FACTORS ASSOCIATED WITH EARLY NEONATAL DEATH IN NORTH OKKLAPA TOWNSHIP HOSPITAL YANGON DIVISION MYANMAR

Mr. Aung Ko Ko

จุฬาลงกรณ์มหาวิทยาลัย
Chulalongkorn University
บทคัดย่อและแฟ้มข้อมูลฉบับเต็มของวิทยานิพนธ์ตั้งแต่ปีการศึกษา 2554 ที่ให้บริการในคลังปัญญาจุฬาฯ (CUIR)
เป็นแฟ้มข้อมูลของนิสิตเจ้าของวิทยานิพนธ์ที่ส่งผ่านทางบัณฑิตวิทยาลัย
The abstract and full text of theses from the academic year 2011 in Chulalongkorn University Intellectual Repository (CUIR)
are the thesis authors' files submitted through the University Graduate School.

A Thesis Submitted in Partial Fulfillment of the Requirements
for the Degree of Master of Public Health Program in Public Health
College of Public Health Sciences
Chulalongkorn University
Academic Year 2014

Copyright of Chulalongkorn University

ปัจจัยที่ส่งผลต่อการตายของทารกแรกเกิดในระยะ 7 วันแรก ในโรงพยาบาลนอร์ทโอกคลาปา ย่างกุ้ง ประเทศเมียนมาร์

นายอ่อง โกโก

จุฬาลงกรณ์มหาวิทยาลัย
Chulalongkorn University

วิทยานิพนธ์นี้เป็นส่วนหนึ่งของการศึกษาตามหลักสูตรปริญญาสาธารณสุขศาสตรมหาบัณฑิต
สาขาวิชาสาธารณสุขศาสตร์
วิทยาลัยวิทยาศาสตร์สาธารณสุข จุฬาลงกรณ์มหาวิทยาลัย
ปีการศึกษา 2557
ลิขสิทธิ์ของจุฬาลงกรณ์มหาวิทยาลัย

Thesis Title	FACTORS ASSOCIATED WITH EARLY NEONATAL DEATH IN NORTH OKKLAPA TOWNSHIP HOSPITAL YANGON DIVISION MYANMAR
By	Mr. Aung Ko Ko
Field of Study	Public Health
Thesis Advisor	Professor Surasak Taneepanichskul, M.D.

Accepted by the Faculty of College of Public Health Sciences, Chulalongkorn University in Partial Fulfillment of the Requirements for the Master's Degree

.....Dean of the College of Public Health Sciences
(Associate Professor Sathirakorn Pongpanich, Ph.D.)

THESIS COMMITTEE

.....Chairman
(Associate Professor Ratana Somrongthong, Ph.D.)

.....Thesis Advisor
(Professor Surasak Taneepanichskul, M.D.)

.....External Examiner
(Nipunporn Voramongkol, Ph.D.)

จุฬาลงกรณ์มหาวิทยาลัย
Chulalongkorn University

อ่อง โกโก : ปัจจัยที่ส่งผลต่อการตายของทารกแรกเกิดในระยะ 7 วันแรกในโรงพยาบาลนอร์ทโอกคลาปา ย่างกุ้ง ประเทศเมียนมาร์ (FACTORS ASSOCIATED WITH EARLY NEONATAL DEATH IN NORTH OKKLAPA TOWNSHIP HOSPITAL YANGON DIVISION MYANMAR) อ.ที่ปรึกษาวิทยานิพนธ์หลัก: ศ. นพ. สุรศักดิ์ ฐานีพานิชสกุล, 52 หน้า.

การลดอัตราการตายของทารกแรกเกิดในช่วงทศวรรษที่ผ่านมาของประเทศที่มีรายได้ต่ำยังคงไม่บรรลุเป้าหมายการพัฒนาแห่งสหัสวรรษ ทารกแรกเกิดประมาณ 450 รายเสียชีวิตทุกชั่วโมงในทั่วโลก แต่เกือบ 99% ของพวกเขามาจากประเทศที่มีรายได้ต่ำและปานกลาง ดังนั้นจึงเป็นตัวบ่งชี้สุขภาพที่สำคัญในการวัดรายละเอียดด้านสุขภาพของประเทศ วัตถุประสงค์ของงานวิจัยนี้คือการระบุปัจจัยที่เกี่ยวข้องกับการเสียชีวิตของทารกแรกเกิดจากกรณีการคลอดจากในโรงพยาบาลโอกะลาปะเหนือ เมืองย่างกุ้ง ประเทศพม่า การวิจัยแบบตัดขวางนี้ได้ดำเนินการในโรงพยาบาลโอกะลาปะเหนือ มารดา 2000 คนที่คลอดในโรงพยาบาลแห่งนี้ตั้งแต่เดือนมกราคม 2557 ถึง ธันวาคม 2557 ได้รับการคัดเลือกจากบันทึกของโรงพยาบาล ข้อมูลเกี่ยวกับแม่และเด็กได้รับการตรวจสอบโดยใช้ข้อมูลทุติยภูมิจากข้อมูลผู้ป่วยที่ถูกบันทึกไว้ในหอผู้ป่วยทารกแรกเกิดและการคลอดบุตร การวิเคราะห์ข้อมูลโดยใช้การทดสอบไคสแคว์ และการวิเคราะห์การถดถอยโลจิสติก ในช่วงระยะเวลาการศึกษา พบว่ามีทารกแรกเกิดเสียชีวิต 30 รายในจำนวนมารดา 2000 คน ผลจากการวิเคราะห์การถดถอยโลจิสติก พบว่า อัตราการเสียชีวิตของทารกแรกเกิดสูงในมารดาที่มีการตั้งครรภ์มากกว่า 5 ครั้ง (OR= 4.08; 95% CI: 1.17, 6.06) สำหรับมารดาที่มีการฝากครรภ์น้อยกว่า 4 ครั้ง (OR = 8.8; 95% CI: 1.7, 43) ในเด็กแรกเกิดที่มีน้ำหนักตัวปกติมีความเสี่ยงต่ำ (OR=0.002, 95% CI: 0.00, 0.021) และในเด็กที่คลอดตามกำหนด (OR=0.09; 95% CI: 0.010, 0.960) เมื่อเทียบกับเด็กที่คลอดก่อนกำหนด ผลของโปรแกรมสาธารณสุขที่มีเป้าหมายในการลดอัตราการเสียชีวิตของทารกแรกเกิดควรเพิ่มโปรแกรมการดูแลสุขภาพของมารดา ซึ่งเป็นปัจจัยที่สำคัญที่สามารถป้องกันการเสียชีวิตของทารกแรกเกิด เช่น การเว้นช่วงการมีบุตร การส่งเสริมโภชนาการระดับจุลภาคและมหภาค และการติดตามสุขภาพของมารดา ซึ่งจะมีผลอย่างมีนัยสำคัญของผลของโปรแกรมเพื่อลดอัตราการเสียชีวิตของทารกแรกเกิด

สาขาวิชา สาธารณสุขศาสตร์ ลายมือชื่อนิสิต .....

ปีการศึกษา 2557 ลายมือชื่อ อ.ที่ปรึกษาหลัก .....

5778826053 : MAJOR PUBLIC HEALTH
KEYWORDS: NEONATAL MORTALITY / SECONDARY DATA

AUNG KO KO: FACTORS ASSOCIATED WITH EARLY NEONATAL DEATH IN NORTH OKKLAPA TOWNSHIP HOSPITAL YANGON DIVISION MYANMAR. ADVISOR: PROF. SURASAK TANEEPANICHSKUL, M.D., 52 pp.

With all progress in reducing neonatal mortality in last decade, in the low income country still yet to achieve the MDGs. Estimated 450 newborns die in every hour around the world but almost 99% of them came from the low and middle income countries. It is the important health indicator in measuring the country health profile. The purpose of this paper is to identify the factors associated with the neonatal mortality from the delivery cases from North OkklaPa Hospital. A cross-sectional study was conducted in North OkkalPa Hospital, Myanmar. 2000 mothers who delivered at NOGH on Jan- 2014 to Dec-2014 were selected from the hospital records. Information concerning both mothers and children were 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. For the complex sample design, the data were analyzed using multiple logistic regressions. During the study period, out of 2000 mothers 30 neonatal deaths were identified. In the multiple regression models, odds of having neonatal deaths was higher in the grand multiparous mothers (OR= 4.08; 95% CI: 1.17, 6.06), mother with less than 4 ANC visits (8.8; 95% CI: 1.7, 43), newborns with normal birth weight had lower risks (OR=0.002, 95% CI: 0.00, 0.021), baby with term delivery (OR=0.09; 95% CI: 0.010, 0.960) compare to the preterm baby. Public health intervention aiming at the lowering neonatal mortality should addressed 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 monitoring the health of the mothers, which will significantly influence the interventions to reduce the neonatal mortality.

จุฬาลงกรณ์มหาวิทยาลัย
CHULALONGKORN UNIVERSITY

Field of Study: Public Health Student's Signature .....

Academic Year: 2014 Advisor's Signature .....

ACKNOWLEDGEMENTS

This thesis could not be possibly complete without the support and kind help of many people who indirectly or directly support my thesis.

I would like to express my utmost gratitude to my advisor Prof. Surasak Taneepanichskul, M.D for his support, encouragement and invaluable assistance throughout the every steps of the thesis progress. In particular, I would like to thank to my examiner Nipunporn Voramongkol, M.D, M.P.H for her patient and guidance every time I ask her. I am very grateful for the experience and knowledge I learned from them.

There are also numbers of colleagues at Chulalongkorn University who offer their support and assistance not only in the progress of thesis but also throughout this course. A special thank goes to Ms. Daonapa Methateeranant, Ms. Vidar Punyavut and other academic staffs for their help throughout the academic year.

At last not least, I would like to thank my family for giving me the opportunity to study at Chulalongkorn University and their support along the way.

