

**BIRTH ASPHYXIA AND ASSOCIATED FACTORS AMONG
NEWBORN DELIVERED IN JIMMA ZONE PUBLIC HOSPITALS,
OROMIA REGIONAL STATE, SOUTH WEST ETHIOPIA, 2015**

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Abstract

Background: - Birth asphyxia is a serious clinical problem worldwide. It is a leading cause of mortality and morbidity in neonates in developing countries. Almost all (99%) neonatal deaths arise in low-income and middle-income countries. Each year approximately 4 million babies are born asphyxiated, which results in 1 million deaths and an equal number of serious neurological sequelae, such as cerebral palsy, mental retardation, and epilepsy.

Objective: - To assess birth asphyxia and associated factors among newborn delivered in Jimma Zone public hospitals, South West Ethiopia.

Methods: Cross-sectional study was conducted from March 1 to 30, 2015 using quantitative data collection techniques. A total of 368 live newborns at Jimma zone public hospitals were involved in the study using systematic sampling method. Data were collected using structured questionnaires, observational check list and chart review. The instrument was pre tested on 5% the sample in Bedele hospital. The data were analyzed by using simple and multivariable logistic regression and statistical associations were measured using odd ratio and 95%CI.

Result: The prevalence of birth asphyxia is 32.9% at first minute and 12.5% at fifth minute. According to the finding factors significantly associated with birth asphyxia were medical complication (AOR: 3.92, 95%CI: 1.62, 9.46) and obstetrics complication (AOR: 3.76, 95%CI: 1.71, 8.26). Prolonged Second stage of labour (>3hours) (AOR: 3.72, 95%CI: 1.46, 12.18), low birth weight of newborns (AOR: 4.21, 95%CI: 1.5, 12.2), meconium stained amniotic fluid (AOR: 8.29, 95%CI: 3.6, 18.9) and Tight nuchal cord (AOR: 7.4, 95%CI: 1.6, 34.1). Not attending antenatal care (AOR: 6.4, 95%CI: 2, 20.2), incomplete antenatal care visit (AOR: 4.6, 95%CI: 2.0, 10.5), non-cephalic presentation (AOR: 6.98, 95%CI: 2.66, 18.28) and caesarian section delivery (AOR: 2.3, 95%CI: 1.0, 5.1)

Conclusion: The prevalence of birth asphyxia is too high. Majority of the factors associated with birth asphyxia are manageable by means of good pre-natal care by improving antenatal, intrapartum and neonatal care services within our limited resources

Recommendation: policy maker and health institutions should have to strength the policy that working to reduce newborn death by giving attention to birth asphyxia, since it a preventable problem and long term neurological sequelae are almost untreatable once asphyxia set in, preventive strategies must be built to reduce the burden of birth asphyxia

Key words: Birth asphyxia, associated factors, live newborns, Jimma zone public hospitals

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Acronym

AH	Agaro Hospital
ANC	Antenatal Care
APGAR	Appearance, Pulse, Grimace, Atone and Reflex
BA	Birth Asphyxia
CPD	CephaloPelvic Disproportion
E.C	Ethiopian calendar
EDHS	Ethiopian Demographic and Health survey
ETB	Ethiopian Birr
FMOH	Federal Ministry of Health
GDM	Gestational Diabetes Mellitus
HIE	Hypoxic-Ischemic Encephalopathy
IUGR	Intra Uterine Growth Retardation
JUSH	Jimma University Specialized Hospital
LGH	Limmu Genet Hospital
MDG	Millennium Development Goals
MOH	Ministry of Health
NNPD	National Neonatal and Perinatal Database
PA	Perinatal Asphyxia
PIH	Pregnancy Induced Hypertension
PROM	Prolonged Rupture of Membrane
SGA	Small for Gestational Age
SGH	Shenen Gibe Hospital
SPSS	Statistical Package for Social Sciences
UNICEF	United Nation of International Children Education Fund
WHO	World Health Organization

CHAPTER ONE: INTRODUCTION

1.1. Background

The health of future societies depends on the health of the children of today and their mothers. The neonatal period is considered as the highest risk period (1). Birth asphyxia is a serious clinical problem worldwide. It accounts for about 1/4th of the 4 million neonatal deaths that occur each year worldwide (2). Asphyxia is a condition that occurs when there is an impairment of blood-gas exchange, resulting in hypoxemia and hypercapnia (3). WHO defines birth asphyxia:- Umbilical artery metabolic or mixed respiratory-metabolic acidemia with pH less than 7.00, a persistent Apgar score of 0 to 3 for more than 5 minutes, Neonatal neurological sequelae, such as seizures, coma or hypotonia (neonatal encephalopathy), multiorgan system dysfunction (4).

Asphyxia remains a common problem in the neonatal nursery and is a significant cause of morbidity and death in the term and preterm neonate (5). 90% of birth asphyxia occurs in the antepartum or intrapartum periods because of placental insufficiency and remaining 10% are postpartum secondary to pulmonary, cardiovascular or neurologic insufficiency. The clinical and neurological sequel following perinatal asphyxia is referred to as Hypoxic-Ischemic Encephalopathy (HIE). The clinical features include altered consciousness, tone problems, seizure activity, autonomic disturbances, abnormalities of peripheral and brain stem reflexes (6).

Diagnosis of infants at risk of perinatal asphyxia by fetal movement counting, abnormal fetal heart rate, Non-stress testing, Meconium staining of the liquor and reduction of liquor volume (7). Up to 10% of newborns require some assistance to begin breathing at birth, but less than 1% require advanced measures, such as the use of cardiac massage, intubation, and medications. Appropriate care through labor and at the time of birth with access to emergency obstetric care, essential and extra newborn care, and neonatal resuscitation are proven effective in preventing or managing intrapartum-related complications (8). If asphyxia does occur, the first response includes an immediate newborn assessment along with drying and tactile stimulation for the baby. Through this care, the majority of newborns will initiate and sustain breathing within the “golden minute” after birth. Within a minute of birth, a baby who is not breathing and does not respond to drying and stimulation should be assisted to breathe with a bag and mask (9).

1.2. Statement of problem

Birth asphyxia is a serious clinical problem worldwide. It is a leading cause of mortality and morbidity in neonates in developing countries, with an incidence of 100-250/1000 live births compared to 5-10/1000 live births in the developed world(10).Major causes of neonatal deaths globally are birth asphyxia (23%), infections (36%), and preterm complications (27%) (11). Although birth asphyxia can be predicted in some conditions such as fetal distress and preterm childbirth, most cases of birth asphyxia cannot be predicted. Therefore, every newborn should be considered as risk of asphyxia. Any infant can have neonatal asphyxia without warning signs during labour (12).

The prevalence of perinatal asphyxia in full-term births in Western countries is about 1-6 per1000 live births, 85/1000 Live births in Nigeria, 58/1000 Live births in Libya, 1.5/1000 Sweden and 1.2/1000 in Japan (13). The Causes of asphyxia are often unknown. Placental abruption, uterine rupture and shoulder dystocia are some of them. Boys are more prone to suffer from asphyxia (61%) than girls are (14). The common causes of neonatal deaths in India include infections, birth asphyxia, and prematurity, which contribute to 32.8%, 22.3%, and 16.8% of the total neonatal deaths, respectively (15,16).

Ethiopia is one of the ten countries, along with China, Democratic Republic of Congo, Pakistan, Nigeria, Bangladesh, India, Indonesia, Afghanistan, and Tanzania that account for more than 65% of all intrapartum related neonatal deaths (17). In Ethiopia neonatal mortality has fallen, only by 39% from 68/1000 live births in 1990 to 29/1000 live births in 2012(18).The Ethiopian Demographic and Health survey indicates that 37/1000 live births die and the causes of death are due to prematurity 17%, asphyxia 25%, infection 37%, tetanus 7%, diarrhea 3%, congenital malformations 4%, and others 7%(19). The Ethiopian Ministry of Health (MOH), UNICEF and the World Health Organization (WHO) are jointly supporting the creation of a fully functional newborn corner in every labor room in the country(20)

Birth asphyxia(47.5%) is one of the leading causes of neonatal death in jimma zone followed by neonatal infections (34.3%) and prematurity (11.1%) were the three leading causes of neonatal mortality accounting for 93% (21).Therefore, this hospital-based study was conducted to identify antepartum, intrapartum, and infant risk factors for birth asphyxia.

CHAPTER TWO: LITERATURE REVIEW

This chapter presents related literature on birth asphyxia and associated factors with the variety of literature relevant researches were reviewed

A descriptive cross sectional study conducted in India for two years from January 2010 to December 2011 with 300 samples size revealed that Risk factors in birth asphyxia were irregular antenatal visits (46%), prolonged rupture of membrane (40%), prolonged labor (40%), anemia (24%), pre-eclampsia (17%) and ante partum hemorrhage (13%)(22). Another descriptive longitudinal study conducted in India at tertiary health center from July 2007 to June 2008 The study included All the babies who were born in the study period, gestational age of >37 weeks and Apgar score of less than seven at 1 minute. It provided evidence that from the 6.6% of the babies born with Apgar score of less than seven at one minute 79.8% were full term and 20.2% were preterm babies. Among BA cases 32.5% were HIE. According to the observed risk factors were 52.2% of the mothers have anemia, 8.1% Pregnancy induced hypertension and 7.5% antepartum hemorrhage. In the study, almost 60% of the mothers had not taken minimum required antenatal care. From nonattendance of ANC 24% of mothers of asphyxiated babies and 5% from in Control group (23).

A prospective case-control study conducted in Cameroon on the risk factors for birth asphyxia among neonates born in Urban Health Facility from May 2010 to September 2010. The study was consecutive sample over the study period. Out of 1117 deliveries carried out 90 were asphyxiated neonates (with an Apgar score < 7 at the fifth minute), giving an incidence of 80.5 per 1000. In addition, 90 controls with an Apgar scores ≥ 7 at the 5th minutes studied. Statistically significant risk factors were the single marital status, place of antenatal visits, malaria, pre-eclampsia/eclampsia, prolonged labor, arrest of labour, prolonged rupture of membranes, and non-cephalic presentation (24).

Another case-control study also carried out in Cameroon from January 1 to June 30, 2013, the consecutively samples method used. It involved 117 parturient whose babies presented with a nuchal cord at delivery. The identified risk factors of clinical birth asphyxia were first delivery, absence of obstetrical ultrasound during pregnancy, nuchal cord with more than one loop, duration of second stage of labor more than 30 minutes during vaginal delivery. The risk factors

for newborn death from clinical birth asphyxia in the presence of nuchal cord were: maternal age < 20 years, first delivery, absence of obstetrical ultrasound during pregnancy, nuchal cord with more than one loop, tight nuchal cord, and duration of second stage of labor more than 30 minutes during vaginal delivery(25).

A prospective population-based cohort study in southern Nepal conducted to identify ante partum, intrapartum, and infant risk factors for birth asphyxia mortality in a rural, low-resource. Out of 23,662 infants were born in study regions from September 2002 to January 2006 birth asphyxia deaths (9.7/1000.0 live births) accounted for 30% of neonatal mortality. Ante partum risk factors for birth asphyxia mortality included low paternal education, Madeshi ethnicity and primiparity. Facility delivery; maternal fever; maternal swelling of the face, hands, or feet and multiple births were significant intrapartum risk factors for birth asphyxia mortality. Premature infants were at higher risk, and the combination of maternal fever and prematurity resulted in a 7-fold elevation in risk for birth asphyxia mortality compared to term infants of a febrile mothers (26).

