## INTRODUCTION

The Millennium Development Goals (MDGs) 4 and 5 aim to lower child mortality and maternal death by 2015, yet the improvement is slower in the area related to reducing the neonatal death (the first 4 weeks after delivery) [1]. The approximate average yearly rate of neonatal mortality reduction was 2.2% from 1990 to 2013, while 4.0% for children aged 1–59 months and 2.6% for maternal deaths (1). The risk of death in the first day after birth is still high and at an alarming level. In 2013, 2.8 million (44%) of 6.3 million deaths of children younger than 5 years occurred during the neonatal period [2] along with an estimated 1.2 million intra partum stillbirths (2). Around 75% of neonatal deaths were estimated to occur during the first week of life. However, Millennium Development Goal (MDG) 4, to reduce child mortality by two-thirds between 1990 and 2015, will probably only be achieved by a few countries, therefore, the developed countries as we approach the post-2015 era. The period around birth and the first few days of life are biologically important and the riskiest period of the

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life as neonates are immunologically susceptible. According to World Health Organization (WHO) [3] and Global Burden of Disease Study [4] reported that annually four millions death of neonates occur worldwide and 99% of the cases are contributed from the low-middle income countries and approximately 50% of them occur at home.

Interest in global trends on neonatal death is growing with the awareness of an increasing proportion of the under 5 mortality occur in the first 28 days of life. There was a remarkable reduction in the child mortality at the latter part of the 20th Century with halving the risk of the death before the age of 5 years. In spite of the high burden of mortality, the issues of the neonatal death gained attention only towards the end of the 20th century. Nowadays, the awareness of this problem receives the highest attention in the international community and has led to concerted efforts to reduce the newborn mortality which in turn will in turn reduce child mortality. Regardless of these efforts most of the countries may not be able to achieve the MDGs to reduce the child mortality by three-quarters by the end of 2015 unless significant progress is made to lower the mortality rate in the first month of the month. Deaths at day of delivery (day zero) are mostly important to access because of the highest mortality rate and their contribution to the huge proportion of the under 5 mortality rate. Also due to the fact, most of the causes are preventable with the certain interventions [2].

Myanmar has made progress over past two decades towards MDGs 4 and 5 [1]. Under five mortality rate (73.4 to 62.4%) [5]and infant mortality rate (67.24 to 49.23%) [5] have been reduced. In addition, measles immunization coverage was increased from 72% to 87 % in the last decade [6] and maternal mortality ratio (230-200) [7] was decreased at the same time. However, despite making progress in health indicators, differences remain between states and regions and between ethnic groups, influenced by access to timely and quality health care.

## MATERIAL AND METHODS

The present study was conducted at the sub-urban township area of Yangon city at North Okklapa Hospital neonatal care unit. From the hospital record, 5889 mothers had singleton live birth during 2014 [8]. Due to the nature of the Net Reproduction Rate (NNR per 1,000 live births) large sample size was required to study. Among all of the deliveries, 2000 newborns including 30 neonatal deaths were selected from hospital records by systemic random sampling with the exclusion of still birth, abortion and mother with incomplete record or data. Information regarding perinatal care, maternal health, delivery history and neonatal physiological factors were collected from the hospital record and ANC records. In the current study, socio-demographic factors such as education and income of the parents were inaccessible due to the limitation of the secondary data.

Information required for the checklist was adopted from the WHO verbal autopsy [9] focusing on the bio-physiological factors of the mothers and newborns. In this study, maternal age group was organized by the reproductive capacity; BMI standard for Myanmar female was used. This proposal was approved by the Ethical Review Committee for Research Involving Human Research Subjects, Health Science Group Chulalongkorn University (protocol no 088.1/58). Parallel Ethical Review proceeded before the collection of the data at Regional Health office, Ministry of Health Yangon Division and approved by Medicare Department of the Ministry of the Health, Myanmar.

## DATA ANALYSIS

SPSS for window version 22 the University licensed was used for calculation of descriptive statistics for data in percentage, means and standard deviation and the analytical statistics, chi-square and multi-logistic regression. The associated factors were defined by the chi-square with the *p-value* 0.05. Only the variables that were associated with ($p<0.2$) used in the multi-logistic regression to calculate the odd ratio of the factors. Finally, the parity, maternal medical condition, birthweight, and gestational age of the newborns, BMI of mothers, ANC usages and mode of delivery were entered into the logistic regression models. The odd ratio of neonatal deaths was calculated at 95% CI by using binominal distribution.