จุฬาลงกรณ์มหาวิทยาลัย
Chulalongkorn University

CONTENTS

Page
THAI ABSTRACT iv
ENGLISH ABSTRACT v
ACKNOWLEDGEMENTS vi
CONTENTS vii
LIST OF TABLES ix
LIST OF FIGURES x
CHAPTER I INTRODUCTION 1
1.1 Background and rationale 1
1.2 Research question 3
1.3 Hypothesis 4
1.4 Objectives 4
1.5 Conceptual framewok 5
1.6 Operational definition 6
CHAPTER II REVIEW OF LITERATTURE 8
2.1 Causes of neonatal death 8
2.2 Factors associated with neonatal mortality 9
CHAPTER III METHODOLOGY 14
3.1 Research design 14
3.2 Research area 14
3.3 Study population 14
3.4 Sampling methods 14
3.5 Sample size 15
3.6 Measurement tools 15
3.7 Validity test 16
3.8 Data analysis (statistics) 16
3.9 Ethical consideration 17
3.10 Limitation of the study 17
3.11 Expected benefit and outcome 18

จุฬาลงกรณ์มหาวิทยาลัย
Chulalongkorn University

Page

4.1 The general information of mothers 19
4.2 Pregnancy information and obstetric history 20
CHAPTER V DISCUSSION 33
5.1 Summary of the results 33
5.2 Factors associated with neonatal mortality 34
5.3 Recommendation 38
REFERENCES 40
APPENDIX A Questionnaire 44
APPENDIX B Time schedule and administration 49
APPENDIX C Budget 50
APPENDIX D Certificated Approval 51
VITA 52

จุฬาลงกรณ์มหาวิทยาลัย
Chulalongkorn University

LIST OF TABLES

Table 1 Characteristic of the mothers and neonates.....21

Table 2 Characteristic of the death cases 24

Table 3 Factors associated neonatal mortality 28

Table 4 Multivariate analysis of factors associated with neonatal mortality.....31

จุฬาลงกรณ์มหาวิทยาลัย
Chulalongkorn University

LIST OF FIGURES

Figure 1 Conceptual Framewok.....5

Figure 2 Numbers of deaths according to the age (days) of baby.....26

CHAPTER I
INTRODUCTION

1.1 Background and rationale

1) Burden of the neonatal death

The effectiveness of Millennium Development Goals (MDGs) in lowering child mortality and maternal death, yet the improvement is much slower in the area related to reducing the neonatal death(the first 4 weeks after delivery)(United Nations, 2013).The approximated average yearly rate of mortality reduction and child mortality was 2.2% from 1990 to 2013, compared with 4.0% for children aged 1–59 months and 2.6% for maternal deaths(United Nations, 2013).The risk of death in the first days after birth is still high and in alarming level. In 2013, 2.8 million (44%) of the6.3 million deaths in children younger than 5 years occurred during the neonatal period(Shefali Oza, 2014),along with an estimated 1.2 million intra partum stillbirths.(Shefali Oza, 2014).Around75% of neonatal deaths is estimated to encounter 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 accomplished by a few countries especially the developed countries as we approach the post-2015 era.

Birth and first few days are biologically important and the riskiest period of the life as neonates is immunologically susceptible. According to (WHO 2006) report with the annual four millions death of neonate occur worldwide and 99% of the cases are contributed from the low-middle income countries and approximately 50% of them occur at home. (Nicholas J Kassebaum, 2014)

Global trend for the information on neonatal death is growing with the acknowledgement that an increasing proportion of the under 5 mortality occur in the first 28 days of life. We see the remarkable reduction in the child mortality at the later part of the 20th Century with the halving the risk of the death before the age of 5 years. However, the lives saved after the first four hours of lives contributed to this reduction of this risk with the relatively reduction of the neonatal death risk.

In spite of the high burden of the mortality, the issues of the neonatal death gained the attention only at the end of the 20th century. Nowadays, the awareness about

this problem reaches the highest attention within the international community and exercises the maximum efforts to reduce the newborn mortality which in turn will reduce the child mortality. Regardless of these efforts most of the countries may not be able to achieve the MDG to reduce the child mortality by three- quarter by 2015 unless significant progress is made in lowering the mortality rate in the first month of the month.

Deaths at day of delivery (day zero) are mostly important to assess because of the highest mortality rate and their contribution to the huge proportion of the under 5 mortality rate. And also due to the fact, most of the causes are preventable with the certain interventions (Shefali Oza, 2014).

2) Effects on the society and economic development of the country

Moreover an infant mortality rate is one of the excellent health indicators within the economy of its own country because the effective human development program also impacts the infant mortality of that country. High infant mortality is the sign of the lack proper health care resulting from the poverty, proper education and low socio-economic status (Shefali Oza, 2014). It also reflects the well-being of the whole population. A population with the high disease burden from the neonatal death will result in the hindrance of the economy in many ways as the unhealthy child will grow into the sickly adult who is prone to the infection. It decreases the productivity of the in turn results the drawback in the progress of the society. It harms the next generation by decreasing school enrolment of children and it increases medical-care expenditure, rendering inefficient allocation of resources. Therefore improving health condition from the newborns is important for superior economic performance of the whole population (MOHAMMED ZAKIR and PHANINDRA V. WUNNAVA, 1999).

3) Gaps between rich and poor, burden on the marginalized people

The neonatal death rate gap between rich and poor countries remains surprisingly high, maximum of an NMR of 1 in Japan with a gross national income (GNI) per capita ofUS$38,210 to minimum of NMR of 61 in Somalia with a GNI per capita of US$140.(Lawn, Kerber, Enweronu-Laryea, & Cousens, 2010).Mothers and new born in the poor family are at high risk of disease and in challenging conditions to

access the health care compared to the one in rich family. There is also a big difference between urban and rural areas. Infant in the rural area has higher risk of death and lesser access to health care compare to the new born in the urban area. More than 50% of the new born death in low income countries occurs at home.(Lawn et al., 2010).But some middle to low income countries such as Thailand and Sri Lanka already achieved MDG 4 and moving towards the MDG plus.

4) Condition in Myanmar

The composition of the ethnic groups in Myanmar is 8 major groups and over the 130 ethnic groups. Burma is the major ethnic group and contributes 60% and second dominant ethnic is Shan 8.5% follow by Rakhine (4.5%) and Kayine 6.2%(Than Tun Sein, 2014). Myanmar language is regarded as the official language while over 100 different dialects are spoken across the country. Every state and region in Myanmar is inhabited heterogeneously by more than one ethnic group. Due to the distribution of the ethnic group, there are small minority group resides hormonally with the larger majority group and this minority group deserve the special attention from Myanmar Policy maker to respect their fundamental human right "Health" (Than Tun Sein, 2014). Myanmar infant mortality in 2011 was 48 and neonatal mortality rate at that time was 30(Unicef, 2015). Projected disability adjusted life expectancy at the time of birth in Myanmar in 2000 was 50.5 years for women and 47.7 years for the men (World Health Orginization, 2006).

Myanmar makes progress over past two decade in attending Millennium development Goal 4 and 5 (United Nations, 2013). Under five mortality rate and infant mortality have been reduced while the prevalence of measles increase and maternal mortality is decreasing gat the same time. However, despite of making progress in attending good health indicators, different remain between states and regions or between ethnic groups in term of access.

1.2 Research question

What are the factors associated with neonatal mortality in North Okklapa Township Hospital, Yangon Division?

1.3 Hypothesis

1) There is association between maternal bio-physiological factors and neonatal death.
2) There is association between health seeking behavior of mother, maternal medical diseases and mode of delivery with the neonatal mortality.

1.4 Objectives

General objective

To investigate the factors associated with neonatal mortality in North OkklaPa Township Hospital, Yangon Division.

Specific objectives

To determine the association between maternal bio-physiological factors and neonatal bio-physiological factors.