According to cross sectional study conducted in Pakistan to determine various perinatal factors leading to birth asphyxia among term newborns total of 196 asphyxiated cases that fulfilled the inclusion criteria were included through consecutive non-probability sampling technique from 1st December 2012 to 1st December 2013. It showed that, Mode of delivery as a factor leading to birth asphyxia was found in 32.14%, cesarean section, 44.39%, spontaneous vertex delivery, and instrumental delivery in 23.47%, Prolonged second stage of labor reported in 72%, prolonged rupture of membranes 29.08%, meconium staining 7.65%, multiple births 5.61%, maternal fever 21.94%, and anemia at delivery 58.84% (27).

Another retrospective case control study conducted in Fang Hospital in England on Factors associated with birth asphyxia from January to 31 December 2012 with sampling method randomized by consecutive selection. Cases were 135 women who delivery newborn with 1-minute Apgar of 7 or less and control were 270 women who delivery newborn with 1- minute Apgar score more than 7. The study showed that the risk factors significantly associated with birth asphyxia included pregnancy induced hypertension, vacuum or forceps extraction, cesarean

section, breech presentation, moderate to thick meconium, birth weight less than 2,500 grams, chorioamionitis, gestational age less than 37 weeks and refer(28).

A retrospective case-control study on Ante partum and Intrapartum Factors Preceding Neonatal Hypoxic-Ischemic Encephalopathy of a total of 405 infants >35 weeks' gestation with early encephalopathy, born at or referred to the Hammersmith/Queen Charlotte's Hospitals between 1992 and 2007, were compared with 239 neurologically normal infants born between 1996 and 1997 infants published 2012. It revealed that both antepartum and intrapartum factors were associated with the development of HIE. Cases Infants were more often delivered by emergency cesarean delivery. Ante partum factor (gestation >41 weeks) and intrapartum factors (prolonged membrane rupture, abnormal cardiotocography, thick meconium, sentinel event, shoulder dystocia, tight nuchal cord, failed vacuum) remained independently associated with HIE. Overall, 6.7% of cases and 43.5% of controls had only ante partum factors; 20% of cases and 5.8% of controls had only intrapartum factors; 69.5% of cases and 31% of controls had antepartum and intrapartum factors; and 3.7% of cases and 19.7% of controls had no identifiable risk factors (29).

In a descriptive cross-sectional observational study conducted in Nigeria on prevalence, and risk factors and outcome of perinatal asphyxia from all babies with Apgar scores, less than six at one minute recruited consecutively. It showed that Out of 630 babies admitted 157 had perinatal asphyxia giving a prevalence of 29.4%. Mean gestational age of affected babies was 36.84 ± 3.67 weeks, and mean birth weight was 3.0 ± 0.9 kg. 39.5% of their mothers had no antenatal care (ANC). Mode of delivery in 62.4% was caesarian section, of which 81.6% were emergencies, many of whom had complications before presentation. 68.2% and 24.2% babies had Apgar score of 4-5 and 0-three in one minute respectively. The commonest risk factor were cephalopelvic disproportion (CPD) in the abnormal presentation, predominantly breech in the fetus. 31.6% of those with severe perinatal asphyxia died (30).

A retrospective case-control study conducted in Iran to assess perinatal risk factors for neonatal asphyxia among all neonates born from May 2002 to September 2005 in Vali-e-Asr Hospital. The study showed that among 546 newborns studied as case (182) and control (364) group. It showed that 19.2% patients had mild asphyxia, 58.8% had moderate asphyxia and 22% diagnosed as severe asphyxia. The risk factors in study were emergency cesarean section, preterm labour

(<37 weeks), low birth weight (<2500), 5 minutes Apgar score (<6), need for resuscitation, nuchal cord, neonatal anemia and maternal infertility (31).

A retrospective case-control study conducted in the Thailand to identify the risk factors to birth asphyxia among newborn infants between January 2011 and October 2012 included 200 cases and 400 controls. According to this study ANC \leq 4 times, meconium stained amniotic fluid, mode of delivery including operative vaginal delivery, elective cesarean section, and emergency cesarean section, and low birth weight was significantly associated with Low 1-minute Apgar score(32). Advanced maternal age, ANC visits less than 4 times, primigravida, hypertension, maternal anemia, breech delivery, vacuum or forceps extraction, cesarean section, chorioamnionitis, thick meconium, oligohydramnios, refer in, IUGR, twin pregnancy, birth weight < 2,500 gm, preterm delivery and fetal distress were significant risk factors for birth asphyxia(33). The risk factors associated with birth asphyxia included moderate to thick meconium, breech presentation , birth weight < 2,500 grams, sedation with morphine or pethidine and preterm delivery(34).

Another prospective case-control study in Thailand on risk factors for birth asphyxia in pregnancies woman who delivered in three hospitals from January 1 to December 31, 2011 studied. The study sample comprised of 100 women who delivered newborns with an Apgar score at 1 minute of seven or less while 200 control groups with Apgar score more than 7 recruited. The study revealed that risk factors of birth asphyxia were maternal and neonatal factor especially in case of Pregnancy induced hypertension (PIH) and Gestational diabetes mellitus (GDM). The inclusion of obstetrics complication with thick meconium, fetal distress, low birth weight and type of deliveries were the main risk factors of birth asphyxia as well. (35) Risk factors that significantly associated with birth asphyxia in pregnancy \geq 37 weeks were: small for gestational age(SGA), prolonged PROM, narcotic analgesic used, no antenatal care, vaginal breech delivery, advance maternal age, large for gestational age, cord compression, oxytocin usage and meconium-stain amniotic fluid(36).

According to retrospectively study conducted in North- Central Nigeria to assess Risk Factors and Mortality Rate of Severely Asphyxiated Neonates showed that out of 398 babies admitted in 2011:-12.6% of the were severely asphyxiated. The severely asphyxiated infants were admitted at a significantly earlier age compared to babies without asphyxia mothers of the

control group and 98.0% of the cases booked for antenatal care. A significantly higher number of mothers whose babies had SBA were multiparous, had prolonged labour or meconium staining of liquor. Hypertension including pre-eclampsia, prolonged rupture of membranes, antepartum hemorrhage and precipitate labour were not significant risk factors for severe birth asphyxia in this study. The mortality rate of babies with severe birth asphyxia in this study was 28.0% which was significantly higher than in the control group (37).

A descriptive, prospective study conducted in Pakistan from April 2005 to April 2006 total of 125 newborn (75 males and 50 females) admitted to the neonatal care unit, who were delivered with delayed cry or low Apgar score (<7) were included. It revealed, Out of 125 neonatal encephalopathy cases, 28% diagnosed as suffering with moderate or severe encephalopathy, whereas 36% had mild encephalopathy. Risk of neonatal encephalopathy increased with increasing or decreasing maternal age. Ante partum risk factors included non-attendance for antenatal care 64% and multiple births increased risk in 4.8%. Intrapartum risk factors included non-cephalic presentation 20%, prolonged rupture of membranes 24% and various other complications. Particularly meconium stained 9.6%, anemic mothers 60% and Vaginal bleeding 34.44% were strongly associated with birth asphyxia(38).

A cross sectional study done in Thailand on Factors associated with birth asphyxia showed that the incidence rate of birth asphyxia was 73.5 per 1,000 live births. The majority of the babies' mothers were Muslim (61.5%), and the rest were Buddhists, with the exception of two who were Christians. With respect to occupation, 62.1% were housewives, 20.4% were laborers, 8.6% were in business, and 5.2% were government officers, 2.4% gardeners, and 0.8% farmers. The most common level of educational attainment was primary school (39.6%). For the remainder, 17.8% had completed junior high school, 12.5% had completed senior high school, 6.5% had a diploma, 8.0% had a bachelor's degree, and 8.3% had some other educational qualification, while 7.3% had no education. The most common complications were previous caesarean birth 13.9%, cephalic pelvic disproportion 7.1%, breech presentation 4.1%, stage 2 prolongation 2.9%, post-term labour 2.5% severe pregnancy-induced hypertension 2.2%, multiple births (2.2%), and preterm labour 1.9%. While most deliveries were normal 57.3%, 36.1% had caesarean deliveries, 3.9% vacuum assisted, 1.4% had spontaneous breech delivery, 1.2% used forceps, and 0.1% had

partial breech extraction. While 95.3% of the babies were born without induction of labour, 2.4% used Oxytocin, 2.0% induced with Mistopolo, and 0.3% used both drugs (39).

A study on nation-wide case-control study in Sweden, maternal and delivery factors associated with asphyxia in 2010 revealed that the associated factors were maternal age >30 years, short maternal stature (<159 cm), previous cesarean delivery, insulin-dependent diabetes before pregnancy and gestational diabetes, induced deliveries and delivery at night. Compared with non-dystocic deliveries, the systolic deliveries fivefold higher and further increased if epidural anesthesia or opioids were used. Small and large-for-gestational age, post term (>42 weeks) births, twins and breech deliveries had a three- to eight fold increase in risk of asphyxia when there was substandard care during labor(40). Another study in Sweden reveals the most common causes of birth asphyxia were malpractice in conjunction with labour were neglecting to supervise fetal well-being (98%), neglecting signs of fetal asphyxia 71 percentage, including incautious use of oxytocin 71%, choosing non-optimal mode of deliver 52 %(41).

A case control study done in Kampala, Uganda on the antenatal and intrapartum risk factors for birth asphyxia among emergency obstetrics referrals showed that there no association between socio-demographic factors and birth asphyxia. Antepartum hospitalization, antepartum or intrapartum anemia, antepartum hemorrhage, severe preeclampsia/eclampsia, Augmentation of labour by oxytocin, PROM, meconium staining of amniotic fluid, vacuum extraction, cesarean section, low birth weight and malpresentation were significantly associated with birth asphyxia(42). Hypoxic ischemic organ damage can occur at antepartum prenatal asphyxia, at intrapartum—perinatal (birth) asphyxia, or after delivery as postpartum asphyxia. Acute maternal infections, pre-maturity of a newborn and multiple births are the most frequent natural risk factors leading to hypoxic conditions in a fetus or newborn. .However, specifically perinatal asphyxia (PA) occurring at the parturition process of delivery is the leading cause of the overall mortality due to hypoxic-ischemic damage to newborns. Consequently, the quality of a medical care at birth is crucial for the overall newborn mortality and long-term outcomes (43).