## RESULTS

According to hospital records of 2014, there were 5889 live births and 103 neonatal death cases. Among the death cases 94 cases (91%) of them were early neonatal death cases. Two thousands samples was selected by systematic random sampling (i.e. every 2 of the patients from the delivery record) including 30 early neonatal deaths are selected to study and their general information was summarized

**Table 1** General characteristics of mothers and their delivery information (n=2,000)

| Characteristics of mothers and their delivery information | Numbers | % |
|---|---|---|
| **Sex of the newborn** | | |
| Male | 955 | 47.8 |
| Female | 1045 | 52.2 |
| **Numbers of pregnancy** | | |
| Mother with first parity | 584 | 29.2 |
| Mother with 2-3 previous pregnancy | 1262 | 63.1 |
| Mother with previous 4 or more pregnancy | 154 | 7.7 |
| **Maternal age (years)** | | |
| <20 | 307 | 15.4 |
| 20- 35 | 1604 | 80.2 |
| >35 | 89 | 4.4 |
| (range of mother age 16-41),SD= 25.6(5.6) | | |
| **First ANC visit** | | |
| 1st trimester of pregnancy (week 1 -12) | 388 | 19.4 |
| 2nd trimester of pregnancy (week 13-27) | 1402 | 70.1 |
| 3rd trimester of pregnancy (week 28 to delivery) | 210 | 10.5 |
| **Total numbers of pregnancy (n=2000)** | | |
| ANC visit 4 times and above | 1494 | 74.7 |
| ANC visit less than 4 times | 506 | 25.3 |
| **Mode of delivery** | | |
| Normal virginal delivery | 1293 | 64.6 |
| Forceps delivery | 30 | 1.5 |
| Vacuum delivery | 156 | 7.8 |
| Cesarean section | 521 | 26.0 |
| **Maternal BMI at delivery** | | |
| Underweight (BMI<18.5) | 285 | 14 |
| Normal weight (BMI 18.6-24) | 1400 | 70 |
| Overweight (BMI >24) | 315 | 16 |
| **Birth weight of newborns (grams)** | | |
| < 1000 | 15 | 0.8 |
| 1000-1499 | 25 | 1.2 |
| 1500-2499 | 140 | 7.0 |
| >2500 | 1820 | 91.0 |
| **Gestational age of newborns (weeks)** | | |
| <28 | 22 | 1.1 |
| 29-32 | 33 | 1.6 |
| 33-36 | 181 | 9.0 |
| >37 | 1764 | 88.3 |
| **Medical diseases (n=699)** | | |
| Diabetes mellitus | 121 | 6.0 |
| High blood pressure | 336 | 17 |
| Heart disease | 35 | 1.8 |
| Maternal infection before delivery | 207 | 10.4 |

in the Table 1. All of these samples were collected from the singleton birth where there were 68 twins and 2 triplets deliveries were recorded in 2014.In this study, secondary data from hospital was used and as drawback information regarding socio-demographic such as income and educational level of the parents are limited.

**General characteristic of mothers**

The mean age of the mothers was 25.6 years. 29.2% of them were first time pregnant mothers while 7.7% of them had 4 or more previous pregnancies. About 52.2% of them delivered the female. About the utilization of antennal care services, only 19.6% of them received first ANC at first trimester. However, 74.7% of mothers could manage to get at least 4 ANC and above. Most common methods of delivery (64.2%) were spontaneous vaginal delivery and rest was assisted delivery and cesarean section delivery.