จุฬาลงกรณ์มหาวิทยาลัย
Chulalongkorn University

1.5 Conceptual framewok

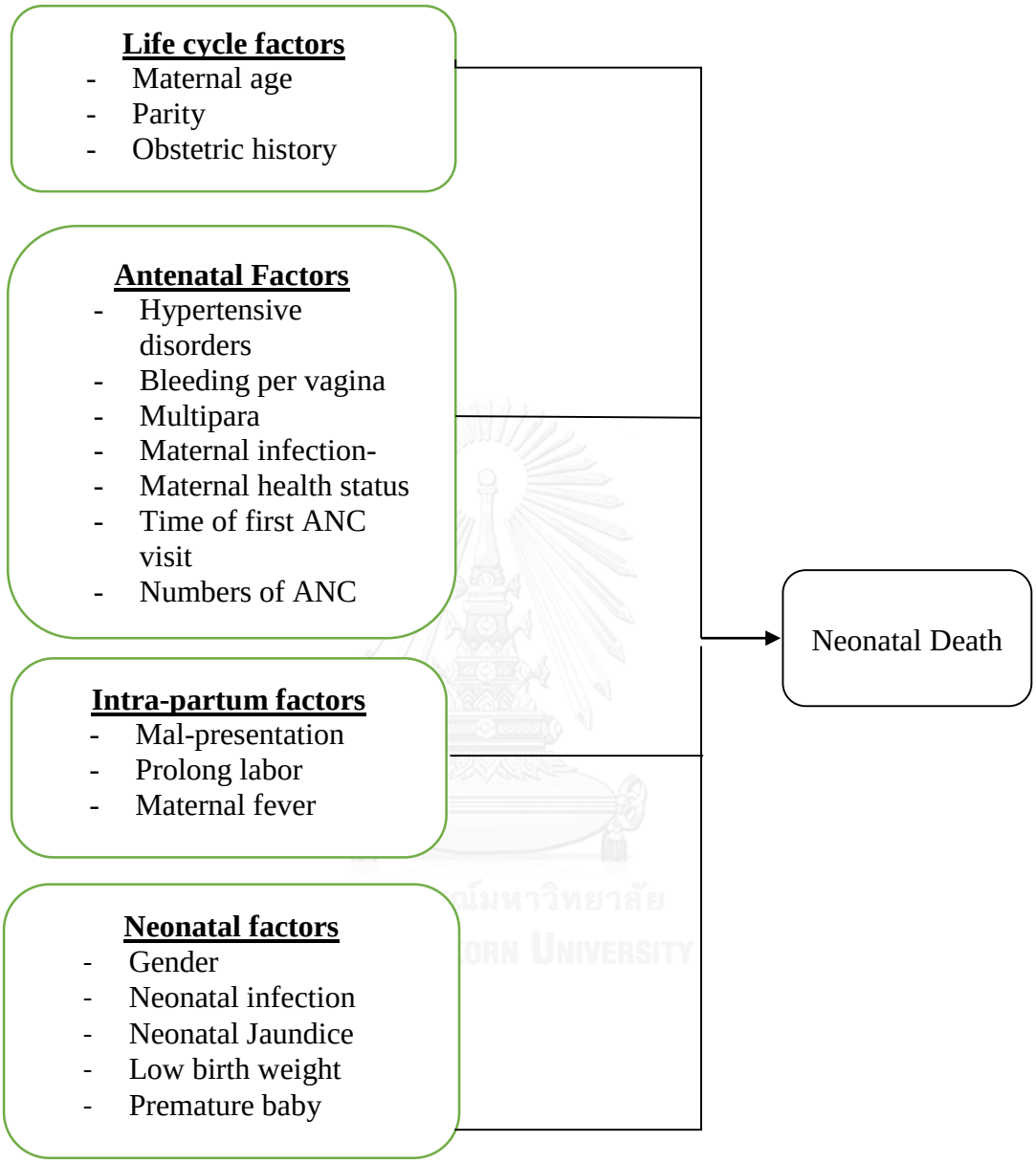

Figure 1 Conceptual Framewok

1.6 Operational definition

1) Age – age of the mother at time of delivery
2) Sex- sex of the new born child
3) Gestational age: The duration of gestation is measured from the first day of the last normal menstrual period. Gestational age is expressed in completed days or completed weeks.
4) Hypertensive disorders: the development of the new hypertension in a pregnant mother after 20^{th} week of pregnancy without prior hypertension.
5) Mal-presentation : Abnormal presentation of the fetus other than vertex (head) e.g. breech presentation
6) Prolong labor: Failure to progress during the delivery for more than 20 hours for the first time mother or 14 hours for the mother with previous delivery.
7) Low birth weight: Birth weight of less than 2500 g (up to and including 2499g), regardless of gestational age.
8) Premature baby: A baby born early than 37 weeks of pregnancy.
9) Neonatal period: Commences at birth and ends 28 completed days after birth. Early neonatal period commences at birth and ends seven completed days after birth. Late neonatal period: Commences after seven days and ends28 completed days after birth.
10) Neonatal death: A neonatal death is defined as death of a live birth during the first 28 days of life. Early neonatal death: death occurs during the first 7days of life. Late neonatal death: death occurs after the 7th day but before 28completed days of life.
11) Neonatal mortality rate: Number of deaths during the first 28 completed days of live per 1000 live births in a given year or period.
12) New born condition is the health status of the neonate such as weight of the new born, ability to suck milk after delivery and how to keep the neonate clean.
13) Maternal health is the medical condition of the mother during pregnancy and delivery period such as hypertension, diabetes, AIDS and other infection.
14) Maternal bio-physiological factors: maternal health's condition before or during the pregnancy, age, maternal nutrition and previous obstetric history.

จุฬาลงกรณ์มหาวิทยาลัย
Chulalongkorn University

15) Health seeking behavior of the mother: the act of seeking of the mother during the pregnancy at the formal health sectors or response to the illness during antenatal period.
16) Multipara: a mothers who has more than 2 or more pregnancies or multiple children at one time(twins)
17) Grand multipara: a mother who has 4 or more than 4 pregnancies in her reproductive life.

จุฬาลงกรณ์มหาวิทยาลัย
Chulalongkorn University

CHAPTER II
REVIEW OF LITERATTURE

2.1 Causes of neonatal death

Globally 2.761 million of the neonate died in 2013 which is 44% of under 5 mortality.

The three leading causes of are Preterm birth complication (0.935 million or 15.4%), Pneumonia (0.935 million or 14.9%) and Intra-partum related complications (0.662 million or 10.5%)(Li Liu, 2014). Reduction in the worldwide trend of infection disease such as diarrhea, pneumonia and measles are observed at 21st century. The most rapid reduction was seen in the neonatal tetanus. On the other hand, preterm, congenital, neonatal sepsis and injuries are with the slowest h. (Li Liu, 2014). If this trend continues, there will be 4.4 million deaths of the children younger than 5 in 2030.

However we can avoid this tragedy by addressing feasible preventions to the three main causes of death along with the highly estimated potential for saving lives. The main constrain is reaching mothers and babies during birth or early postpartum period. More and must be address these issues to reach the MDG 4 especially at Asia and Africa (Lawn et al., 2010). There are auspicious community based service deliveries models with the low cost sharing are tested in Asia which are tested and adapted at large scale in Africa.

Crucial to making progress is the improvement of neonatal death data and making better use of existing and future data in selecting and implementing the “best buys.” Available information is often not used effect more than investment.

2.2 Factors associated with neonatal mortality

1) Socio-demographic factors

Regardless of preventing of further mortality or planning intervention to reduce the mortality, it is crucial to know the associated factors of the neonatal death. Some researchers (Bhattacharya, 1995; Oladeji, 2013) stated the infant mortality and fertility rates of the mother are closely related. They revealed that high fertility rate can put the burden on the mother health. (Chowdhury, 1988) had discussed that if a woman bear the multiple pregnancies, the chances of mortality for her new born is increased so as the maternal mortality rate. He suggested this phenomenon as the dual casualty between fertility rate and infant mortality rate. Interestingly, the survival of the child also influences the birth spacing practice of the mother (Grummer-Strawn, 2002; Gyiham, 2002; Oladeji, 2013).

Most of the neonatal and maternal deaths occur in developing world and low income countries. In the light of these cases, many researchers tried to address the solution in this situation and found out that socio- demographic factor have the both direct or indirect impact on the death of new-born and mothers (Allen, 1991; Clarke, 1991; Ravi, 2013). Age, race, education, socio- economical and living status of the mothers have direct effects on the morality rate while the resident area has indirect relation by the availability of the physicians, difficulties in transportation, opportunity for education and health care services.

จุฬาลงกรณ์มหาวิทยาลัย
Chulalongkorn University

2) Low birth weight and premature delivery

Low birth is important determinant of the neonatal mortality and morbidity (Neal, 2009). It can be the complication of the intra uterine growth restriction or pre-mature delivery which will later on lead the new born to the other causes of morbidity and mortality such as respiratory distress, infections. Low birth-weight new born is vulnerable to infection and 20 times more likely to dies than normal weight child (Unicef, 2004) and also determinants factors for the wellbeing in the rest of the childhood and moreover into the adult life .

Premature delivery is also known as the delivery or birth of a baby before 37^{th} week of gestational age. Premature infants have higher risk of having mortality and morbidity such as delayed development, cerebral palsy and defects in hearing, seeing

and other nervous system development problem. The earlier the baby is born the higher the risk he bears (Development., 2015). The underlying causes of preterm delivery included high blood pressure, diabetes mellitus, multiparty, malnutrition of the mothers, reproductive tract infection and smoking but in some cases of the preterm delivery ethology is unknown. (WHO, November 2014). It was estimated that with the support of proper treatment 75% of the preterm delivery can be prevented. Premature delivery is one of the most common causes of child death in worldwide. (Development., 2015) estimated that 5-18% of the all delivery worldwide are preterm delivery.

3) Ethnical different

Countless researches (Besculides M, 2005; Hessol NA, 2005; Kitsantas P, 2010; Lane SD, 2001; Wingate MS, 2010)prove that ethnical different between different races is the preceding risk factor for the neonatal mortality. Other profound risk factor for neonatal mortality is the age of mother at birth. Young mother has relatively higher risk of having preterm baby, low birth weight and still birth while older mothers are having the risk of their child with the congenial abnormality (Lewycka, 2010; Mahy, 2003; Ravi, 2013). Comparing between the gender of the new born, girls have the higher chances of surviving the neonatal period mainly due to biological advantages of lower vulnerability of infections (Mahy, 2003; World Health Orginization, 2006). However opposite or different trend is seen in Asia where parents prefer or favor sons(Nielsen BB, 1997).

4) Poverty and Low income

Low income of the family, limited expenditure on the health care and poverty are the strong socio-economic factors for the neonatal death. Due to high exposure to the infections, poor care practice and preventive interventions will increase the vulnerability of the child to the infections by lowering resistance. Limited finical access, lower access to health cares, less likely to have the specialist care and life-saving drugs will increase the morbidity and mortality of the critically ill-child (Gwatkin DR, 2005; Victora CG, 2003; Wagstaff A, 2004).

5) Maternal education

Maternal education is one of the most important factors influencing the child mortality in developing countries (Patriciadargent-molina, 1994). The study suggested that maternal education is the string protective factors for infant mortality but in the disadvantaged community with the limited setting this effect is diminished (Alva, 1998). Most of the time mother is the sole care taker of the baby, her education results in favorable practice and better behavior which will lead to improve the health status of the newborn (Alva, 1998; J.C Caldwell, 1994).

The well-established relationship between educational level of mother and child mortality had been discovered by many researchers (Alva, 1998; J. C. a. P. C. Caldwell, 1993). It also revealed the strong relation between the maternal education and the child health status (Bicego, 1993). By using the secondary data from the population base study in Africa (John C Caldwell, 1979) proved the important of the maternal education to the health outcome of the child after controlling the other factors such as income and occupation of the parents.

To support these theories, some researchers identified maternal education as the protective factors by increasing the educational level of the mothers at the community level and increasing the health outcome of the child at both individual and community level. They also explained that

จุฬาลงกรณ์มหาวิทยาลัย
Chulalongkorn University

6) Antenatal care

Antenatal care for the pregnant mother included the screening of the maternal health condition and fetal development to detect the adverse outcome of the delivery as much as possible. Healthcare personal provides both curative and preventive intervention to the pregnant mothers, giving health education for the safe motherhood in case of emergencies how to handle them. (WHO, 2003). Moreover, certain medical condition become worsens during the pregnancy such as HIV, malaria, malnutrition and anemia due to the hormonal changes and immune depression. It was estimated that 30-50% of the high blood pressure during the pregnancy and antepartum hemorrhage which can be sufficiently reduced by ANC. (Ornella Lincetto, 2006)

ANC during the pregnancy provides the advantages to the maternal and child health especially at the low income countries where the maternal and neonatal mortality was high. The benefit from the ANC will help to reach the mothers with predesigned intervention such informing the danger signs of the pregnancy to the pregnant mothers and their family. ANC period is also presented with the good opportunity to inform the births pacing and contraceptive which is important for the reducing the numbers of the child bearing and the furthermore it will reduce the maternal and infant mortality. (WHO, 2003).

7) **Maternal disease and health problems**

Maternal health condition, nutrition status (obesity or malnourished), chronic health diseases and infectious diseases such as AIDS and hepatitis have already established the association with the health status of the new born. Pregnancies from ill-health conditions mother may result in diseased and malnourished children whose have the higher chances of death before or after delivery (Birdsall, 1988). Pregnant mothers with pre-existing diabetes have higher chances of having still-birth compare to the non-diabetes mothers (Dunne FP, 2009; Persson M, 2009; Reddy UM, 2010). Many researchers (Evers IM, 2004; Jensen DM, 2004; Penney GC, 2003; Persson M, 2009) found out that type I diabetes has 3.5- 4 times higher rates of prenatal mortality, still birth and infant death compare to general population. Moreover, (Clausen TD, 2005; Cundy T, 2000) prove that Type II diabetes is the stronger risk factors of early new born death and intermediate fetal death than Type I diabetes.

Hypertension is one of the independent and significant risk factor for the still birth and perinatal mortality (Ananth CV, 2010; Reddy UM, 2010 ; Rey E, 1994; Vanek M, 2004). Not just pre-exiting hypertension, pregnancy induced hypertension (PIH) also is the important risk factor for still-birth and neonatal death and the risk is higher as the increasing order of the birth, showing the statically significant liner trend (Ananth CV, 2010).