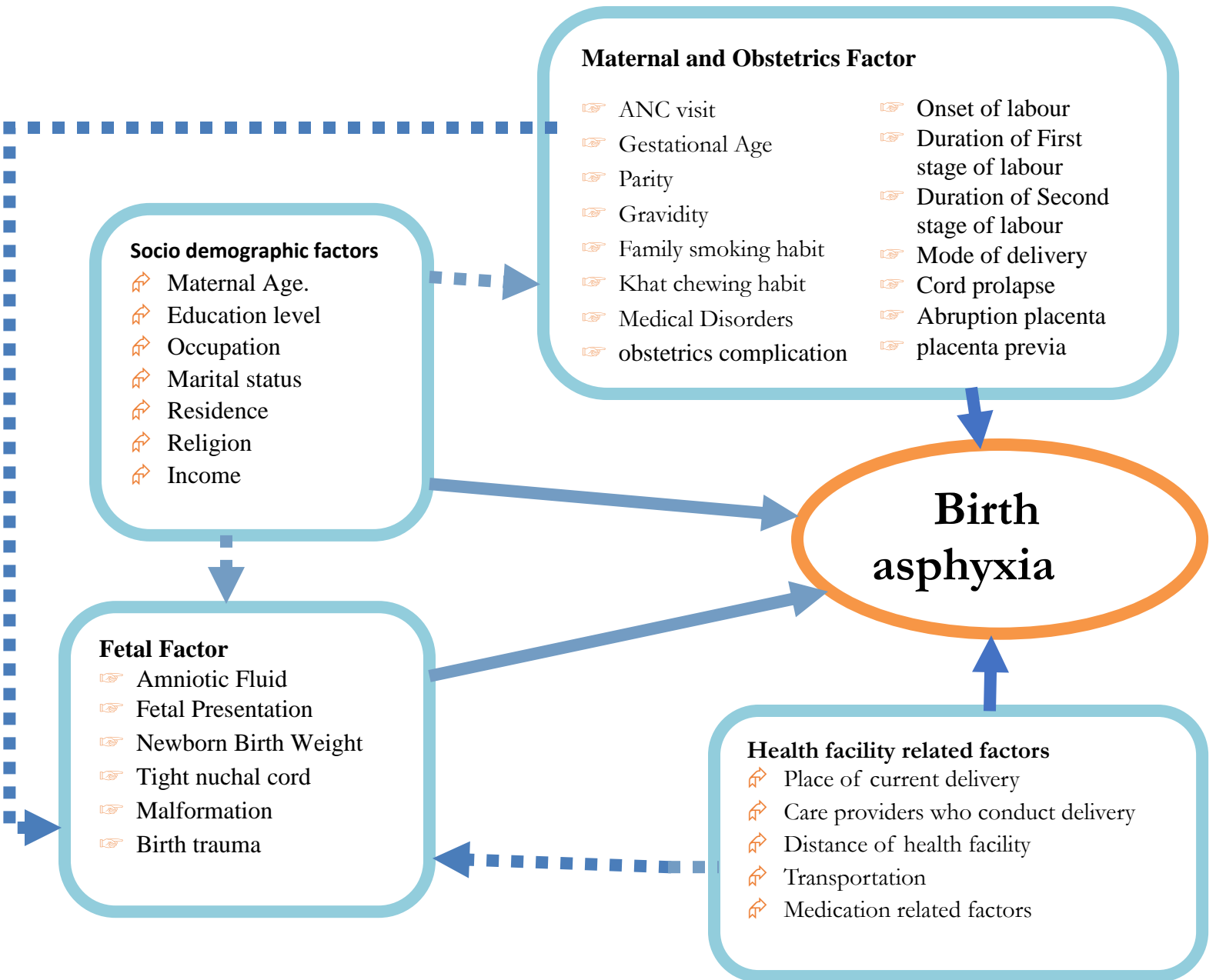
A prospective study conducted in Jeddah, Saudi Arabia in medical and obstetrics risk factors associated with perinatal hypoxic encephalopathy signs and it is short-term. The intrapartum proximal risk factors were abnormal fetal heart rate patterns 30.5%, prolonged labor duration,

vacuum delivery 20.3%, pregnancy-induced hypertension 17%, fetal growth restriction 6.8% and abruption placenta 5.1% (44).

According to Retrospective Study conducted in Nepal on the prevalence of birth asphyxia, common obstetric and neonatal risk factors from Jan 2007 to Oct 2009 with a diagnosis of birth asphyxia (5 min Apgar < 7 and those with no spontaneous respirations after birth) were included. Among the 3784 live births there were 102 babies with birth asphyxia prevalence of 26.9/1000 live births. Babies with Hypoxic ischemic encephalopathy (HIE) Stage 1 had a very good outcome but HIE III was associated with a poor outcome. Males, primipara and pregnancies with complications were associated with a higher rate of birth asphyxia (45).

Another retrospective case-control study in UK was conducted to investigate both antepartum and intrapartum factors. It showed that Cases infants more often delivered by emergency cesarean delivery. Antepartum factor (gestation \geq 41 weeks) and intrapartum factors (prom, abnormal cardiotocography, thick meconium, sentinel event, shoulder dystocia, tight nuchal cord, failed induction) remained independently associated with hypoxic ischemic encephalopathy (46).

2.1. Conceptual framework of the study



Note – solid lines indicates the interest of investigator to assess their association to birth asphyxia

... Broken lines indicate may be there is association but not the aim of principal investigator

Figure 1: schematic presentation of conceptual framework developed for birth asphyxia and associated factors in 2014/15. It is synthesized after reviewing relevant literature and based on WHO Assessment tools of birth asphyxia 2007(4).

2.2. Significance of the study

This study will attempt to identify birth asphyxia and associated factors among newborn delivered at Jimma zone public hospitals, South West Ethiopia

Several study on factors associated with birth asphyxia were done in many developed countries and some African countries. Significant improvements in the early neonatal period will depend on essential interventions for mothers and babies before, during and immediately after birth. Since there is no research done on this topic in the study area, it is believed that it could be a reference for those who are interested to perform a research on the same topic. It will uses as basic information for preventing birth asphyxia in the future and hoped that the provision of such data on this very important subject may alert researchers, clinicians, midwives, nurses, health extension workers, community and individuals to the problem.

It helps to drawing the attention of responsible parties of the study site to respond appropriately to reduce birth asphyxia and there by Contribute to the reduction of perinatal mortality and morbidity in the short term and Physical and mental disability in the long-term. Furthermore, by avoiding birth asphyxia the financial burden resulting from care of affected neonates will reduce.

CHAPTER THREE: OBJECTIVES

3.1. General objective

To assess birth asphyxia and associated factors among newborn delivered in Jimma zone public hospitals, South West Ethiopia from March 1 to 30, 2015

3.2. Specific objectives

1. To determine the magnitude of birth asphyxia among newborns delivered in Jimma zone public hospitals
2. To identify factors associated with birth asphyxia among newborns delivered in Jimma zone public hospitals

CHAPTER FOUR: METHODS AND MATERIAL

4.1. Study area and period.

The study was conducted from March 1 to 30, 2015 in Jimma zone public hospital. Jimma zone is one of the eighteen Zones in Oromia Regional State, which is far about 354 kilometers away from Addis Ababa. The zone has a total area of 119,316 Square kilometers and its altitude is 880-2600 above sea level. The annual mean temperature and rainfall max are 10-33°C and 2000mm respectively. It has 18 woreda and one town administration with a total of 555 Kebele. The population projection of 2014/15 of the zone is 3,090,112 and the total population of Jimma town is 184,925. The zone has three distinct hospitals, 116 health centers, one referral hospital. The total reproductive age groups of Jimma zone is 616,380 and the targets of pregnant women of Jimma zone is 121,168. The zone has 158 private clinics with primary health service coverage is ninety percent.

Jimma university specialized hospital plays a pivotal role in this zone and it is the only teaching and referral hospital in the south western part of the country, and provides specialized clinical services to about 15 million people and delivery service given in 2006 was 5520 women. Limmu hospital, Agaro hospital and Shenen Gibe hospital are public hospitals found in Jimma zone, which is located about 72,45,5 kilometers away from Jimma zone respectively. The delivery service in 2006/2014 in Limmu Genet hospital for 1320 women's, in Agaro hospital for 1680 women's, in Shenen Gibe hospital for 700 women's were given. The total delivery services in the four hospitals were for 9220 women's (47).

4.2. Study Design

Public health Facility based cross sectional study with quantitative method of data collection was conducted

4.3. Population

4.3.1. Source population

All newborns delivered and their mothers in Jimma zone public hospitals during the study period. .

4.3.2. Study population

All sampled newborns delivered and their mothers in Jimma zone public hospitals during the study period

4.4. Inclusion and Exclusion Criteria

4.4.1. Inclusion Criteria

Newborns delivered with 28 weeks gestation or more

During multiple deliveries, those randomly selected newborns were included

4.4.2. Exclusion criteria

Live birth those mothers critically ill during data collection time and still birth

4.5. Sample size Determination and Sampling technique

4.5.1. Sample size Determination

The sample size for this particular study was calculated using formula for a single population Proportion considering the following assumptions.

Assumptions: A 95% confidence level, margin of error (0.04), proportion of birth asphyxia in Jimma town ($p = 0.475$) (21) is substituted in the following single population proportion formula

$$n = Z_{\frac{\alpha}{2}}^2 \frac{P(1-P)}{d^2}$$

$$n = \frac{(1.96)^2 \times (0.475)(1-0.475)}{(0.04)^2} = \underline{\underline{n = 599}}$$

Where n = required sample size

$(Z_{\alpha/2})^2$ = critical value for normal distribution at 95% confidence level which equals to 1.96 (z value at $\alpha = 0.05$)

P = Proportion of birth asphyxia 47.5 % (21).

Since total of source population is 768, correction formula is used 337

$d = 0.04$ (4% margin of error); and non-response rate 10%.

Considering 10% non-response rate, $337 \times 10\% = 34$

$$337 + 34 = 371$$

The total sample size is 371

4.5.2. Sampling technique

Systematic sampling was applied

4.5.3. Sampling Procedure

The systematic sampling was applied to select study subjects from the study population in Jimma zone public hospitals from the four public hospitals of Jimma zone. From each hospital, newborns delivered averagely calculated from six month. Live newborns delivered in one month in Jimma university specialized hospital was 460, In Limmu hospital was 110, Agaro hospital 140 and Shenene Gibe hospital for 58 clients. The total sample size (371) proportionally allocated to four hospitals. The study participants' were selected from sampling frame from List of delivery attending mothers on the registration book for each hospital by using the interval (k). The k was every two intervals. The first study subjects were selected by lottery method. In case of multiple delivery only one newborn, represent mother selected by randomly methods.