**Table 2** Factors associated with neonatal mortality

| Factors | Alive (1970) | Death (30) | *p-value* |
|---|---|---|---|
| **Maternal age (years)** | | | |
| Less than 20 | 305 | 2 | |
| 21-35 | 1582 | 22 | 0.004* |
| 36 and above | 83 | 6 | |
| **Sex of the newborn** | | | |
| Male | 939 | 16 | 0.537* |
| Female | 1031 | 14 | |
| **Numbers of pregnancy** | | | |
| Mother with first parity | 580 | 4 | |
| Mother with 2-3 previous pregnancy | 1244 | 18 | 0.002* |
| Mother with previous 4 or more pregnancy | 146 | 8 | |
| **Perinatal care** | | | |
| ANC at first trimester | 383 | 5 | |
| ANC at second trimester | 1388 | 14 | 0.001* |
| ANC at third trimester | 199 | 11 | |
| **ANC total** | | | |
| ANC 4 times and above | 1486 | 8 | 0.000* |
| ANC less than 4 times | 484 | 22 | |
| **Maternal BMI at delivery** | | | |
| Underweight | 263 | 10 | |
| Moderate | 1410 | 14 | 0.004* |
| Overweight | 297 | 6 | |
| Medical diseases | 669 | 18 | 0.003* |
| **Mode of delivery** | | | |
| NSVD | 1268 | 25 | 0.031** |
| Assistant delivery | 702 | 5 | |
| **Birth weight (grams)** | | | |
| <1000 | 8 | 7 | |
| 1000-1499 | 16 | 9 | 0.000** |
| 1500-2499 | 129 | 11 | |
| >2500 | 1817 | 3 | |
| **Gestational age (weeks)** | | | |
| <28 | 14 | 8 | |
| 29-32 | 25 | 8 | 0.000** |
| 33-36 | 172 | 9 | |
| >37 | 1759 | 5 | |
| **Jaundice** | 391 | 1 | 0.71* |

*Chi-square, **= Fisher's Exact)

## Neonatal death

The neonatal mortality rate in the study area was 17.14 per 1000 live births and early neonatal mortality was 15.96. According to hospital record, 103 newborns died in 2014, most common cause of the neonatal mortality was infection 33 (32.04%), perinatal asphyxia 26 (25.24%) and prematurity 26 (23.30%). About 86.6% neonatal deaths came from the multiparous mothers and grand multiparous mothers and also 73.3% of mothers of death child had less than 4 ANC.

Table 2, dominant age group (21-35 years) had the most incident. However, the risk of neonatal deaths was increased at the maternal age group 36 and above as 6 out of 83 newborns were reported as death. Mothers with first time of ANC received during the pregnancy had p-value equal to 0.001 while the total number of ANC received is equal to 0.000a indicating that both numbers and time of antennal cares received have strong association with neonatal deaths. Among these factors birth weight of the newborns and gestational age had p-value 0.000 and mode of delivery has 0.031. However, jaundice well-known important risk factors for neonatal mortality and morbidity fails to establish the association, the best possible explanation is all the children in this study were under the treatment of special baby care from the hospital.

**Table 3** Multi-variants analysis with the odd of neonatal deaths

| Variables | B | Odd ratio | *p-value* | 95% CI | |
|---|---|---|---|---|---|
| | | | | Lower | Upper |
| **Numbers of pregnancy** | | | | | |
| Mother with first parity (ref) | | | | | |
| Mother with 2-3 previous pregnancy | -0.041 | 0.960 | 0.963 | 0.167 | 5.514 |
| Mother with previous 4 or more pregnancy | 2.515 | 4.081 | 0.019 | 1.170 | 6.061 |
| **Birth weight of newborns** | | | | | |
| <1000 grams (ref) | | | | | |
| 1000-1499 grams | 0.601 | 1.824 | 0.552 | 0.251 | 13.237 |
| 1500-2499 grams | -2.398 | .091 | 0.015 | 0.013 | 0.622 |
| >2500 grams | -6.477 | .002 | 0.000 | 0.000 | 0.021 |
| **Gestational age of newborns** | | | | | |
| <28 weeks (ref) | | | | | |
| 29-32 weeks | -1.078 | 0.340 | 0.307 | 0.043 | 2.696 |
| 33-36 weeks | -1.652 | 0.192 | 0.106 | 0.026 | 1.419 |
| >37 weeks | -2.312 | 0.099 | 0.046 | 0.010 | 0.960 |
| **Body mass index of mothers at delivery** | | | | | |
| Underweight (ref) | | | | | |
| Normal weight | -0.633 | 0.278 | 0.051 | 0.087 | 1.320 |
| Overweight | -0.895 | 0.510 | 0.043 | 0.051 | 2.557 |
| **First ANC visit** | | | | | |
| ANC at first trimester (ref) | | | | | |
| ANC at second trimester | 0.258 | 1.504 | 0.302 | 0.096 | 2.566 |
| ANC at third trimester | 0.082 | 6.976 | 0.008 | 1.451 | 12.355 |
| **Total number of ANC** | | | | | |
| ANC 4 and above (ref) | | | | | |
| ANC less than 4 | 2.178 | 8.825 | 0.005 | 1.773 | 43.915 |
| **Mode of delivery** | | | | | |
| Assisted delivery (ref) | | | | | |
| Normal vaginal delivery | -1.018 | 0.36 | 0.039 | 0.l38 | 0.949 |
| **Medical diseases** | | | | | |
| No medical diseases (ref) | | | | | |
| With medical diseases | 1.207 | 3.34 | 0.001 | 1.62 | 6.89 |