Common heart disease problems during the problems are valvular heart diseases. Due to the hormonal and physiological changes during pregnancy, there is remarkable increased in the blood flow and cardiac output. With will cause the

mechanical constrain on the mother heart and worsen the preexisting heart disease of the mothers. Pregnant mother with heart disease should be closely monitor before or after the delivery (Roeder HA, 2011)

8) Maternal Nutrition

Poor nutrition of the mother will lead her child to both the acute perinatal infection and chronic infection. Deaths of children from the nutrition related causes are estimated around 1 million per year (WHO, 2007). Birth defect and low birth weight are the major causes of infant death from malnourished mother. Mother is the only nutrition source for the baby during the fetal or infant life. It is clear that maternal nutrition can decide the infant health directly or indirectly.

Birth defect contribute 20 percentage of the infant deaths in even in the developed countries like USA(Michael C 2007). A susceptible infant of the nutrition deficient mother can result in the birth defect during the intrauterine life. The organogenesis of the fetus starts early pre-existing nutritional deficiency can are most dangerous to the fetus(Mahomed, 2000). Many studies (Berry RJ, 1999; Moore LL, 2003; Mulinare J, 1988) has proven that inadequate intake of food based folic acid or supplements will increase the chance of baby to get birth defect two to eight fold compare to the normal mother.

จุฬาลงกรณ์มหาวิทยาลัย
Chulalongkorn University

9) Review the demography data and vital statistics of study area

North OkkalPa is one of the townships of Yangon City and located on the eastern part of Yangon Division. It consisted of 19 wards. East to the North OkkalPa is North Dagon Township and west is Mingalardon Township and the west is Kamayut Township. North OkkalPa Township had the estimated population of 333,293 in 2014 census.

Regarding reproductive health 23.6% of the delivery are assisted by health staffs (BHS and AMW) and ANC coverage was 56.89% (Department of health, 2012). Population growth rate was 2.4 and approximately 2300 pregnant mother delivered in 2011. Among them only 12.6% of mother s delivered at health facility. Infant mortality rate in the township was 41.91% per 1000 live birth which is one of the highest among Yangon Division.

CHAPTER III
METHODOLOGY

3.1 Research design

Descriptive observational study with cross sectional design was applied with the consideration of new born (alive) and incident cases (death) for data analysis.

3.2 Research area

North OkkalPa Township,Yangon Division.

3.3 Study population

All the mothers who delivered in North OkklaPa Regional hospital in 2014.

3.4 Sampling methods

Out of the 45 townships in Yangon Division, North OkklaPa Township was chosen by purposive sampling due to the high delivery rate at hospital and sub urban demographic. Secondary data from the township hospital regarding all the deliveries cases in 2014 will be collected.

Inclusion criteria

(a) Mother delivered in Township hospital
(b) All ages
(c) All ethnics
(d) Mothers of both dead and alive child
(e) Early neonatal death (neonatal death within 7 days of life)

Exclusion criteria

(a) Mothers with the incomplete record or data
(b) Still birth
(c) Abortion
(d) Neonatal death after 7 days of life

Chulalongkorn University

3.5 Sample size

According to township health profile 2014, 5969 mothers delivered at the hospital in 2014.

The sample size of students is calculate based on following formula which has simplified formula for calculate sample size.

$$n = \frac{z^2pq}{d^2}$$

Where;

n = the sample size

z = 2.576 (value from the normal distribution for the desired confidence)

Correspond to 99% CI

p = 0.03 (prevalence of neonatal death)

q= 100-p

d= 0.1(the desired precision)

$$n = \frac{(2.576)^2(0.03)\ (99.97)}{(0.1)^2}$$

n= 1990 cases

It yields, 1990 cases where we round up to the 2000 cases.

After reviewing the hospital records, 2000 samples was selected from all the delivery cases. Patients were selected by systematic random sampling, every 2 of the patients from the patients list will selected in the participation in this study.

3.6 Measurement tools

All the pathophysiology condition of the mothers and neonate will be collected by using adopted version WHO verbal autopsy for neonate. All available data sources from the obstetric and neonatal wards will be explored and necessary opinions will be

จุฬาลงกรณ์มหาวิทยาลัย
Chulalongkorn University

consulted with experts from the field of maternal and child health, demography and statistics. Death cases will be reviewed from the neonatal hospital records and death certificated.

Maternal age in the study was organized into three groups according to their reproductively. According to American Society of the reproductive medicine (MEDICINE, 2012) a woman has her best fertility during her 20s and decline after the age of 30s. Both extreme ages are noted as the dangerous to bear the pregnancy. BMI standard for the Asian adult woman is used to measure maternal nutritional status.

Birth weight of the baby was organized into 4 groups, <1000 grams- extremely low birth weight, 1000-1499 grams very low birth weight, 1500-2499 grams low birth weight and >2500 grams normal or over weight. Gestational age of the newborns was also defined into 4 groups; < 28 weeks extremely preterm baby, 29-32 severely preterm baby, 33-36 weeks preterm baby and >37 term baby.

3.7 Validity test

The questionnaire or checklist was developed from the verbal autopsy for neonatal death from World Health Organization (Orginization, 2012). After questionnaire was revised, it was submitted two experts for the content validity. The questionnaires was revised and upgraded according to suggestion and advice from the experts.

จุฬาลงกรณ์มหาวิทยาลัย
Chulalongkorn University

3.8 Data analysis (statistics)

Descriptive statistics was applied to data in percentage, means and standard deviation. The analytical statistics was Chi-square and multi-logistic regression.

Chi-square test was used to test the association of each variant. After the association was confirmed between variants, multi-logistic regression was used to measure the strength of the association between each variant with the dependent variable by using SPSS.

3.9 Ethical consideration

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).

Before the respondents endorsed for consent form, the researcher will explain the objective of the study to the local health officer and township health department. The information and identity of the participant was kept to secret. Furthermore, the name of mother is not presented in the questionnaire or their personal information including their medical history will not be revealed.

Parallel Ethical Review proceeded before the collection of the data at Regional Health office, Ministry of Health Yangon Division and approved by Medicare of the Ministry of the Health, Myanmar.

3.10 Limitation of the study

The descriptive and quantitative data obtained from the cross sectional study design can only describe the outcome at one specific point of time, so cannot explain outcome in long period.

By using secondary data from the hospital records, demographic and socio-economic data will not be revealed. A few numbers of neonatal death which are not reported in the formal system can be missed.

Regarding the medical history of the mothers, all of the data were from the history taking section of the mothers such as history of heart diseases. But some of the diseases can be clinically defined during the hospital stay such as diabetes mellitus and high blood pressure.

One of the drawbacks of the secondary data was unable to trace the maternal body weight before the pregnancy or body weight at the first trimester because of the different time of registration for ANC of the mothers in the study.

Due to the nature of the neonatal mortality, very small numbers (described in 1000 live birth) high numbers of samples size is required for this kind of study. Due to the time limitation, it is not feasible for the researcher to use the interview methods to explore the socioeconomic factors and others details information.

3.11 Expected benefit and outcome

This research is aim to identify the factors for the neonatal death related to the local context of the area for further prevention and planning for the maternal and child health issues.

จุฬาลงกรณ์มหาวิทยาลัย
Chulalongkorn University

CHAPTER IV

RESULTS

This study aimed to identify the factors associated with neonatal mortality occurred in North Okkla Pa hospital, Yangon, Myanmar at 2014. A total of 2000 pregnant mothers including 30 death neonates. All the bio-physical information regarding the mothers and children are collected from the hospital records with the permission from Medical Department of Ministry of health and cooperation from the NOGH administration and collaboration from the special child care unit (Neonatal Care units).

The descriptive information of mothers

4.1 The general information of mothers

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. 2000 samples including 30 early neonatal deaths are selected to study and their general information was summarized in the Table 1. All of these samples are collected from the singleton birth where there were 68 twins and 2 triplets deliveries are 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.

Regarding the table 1, 47.8% of the newborns are male and that is accounted for 955 in numbers. The age of the mothers range from 16-41, the mean age of the mothers involved in the study is 25.6 (SD = 5.6) and majority of the mothers (80.2%) are from the age group of 20-35. Concerning the ethnicity of the mother, more than 86% of them were come from the same ethnic (Burmar, major ethnic of Myanmar) and the rest were distributed between Kayin, Mon, Kayar and Chinese. Same distribution was observed between both death and alive cases.

In the year of 2014, 253 cases of mal-presentation were reported and they were successfully delivered by the supervision of the specialists either assistant delivery or

operation. So in this study, mal-presentation was excluded from the univariate and multivariate analysis.

4.2 Pregnancy information and obstetric history

Among 2000 mothers, 548 of the mothers were first parity (first pregnant mother) and accounted for 29.2% of total mothers. 154 pregnant mothers were recorded as parity 4 and above (mother with previous 4 pregnancies and above) and the rest 1262 (63%.1) is parity 2 to 3 (pregnant mothers with 2 or more pregnancies). Only 19.6 % of the pregnant mothers received ANC at the first trimester of the pregnancy. On the other hands, 1402 (70.1%) of the mothers received their first ANC visit at second trimester. But total 1494 out of 2000 mothers managed to get at least 4 ANC during their pregnancy period, leaving 25.3% of the mother with incomplete ANC visits.

Body mass index for the Asian adult women is used to define the nutritional status of the mothers and recorded from ANC records and hospital record of the mothers. The body mass index of the mothers in this study was calculated from the weight of the mother in Kg before the delivery and height in mm^2. The standard BMI of the Asian women may not be the best to measure for the BMI of the pregnant mother at 3^{rd} trimester due to the extra weight of the fetus. But due to the incomplete data for the weight of the mothers before delivery (secondary data) and time of registration for ANC was different for each mother, neither weight gain during the pregnancy or BMI before the pregnancy could not be traced. In this study, BMI of the mother before the delivery was used as the best possible indicator for the nutritional status of the mother. 15.2% out of 2000 mothers can be regarded as the underweight while else 1408 (70.4%) of the total pregnant are within the normal BMI range.

The most common delivery method is the normal vaginal delivery 64.2%. The forceps assistance delivery is the least common mood of delivery (1.6%). Caesarean section (26.2%) includes both emergency and elective operation that performed in 2014 at NOGH hospital. According to hospital report of 2014, 17% of the cesarean section was emergency operation and the major causes of the operation were placenta previa, eclampsia, prolong labour, malposition of the fetus or twin pregnancy.

22 newborns (1.1%) of the newborns delivered before the 28 weeks of the gestation. Total 236 newborns (11.7%) were delivered before the expected day of

delivery or 37th week of pregnancy. Among 2000 neonate, 179 (9%) had low birth weight.

