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SCHOOL OF NURSING AND MIDWIFERY
POST GRADUATE PROGRAM**

PREVALENCE AND ASSOCIATED FACTORS OF MECONIUM
ASPIRATION SYNDROME AMONG NEONATES ADMITTED IN
GOVERNMENTAL HOSPITALS IN ADDIS ABABA ETHIOPIA
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ACRONOMYS

AGA	Appropriate For Gestational Age
ANC	Antenatal Care
APGAR	Appearance, Pulse Grimace, Activity, Respiration
ARM	Artificial Rupture Of Membrane
CPAP	Continues Positive Air Way Pressure
CPD	Cephalo Pelvic Disproportion
GAG	gestational Age
IUGR	Intra Uterine Growth Retardation
MAS	Meconium Aspiration Syndrome
MSAF	Meconium-Stained Amniotic Fluid
NICU	Neonatal Intensive Care Unit
NRFHRP	Non-Reassuring Fatal Heart Rate Pattern
PPHN	Persistent Pulmonary Hypertension
PPROM	Prolonged Premature Rupture of Membrane
PROM	Premature Rupture of Membrane
ROM	Rupture of Membrane
TEF	Tracheoesophageal Fistula

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ABSTRACT

Background: - Meconium aspiration syndrome (MAS) is a life-threatening respiratory disease occurring when neonates aspirate meconium-stained amniotic fluid near or around birth with varying severity. An average of 8% to 25% live birth neonates with meconium-stained amniotic fluid have delivery complications and from these around 5% of them develop MAS with a 50% chance of needing for mechanical ventilation. There is a paucity of literatures in the study area regarding the study topic. Therefore, the study aimed to assess the prevalence and associated factors of meconium aspiration syndrome among neonates admitted in NICU of governmental hospitals in Addis Ababa Ethiopia.**Methods:** - An institutional based retrospective cross-sectional study design was employed to collect data from February to March 2021. A three-year chart review from January 2018 to January 2021 was conducted. The data was collected by using structured questionnaire. Systematic random sampling technique was used to involve the estimated study participants (268). Factors associated with meconium aspiration syndrome were determined using bivariate and multivariate logistic regression models. Statistically significant associations were declared at P value less than or equal to 0.05.**Result:** The findings from this study revealed that 30.6% were diagnosed to have meconium aspiration syndrome. Factors associated with meconium aspiration syndrome included being post term (Adj OR=17.548 95% CI (2.894,106.413)), first minute APGAR score of 7-10 (Adj OR=17.548 95% CI (2.894,106.413)), duration of labor from 12-24 hour (Adj OR=4.98 95% CI (1.677, 14.792)) and maternal blood group of AB (Adj OR=0.118 95% CI (0.029, 0.470)).**Conclusion and recommendation:** In this study almost 1/3 of the neonates had developed meconium aspiration syndrome which indicates for the initiate delivery before 40 completed weeks of gestation and anticipation of neonatal resuscitation for neonates born from blood group of AB mothers. **Key words:** -MAS, neonate, respiratory distress and MASF.

1. INTRODUCTION

1.1 Background

Meconium aspiration syndrome (MAS) is a life-threatening respiratory disease occurring when neonates aspirate meconium-stained amniotic fluid near or around birth with varying severity. An average of 8% to 25% live birth neonates with meconium-stained amniotic fluid have delivery complications and from these around 5% of them develop MAS with a 50% chance of needing for mechanical ventilation.

Meconium can be defined as the first stools expelled by a new born baby, which is habitually seen within 24 hours of new born life by more than 90% of newborn(1,2).

Meconium aspiration syndrome is mostly experienced issue by pediatricians working in the delivery room and newborn nursery. Different risk factors had role to cause meconium aspiration syndrome, post maturity, presence of fetal heart rate (FHR) irregularities in the intrapartum period, cesarean birth, fetal distress, and intrauterine growth restriction (IUGR) are found to be the major risk factors. Meconium aspiration syndrome happens when new born aspirate first stool of neonate or meconium in to the lungs near or around the time of birth(3).