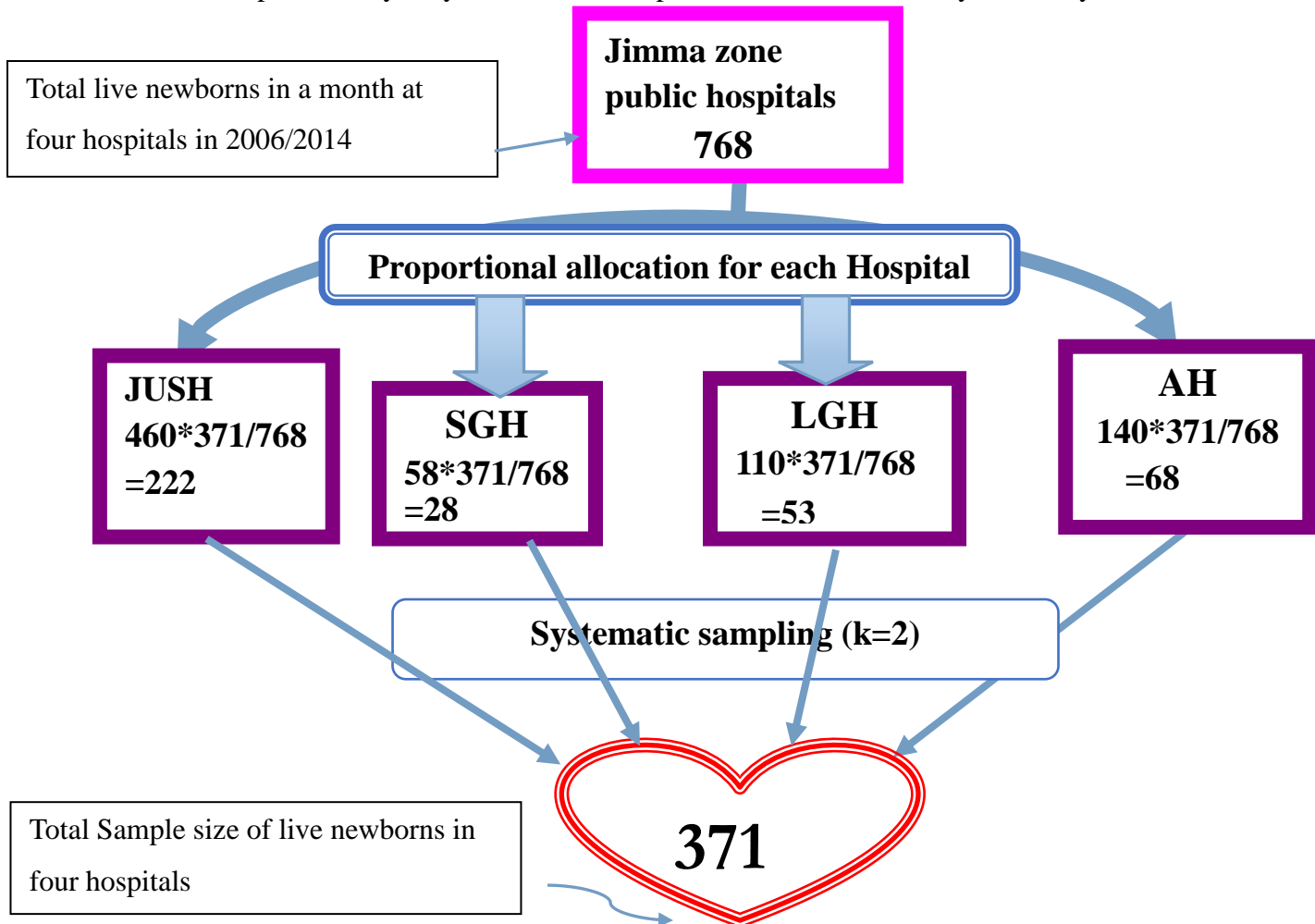


Figure 2. Schematic presentation of sampling procedure in Jimma zone hospitals in 2015

4.6. Study Variables

4.6.1. *Dependent variables*

- 🏠 Birth asphyxia

4.6.2. *Independent Variables*

A. socio demographic factors

- Maternal Age
- Education level
- Occupation
- Marital status
- Residence
- Religion
- Income

B. Maternal and Obstetrics factors

- ✓ ANC visit
- ✓ Gestational Age
- ✓ Parity
- ✓ Gravidity
- ✓ Family smoking habit
- ✓ Khat chewing habit
- ✓ Medical Disorders
- ✓ obstetrics complication
- ✓ Onset of labour:
- ✓ Duration of First stage of labour
- ✓ Duration of Second stage of labour
- ✓ Mode of delivery
- ✓ Cord prolapsed
- ✓ Abruption of placenta
- ✓ placenta previa

C. Fetal Factor

- ✓ Amniotic Fluid
- ✓ Fetal Presentation
- ✓ Newborn Birth Weight
- ✓ Malformation
- ✓ Birth trauma
- ✓ Tight nuchal cord

D. Health facility related factors

- ✓ Place of current delivery
- ✓ Care providers who conduct delivery
- ✓ Distance of health facility
- ✓ Transportation
- ✓ Medication related factors

4.7. Operational Definitions and definition of terms

Birth Asphyxia: - refers to the state or a condition that the live birth has a Persistence of Apgar score at 1 minute of less than 7 (48).

Apgar score: - refers results of an evaluation of a newborn's physical status, including heart rate, respiratory effort, muscle tone, response to stimulation, and color of skin (48).

Newborn: - refers to the live birth with more than 28 weeks gestation (48).

Live birth—Birth in which the neonate manifests any heartbeat, breathes, or displays voluntary movement, regardless of gestational age

Shoulder dystocia: - difficult delivery of the shoulders after delivery of the fetal head (49).

Hypo-ischemic encephalopathy (HIE) - refers to a collection of abnormal neurological signs that occur in a temporal sequence over a period and has subdivided into mild, moderate and severe categories (48).

Gestational age: - refers to the period of gestation counted from the first date of last menstrual period until the delivery date. In case of being unable to remember it, the gestational age will be calculated by the size of uterus or the ultrasound scan from the chart.

Antenatal visit: - refers to the numbers antenatal visit with health care personnel.

Fetal presentation: - refers to the part of fetal body that first enters the pelvis during perinatal period.

Medical disorders: - defined as mothers who had at least one medical complication during current pregnancy and delivery

Obstetrics complication: - defined as mothers who had at least one of obstetrics complications during current pregnancy and delivery

First stage of labour: - refers to the period of time that from the first true uterine contraction until the cervix has full dilatation, if more than 18 hours considered as prolonged labour (49).

Second stage of labour: - refers to the period from full cervix dilatation until the baby passes through the birth canal- the vagina, if more than 3 hours considered as prolonged labour (49).

Birth trauma: refers any mechanical injury that result during instrumental delivery, caesarean section and prolonged labour

Malformation: refers any congenital defect.

4.8. Data Collection Instrument

Data were collected using structured questionnaire, observation checklist and chart review, which designed to cover all contents and achieve the objective of this research study. The contents were categorized as follows: Demographic factors, maternal and obstetrics factors, fetal factors, health facility related Factors, and the outcome variable is presence of birth asphyxia in newborns

4.9. Data collectors

A total of ten midwives were recruited. Eight BSc midwives were data collectors and two BSc midwives were supervisors. They were trained and oriented for one day on each items of questionnaire and the way of data collection. They recruited into four zonal hospital to minimize bias one supervisors was recruited for two hospitals and two data collectors were recruited for each hospitals. Data were collected starting from onset of labour up to after fifth minute of post partum period.

4.10. Data Quality Control

Fluent speakers write and read Afan Oromo and Amharic from outside of selected hospitals for data collection was recruited. Training was given for data collectors and supervisors. The sessions of the training included the purpose and objectives of the study, meanings of each question and techniques of interview. In addition, the role and responsibilities of data collectors and supervisors were also address. The structured questionnaires that need interview were translated into Afan Oromo and Amharic for better understanding for both data collectors and respondents.

The collected data was reviewed and checked for completeness by the data collectors, supervisors and principal investigator. To assure anonymity, code numbers were placed on the completed questionnaires after they return to the investigators. The instrument was checked by doing pre tested on 5% the sample at Bedele hospital, content validity of instrument was verified by experts and amendment were made to the tools.

4.11. Data Processing and Analysis

The data were edited, entered into Epi-Data version 3.1 and exported to SPSS Statistics Version 21 for analysis. The results were summarized and presented by tables, charts and graphs. Percentage, frequency and mean were calculated. Next, simple logistic regression was used to determine independent predictors of birth asphyxia. Variable significant at $p < 0.25$ were

considered for adjustment in the multivariable logistic regression. Results were reported as the odds ratios (OR) with respective 95% CI. Finally, independent variables, which had a statistically significant association with the dependent variable $P < 0.05$, were entered to the regression model.

4.12. Ethical Consideration

Ethical clearance and approval letter was obtained from Jimma University College of Health Sciences, Institution review board to communicate with Hospitals administrative body of hospitals. Permission letters was obtained from administrative body of each hospital. Finally, oral consent was obtained from each study participants before making interview and confidentiality secured. In addition, the respondents' right to refuse or withdraw from filling out the questionnaire was fully maintained and the information provided by each respondent was kept strictly confidential

4.13. Dissemination plan

The finding of the study will be disseminated to all relevant stakeholders through presentation and publication. The final report will disseminate to the department of nursing and midwifery College of health sciences Jimma University. Also the study findings will be disseminated to the Jimma University Specialized Hospital, Shenen Gibe hospital, Limu Genet hospital, Agaro hospital, Jimma zone health office, and other relevant bodies. Attempts will made to publish the findings in scientific journal.

CHAPTER FIVE: RESULTS

5.1. Sociodemographic profile of study participants

During the study period, there were 768 live newborns delivered. Out of these 371-sampled, live births were selected to the study. The response rate was 99 % (368). The study result on the socio-demographic variables showed that, 121 (32.9%) of the study participants' age 20-24 years followed by 119 (32.3%) 21- 25 years. The mean age of respondents was 25.41 years with a standard deviation of 5.211 (table 1).

Table 1: Distribution of Sociodemographic characteristics' of mothers who gave live newborns at Jimma zone public hospitals, from March 1 to 30, 2015

Sociodemographic variables		Frequency	Percentage
Maternal Age	≤19	45	12.2
	20-24	121	32.9
	25-29	119	32.3
	30- 34	51	13.9
	≥35	32	8.7
	Total	368	100.0
Educational level	No formal education	127	34.5
	No formal education but read and write	19	5.2
	Grade 1 to 8	125	34.0
	Grade 9 to 12	71	19.3
	above grade 12	26	7.1
	Total	368	100.0
Occupation	Government employee	50	13.6
	Employee of private/NGO	10	2.7
	Business women	40	10.9
	Farmer	58	15.8
	Housewife	191	51.9
	Daily laborer	9	2.4
	Student	10	2.7
	Total	368	100.0
Marital status	Single	16	4.3
	Married	341	92.7
	divorced	11	3.0
	Total	368	100.0

Religion	Orthodox	73	19.8
	Catholic	6	1.6
	Muslim	254	69.0
	Protestant	32	8.7
	Wakeffata	3	0.8
	Total	368	100
Monthly income	≤ 780	86	23.4
	781-1050	90	24.5
	1051 - 2000	104	28.3
	>2000	88	23.9
	Total	368	100.0
Residence	Urban	247	67.1
	Rural	121	32.9
	Total	368	100.0

Note: income is categorized based on data source, computer ranking into quaternary