The data for the medical disease of the mothers were reviewed from the hospital record, total of 121(6%) of mothers had the history of the diabetes, 136 (6.8%) of them had high blood pressure before the delivery.

Table 1 Characteristic of the mothers and neonates (n-=2000)

No		Numbers	Percentage
1	Sex of the newborns		
	Male	955	47.8
	Female	1045	52.2
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
3	Maternal age mean (SD)	25.6(5.6)	
	Age <20 years	307	15.4
	20- 35 years	1603	80.2
	>35 years	89	4.4
	(range of mother age 16-41)		
4	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
5	Total numbers of pregnancy		
	ANC visit 4 times and above	1494	74.7
	ANC visit less than 4 times	506	25.3

จุฬาลงกรณ์มหาวิทยาลัย
Chulalongkorn University

No		Numbers	Percentage
6	Mode of delivery		
	Normal virginal delivery	1293	64.6
	Forceps delivery	30	1.5
	Vacuum delivery	156	7.8
	Cesarean section	521	26.0
7	Maternal BMI at delivery		
	Underweight (BMI<18.5)	285	14
	Normal weight (BMI 18.6-24)	1400	70
	Overweight (BMI >24)	315	16
8	Birth weight of newborns		
	< 1000 gram	15	0.8
	1000-1499 gram	25	1.2
	1500-2499 gram	140	7.0
	>2500 gram	1820	91.0
9	Gestational age of newborns		
	<28 weeks	22	1.1
	29-32 weeks	33	1.6
	33-36 weeks	181	9.0
	>37 weeks	1764	88.3
10	Medical disease		
	Diabetes Mellitus	121	6.0
	High blood pressure	336	17
	Heart disease	35	1.8
	Maternal infection before delivery	207	10.4

Reported as mean and standard deviation (SD)

จุฬาลงกรณ์มหาวิทยาลัย
Chulalongkorn University

4.3 Characteristic of the death cases

In the Table II, the characteristic of the death cases (n= 30) are described. Mean of the maternal age for the death cases is 27.26 (SD=7.1) and 70% of them are from the age group of 20-35 years. The age of the mothers involving in this study are range from 16 to 41.Regarding the genders of the neonate, male is the dominate group with 53.3% and accounted for 16 cases. Most of the death cases 18 (60%) come from the multipara mothers and 8 (26.7%) of them were from the grand multipara.

Concerning the health seeking behavior of the mothers of the death children means (SD) for perinatal care visit was 4.90 (2.32) and majority of the mothers (46.7%) received antenatal care at the second trimester of the pregnancy. 22 (73.3%) out of 30 mothers received the antenatal care less than 4 times. Vaginal delivery is still the most common methods of delivery 53.3 % but the different was seen at the forceps and vacuum assistant delivery. For the forceps delivery, the percentage was increased from the 1.6 to 16.7, for the vacuum 8.0 to 13.3.

For maternal body mass index, normal weight mothers were recorded 14 (46.7) but the prevalence of the underweight mother was increased from 15.2 to 40. The same fluctuation is observed at the birth weight of the baby with the spike in the prevalence of the extreme low birth weight from 0.8 to 28.7. And also the premature delivery rate for $<28^{th}$ week and 28-32 week was also increased from 2.7 to 53.4.

จุฬาลงกรณ์มหาวิทยาลัย
Chulalongkorn University

Table 2 Characteristic of the death cases
(n=30)

No		Numbers	Percentage
1	Sex of the newborn		
	Male	16	53.3
	Female	14	46.7
2	Number of pregnancy		
	Mother with first parity	4	13.3
	Mother with 2-3 previous pregnancy	18	60
	Mother with previous 4 or more pregnancy	8	26.7
3	Maternal age (SD)	27.26(7.1)	
	< 20 years	2	7
	20-35 years	22	73
	>35 years	6	20
4	First ANC visit		
	ANC at first trimester	5	16.7
	ANC at second trimester	14	46.6
	ANC at third trimester	11	36.7
5	Total Numbers of ANC		
	ANC 4 times and above	8	26.7
	ANC less than 4 times	22	73.3
6	Mode of delivery		
	Vaginal delivery	16	53.3
	Forceps delivery	5	16.7
	Vacuum delivery	4	13.3

จุฬาลงกรณ์มหาวิทยาลัย
Chulalongkorn University

No		Numbers	Percentage
	Caesarean delivery	5	16.7
7	Maternal BMI at delivery		
	Underweight (BMI<18.5)	11	37
	Normal weight (BMI 18.6-24)	14	46
	Overweight (BMI >24)	5	17
8	Birth of newborns		
	< 1000 gram	8	26.7
	1000-1499 gram	7	23.3
	1500-2499 gram	12	40.0
	>2500 gram	3	10.0
9	Gestational age at birth		
	< 28 weeks	8	26.7
	29- 32 weeks	8	26.7
	33- 36 weeks	9	30.0
	>37 weeks	5	16.7
10	Medical disease		
	Diabetes Mellitus	3	10
	High blood pressure	2	7
	Heart disease	4	13
	Maternal infection before delivery	9	30

จุฬาลงกรณ์มหาวิทยาลัย
Chulalongkorn University

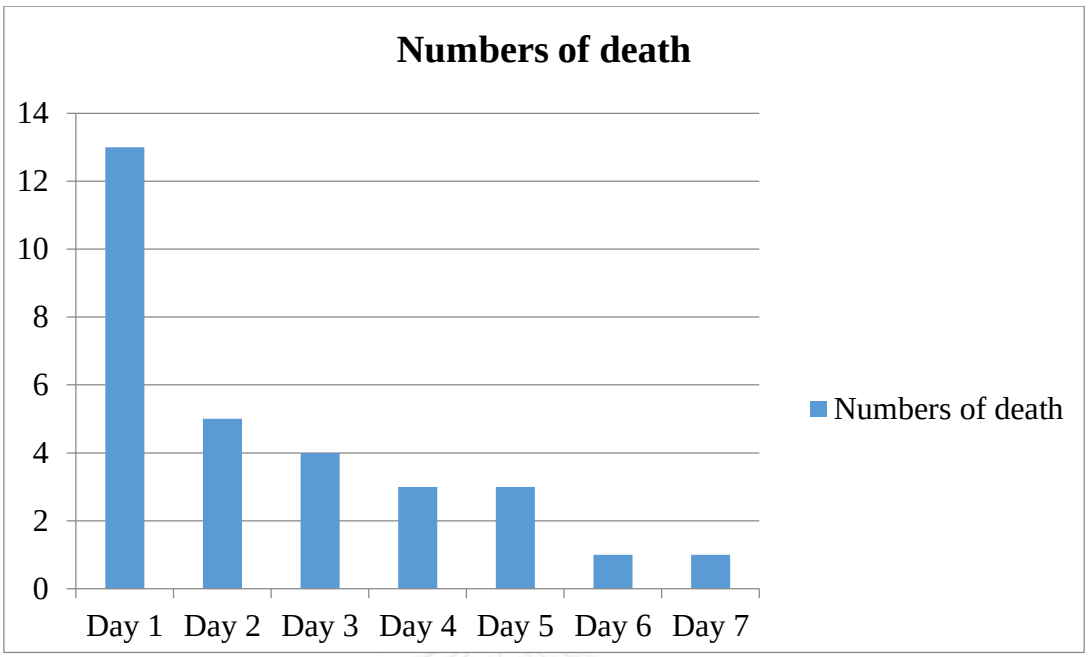

Figure 2 Numbers of deaths according to the age (days) of baby

Chart 1 showed the numbers of death of newborns according to the age (days). As this study focused on the early neonatal deaths, all of the deaths cases (30) range from day 1 to day 7. At day 1, the numbers of death case is 13 which were 43% of the total expired cases in the study.

จุฬาลงกรณ์มหาวิทยาลัย
Chulalongkorn University

4.4 Factors associated with the neonatal mortality

As shown in the table 3, Chi-square and Fisher's Exact was used to test the association and found out that maternal age has P-value < 0.005 and among them dominant age group (21-35) has the most incident. However, the risk of early neonatal deaths was increased at the maternal age group 36 and above as 6 out of 83 newborns were reported as death. Parity of the mother also established the association with the early neonatal mortality (p-value 0.002).

Chai square and Fisher's Exact were used to find out the association between the pregnancy related information, maternal BMI, numbers of antenatal care received and the early neonatal deaths. It found out that most variables have p-value <0.005, on top of that 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 early neonatal deaths. Also the parity of mother and body mass index of the mother also had association (p-value=0.002) with the neonatal mortality.

Diabetes mellitus, high blood pressure, heart disease and maternal infection were organized into one variable "medical disease of mother" due to the small numbers of neonatal death from the each disease except maternal infection.

Univariate statistical analysis methods were used to establish the association between mode of delivery of mothers, birth weight of the newborns, gestational age of the neonate and neonatal jaundice with the neonatal mortality. 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 Factors associated neonatal mortality

No		Alive (1970)	Death (30)	P- value
1	Maternal age			0.004*
	Less than 20	305	2	
	21-35	1582	22	
	36 and above	83	6	
2	Sex of the newborns			0.537*
	Male	939	16	
	Female	1031	14	
3	Numbers of pregnancy			0.002*
	Mother with first parity	580	4	
	Mother with 2-3 previous pregnancy	1244	18	
	Mother with previous 4 or more pregnancy	146	8	
4	First ANC received			0.001*
	ANC at first trimester	383	5	
	ANC at second trimester	1388	14	
	ANC at third trimester	199	11	
5	ANC total			0.000*
	ANC 4 times and above	1486	8	
	ANC less than 4 times	484	22	
6	Maternal BMI at delivery			0.004*
	Underweight	263	10	
	Moderate	1410	14	
	Overweight	297	6	

No		Alive (1970)	Death (30)	P- value
7	Medical diseases	669	18	0.003*
8	Mode of delivery			0.031**
	NSVD	1268	25	
	Assistant delivery	702	5	
9	Birth weight			0.000**
	<1000g	8	7	
	1000-1499g	16	9	
	1500-2499	129	11	
	>2500g	1817	3	
10	Gestational age			0.000**
	<28th week	14	8	
	29-32 week	25	8	
	33-36 week	172	9	
	>37 week	1759	5	
11	Jaundice	391	1	0.71*

(*=Chi-square and **= Fisher's Exact)

จุฬาลงกรณ์มหาวิทยาลัย
Chulalongkorn University

4.5 Multivariate analysis of factors associated with neonatal mortality

Logistic regression was used to test the strength of the associated factors which were tested or significant at Chi-square and Fisher's exact test in order to obtain the better view of the associated factors. In this part, the dependent variable is the neonatal mortality which was classified into 2 categories, 0= No and 1= Yes.