*Reported as variable with *p-value* <0.05, ref= reference variable

All the independent variables used in the logistic regression was collected from the result of the univariate analysis with had p-value <0.20 which trends to be associated with the early neonatal mortality. Selecting variables with the p-value less than <0.20 is to retest the variables that was not associated in the bivariate analysis. The finding was shown in the Table 3, it was found out that 8 factors had the *p-value* <0.005 and statically significant associated factors for neonatal mortality. Mother with 4 or more pregnancies has higher risk of having death child and odd ratio is 4.081 compared to first pregnant mothers. Mothers with the history if medical disease had odd ratio of 3.34 having death child compare to the mothers without heart diseases. Reference category of the birth weight of the newborns is the newborns with birth weight lower than 1000 grams and it had the *p-value* of 0.000 proving the strong association between the variable and neonatal mortality. Under the same variable, newborns with birth weight >2500 grams had fewer chances of dying (OR= 0.002) compare to the severely low birth weight child.

For the gestational age of the neonates, the one who delivery after the complete maturation (≥ 37 weeks) had the lower risk (OR= 0.09) of dying compare to the premature newborns. Mother who received her first ANC at the third trimester has higher risk (OR=6.97) of having death child compare to the mother with ANC at first trimester. The total numbers of antenatal care received had *p-value* 0.005 showing that the mothers who didn't receive complete antenatal care had higher risk of neonatal mortality. Normal vaginal delivery is the safest way to deliver a child and odd of having death child is reduce to 0.36 compare to instrumental assisted delivery and surgery.

## DISCUSSION AND CONCLUSION

Countless numbers of studies [10-14] reported that socio-demographic factors such as income, poverty and educational level of the family are the important factors in determining the neonatal mortality especially at low and middle income countries. In this present study, researcher focused on the bio-physiological factors of both mothers and neonate and found out that maternal age, parity of mother, antenatal care, nutritional status of mother, pre-exiting medical diseases (heart disease and diabetes), gestational age at delivery and birth weight of the newborns have the association with neonatal mortality even at the hospital delivery under the observation of medical personal with well-equipped facility. As a limitation of the study, well known association such as socioeconomic factors, health seeking behavior of the mother and male involvement during the pregnancy could not be accessed, all of which are recommended to be considered in the future study of same study area of Myanmar.

According to the review of vital static from the United Stated [15], the chance of having neonatal deaths was increased as the mothers get older with the exception of extremely young mothers (under 15 year). The rate of variation was observed and remarkably high risk was noted after the age of 35. Similar result was obtained from this research. Concerning with the parity of mothers, common finding is parity has the strong association with the outcome of neonatal health in many ways. Maternal parity has synergic effect with maternal age in predetermining the outcome of neonatal health for e.g. extreme age primipara mother bears the higher risk of dying child compare to the mothers in their 20s-30s [16]. In this study hospital, low birth weight is 9% of all delivery cases which is less than survey report of the national nutrition center of the district (10%) [17], this could be explained by the location of the study area is sub-urban area with easy access to center of the city where prevalence of low birth weight is reduced comparing to rural area. Among the low birth weight newborns 0.8% of them were extremely low birth weight and 1.2% of them are very low birth weight, mortality rate from the each category is extremely high 31% and 52% each. Low birth-weight new born is vulnerable to infection and 20 times more likely to dies than normal weight child Low birth is important determinant of the neonatal mortality and morbidity [18, 19].

It must be noted that Myanmar still has high neonatal mortality rate compare to neighboring countries. Approaching to MDG goals is in progress but yet to achieve. This study was conducted in the sub-urban area which has better transportation and easy access to quality health care. The worse scenario could be expected from the studies done in the remote area. Aside from the socio-demographic different, this study highlight the modifiable factors in reducing in the neonatal mortality.

Clear understanding of local culture is critical part of health prevention and promotion program [20]. The transformation of medical knowledge into the common practice to intergrade in the community is still a big challenge for health professional [21]. For better utilization of health services, birth spacing and nutritional habits remains cornerstone in the rural population. Lack of proper database system in the health facility is hindrance for the future researches and analysis. The key channel for reducing neonatal mortality is by improving maternal health care [22]. National Health Plan 2011-2016 [23] stated that unmet need for the contraception in Myanmar is still high, it was acknowledged that extension of birth spacing program is needed not only as a part of the quality reproductive health care but also to reduce the risk of maternal death and child death by preventing multiparty and unsafe abortion. Maternal and child nutritional program and health education for safe motherhood would be ideal suggestion. But with the limited resources in the health system, further collaboration with NGO and local organization should be done.