5.2. Prevalence of birth asphyxia

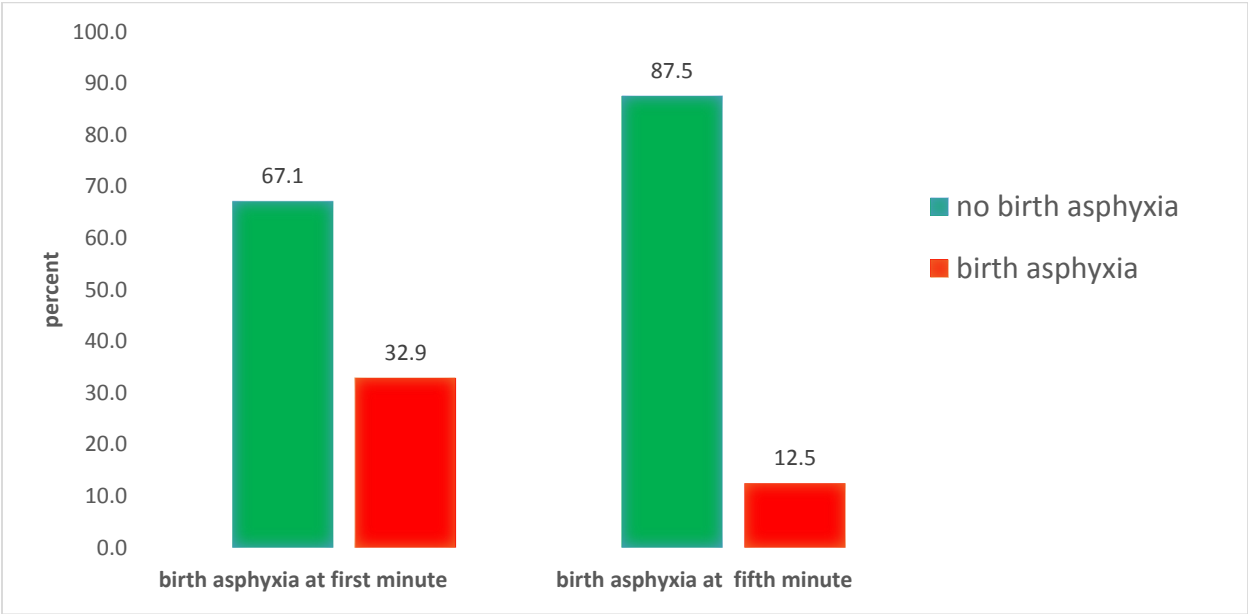


Figure 3: Distribution of the live newborns by birth asphyxia at first and fifth minute less than 7 Apgar score of in Jimma zone public hospitals from March 1 to 30, 2015.

Table 2: Distribution of prevalence of birth asphyxia based on Apgar score at 1st and 5th minute among live births at Jimma zone public hospitals, from March 1 to 30, 2015

Birth asphyxia	APGAR score	At 1 st minute		At 5 th minute	
		Frequency	%	Frequency	%
Presence	0 - 3	21	5.7	6	1.6
	4 - 6	100	27.2	40	10.9
Absence	7 - 10	247	67.1	322	87.5
	Total	368	100	368	100

5.3. Maternal and Obstetrics factors

Out of 368 live newborns mothers 59(16%) chew khat during current pregnancy and in 33(9%) their family smoke cigarettes. Concerning antenatal care 159 (43.2%) of the mothers had more than four antenatal visit followed by 157 (42.7%) had 1 - 3 antenatal care visit and 52 (14.1%) had not attend any antenatal care. Out of live newborn smothers 174(47.3%) had 2-4 gravidity, 138(37.5%) had 1 gravidity and the rest 56(15.2%) mother had more than four gravidity.

Out of 368 live newborns mothers 136(37.0%) of them had two to four children's, 133(36.5%) mothers had one children and 99(26.5%) had more than four children's. Regarding their gestational age 251 (68.2%) of them were between 37 completed weeks to 42weeks, 74 (20.1%) of them were between 34weeks to 37 weeks, 26(7.1%) were between 28 weeks to 34 weeks and 17 (4.7%) of them above 42 weeks. The mean gestational age was 38.32 and 2.48 standard deviation. From the respondents 57(15.5%) of them had history of abortion. Out of these 44(77.2%) had one times of abortion, 11(19.3%) had two times and the rest were more than two abortion.

Concerning medical complications in current pregnancy 90 (24.5%) had medical complications like 7(7.8%) diabetic mellitus, 15(16.7%) chronic hypertension, 16(17.8%) cardiac disease, 7(7.8%) asthma, 54(60.0%) anemia, 4(4.4%) seizure disorders were some complication. It showed that out of study participant 155(42.1%) had obstetric complication. Out of them 20 (12.9%) gestational HTN, 28(18.1%) pre-eclampsia, 4(2.6%) eclampsia, 11(7.1%) hyperemesis gravid arum, 12(7.7%) shoulder dystocia, 2(1.3%) uterine rupture, 9(5.8%) polyhydramnios, 7(4.5%) oligohydramnios, 13(8.4%) abruption placenta, 11(7.1%) placenta previa, 32 (20.6%) PROM > 18 hours, 37 (23.9%) obstructed labour, Chorioamnitits 4(1.1%) and 6 (1.6%) were other obstetrics complication.

The study showed that 338(91.8%) of labour started spontaneously, 27(7.3%) were induced due to PROM 8(30.8%), postdate 7(26.9%), pregnancy induced hypertension 7 (26.9%), placental abruption 2(7.7%), weak contraction and 3(0.8%) were elective caesarean section. Mode of Inductions were 22(81.5%) through intravenous, 4(14.8%) through Intracervix/vaginal (misoprostol) and others were artificial rupture of membrane. Regarding to the previous mode of delivery, out of 235(63.8%) previous delivery, 198 (84.3%) were spontaneous vaginal delivery, 26(11.1%) Caesarean Section and others were instrumental and caesarean delivery. The current mode of delivery were 218(59.24%) spontaneous vaginal delivery, 123(33.42%) Caesarian Section and the rest were instrumental delivery (figure 4).

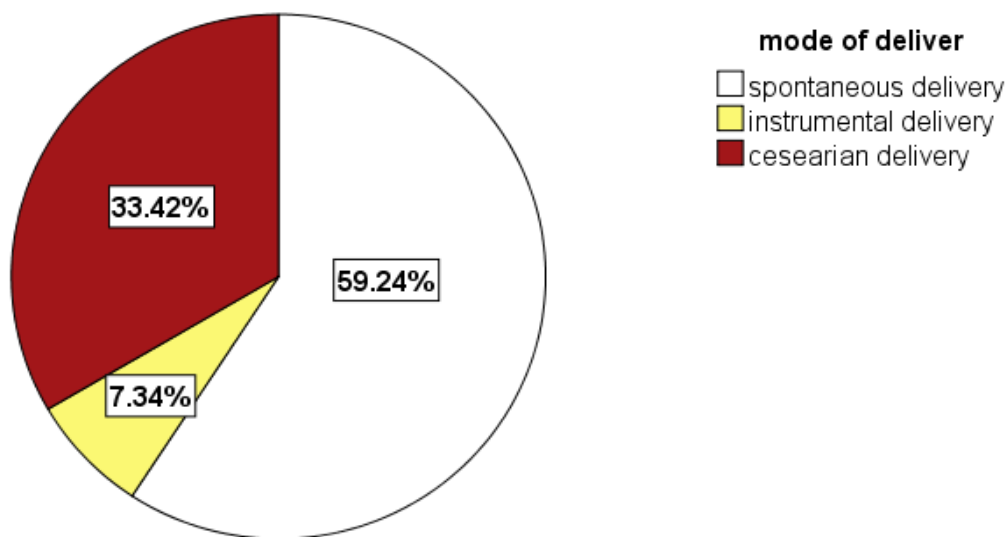


Figure 4: Distribution of mode of delivery among live newborn delivered in Jimma zone public hospital from March 1 to 30, 2015

The indication of caesarean sections were 26(21.1%) cephalopelvic disproportion, 17 (13.8%) breech presentation, 9 (7.3%) face presentation, 30 (24.4%) Non-fetal reassurance of heart rate, 11 (8.9%) placenta Previa and others were previous caesarean section, cervical arrest, Polyhydramnios, transverse lie, failed induction and uterine rupture, 1st twin breech, abruption placenta, cord prolapse, eclampsia, Failed VBAC, fetal tachycardia, footling presentation, frank breech presentation, obstructed labour, prolonged second stage, prolonged PROM and shoulder Dystocia were more contribution to caesarean section. Out of 27(7.3%) forceps and vacuum applied, the indications were 9(33.3%) bradycardia, 8 (29.5%) poor maternal effort 8(29.5%) prolonged second stage and others were left occiput anterior position and left occiput transverse position. Tight nuchal cord were 24 (6.5%) and Cord prolapse 2(0.5%).

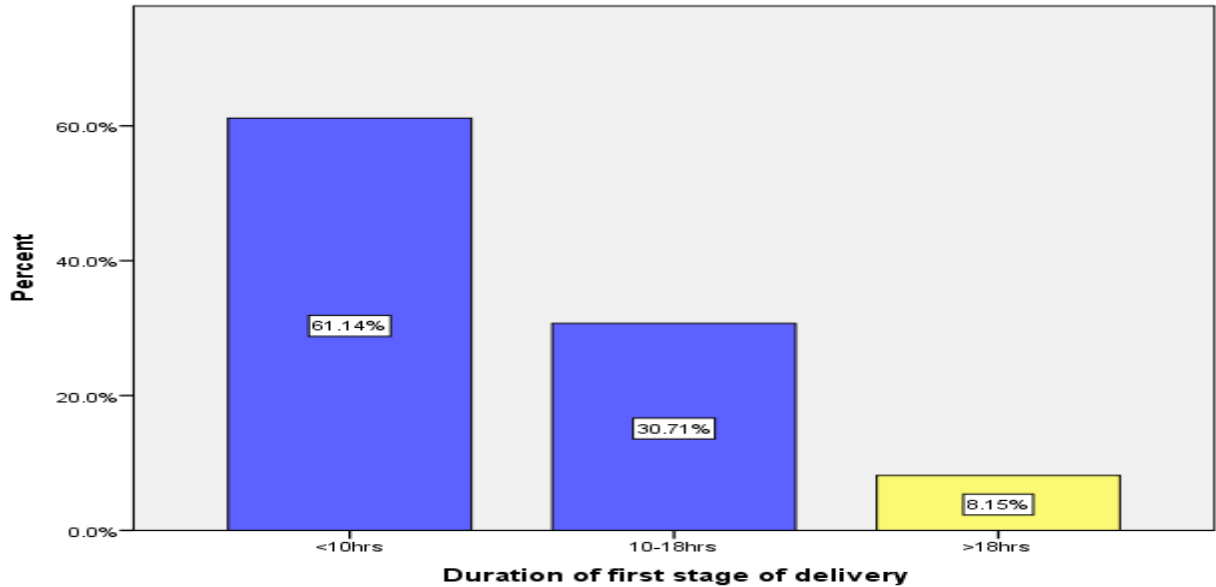


Figure 5: Distributions of duration of first stage of delivery among live newborns delivered in Jimma zone public hospitals from March 1 to 30, 2015

Duration of first stage of labour if > 18 hours, it was considered as prolonged labour that was 8.15% and in second stage of labour if > 3 hours, it was considered as prolonged labour that was 19.84%.