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 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. Under this assumption, there were total 8 variables to be tested in the logistic regression model; they are total number of pregnancies, birth weight of the newborns, gestational age of newborns, body mass index of the mothers, times of the first ANC visits and numbers of total ANC, mode of delivery of the mothers and medical diseases of the mothers.

The logistic regression model was run after putting all the variables to test the strengths of the association of each variable. The result was shown in the table 4, 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 OR=8.8 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.

Table 4 Multivariate analysis of factors associated with neonatal mortality

No	Variable	B	Odd ratio	P-value	95% CI	
					Lower	Upper
1	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
2	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
3	Gestational age of newborns					
	<28th 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
4	Body Mass index of mothers at delivery					
	Underweight (ref)	-0.633	0.278	0.051	0.087	1.320
	Normal weight	-0.895	0.510	0.043	0.051	2.557
	Overweight					

จุฬาลงกรณ์มหาวิทยาลัย
Chulalongkorn University

No	Variable	B	Odd ratio	P-value	95% CI	
					Lower	Upper
5	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
6	Total number of ANC					
	ANC 4 and above (ref)					
	ANC less than 4	2.178	8.825	0.005	1.773	43.915
7	Mode of delivery					
	Assisted delivery (ref)					
	Normal vaginal delivery	-1.018	0.36	0.039	0.l38	0.949
8	Medical diseases					
	No medical diseases (ref)					
	With medical diseases	1.207	3.34	0.001	1.62	6.89

จุฬาลงกรณ์มหาวิทยาลัย
Chulalongkorn University

CHAPTER V
DISCUSSION

This is a cross-sectional study with the aim to study the factors especially bio-physiological factors of mothers and children in the neonatal mortality at North OkklaPa hospital, Yangon Division. Base on the author's this is first research to study the neonatal mortality in the target area. As neonatal mortality is still the important public health problems in Myanmar and others low income countries even though showing progress in the last decades. While Thailand and other middle income countries fulfilled Millennium Development Goals and moving to the MDG plus, Myanmar is still aiming at MDG.

5.1 Summary of the results

Among 2000 samples from the neonatal care unit of North OkklaPa Hospital, it was recorded that 15 early neonatal mortality per 1000 live births (within 7 days of life). Majority of them >86% have same ethnicity (Burma). 52% of the newborns are females. Among the mothers, 29.2% of them had their first pregnancy while 69.8% of them had 2 or more pregnancies. During their pregnancy, 10.4% and 6.0% of mothers had the history of bleeding per vagina and vaginal discharge respectively. 88.2% of mothers had term and post-term delivery and 11.7% of them delivery before the expected day of delivery. For the birth weight of the newborns, 9% of them had low birth weight (less than 2500 grams) among them 1.1% of neonate had extreme low birth weight. Regarding the medical history of mothers, 1.8% of mothers reported fit or convulsion during the pregnancy, 6.8% of them had the history of heart disease and dispone on excretion. Among them 6.1% of them had fever before or after the delivery.

Most common maternal age group was 20-35 and they contributed 80.2% of the all mothers. Where else, 15.4% of them are younger than 20 and 4.4% of them are older than 35 years. 70% of the mothers had moderate body mass index (BMI), while 15.2% of them had underweight BMI and 14.4% of them were overweight. The most common cause of delivery is the normal spontaneous delivery (NSVD) 64.6%, followed by

cesarean section (both emergency and elective) 26.0%, vacuum assistance delivery 7.8% and forceps 1.5% respectively.

Regarding the antenatal care during the pregnancy of the mothers, only 19.6% of them received first antenatal care during the first trimesters and 10% of them had their first ANC at third trimester while the 70.1% of them had ANC during second trimesters. However, 74.7% of mothers had the complete ANC visits, leaving 25.3% of them with less than 4 ANC. The similar result was seen at the other study (Sein, 2011) from different township in Yangon.

5.2 Factors associated with neonatal mortality

Countless numbers of studies (Allen, 1991; Alva, 1998; Clarke, 1991; Gwatkin DR, 2005; Ravi, 2013) 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, health seeking behavior of mother during pregnancy, nutritional status of mother, pre-exiting medical diseases (heart disease and CNS disorder), 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.

จุฬาลงกรณ์มหาวิทยาลัย
CHULALONGKORN UNIVERSITY

Maternal age

During the life cycle of human physiology, reproductive potential or fertility change with age. A woman has the most reproductive potential in her 20s and it will gradually reduce after 30 years of ages (MEDICINE, 2012).According to the review of vital static from the United Stated (T.J. Mathews, 2010), 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. Another meta-analysis, using WHO database revealed the higher chance of having the death child from mothers with >35 years old (OR=1.51). The causes and effects of late fertility and declining reproductive potential with the advanced maternal age was explained Marie Vandresse (Vandresse, 2008). The risk of having preterm delivery is increased in mother with > 35 years old which could be

indirectly effect the neonatal mortality. It also attributes to the greater incidence of congenital abnormality of child or may result in maternal mortality or morbidity such as gestational diabetes or eclampsia (UDUGAMA, 2003; Yariv Yogev, 2010).

Parity of mothers

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. Naoko Kozuki and Anne CC Lee proved that odd of having neonatal mortality was higher in the nulliparous mother of <18 years or > 35 years old mothers and higher risk was seen form the mothers with >35 years and had 3 or more previous pregnancy(Naoko Kozuki1, 2013).

Antenatal Care

According to the national and regional figures of South East Asia from World Health Organization (WHO, 2003) antenatal care utilization in developing world was 68%. World health organization recommended that most of the normal pregnant mothers should be at least four times during the pregnancy. In this research, result from the logistics model revealed that the numbers of visit is more important risk factors than the timing of the visit, i.e. mothers with the less than 4 ANC visits had OR=8.8 of having poor neonatal outcome compare to the mothers with 4 ANC and above where else the risk between the mother who received her ANC at first trimester and the mother with the first ANC at second trimester cannot be statically identified. Similar results was seen in the research done in Indonesia, revealing that the frequencies of ANC utilization at least 4 times in the pregnancy period reduce the risk of having poor delivery outcome, it explained that the advantages of having early first ANC over the late is diminished. In reverses, the important of the receiving ANC in third trimester was highlighted due to the development of complication, medical problems and rapid growth of the baby in the third trimester (Juliani Ibrahim, 2012).

Maternal nutritional and neonatal mortality

Nutrition is not only the profound risk factors but also the modifiable one that should be properly addressed in reducing the mortality and morbidity of both mothers and children. Even in the world leading country like United Stated, well documented evidence revealed that the nutrition is still contribution large part of mortality and morbidity of mothers and newborns (U.S. Department of Health and Human). Nutrition has both direct and indirect effects on neonatal mortality and morbidity such as poor nutritional mothers have higher risk of child with birth defect, low birth weight or sudden infant death syndrome (SADS) or leading to the complication during the pregnancy such as anemia, infection or inflammation(Michael C 2007; R. Kulier, 1998). Poor maternal nutrition and low gestational weight gain is associated with the greater risk of preterm delivery with the odd ratio of 1.5 to 2.5 (Schmidt MK, 2002).

Maternal medical diseases

In this study all the pre-pregnant medical condition such as diabetes, heart disease and pregnancy related disease such as pre-eclampsia and eclampsia was combined into one variable. Association between the maternal medical diseases and neonatal mortality was established. The odd ratio of mother with medical diseases was 3.34 compare to these who do not have medical condition before or during pregnancy. Similar result was seen in a cohort study done by (Evers IM, 2004) showed that the risk of having neonatal and perinatal mortality of mother with diabetes was 3.5 times higher than normal mothers. A cross-sectional study done in the Untied States, (Ananth CV, 2010) estimated that the odd ratio of neonatal mortality in pregnancy induced hypertension was 1.32 and risk of still birth was 1.37.

Maternal infection can trigger the inflammation reaction in local or systemic response. Massive inflammation can provoke the preterm delivery and other disorders such as chronic lung infection, heart disease, premature infants and eye problems in the newborns.

Gestational age at delivery

The cohort study (Khashu M, 2009) from the British Columbia from April 1999 to March 2002 proved that the rate of neonatal death and infant mortality was higher in the preterm delivery compared to those of the term delivery mothers. Another cohort study focused on the very preterm infants concluded that chances of survival varies greatly with the maturity of the baby, even though access to health care and limitation of the intensive care were the great contributors to the causes, the gestational age at the time of delivery itself was important factors in the neonatal mortality (B Larroque, 2004). Another study focus on the late preterm baby (34-36 weeks) found out that the late-preterm bears the higher risk of mortality and morbidity compare to the term delivery neonate (37-41 weeks) (Kay M, 2003). The different studies focused on the different period of the gestational ages (early preterm and late preterm) concluded that the termination of the pregnancy at the term or term delivery is the significant risk factors for both neonatal mortality and morbidity. It could be explained by the fact that the incomplete process of organogenesis of fetal organs such as lungs and livers and weak or undeveloped immune system of the preterm baby.

Birth weight of the newborns

In this study population, the prevalence of low birth weight is 9% which is less than WHO regional estimation (15%)(W. a. Unicef, 2010), 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 compare 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.

Babies with the birth weight less than 1000 grams are defined as the extreme low birth weight and newborns with birth weight less than 1500 grams are called very low birth weight child. Well knows risk factors for the low birth weight delivery are mostly bio-physiological factors which most of them are modifiable such as anemia, infection such as malaria, maternal pre-exiting health condition, parity and age of the mothers while some of factors cannot be control e.g. Ethnicity or race, twin pregnancy. Complications followed by the low birth weight such as hypothermia, hypoglycemia,

sepsis, fluid and electrolyte imbalance are similar with those of the preterm delivery where intensive neonatal care unit is required.

5.3 Recommendation

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 not 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. The transformation of medical knowledge into the common practice to intergrade in the community is still big a challenge for health professional. 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. Extending birth spacing program, 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.

Advocate to the mothers for the birth spacing programs for the better result in the pregnancy and delivery which will increase the survival of both mothers and child. It is recommended to formulate a program to achieve the desired birth spacing and interval especially at the rural area.

Not only the nutrition specific intervention is important but also the eating habit and knowledge of the balance can determined the both micro and macro nutrition of mothers. There is still knowledge gap in the rural area and urban area, it is important to identify and support the mothers with nutrition defects during the pregnancy. Innovative community base nutrition program are successfully in promoting the nutritional status of the mothers and should be considered for the rural population base on the availability and types of local food.

5.4 Further study

Extend this research in the community to gain more information about the preventable risk factors. Moreover, population base study should be conducted. Factors associated to the neonatal death in the remote areas should be researched and need to be properly address to lower the neonatal mortality in Myanmar country.