Under normal circumstances even though the fetus had no feeding their intestine contains substance which is thick, black-green, odorless and free from germ called meconium primarily recognized nearly 12weeks of gestation and stores in the colon throughout gestation. Because of low motile level and tonic contraction of fetal anal sphincter resulting in lack of intestinal peristalsis this substance is not released in bowel movements till the time of birth. Nevertheless, sometime a baby will have a bowel movement prior to birth, excreting the meconium in to the amniotic fluid, comprises masses of debris, desquamated cells from the intestine, lanugo hair fatty material from the vernix caseosa and intestinal discharge(4,5).

Meconium passage in new born is a developmentally mechanized event typically seen with in the first 24 to 48 hours of new born life. In preterm or term fetus Passage of meconium during Intrauterine life

has been accompanied with feto maternal stress factor hypoxia and infection Where as meconium passage after 40 weeks of gestations has been credited to gastrointestinal advancement.

Aspiration of meconium into amniotic fluid can occur when fetus gasps or during first breaths of newborn after delivery. As contrasting to acute perpartum events Chronic in utero offense has been proposed to be in charge for severe cases of meconium aspiration syndrome. A newborn having meconium aspiration syndrome will be presented with peeling of the skin, long finger nails, weight loss, and decreased vernix which are the signs of post-maturity. Depending upon the time of exposure; nails become tainted six hours before vernix which may be stained after 12–14 hours of exposure(5,6).

The pathophysiology of meconium aspiration syndrome is multifaceted. When a newborn suffers meconium aspiration syndrome the aspirated meconium can mark regular breathing by several ways. Hypoxemia neonate in babies with meconium aspiration syndrome occurred when the aspirated meconium cause obstruction in newborn airway, interfere with the function of surfactant or release inflammatory mediators causing chemical pneumonitis, persistent pulmonary hypertension with right-to-left extrapulmonary shunting. The joint disturbances of lung function in babies with meconium aspiration syndrome include hypoxemia and decreased lung compliance. Poor oxygenation is attributed to a blend of ventilation perfusion mismatching, intrapulmonary shunting related to regional atelectasis and extrapulmonary shunting related to PPHN. The meconium aspirated by newborn may cause partial obstruction to complete airway blockage depending on the content and amount of meconium, finally resulting in alveolar hyperinflation or atelectasis. When there is air trap there will be rupture resulting in air leaks symptoms such as pulmonary interstitial emphysema, pneumothorax, and pneumomediastinum (7,8). Therefore, the study has assessed its prevalence and associated factors in the study area.

1.2 Statement of the problem

Even though World health organization is working in collaboration with ministry of health and partners towards qualifying particular areas for neonates especially around the time of birth and the first week of life most newborns are dying in this time period; according to the report on 2017 the first week of life is the riskiest time of neonates, about 1 million newborns die within the first 24 hours. The causes of death were preterm birth, intrapartum-related complications (birth asphyxia or lack of breathing at birth which directly or indirectly related with meconium aspiration syndrome infections and birth defects (9).

Meconium aspiration and birth asphyxia are the main causes of disease and death in term neonates in South Africa. On the study done on new borns at NICU, in Portugal 0.66% were diagnosed with MAS, with higher prevalence of caesarean delivery ($p < .001$), nonreassuring fetal heartbeat (CTG) ($p < .001$), baby of mothers with febrile episode during delivery ($p = .002$), new born first minute Apgar scores < 7 ($p < .001$) and need of mechanical ventilation at birth ($p < .001$). Newborns with severe meconium aspiration syndrome had higher median reactive C protein (86.9 versus 9.65, $p = .001$) and 73.3% had pulmonary hypertension ($p = .027$). They required significantly long duration of oxygen treatment, mechanical ventilation (8,10).

Sub-Saharan Africa still has the highest child mortality rates in the world. Global child mortality has dropped by 53% from 12.7 million in 1990 to 5.9 million in 2015. South Africa has reduced its child mortality rate from 60 death as per every 1000 live births in 1990 to 41 in 2015, though the MDG target is 20 (11).