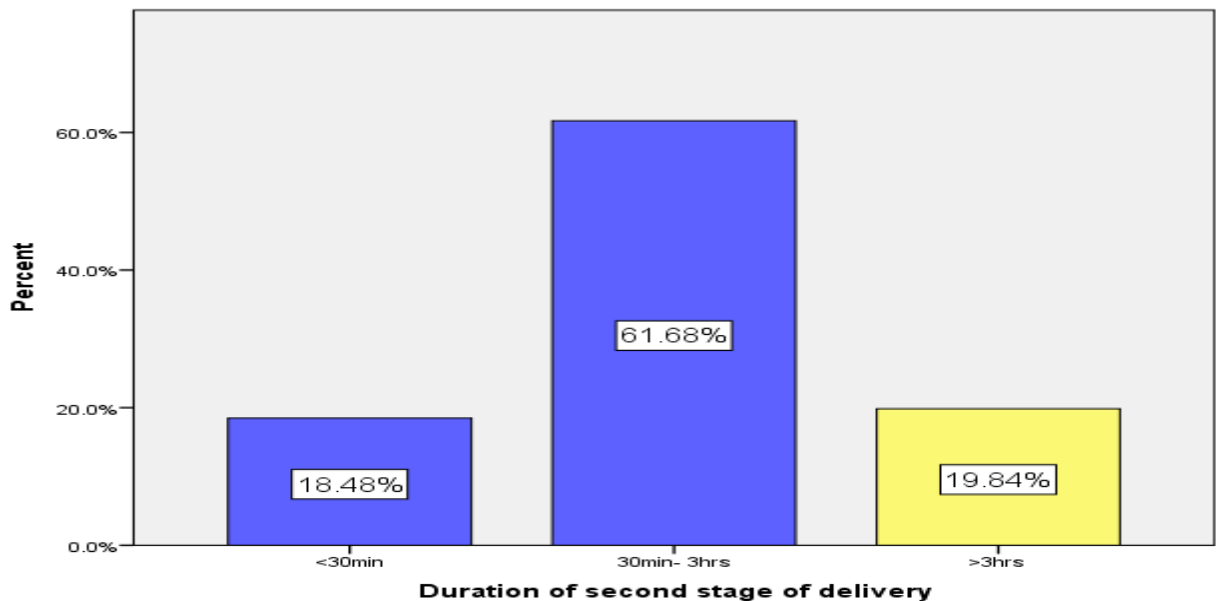


Figure 6: Distribution of duration of second stage of delivery among live newborns in Jimma zone public hospitals from March 1 to 30, 2015

5.4.Fetal Factor

During the study period, there were 768 live newborns delivered in a month in Jimma zone public hospitals from March 1 to 30, 2015. Out of them 368 live newborns were selected systematic sampling every two delivery. In case of multiple pregnancies, only one newborn selected randomly to represent a mother. Among study participants, 251 (68.2%) were full term babies, 100 (27.2%) were preterm babies and 17(4.6%) were post term babies. The genders of newborn were 192(52.2%) female and 176(47.8%) male. The study revealed that birth weight of newborns 304(82.6%) lies between 2500gram to 4000gram, 48(13%) lies below 2500grams and 16(4.3%) were lies above 4000grams. Concerning to numbers of tone or newborns during current delivery 343(93.2%) were single fetus, 11 (3%) were identical twin, 13(3.5%) delivery were fraternal twin and one were triplet fetus. Regarding to fetal presentation 316 (85.9%) head / normal presentation, 42 (11.4%) breech presentation and 10(2.7%) were shoulder presentation. Color of amniotic fluid 278(75.5%) were clear, 76(20.7%) were meconium stained amniotic fluid, 14(3.8%) were bloody stained.

5.5.Health facility related factors

From the respondents 219(59.5%) of the delivery were conducted in Jimma university specialized hospital, 68(18.5%) of delivery were in Agaro hospital, 53(14.4%) of delivery were in Limmu Genet hospital and 28(7.6%) of delivery were in Shenan Gibe hospital. Concerning to care providers who conducted delivery were 3(.8%) general practitioners, 12(3.3%) senior obstetrician and gynecologist, 99(26.9%) of delivery were by BSc of midwives, 61(16.6%) medical intern, 85(23.1%) medical Resident 1-2, 40(10.9%) medical Resident-3, 51(13.9%) diploma midwives and 17(4.6%) were Emergency surgery. Regarding to transportations to health facility during current delivery, 262 (71.2%) were came to health facility by car like Bajaj, taxis and others different vehicles, 74(20.1%) by ambulance and 32(8.7%) were by foot. 156 (42.4%) were came from more than 12km, 104(28.3%) were came from less than 1km and 75(20.4%) were got health facility within 1km to 12kms. Out of 208(51%) anti pain given during pregnancy and deliveries 100(48.1%) tramadol, 48(23.1%) diclofenac, 40(19.2%) pethidine and 20(9.6%) parastamol. Among 94(25.5%) mothers given other than antipain to treat, diseases or disorders, 18(19%) Magnesium sulphate, 17(18.1%) ampicillin, 13(13.8%) iron, 4(4.3%) methyl dopa, 22(23.4%) oxytocin, 9(9.6%) hydralazine, 4(4.3%) nifedipine, 3(3.2%) diazepam and 4(4.3%) amoxicillin,

5.6. Factors associated to birth asphyxia among Independent predictor variables

Table 3: shows the simple logistic regression and corresponding p-values for the associations between the birth asphyxia at first minute and socio-demographic, maternal and Obstetrics factors in Jimma zone public hospitals from March 1 to 30, 2015

Categorical variables		p	COR	95% C.I.	
				Lower	Upper
Maternal Age	≤19	.176*	1.563	.818	2.986
	21 -34		1		
	≥35	.023**	2.345	1.122	4.900
Marital status	Married		1		
	Single	.115*	2.25	0.82	6.15
	Divorced	.009**	5.99	1.56	23.04
Monthly income	≤ 780	.118**	1.68	0.88	3.20
	781-1050	.036*	1.97	1.05	3.72
	1051–2000	0.79	1.09	0.58	2.07
	>2000		1		
History of family smoking	No		1.00		
	Yes	.224*	1.57	0.76	3.25
Chew Chat	No		1		
	Yes	.000**	4.13	2.31	7.37
Residence	Urban		1.00		
	Rural	.173*	0.72	0.45	1.16
Antenatal care visit	No ANC	.000**	0.25	0.13	0.51
	1 – 3	.000**	0.05	0.02	0.11
	≥4		1.00		
Gestational age	Term (37 - 42 wks)		1.00		
	Preterm (< 37wks)	.005**	1.99	1.23	3.22
	Post term (>42 wks)	0.54	1.38	0.49	3.88
History of abortion	No		1.00		
	Yes	.012**	2.08	1.17	3.69
Medical complication	No	.	1.00		
	Yes	.000**	14.28	8.04	25.35
Obstetric complication	No		1.00		
	Yes	.000**	10.62	6.33	17.79
Mode of deliveries	Spontaneous		1.00		
	Instrumental	.215*	1.72	0.73	4.08
	Caesarian	.000**	3.62	2.25	5.83
Duration of first stage of labour	< 18hrs		1.00		
	>18hrs	.002**	3.10	1.50	6.42
Duration of second stage of labour	<3hrs	.	1.00		
	>3hrs	.000**	9.03	5.23	15.58

Table 4: shows the simple logistic regression and corresponding p-values for the associations between the birth asphyxia at first minute and fetal factors in Jimma zone public hospitals from March 1 to 30, 2015

Categorical variables		p	COR	95% C.I.	
Fetal Presentation	Cephalic		1		
	Non cephalic	.000**	12.68	6.52	24.66
Birth weight	<2500 gram	.000**	5.07	2.65	9.71
	2500-4000gram		1.00		
	>4000gram	0.41	0.59	0.16	2.10
Fetal tone/number of fetus	Single tone		1.00		
	Twin or more	.000**	12.76	4.27	38.11
Amniotic Fluid	Clear		1.00		
	Mecoid and Bloody	.000**	9.54	5.56	16.39
Birth trauma	No		1.00		
	Yes	.133*	2.53	0.76	8.45
Tight nuchal cord	No		1.00		
	Yes	.000**	12.03	4.01	36.08

Table 5: shows the simple logistic regression and corresponding p-values for the associations between the birth asphyxia at first minute and health facility related factors in Jimma zone public hospitals from March 1 to 30, 2015

Categorical variables		p	COR	95%CI	
care providers who conduct delivery	Diploma midwife		1		
	BSc midwife	.38	1.43	0.65	3.19
	Medical intern	.15*	0.47	0.17	1.32
	Emergency surgery	.02**	4.09	1.28	13.09
	General practitioner and above	.00**	3.24	1.54	6.83
Transportation	Foot		1.00		
	Bajaj	.092*	0.49	0.22	1.12
	Taxi	.052*	0.41	0.17	1.01
	Other cars	.71	0.86	0.38	1.93
	Ambulance	.33	0.66	0.28	1.53
Anti-pain given during deliveries	Pethidine	.056*	2.03	0.98	4.22
	Diclofenic	.004**	2.64	1.35	5.14
	Tramadol	.000**	2.66	1.57	4.51
	Parastamol		1		

Note: - “* ”show that it’s candidate for multiple logistic regression ($p < 0.25$)

“** “show that it’s has significant association to birth asphyxia ($p < 0.05$)

Multivariable Logistic regression analysis was done to identify the effect of independent variables on birth asphyxia. The study showed neonates whose mothers had not attend antenatal care visit were 6.36times more likely develop birth asphyxia (AOR: 6.36, 95%CI: 2.00, 20.28) than those complete antenatal care visit. In addition, those had incomplete antenatal care visit were 4.58times more likely to develop birth asphyxia (AOR: 4.58, 95%CI: 2.0, 10.47) than those complete antenatal care visit.

Neonates whose mothers had medical complication were 3.92 time more likely to cause birth asphyxia (AOR: 3.9, 95%CI: 1.6, 9.5) than those had not medical complications. Neonate whose mothers had Obstetrics complication were 3.8times more likely to cause asphyxiated infants (AOR: 3.8, 95%CI: 1.7, 8.3) than those free of obstetrics complication by adjusting other variables. Regarding to fetal presentation those newborns non-cephalic presentation were 6.95times more likely to develop birth asphyxia (AOR: 6, 95%CI: 2.7, 18.3) than cephalic presentation compared to non-asphyxiated infants by adjusting others variable. Concerning mode of delivery those infants born with caesarian deliveries were 2.3more likely to develop birth asphyxia (AOR: 2.3, 95%CI: 1.0, 5.1) than spontaneous vaginal deliveries by adjusting others variables.

The study revealed that duration of second stage of deliveries also had strong positive significant association with birth asphyxia. Prolonged second stage of deliveries more than 3hours were 3.72 more likely to cause birth asphyxia (AOR: 3.72, 95%CI: 1.458, 12.178) than those gave birth less than 3hours by controlling other variables. Birth weight of newborns also had strong positive significant association with birth asphyxia. Low birth weight were 4.2 more likely to have birth asphyxia (AOR: 4.214, 95%CI: 1.458, 12.178) than normal birth weight when compared with non-asphyxiated infants by adjusting other variables.