จุฬาลงกรณ์มหาวิทยาลัย
Chulalongkorn University

REFERENCES

Allen, D. I., and Kamradt, J.M. (1991). Relationship of infant mortality to the availability of obstetrical care in Indiana. *Journal of Family Practice, 33(6)*, 609-613.

Alva, S. D. a. S. (1998). Maternal education and child health: Is there strong causal relationship? *Demography, Vol-35-1*, 71-81.

Ananth CV, B. O. (2010). Impact of pregnancy-induced hypertension on stillbirth and neonatal mortality. *Epidemiology, 21(1)*.

B Larroque, G. B. a., M Kaminski, M Dehan, M Andre´, A Burguet, H Grandjean, B Lede´sert,C Le´veˆque, F Maillard, J Matis, J C Roze´, P Truffert. (2004). Survival of very preterm infants: Epipage, a population based cohort study.

Berry RJ, L. Z., Erickson JD, Li S, Moore CA, Wang H, et al. (1999). Prevention of neural-tube defects with folic acid in China. *N Engl J Med*.

Besculides M, L. F. (2005). Racial and ethnic disparities in perinatal mortality: applying the perinatal periods of risk model to identify areas for intervention. *J Natl Med Assoc, 97(8)*, 1128-1132.

Bhattacharya, B., Singh, K.K. and Singh, U. (1995). Proximate determinants of fertility in Eastern Uttar Pradesh. *Human Biology, 67*, 867-886.

Bicego, G. T. a. J. T. B. (1993). Maternal Education and Child Survival: A Comparative Study of Survey Data from 17 Countries. *ocial Science and Medicine 36*.

Birdsall, N. (1988). *Economic approaches to population growth*. Netherland Elsevier Science Publishers B.V.

Caldwell, J. C. (1979). Education as a Factor in Mortality Decline: An Examination of Nigerian Data. *Population Studies 33(3)*.

Caldwell, J. C. (1994). How is greater maternal education translated to lower child mortality? *Health Transition review, 4:224*.

Caldwell, J. C. a. P. C. (1993). Women's position and Child mortality and morbidity in less developing countries

Chowdhury, A. R. (1988). The infant mortality–fertility debate,some internationalevidence. *Southern Economic Journal*, 54,666-674.

Clarke, L., and Coward, R. (1991). A multivariate assessment of the effects of residence on infant mortality. *Journal of Rural Health, 7(3)*(1991), 246-265.

Clausen TD, M. E., Ekbom P, Hellmuth E, Mandrup-Poulsen T, Damm P. (2005). Poor pregnancy outcome in women with type 2 diabetes. *Diabetes Care, 28(2)*.

Cundy T, G. G., Townend K, Henley PG, MacPherson P, Roberts AB. (2000). Perinatal mortality in Type 2 diabetes mellitus. *Diabet Med, 17(1)*.

Department of health, Y. D. (2012). North OkkalaPa Township Profile

Development., E. K. S. N. I. o. C. H. a. H. (2015). Prematrue labor and Birth Condition inforamtion *Human Biology*.

Dunne FP, A. G., Durkan M, Mitchell Y, Gallacher T, Keenan M, Hogan M, Carmody LA, Gaffney G. (2009). pregnancy outcome for women with pregestational diabetes along the Irish Atlantic seaboard. *Diabetes Care*.

Evers IM, d. V. H., Visser GH. (2004). Risk of complications of pregnancy in women with type 1 diabetes: nationwide prospective study in the Netherlands. *BMJ*(2004 Apr).

Grummer-Strawn, L. M., Stupp, P.W., and Mei, Z. (2002). (2002). Effect of a child's death on birth spacing: A cross-national analysis in: Montgomery (pp. 39-73). National Academy Press: Washington D.C.

Gwatkin DR, W. A., Yazbeck A. (2005). Reaching the poor with health, nutrition, and population services: what works, what doesn't work, and why. *World Bank*(Washington DC).

Gyiham, S. O. (2002). Lagged effect of childhood mortality on reproductive behavior in Ghana and Kenya. London, Canada.

Hessol NA, F.-A. E. (2005). Ethnic differences in neonatal and postneonatal mortality. *Pediatrics, 115(1)*, e44-51.

Jensen DM, D. P., Moelsted-Pedersen L, Ovesen P, Westergaard JG, Moeller M, BeckNielsen H. (2004). Outcomes in type 1 diabetic pregnancies: a nationwide, population-based study. *Diabetes Care*(2004 Dec).

Juliani Ibrahim, T. Y., 1 Toshihide Tsuda,2 Saori Kashima,3 and Hiroyuki Doi1. (2012). Frequency of Antenatal Care Visits and NeonatalMortality in Indonesia

Kay M, T., Carrie K, Shapiro - Mendoza, Michael J, Davidoff and Joann R, Petrini. . (2003). Differences in Mortality between Late-Preterm and Term Singleton Infants sin the United States, 1995–2002.

Khashu M, N. M., Bhargava S, Osiovich H. (2009). Perinatal outcomes associated with preterm birth at 33 to 36 weeks' gestation: a population-based cohort study.

Kitsantas P, G. K. (2010). Racial/ethnic disparities in infant mortality. *J Perinat Med, 38(1)*, 87-94.

Lane SD, C. D., Milano LP, Shaw M, Bourgeois B, Schweitzer F, Steiner C, Dygert K, DeMott K, Wilson K, Gregg R, Webster N, Milton D, Aubry R, Novick LF. (2001). Racial and ethnic disparities in infant mortality: risk in social context. *J Public Health Manag Pract, 7(3)*, 30-46.

Lawn, J. E., Kerber, K., Enweronu-Laryea, C., & Cousens, S. (2010). 3.6 million neonatal deaths--what is progressing and what is not? *Semin Perinatol, 34*(6), 371-386. doi: 10.1053/j.semperi.2010.09.011

Lewycka, S. O. (2010). *Reducing maternal and neonatal deaths in rural Malawi: Evaluating the impact of a communitybased women's group intervention.* (Doctor of Philosophy), University College London, London.

Li Liu, S. O., Daniel Hogan, Jamie Perin, Igor Rudan, Joy E Lawn, Simon Cousens, Colin Mathers, Robert E Black,. (2014). Global, regional, and national causes of child mortality in2000–13, with projections to inform post-2015 priorties: an updated systematic analysis. *Lancet Glob Health*.

Mahomed. (2000). Iron and folate supplementation in pregnancy.

Mahy. (2003). Childhood mortality in the developing world: A review of evidence from the demographic and health surveys. *Calverton, Maryland*(Macro2003).

MEDICINE, A. S. F. R. (2012). Age and Fertility.

Michael C , J. (2007). Maternal Nutrition and Infant Mortality in the Context of Relationality.

MOHAMMED ZAKIR and PHANINDRA V. WUNNAVA. (1999). Factors affecting infant mortality rates: evidence from cross-sectional data. *Applied Economics Letters, 6*, 271–273.

Moore LL, B. M., Singer MR, Rothman KJ, Milunsky A. (2003). Folate intake and the risk of neural tube defects: an estimation of dose-response. *Epidemiology*.

Mulinare J, C., Erickson, Berry (1988). Periconceptional

use of multivitamins and the occurrence of neural tube defects. *JAMA*.

Naoko Kozuki1, A. C. L., 2, Mariangela F Silveira3, Ayesha Sania4, Joshua P Vogel5,6, Linda Adair7. (2013). The associations of parity and maternal age with small-for-gestational-age, preterm, and neonatal and infant mortality: a meta-analysis.

Neal, S. E. (2009). *Neonatal Mortality in Developing Countries: an analysis of trends and determinants* (Ph.D), University of Southampton

Nicholas J Kassebaum, e. (2014). Global, regional, and national levels and causes of maternal mortality during 1990–2013: a systematic analysis for the Global Burden of Disease Study 2013. *Lancet Glob Health, 384*, 980–1004.

Nielsen BB, L. J., Hedegaard M, Thilsted SH, Joseph A. (1997). Reproductive pattern, perinatal mortality, and sex preference in rural Tamil Nadu, south India community based, cross sectional study. *BMJ, 314(7093),* 1521-1524.

Oladeji, D. a. O., M.F. (2013). Child Survival and Birth Spacing Practices in Nigeria. *International Journal of Maternal and Child Health*.

Orginization, W. H. (2012). Verbal Autopsy for the neonatal death.

Ornella Lincetto, S. M.-A., Patricia Gomez, Stephen Munjanja. (2006). Antenatal Care. *Opportunities for Africa's Newborns*.

P, G.-M. S. a. L. (1998). The developement of low birth weight infants and the effcts of the enviroment in the North East Brazil *Jounral of Pediatrics*.

Patriciadargent-molina, s. J., david s. Strogatz' and davida. Savitz. (1994). Associations between maternal education and infant diarrhea in different household and community environment of CEBU, Philippines. *Sci.Med, Vol.38,No.2*, 343-350.

Penney GC, M. G., Pearson DW. (2003). Scottish Diabetes in Pregnancy Group. Outcomes of pregnancies in women with type 1 diabetes in Scotland: a national population-based study. *BJOG*(2003 Mar).

Persson M, N. M., Hanson U. (2009). Obstetric and perinatal outcomes in type 1 diabetic pregnancies: A large, population-based study. *Diabetes Care, 32(11).*

R. Kulier, M. d. O. b., A.M. Giilmezoglu, J. Villar. (1998). Nutritional interventions for the prevention of maternal morbidity.

Ravi, D. R. P. (2013). Does Socio-demographic Determinants Influence Complications While Delivery among Young Married Women in TamilNadu, India. *International Journal of Maternal and Child Health, 1(2)*(2013 Apr), 38-44.

Reddy UM, L. S., Sun L, Troendle J, Willinger M, Zhang J. (2010). Prepregnancy risk factors for antepartum stillbirth in the United States. *Obstet Gynecol, 116(5).*

Rey E, C. A. (1994). The prognosis of pregnancy in women with chronic hypertension. *Am J Obstet Gynecol, 171(2).*

Roeder HA, K. J., Barker PC. (2011). Maternal valvular heart disease in pregnancy. *PubMed.*

Schmidt MK, M. S., Schultink W, West CE, Hautvast JG. . (2002). Randomised double-blind trial of the effct of vitamin A supplementation of Indonesian pregnant women on morbidity and growth of their infants during the fist year of lif. *Eur J Clin Nut.*

Sein, K. K. (2011). Maternal Health Care Utilization Among Ever Married Youths in Kyimyindaing Township, Myanmar.

Shefali Oza, S. N. C., Joy E Lawn, . (2014). Estimation of daily risk of neonatal death, including the dayof birth, in 186 countries in 2013: a vital-registration and modelling-based study. *Lancet Glob Health, 2*, 35–44.