At least for the first 24 hours, risky neonates especially infants born with meconium stained amniotic fluid should be monitored for any signs of respiratory distress. Presence of respiratory distress in an infant born through MSAF, with an alternate cause for respiratory distress is found to be important clue to diagnose a newborn as having meconium aspiration syndrome. Chest xray and analysis of arterial blood gas may be necessary. Since pathophysiology of MAS is different radiographic findings are different. The classic x ray findings new born diagnosed with MAS are widespread coarse patchy infiltrates overexpanded lungs. There may not be direct relation

Between the severity of the X-ray decoration with the clinical picture. The lack of association between clinical harshness and xray pattern recommends that MAS is less dependent on the amount of meconium obstruction and parenchyma damage than on other aspects of MAS, such as the presence and severity of PPHN(7).

In developing countries the negative effect of meconium stained amniotic fluid is even worse and this may be due to amultitude of factors interrelated with socioeconomic and fame of service, In Ethiopia very little information is known about the situation, mainly the study area to design appropriate prevention strategies .At Felege Hiwot comprehensive specialized referral hospital North West Ethiopia, On the study done on the prevalence of meconium stained amniotic fluid and its associated factors the prevalence of meconium stained amniotic fluid was found to be 17.8% (13).

Signs in new borns with meconium aspiration syndrome is frequently associated with a vicious cycle of hypoxemia with related symptoms like (apnea, cyanosis), shunting, acidosis, and pulmonary hypertension. Much of the morbidity associated with MAS mortality is from causes secondary to related problems such as asphyxia, sepsis, and PPHN. So, the purpose of intervention in the delivery room should be directed to reduce the incidence and severity of meconium aspiration and these co morbidities. For the past years involvements such as selective reduction of post-term births, aggressive management of fetal distress and reduction of birth asphyxia have resulted in a significant decrement in MAS incidence (13). Due to a multitude of factors associated with socioeconomic and quality of service the ill effect of meconium stained amniotic fluid is even worse in developing countries. But there is a paucity of research in Ethiopia specially in the study area. Hence this study aimed to determine the prevalence of meconium aspiration syndrome and its associated factors among neonates admitted in governmental hospitals in Addis Ababa, Ethiopia.

1.3 Significance of the study

Different maternal and neonatal risk factors are assumed to have an association with meconium aspiration syndrome. Few studies has been done on the prevalence of meconium aspiration syndrome and its associated factors in Ethiopia especially in largest geographical area and tertiary hospital as well as this study was done in tertiary hospitals in which many referral cases with several predictors are supposed to be diagnosed so this will be an additional finding. This study was be conduct to appreciate the factors resulting in MAS and its scientific contour with their outcome, morbidity and mortality. The study also was used to increase existing knowledge of practitioners about risk factors of meconium aspiration syndrome in the study are and gives insight at the country level.

Determining contributing factors also help policy maker and health care professionals to formulate effective neonatal care policy through focusing on the contributing factors, developing guidelines and regulations for the management and prevention of meconium aspiration syndrome.

In cumulative the result of this study could have its own effect in decreasing and combating early neonatal mortality and also helps in identification of those factors that have significant effect on the decrement of meconium aspiration syndrome. Furthermore,it will provide information for the mothers and clients visiting health facilities during service.

2.Literaturereview

2.1 overview of meconium aspiration syndrome

Meconium starts to be seen in newborns' intestine by the 10th week of life, under the normal physiology. Till term, there is no passage of meconium in utero due to lack of strong peristalsis, good anal sphincter tone, low levels of motilin, and a cap of viscous meconium in the rectum. But these conditions leading to meconium passage like hypoxia and acidosis lead to a vagal response which results in increased peristalsis and a relaxed anal sphincter. Integrity of the parasympathetic system therefore appears to be a prerequisite for meconium passage, making it a maturational event and rare before term (14).