Concerning color of amniotic fluid, being meconium stained amniotic fluid and bloody were 8.29time more likely to have birth asphyxia(AOR: 8.292, 95%CI: 3.633, 18.928) than clear amniotic fluid compared to non-asphyxiated infants by controlling other variables. Those newborns had cord tight around their neck were 7.39 times more likely to have birth asphyxia (AOR: 7.389, 95%CI: 1.599, 34.131) than those had not cord tight around their neck compared to non-asphyxiated infants by adjusting other variables (table: 5).

The model below was adjusted with monthly income, history of family smoking, chew chat during current deliveries, residence, gestational age, history of abortion, fetal tone/number of fetus, duration of first stage deliveries, professions of Care providers, birth trauma, transportation and anti-pain given during deliveries.

Table 6 : shows multiple logistic regression and corresponding p-values for the associations between the birth asphyxia at first minute and independent predictors in Jimma zone public hospitals from March 1 to 30, 2015

Model		freq (%)	P	AOR	95% C.I.	
					Lower	Upper
Medical complication	No	227(75.5)		1		
	Yes	90 (24.5)	.002	3.92	1.62	9.46
Obstetrics complication	No	213(57.9)		1		
	Yes	155(42.1)	.001	3.76	1.71	8.27
Durations of second stage of delivery	<3hrs	295(80.2)	.000	1		
	>3hrs	73(19.8)	.001	3.72	1.71	8.08
Birth weight of newborns	2500 – 4000	304(82.6)		1		
	<2500	48(13.1)	.008	4.21	1.46	12.18
	>4000	16(4.3)	.103	0.13	0.01	1.51
Color of Amniotic fluid	Clear	278(75.5)		1		
	Mecoid and Bloody	90(24.5)	<.0001	8.29	3.63	18.93
Tight nuchal cord	No	344(93.5)		1		
	Yes	24(6.5)	.010	7.39	1.60	34.13
ANC	No ANC	52 (14.1)	.002	6.36	2.00	20.28
	1 – 3	157 (42.7)	<.0001	4.58	2.00	10.47
	≥4	159 (43.2)		1		
Fetal presentation	Cephalic	305(82.9)		1		
	Non cephalic	63(17.1)	<.0001	6.98	2.66	18.28
Mode of delivery	Spontaneous	218(59.2)		1		
	Instrumental	27(7.4)	.407	0.55	0.14	2.25
	Caesarian	123(33.4)	.035	2.35	1.06	5.18

CHAPTER SIX: DISCUSSION

This study showed that the prevalence of birth asphyxia was 32.9 % at first minute and 12.5% at 5th minute Apgar score of less than 7. Compared to the previous study in Jimma zone that reflects birth asphyxia account 47.5 %(21). This gap is might be because of differences of the study design, sample size that was large and relatively increased early identification of high-risk mothers with improved antenatal and perinatal care. On the other hand, the prevalence of this study was higher than what has been observed in Nigeria, Pakistan ,India, Thailand and Cameroon revealed that 29.4%, 28%, 6.6%, 7.35% and 8.05%, respectively (23,24, 30, 38, 39,). This gap might be due to various definitions of birth asphyxia, sample size, time/ long duration and different study design which makes comparison between different studies difficult.

According to this finding sociodemographic factors like maternal age, marital status, history of family smoking, chew khat, residence were had significant association at simple logistic regression analysis method. After adjusting with other factor, they were not. The study revealed that maternal factors significantly associated with birth asphyxia were medical complication, obstetrics complications, and durations of second stage of delivery, not attending antenatal care visit, incomplete antenatal care visit and caesarian section in multivariable logistic regression. Significant associated fetal factors were low birth weight, tight nuchal cord, meconium and blood stained amniotic fluid and non-cephalic presentation. This study has found medical complication in pregnancy had a significant factor for birth asphyxia. This was consistent with findings in India, Pakistan, Thailand and Sweden (22, 27, 34, 40). A facility based National Baseline Assessment for Emergency Obstetric & Newborn Care done in 2008 has revealed that 9% had indirect complications leading causes of maternal mortality in Ethiopia (48).In facts that some of these diseases such as chronic hypertension, Cardiac Disease, Asthma and Anemia are themselves, risk factors for low Apgar score.

Obstetrics complications also had positive strong significant association to birth asphyxia. Those complications were 20 (12.9%) gestational HTN, 28(18.1%) pre-eclampsia, 4(2.6%) eclampsia, 11(7.1%) hyperemesis gravidarum, 12(7.7%) shoulder dystocia, 2(1.3%) uterine rupture, 9(5.8%) polyhydramnios, 7(4.5%) oligohydramnios, 13(8.4%) Abruptio placenta, 11(7.1%)

placenta Previa, 32 (20.6%) PROM > 18 hours, 37 (23.9%) obstructed labour and 4(1.1%) Chorioamnionitis. There were different studies that support this finding in India, Cameroon, England, Nigeria and Thailand (32, 34, 38, 40, 44). If there is obstetric complication acting quickly is important because a woman and her infant could die in a short period: in antepartum hemorrhage, she can die in just 12-hours, in postpartum hemorrhage she can die in just 2 hours, with complications of eclampsia in as few as 12 hours and with sepsis in about 3 days (48).

Prolonged second stage of labor (>3hours) and birth asphyxia have strong significant association to birth asphyxia. This result is consistent with the earlier findings in India, Cameroon, Pakistan, Nigeria and Thailand (23, 24, 27, 37, 39). This is due to prolonged second stage is associated with fetal and maternal exhaustion and also fetal distress which results in birth asphyxia. Proper management of labour to reduce prolonged labour with earlier intervention may reduce the incidence of birth asphyxia. Those mothers who had no antenatal care visits and incomplete antenatal care visit were significantly associated to birth asphyxia. This study is in line with study result reported in India (23), Nigeria (30) and Thailand (34, 36) were similarly significant. This could be explained by the fact that the women who complete antenatal care improves the survival and health of babies directly by reducing stillbirths and neonatal deaths and indirectly by providing integrated care, promoting healthy home practices, influencing care seeking behavior, and linking women with pregnancy complications to a referral system.

There was also a strong relationship between caesarian section and birth asphyxia, 123(33.42%) of deliveries were emergency Caesarian Section. Similar findings were reported in several studies in Pakistan, Nigeria, Iran, Thailand, Uganda and UK (27, 30, 31, 34, 42, 46). This could be explained by the most of the indications of caesarian section, which compromise adequate oxygen delivery to the fetus as prolonged labor, arrest of labor, hypertensive disorders in pregnancy, cephalo-pelvic disproportions, might be due to some risk factors, which are not identified early in pregnancy, which might cause acute fetal distress and consequently lead to birth asphyxia.

Low birth weight and prematurity were significantly associated to birth asphyxia. From the previous study showed similar result in Nepal, England, Iran, Thailand and Uganda (26, 28, 31, 34,43). Possible explanation might be the premature and low birth weights usually have

pulmonary immaturity and limited respiratory muscle strength. It is important to make a diagnosis and find the cause to provide appropriate management to prevent preterm delivery.

The study also identified that tight nuchal cord was significant association for birth asphyxia and it has supported with others studies in Cameron, Iran and UK (25, 31, 46). The reason behind is Cord accidents often lead to reduced blood flow from the placenta to the fetus causing impaired gaseous exchange and the babies are usually born asphyxiated. In a study, meconium and bloody stained amniotic fluid was found to be present as factor significantly associated to birth asphyxia. This finding in line with previous studies in Pakistan, England and Thailand, (27, 28, 32). Almost all studies were supported that newborns delivered with meconium stained have high probability to develop birth asphyxia. The explanation for this association is likely due to meconium aspiration syndrome, which happens when a baby breathe meconium into the lungs leading to an acute airway obstruction right after birth. To minimize incidence of birth asphyxia, if the meconium-stained amniotic fluid was presented, immediate endotracheal meconium suction after delivery could reduce meconium aspiration syndrome.

The study also identified that non-cephalic presentations such as breech and shoulder presentation were had significant association with birth asphyxia. Similar study result was reported in Cameron, Uganda, Nigeria, Thailand and UK (24, 29, 30, 34, 46). The assumption is that breech presentation has a high rate of umbilical cord prolapsed and birth trauma increased incidence of birth asphyxia.

This study was strengthen by training data collectors and supervisor's, questionnaires was pretest and used multiple data collection techniques. As limitations, Lack of a uniform definition of birth asphyxia, which can be applied in areas without sophisticated diagnostic tools and unavailability of similar study in the country after the searching of different websites

CHAPTER SEVEN: CONCLUSION AND RECOMMENDATION

7.1. Concussion

The prevalence of birth asphyxia is too high in compared with the profound figure that was reported in EDHS 2011 and other studies in different countries. However, it is lower than profound studies in Jimma zone. significantly associated factors were- medical complications, obstetrics complication, Prolonged second stage of labor (>3hours) , low birth weight of newborns, meconium and blood stained amniotic fluid, Tight nuchal cord, No antenatal care and incomplete antenatal care visit, non-cephalic presentation and caesarian section delivery Majority of these factors may be manageable by means of good pre-natal care.

7.2. Recommendation

Based on the study findings the following recommendations are forwarded:-

1. Policy makers and health institution should have to strength the policy that working to reduce newborn death by giving attention to birth asphyxia, since it a preventable problem and long term neurological sequels are almost untreatable once asphyxia set in, preventive strategies must be built to reduce the burden of birth asphyxia.
2. In a resource, constrained country like Ethiopia efforts should be put on preventing birth asphyxia through sensitizing mothers/communities on the need for regular ANC visits
3. The accurate prognosis of fetal presentation should done within the third trimester of gestation in order to prepare the appropriate route of delivery for the mothers and early identification of high risk mothers with improved antenatal and perinatal care can decrease incidence of birth asphyxia
4. There is urgent need to conduct studies on larger number of neonates and follow up study should be done on the long term outcome of babies with moderate and severe asphyxia

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Appendices
Questionnaires

Jimma University College of Public Health and Medical Sciences Department of Nursing and midwifery Information sheet

Dear Mr. /Ms. -----I am currently undertaking an Honors MSC Degree in Maternity Nursing Studies in Jimma University College of public health and medical sciences, Department of Nursing and midwifery. This research topic aims to **assess birth asphyxia and associated factors among newborn delivered in Jimma zone public hospitals in 2015**. Since there is no research done on this topic in the study area, Provision of such data on this very important subject may alert researchers, health workers, community and individuals for better health of mothers and newborns. It will be used as reference for those who are interested to perform a research on the same topic. The study will involve you completing the questionnaire that is enclosed with this letter and it will not take more than 20 minutes to complete.

Confidentiality and anonymity is fully assured, as your name is not required on the questionnaire and only the research team will have access to the results.

Informed Consent Form

Dear my participant, I would be grateful if you would participate in this study by completing this questionnaire. It hoped that the findings of this study would help to identify factors associated to birth asphyxia in Jimma zone public hospital. Be assured that the information you provide will be used for research purposes only and will be treated as confidential and participation will be based on voluntarily will. **I also would like to assure you that any time you feel uncomfortable participating on the study and withdrawing from the study. The study does not have any effect on the service you obtain from the respective health facility.** Are you willing to participate and have your permission to continue? Yes No

If No stop the interview and thank the respondent.