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## REFERENCES

1. United Nations, Population Division. World mortality report 2013. [N.p]: United Nations; 2013.
2. Oza S, Cousens SN, Lawn JE. Estimation of daily risk of neonatal death, including the day of birth, in 186 countries in 2013: a vital-registration and modelling-

based study. The Lancet Global Health. 2(11): e635-e44. doi: 10.1016/S2214-109X(14)70309-2

3. World Health Orginization [WHO]. Neonatal and perinatal mortality: country, regional and global estimates. Geneva: WHO; 2006.
4. Kassebaum NJ, Bertozzi-Villa A, Coggeshall MS, Shackelford KA, Steiner C, Heuton KR, et al. Global, regional, and national levels and causes of maternal mortality during 1990-2013: a systematic analysis for the Global Burden of Disease Study 2013. The Lancet. 384(9947): 980-1004. doi: 10.1016/S0140-6736(14) 60696-6
5. World Bank. Worldwide governance indicators. [N.p.]: World Bank; 2011
6. World Health Organization [WHO]. WHO/UNICEF estimates of national immunization coverage. Geneva : WHO; UNICEF; 2013.
7. Sein TT, Myint P, Tin N, Win H. The Republic of Union of Myanamar health system review. Geneva: WHO; 2014. p.206.
8. Department of Health, Mayanmar. North Okkalapa township profile. Yangon: Department of Health; 2012.
9. World Health Organization [WHO]. Verbal autopsy standards: the 2012 WHO verbal autopsy instrument. Geneva : WHO; 2012.
10. Allen DI, Kamradt JM. Relationship of infant mortality to the availability of obstetrical care in Indiana. J Fam Pract. 1991 Dec; 33(6): 609-13.
11. Clarke LL, Coward RT. A multivariate assessment of the effects of residence on infant mortality. J Rural Health. 1991 Summer; 7(3): 246-65.
12. Ravi RP. Does socio-demographic determinants influence complications while delivery among young married women in TamilNadu, India. International Journal of Maternal and Child Health. 2013; 1(2): 38-44.
13. Emily Grace S. Maternal education and child health: Is there strong causal relationship? Paper presented at the 54th Annual Conference of the Comparative and International Education Society, Palmer House Hotel, Chicago, Illinois, 1998. p.71-81.
14. Gwatkin DR, Wagstaff A, Yazbeck AS. Reaching the poor with health, nutrition, and population services: what works, what doesn't work, and why. Washington, DC: World Bank; 2005.
15. Matthews TJ, MacDorman MF. Infant mortality statistics from the 2010 period linked birth/infant death data set. Natl Vital Stat Rep. 2013 Dec; 62(8): 1-26.
16. Kozuki N, Lee AC, Silveira MF, Sania A, Vogel JP, Adair L, et al. The associations of parity and maternal age with small-for-gestational-age, preterm, and neonatal and infant mortality: a meta-analysis. BMC Public Health. 2013; 13(Suppl 3): S2. doi: 10.1186/ 1471-2458-13-s3-s2
17. Department of Health [DOH], National Nutritional Center. Community survey report of the National Nutritional Center, Lower Myanamr. [Yangon]: DOH; 2010.
18. Neal SE. Neonatal mortality in developing countries: an analysis of trends and determinants. [Doctoral dissertation]. Southampton: University of Southampton; 2009.
19. World Health Organization [WHO], UNICEF. Low birthweight: country, regional and global estimates. Geneva: WHO; 2004.
20. World Health Organization [WHO]. Community-based management of severe acute malnutrition: a joint statement by the World Health Organization, the World Food Programme, the United Nations System Standing Committee on Nutrition. Geneva: WHO; 2007.
21. Kulier R, de Onis M, Gulmezoglu AM, Villar J. Nutritional interventions for the prevention of maternal morbidity. Int J Gynaecol Obstet. 1998 Dec; 63(3): 231-46.
22. Taxas Department of State Health Services. Maternal risk factors associated with fetal and infant mortality. Austin, TX: Taxas Department of State Health Services; 2010.
23. Ministiry of Health [MOH]. National Health Plan 2011-2016. Yangon: MOH; 2010. p. 43.