According to different studies, there is marked improvement in neonatal morbidity and mortality associated with MAS due to an advancement of practice towards maternal, obstetric, and neonatal healthcare practice. The babies' chance of inhaling meconium occurs in and around 10% of all births, with a possibility of 1-3% progressing to cause MAS, happens after 34 to 42 weeks of gestation. And from the total babies with MAS, 30% of them need ventilation. In the industrialized world, meconium in the amniotic fluid can be detected in 8-25% of all births after 34 weeks' gestation. Of those newborns with meconium-stained amniotic fluid, approximately 10-15% develop meconium aspiration syndrome. But in developing countries, there is a lack of novel therapeutic facilities and protocolized management guidelines, making MAS still a major problem. For neonates with meconium aspiration syndrome, supportive care is the cornerstone of management, and with its judicious use, babies even with severe MAS survive with an acceptable burden of short- and long-term morbidity (2, 11, 15, 16).

Newborns with severe MAS required more days of oxygen therapy and more days of mechanical ventilation ($p < .001$) and a higher need of inhaled nitric oxide. Patients met criteria for hypothermia treatment protocol and A core at the first minute ($OR 34.9, 95\% CI$) were significantly associated with development of MAS. From the possible predictors of severity, only the need of surfactant therapy was associated with the development of severe MAS (17).

2.1. Socio demographic characteristics

As the study done on MAS government general hospital in Anantapuramu, Andhrapradesh showed MAS was responsible for 1.4% of all Neonatal Intensive Care Unit (NICU) admissions, Seventy-two newborns were analyzed during the study period:55.6%(n=40) were of female gender and as the study done on Prevalence of meconium stained amniotic fluid and its associated factors among women who gave birth at term in Felege Hiwot comprehensive specialized referral hospital, North West Ethiopia Nearly two third, 344 (69.5%) of mothers were in the age group of > 30 years and 403 (81.4%) of them were from urban areas and in other study 72 newborns identified with MAS, 11 (15.3 %) were born asymptomatic, developing respiratory distress during their first hours of life, while(12, 15,18).

2.3.Neonatal factors

A study done on MAS cases attending to Government general hospital in Anantapuramu, And hrapradesh showed MAS was responsible for 1.4% of all Neonatal Intensive Care Unit (NICU) admissions, Seventy-two newborns were analyzed during the study period:55.6%(n=40) were of the female gender, 62.5 % were delivered by caesarean section, 93 % had >36 weeks of gestational age and 91.2% had a birth weight over 2500g.Sixty-nine percent had an Apgar score<7 at 1 minute and 23.6% an Apgars core <7at5 minutes; fetal bradycardia was present in 26.4 % of the newborns and tachycardia in 1.4%.

The presence of meconium was associated with severe asphyxia and carried a bad prognosis with an increased risk of developing hypoxia (58.3%), need of mechanical ventilator support (43.1 %), respiratory and/or metabolic acidosis (30.6%), pulmonary hypertension (11.1%) and hypoxic ischemic encephalopathy (29.2%). The mortality rate was2.8%. Thick meconium was associated with higher morbidity and mortality rates(15,18).

On the study done in India the mortality in MAS cases was significant in low5-minute APGAR Score and non-vigorous baby and almost 3/4th of the MAS neonates were term and AGA(19).

As the study in Kamineni Institute of Medical Sciences, Narketpally showed Out of 2380 live births160i.e.67per1000livebirths had meconiumstained amniotic fluid. Outof160caseswith

MSAF,21(6.7%) cases had MAS. Out of 21 cases with MAS,5(23.81%) cases needed CPAP support and 4(19.04%) cases needed mechanical ventilation. Only one mortality was encountered in the present study (20).