Witness's signature certifying that the informed consent will be given.

Signature _____ Dated _____

Data collector: Name _____ Signature _____

Date _____ Start time _____ End time _____

DATA COLLECTION SHEET

Part A: Questions related to socio-demographic characteristics of study participants

<i>No</i>	Questions	Coding categories	Skip to
101	Code	.....
102	What is your Age?	----- years	
103	What is your current marital status?	1) Single 2) Married 3) Divorced 4) Widowed 5) Other.....	
104	What is the highest level of education you completed?	1. No education 2. No formal education but read and write 3. Grade 1 to 8 4. Grade 9 to 12 5. Above grade 12	
105	What is your Occupation?	1. Government employee 2. Employee of private/NGO 3. Business women 4. Farmer 5. Housewife 6. Daily laborer 7. Student 8. Others.....	
106	What is your religion?	1. Orthodox 2. Catholic 3. Muslim 4. Protestant 5. Wakeffata 6. Other specify...	
107	Is there anyone who is smoking in the family?	1. Yes 0. No	
108	Did you chew chat during current pregnancy?	1. Yes 0. no	
109	Distance of health facility from the home	.....Kms	
110	What is the Means of transportation to health facility during current delivery?	1. by foot 2. by Bajaj 3. taxis 4. Others car 8. ambulance	
111	Residence	1. Urban 2. Rural	
112	Income Birr/month	----- Birr	

Part B: Questions related to obstetric history

201	The number of antenatal care visit attended in the current Pregnancy	.....visits	
202	Gestational age of current pregnancy	.....weeks	
203	Number of gravidity	..... pregnancy	
204	Number of parity (having given birth)	.....children	
205	What was your previous mode of delivery?	1) Caesarean Section 2) Instrumental delivery 3) SVD 4) C/S and SVD 5) Not applicable	
206	Did mothers had history of abortion?	1. Yes 0. No	If 1→207
207	If response to Q206 Yes, how many times?	.....times	

Part C: Questions related to medical problems during current pregnancy and delivery from the card

201	Did mother had any medical complication in current pregnancy?	1. Yes 0. No	If 1→302
202	If yes Q301, select medical complication the mother had during current pregnancy.		
	1) Chronic HTN	1. Yes 0. No	
	2) DM	1. Yes 0. No	
	3) Cardiac Disease	1. Yes 0. No	
	4) Anemia	1. Yes 0. No	
	5) Seizure Disorder	1. Yes 0. No	
	6) Asthma	1. Yes 0. No	
	7) Other specify	.....

Part D: Questions related to obstetrics problems during current pregnancy and delivery.

401.	Did mother had any obstetric complication in current pregnancy?	1. Yes 0. no	If 1 →402
402.	If yes Q401, select obstetric complication the mother had during this pregnancy. (select more than one if necessary)		
	1) Gestational HTN	1. Yes 0. No	
	2) Pre-eclampsia	1. Yes 0. No	
	3) Eclampsia	1. Yes 0. No	
	4) Hyperemesis Gravidarum	1. Yes 0. No	
	5) Shoulder Dystocia	1. Yes 0. No	
	6) Uterine rupture	1. Yes 0. No	
	7) Polyhydramnios	1. Yes 0. No	
	8) Oligohydramnios	1. Yes 0. No	

	9) Abruptio placenta	1. Yes 0. No	
	10) placenta previa	1. Yes 0. No	
	11) PROM > 18 hours	1. Yes 0. No	
	12) Obstructed labour	1. Yes 0. No	
	13) Other specify	.....
403.	Onset of labour	0. Induction 1. Spontaneous 2. elective c/s	If 0→404 &405
404.	If induction Q403, mode of Induction	1. IV oxytocin 2. Intracervix/vaginal 3. AROM 4. Others specify...	
405.	If induction Q403, Indication of induction	1. placental abruption 2. PROM 3. Oligohydramnios 4. pregnancy induced Hypertension, 5. Chorioamnionitis 6. Others specify.....	
406.	What is Mode of current delivery?	1. SVD 2. Vacuum Extraction through SVD 3. Forceps Extraction through SVD 4. Emergency Caesarian Section 5. Elective Caesarian Section	
407.	If response to Q406 is C/S, what is the indication?	.....
408.	If response to Q406, is vacuum or forceps what is the indication?	.....
409.	Antipain given during delivery	1. Pethidine 2. diclofenac 3. tramadol 4. Other specify...	
4010.	Other than antipain given medication during pregnancy or delivery	1. Diazepam 2. Magnesium sulphate 3. Other specify...	

Part E: Questions related to fetal factors.

501	Did the newborns has the following?		
	1. congenital or malformed fetus	1. Yes 0. No	
	2. Birth Trauma	1. Yes 0. No	
	3. Tight nuchal cord	1. Yes 0. No	
	4. Cord prolapse,	1. Yes 0. No	
502	Fetal Presentation	1. Head / Normal presentation 2. Breech Presentation 3. should	

503	Newborn Birth Weight	.....grams	
504	Gender of newborn	1. Male 0. Female	
505	Numbers of tone or newborns during current delivery	1. Single fetus 2. Identical twin 3. Fraternal twin 4. Triplet fetus	

Part F: Questions related to facility and fetal related factors during delivery

601	Place of delivery	1. JUSH 2. Shenen Gibe hospital 3. Limmu Genet hospital 4. Agaro hospital	
602	Who has conducted the delivery?	1. Midwives diploma 2. BSc midwives 3. Medical intern 4. General practitioner 5. Medical Resident 1-2 6. Medical Resident 3- 4 7. Senior 8. Others specify.....	
603	Duration of first stage of deliver	.....hrs.	
604	Duration of second stage of delivery	.....hrs.	
605	Color of Amniotic Fluid	1) M- Meconium stained 2) C -clear 3) A – Absent 4) B - Blood-stained fluid	
606	Apgar score at 1 minute	.....
607	Apgar score at 5 minute	.....

THANK YOU FOR YOUR PARTICIPATION!

Amharic version
ጥያቄዎች

Jimma University College of Public Health and Medical Sciences

Department of nursing and midwifery

Part one: Structured questionnaire for face to face interview

የእናትን አጠቃላይ ሁኔታ በተመለከተ የሚጠየቁ ጥያቄዎች

ተ.ቁ	ጥያቄዎች	ምርጫዎች	ዝለል	ኮድ
101	ኮድ	.....	
102	ዕድሜዎ ስንት ነው? (በአመት)	-----		
103	ሐይማኖትዎስ?	7. ኦርቶዶክስ 8. ካቶሊክ 9. ሙስሊም 10. ፕሮቴስታንት 11. ዋቄራታ 12. ሌላ ካለ.....		
104	የትምህርት ደረጃዎ ምንድነው?	6. ምንም አልተማርኩም 7. መጻፍ እና ማንበብ እችላለሁ 8. ከ 1ኛ እስከ 8ኛ ክፍል 9. ከ 9ኛ እስከ 12ኛ ክፍል 10. ከ 12ኛ ክፍል በላይ		
105	በቤተሰብዎ ሲጋራ የሚያጨስ ሰው አለ?	2. አለ 0. የለም		
106	ስራዎ ምንድነው?	9. የመንግስት ሰራተኛ 10. መንግስታዊ ባልሆነ ተቋም ነው ምስራው 11. ነጋዴ 12. አርሶ አደር 13. የቤት አመቤት 14. የቀን ሰራተኛ 15. ተማሪ 16. ሌላ ካለ.....		

107	የትዳር ሁኔታ ምን ይመስላል?	6) ያገባ 7) ያላገባ 8) ፍቺ የፈጸመ 9) ባል/ሚስት በሞት የተለየው 10) ሌላ ካለ.....		
108	የመኖሪያ ቤትዎ ከጤና ተቋም ያለው ርቀት በግምት ምን ያህል ነው?	.....ኪ.ሜ		
109	ወደ ጤና ተቋም ሲሄዱ የሚጠቀሙት መጓጓዣ ምንድነው?	1. የእግር ጉዞ 2. ባጃጅ 3. ታክሲ 4. ሌላ ካለ....		
110	የወር ገቢዎ በአማካይ ምን ያህል ነው?	----- ብር		
111	የእርግዝና ክትትል ምን ያህል ጊዜ አድርገዋል?	1.		
112	ስንት ጊዜ ነፍሰ ጡር ሆነዋል?	.....	
113	ስንት ጊዜ ወልደዋል?	.....	
114	በዚህ እርግዝና ጊዜ ጫት ቅመው ነበር?	2. አዎን 0. አይደለም		

Afan Oromo version

Gaaffilee

Data Collecting Instrument to assess birth asphyxia and associated factor among newborn delivered in Jimma zone public hospitals in 2015

Gaaffii hadholeen da'umsaaf dhufan gaafataman

<i>No</i>	Gaaffilee	deebii	Irra darbi	kooddi
101	Kooddi	.....	
102	Umurin kee meeqa?	-----		
103	Amantiin kee maali?	1. Ortodooxii 2. kaatolikii 3. Musliima 4. protestantii 5. Wakeffata 6. Kan biraa yoo jiraate ibsi.....		
104	Sadarkaan barumsaa hammami?	1. Hin baranne 2. Hin baranee garu dubbisuf bareessuu ni danda'a 3. Daree 1 – 8 4. Daree 9 - 12 5. 12 ol kan baratee		
105	Maatii keesaa siigaaraa kan xuuxu jiraa?	eyyee 0. Hin jiru		
106	Hojiin kee maalii?	1. Hojjeta mootummaa 2. Hojii dhunfaa 3. daldaalaaa 4. Qonnan bulaa 5. Hojjettu mana keessati 6. Hojii humnaan bulaa 7. Barataa 8. Kan biraa yoo jiraate ibsi.....		

107	Haala fudhaaf heerumaa	1. Hin heerumnee 2. heerumteetti 3. walhikneerra 4. abbaan manaa kan jalaa du'e 5. Kan biraa yoo jiraate ibsi.....		
108	Fageenya hospitaala kanaa manaarra qabuu kilometraan meeqaa?	.....km		
109	Gara hospitaala kanaa maalin dhuftaanii?	1. milaan 2. bajaajin 3. taaxiidhaan 4. Kan biraa yoo jiraate ibsi.....		
110	Gaalii ji'aa qarshidhaan yoo tilmaamamu meeqaa?	-----		
111	Hordoffii tajaajilaa da'umsaan duraa ulfaa kanaaf yeroo meeqa ilaalamteetta?	-----		
112	Baayinni ulfa ulfooftee meeqaa?	.....	
113	Baayinni ulfaa turban 28 olitti kaasee meeqaa?	.....	
114	Yeroo ulfaa kanaa ykn ulfa duraa kaasee hanga da'umsa kanaatti ca'ati qamateetaa?	3. eeyyee 0. miti		

DECLARATION

I, the undersigned, declare that this thesis is my original work, has not been presented for a degree in this or any other university and that all sources of materials used for the thesis have been fully acknowledged.

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Signature: _____

Name of the institution: Jimma University

Date of submission: 08/06/2015

This thesis has been submitted for examination with my approval as University advisor

Name and Signature of the first advisor

Professor Tefera Belachew_____

Name and Signature of the second advisor

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