T.J. Mathews, M. S. a. M. F. M. (2010). Infant Mortality Statistics from the 2010 Period Linked Birth Infant Death Data Set. *National Vital Statistics Reports*.

Than Tun Sein, P. M., Nialr Tin ,Htay Win, San San Aye and Than Sein. (2014). The Repulic of the Union of Myanmar, Health System Review, Health System In Transition

U.S. Department of Health and Human, C. f. D. C. a. P., Division of Reproductive Health. Infant Mortality.

UDUGAMA, D. S. W. a. S. G. (2003). Pregnancy at 40 and over: a case – control study in adeveloping country. *Journal of Obstetrics and Gynaecology*.

Unicef. (2004). Country, regional and global estimates *Unicef Low birth underweight*.

Unicef. (2015). Count down to 2015, Maternal ,New Born and Child heatlh survior

Unicef, W. a. (2010). Low birth weight, Country,Regional and Global Estimated

United Nations, D. o. E. a. S. A., Population Division,. (2013). World Mortality Report 2013: United Nations publication.

Vandresse, M. (2008). Late Fertility : Its Causal Effects on Health of the Newborn and Its Implications in Fertility Decision Process.

Vanek M, S. E., Levy A, Mazor M. (2004). Chronic hypertension and the risk for adverse pregnancy outcome after superimposed pre-eclampsia. *Int J Gynaecol Obstet, 86(1)*.

Victora CG, W. A., Schellenberg JA, Gwatkin D, Claeson M, Habicht J-P. (2003). Applying an equity lens to child health and mortality: more of the same is not enough. *Lancet, 362(9379)*(2003 Jul 19), 233-241.

Wagstaff A, C. M., Bank W. (2004). The Millennium Development Goals for Health: Rising to the Challenges. *The World Bank*.

WHO. (2003). Antenatal care in developing countries. Promises, achievements and missed opportunities: an analysis of trends, levels and differentials.

WHO. (2007). 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 Nutritio.

WHO. (November 2014). Preterm Birth and FactSheets

Wingate MS, B. W. (2010). Racial and Ethnic Variations in Temporal Changes in Fetal Deaths and First Day Infant Deaths. *Matern Child Health J*.

World Health Orginization, W. (2006). Neonatal and perinatal mortality: country, regional and global estimates.

Yariv Yogev, M. N. M., MD; Ron Bardin, MD; Kinneret Tenenbaum-Gavish, MD. (2010). Pregnancy outcome at extremely advanced maternal age. *Am J Obstet Gynecol*.

จุฬาลงกรณ์มหาวิทยาลัย
Chulalongkorn University

APPENDIX A

Questionnaire

This draft version of the questionnaire is constructed for the purpose of collection the data for academic research concerning about the neonatal death and post neonatal death in the study area. To investigate the cause of child mortality and its associated factors, the questionnaire contains 66questions and 9 sections

Note: the purpose of the study is solely academic.

The condition of the neonate

☐ Alive ☐ Dead

Participant code number ---------- (Please filled with 3 digits .e.g.00)

Section 1: Personal information		
1.1	Sex of the new born	
1.2	Date of birth of the new born	-------/---------/----------
Section 2: Information about parent		
2.1	Age of mother	------ Years ------Months
2.2	Ethnic	
Section 3:Obstertric history		
3.1	Number of pregnancies(Gravidity)	
3.2	Number of still alive children	
3.3	Number of still birth	
3.4	Number of neonatal death	
3.5	Number of abortion	
3.6	Number of CS	
3.7	Did the pregnancy end earlier than expected? If yes, how many weeks before expected date of delivery?	1) Yes----------weeks 2) No
Section 4: Mother Health Status		

4.1	During the last 3 months of pregnancy did the mother suffer from any of the following illnesses: 1) Bleeding per vagina 2) Vaginal discharge 3) Headache 4) Puffy face 5) Convulsion 6) Fever/ Illness 7) Dyspnea or shortness of breath 8) Severe abdominal pain (not labor pain)	1) Yes No 2) Yes No 3) Yes No 4) Yes No 5) Yes No 6) Yes No 7) Yes No 8) Yes No
4.2	During the pregnancy did the mother suffer from any of the following known illnesses: 1) High blood pressure 2) Heart disease 3) Diabetes 4) Epilepsy / Convulsion 5) Other medical disease?	1) Yes No 2) Yes No 3) Yes No 4) Yes No 5) Yes No ----------
Section 5: ANC for the last pregnancy		
5.1	Date of last menstruation	
5.2	ANC during last pregnancy? If yes describe how many times?	1) Yes 2) No If yes, ----------
5.3	When did she get her first ANC?	1) 0-13th weeks 2) 14th -27th week

		3) 28^{th}- delivery
5.4	State ANC services she received during her last pregnancy?	1) blood pressure 2) urine test 3) ultrasound 4) Immunization 5) serology 6) weight measuring 7) maturity assessment (height of the uterus) 8) health education 9) others
Section 6: Delivery		
6.1	What was the mode of delivery?	1) Normal delivery 2) Vacuum 3) Caesarean delivery
6.2	Did something (complication) happen during the delivery?	1) Yes 2) No if no skip 6.7
6.3	If you have complication during delivery. Please specify	1) Prolong labor 2) Premature delivery 3) Low birth weight 4) Massive bleeding 5) Fit and convulsion 6) Premature rupture of membrane 7) Meconium stain liquor 8) Other----------
Section 7. Health status of the neonate		
7.1	What was the weight of the new born?	----------Gram

จุฬาลงกรณ์มหาวิทยาลัย
Chulalongkorn University

7.2	If the baby was not weight, was the baby	1) Smaller than normal 2) Normal 3) Bigger than normal 4) Don't know
7.3	Was the baby able to suck the milk after birth?	1) Yes 2) No
7.4	When was the breast feeding initiated?	1) Within one hour delivery 2) Later than one hour after delivery 3) No breast feeding (if no skip to 7.6)
7.5	How many days after the birth did the baby have yellow coloration of skin and jaundice?	----------Days
7.6	If the baby had fever, (1) Blue coloration of skin and face (2) Cold extremities (3) Cough (4) Fast breathing (5) Difficulties in breathing (6) Chest in drawing (7) Diarrhea	(1) Yes No (2) Yes No (3) Yes No (4) Yes No (5) Yes No (6) Yes No (7) Yes No
7.7	Did the new born get convulsion or spasm after delivery?	1) Yes 2) No, skip to 7.13
7.8	When did the convulsion start after the delivery?	----------Days

7.9	Any malformation on the new born?	1) No 2) Head 3) Body 4) Arm/hand 5) leg/ feet 6) appearance 7) other ----------

จุฬาลงกรณ์มหาวิทยาลัย
Chulalongkorn University

APPENDIX B

Time schedule and administration

Tasks	Year-Month										
	2014				2015						
	9	10	11	12	1	2	3	4	5	6	7/ 24
Literature review											
Questionnaire design											
Questionnaire translation											
Proposal Examination											
Questionnaire review by two experts											
Thesis Topic Request											
Ethical review and preparation											
Data collection											
Data analysis											
Data interpretation											
Thesis Completion											
Thesis Examination											
Thesis Submission											
Article submission to JHR											

จุฬาลงกรณ์มหาวิทยาลัย
Chulalongkorn University

APPENDIX C

Budget

Items	Budget (Baht)
Operational cost	
Transportation fee	16,000
Data collection cost ● Gifts ● Training cost	10,00
Photocopy and printing fee	7,000
Thesis binding fee	1,000
Material costs	
Paper cost	1,000
Stationary cost	2,000
Others	3,000
Total	30,000

จุฬาลงกรณ์มหาวิทยาลัย
Chulalongkorn University

APPENDIX D

Certificated Approval

AF 02-12

The Research Ethics Review Committee for Research Involving Human Research Participants, Health Sciences Group, Chulalongkorn University
Jamjuree 1 Building, 2nd Floor, Phyathai Rd., Patumwan district, Bangkok 10330, Thailand,
Tel/Fax: 0-2218-3202 E-mail: eccu@chula.ac.th

COA No. 128/2015

Certificate of Approval

Study Title No. 088.1/58 : **FACTORS ASSOCIATED WITH NEONATAL MORTALITY IN NORTH OKKLAPA HOSPITAL, YANGON DIVISION, MYANMAR**

Principal Investigator : MR. AUNG KO KO

Place of Proposed Study/Institution : College of Public Health Sciences, Chulalongkorn University

The Research Ethics Review Committee for Research Involving Human Research Participants, Health Sciences Group, Chulalongkorn University, Thailand, has approved constituted in accordance with the International Conference on Harmonization – Good Clinical Practice (ICH-GCP) and/or Code of Conduct in Animal Use of NRCT version 2000.

Signature: ..... Signature: .....

(Associate Professor Prida Tasanapradit, M.D.) Chairman

(Assistant Professor Nuntaree Chaichanawongsaroj, Ph.D.) Secretary

Date of Approval : 29 June 2015 Approval Expire date : 28 June 2016

The approval documents including

1) Research proposal
2) Researcher

Protocol No. 088.1/58
Date of Approval 29 JUN 2015
Approval Expire Date 28 JUN 2016

The approved investigator must comply with the following conditions:

1. *The research/project activities must end on the approval expired date of the Ethics Review Committee for Research Involving Human Research Subjects, Health Science Group, Chulalongkorn University (ECCU). In case the research/project is unable to complete within that date, the project extension can be applied one month prior to the ECCU approval expired date.*
2. *Strictly conduct the research/project activities as written in the proposal.*
3. *Using only the documents that bearing the ECCU's seal of approval with the subjects/volunteers (including subject information sheet, consent form, invitation letter for project/research participation (if available).*
4. *Report to the ECCU for any serious adverse events within 5 working days*
5. *Report to the ECCU for any change of the research/project activities prior to conduct the activities.*
6. *Final report (AF 03-12) and abstract is required for a one year (or less) research/project and report within 30 days after the completion of the research/project. For thesis, abstract is required and report within 30 days after the completion of the research/project.*
7. *Annual progress report is needed for a two- year (or more) research/project and submit the progress report before the expire date of certificate. After the completion of the research/project processes as No. 6.*

VITA

Name: Aung Ko Ko

Address: No: 41, AnayaHtar Road, 16 wards, North Dagon, Yangon, Myanmar.

Tel: +959 420740 195.

Email. aungkk.whoami@gmal.com

Date of birth. May 5th, 1985

Education

Year: 2002-2007

Degree: M.B.B.H

Subject of study: Medicine

Name and location of the study: University of Medicine II, Yangon, Myanmar

Year: 2014-2015

Degree: M.P.H

Subject of study: Public Health

Name and location of the study: College of Public health science, Chulalongkorn University.

จุฬาลงกรณ์มหาวิทยาลัย
Chulalongkorn University