The study done in Burgundy perinatal from 2000 to 2007 from a total of 133087 births with GA ≥ 37 weeks 132884 eligible neonates (7.93%) were delivered within MSAF with aleaner increment in incidence of MSAF with increased GA. The rate of MSAF was 3.52%at37-38WG versus 9.07% at 39–41WG (OR=2.74[2.56to2.92,P<0.0001]) and 14.37% at 42-43WG(OR=4.6 and prevalence of MAS were 0.18% of the overall population. When we see the treatment modalities according to that study of 241 MAS, the treatment were oxygen alone in152(63.1%), nasal CPAP without mechanical ventilationin3(1.2%).This indicates that, severe MAS(i.e., MAS treated by mechanical ventilation and/or nasal CPAP) was identified in 89 neonates with 0.067% prevalence of severe MAS,0.84% of neonates born through MSAF, and 36.9% of MAS (21).

In study done in Ethiopia at jimma first minute Apgar score was less than 7 in 88% of the new born while it was less than 4 in 15% of the cases. However, there was no statistically significant association between the thickness of meconium and low first minute Apgar score and Those babies who were delivered with operative delivery had 16 times increased risk of low5thminute Apgar score. Among the 27.1%of new borns in the Neonatal Intensive CareUnit,71.4% (19.9%of the total) were diagnosed to have Meconium Aspiration Syndrome with clinical examination alone. Those newborns with first minute Apgar score<7hadthree times increased risk of MAS(95% CI: and the presence of meconiumstained secretion in the oropharynx of a new born resulted in 9 times increased risk of Meconium Aspiration Syndrome(22).

2.4. Maternal factors

On the study done on MAS cases attending to Government general hospital in Anantapuramu, Andhra Pradesh to see incidence of Meconium aspiration syndrome in relation to the pattern of thev delivery, showed that babies born by normal vaginal delivery formed the highest percentage of cases (48% of cases) , caesarean section(36%of cases), forceps delivery were 10% of cases and by vacuum extraction, the number of cases were 3% of cases,29(58%) cases were primi-para ,19(38%) cases were multi-para and02(04%) cases were those mothers conceiving for more than five times (18).

On the study done in India of 8765 deliveries in hospital 1220 neonates were born with MSAF incidence of MAS out of MSAF was 7.7%.13.82% of the babies died as a result of MAS.MAS were more common in primgravida mother (68%) and LSCS deliveries(53.2%).Of the total MAS54.2% had thick meconium in whom mortality was 92.3%(19).As the study done in Nepal showed Babies born to nulliparous mothers were found to have a significant risk of MAS 2.45 (odds ratio(OR)=2.45;95%CI and also babies born through instrumental delivery (OR= 5.56,95% CI, caesarean delivery (OR= 4.73,95% CI: and babies delivered from mothers having infection had threet imes higher risk of developing MAS(OR=3.30; 95% CI(3).

In Ethiopia on the study done in Felege Hiwot comprehensive specialized referral hospital, North West Ethiopia: variables seen to have association with MAS was women whose age greater than 30 years [AOR=5.63,95% CI, duration of labor greater than 24h [AOR=7.1,95%CI, induced labor [AOR= 2.60,95% CI, preeclampsia [AOR= 3.45,95% CI and obstructed labor [AOR=5.9,95%CI were found to be associated with meconium-stained amniotic fluid. The prevalence of meconium stained amniotic fluid was found to be 17.8% and comparatively on the study done at jimma The overall rate of meconium stained amniotic fluid was15.4%(151/979) and 74.8%of the cases had moderate to thick meconium stained amniotic fluid. Mode of delivery in 70.2% of cases was operative delivery; and those mothers with a grade three meconium-stained liquor had about 5 times increased risk of operative delivery when compared with mothers with grade1 staining (OR=4.66, 95%CI (22,23).

The study showed attertiary hospital, Northwest Ethiopia: on MAS prevalence proportion of MSAF was at149 (24.6%) [95%CI.No reassuring fetal heart rate pattern (AOR:21.9,95% CI, post term pregnancy(4.54,95% CI, duration of labor more than15hours (AOR:2.83,95% CI, pregnancy induced hypertension (AOR:2.43,95% CI, oligohydramnios (AOR:2.53,95% CI interpregnancy interval less than 2years (AOR:2.24,95%CI and monthly family incomeless than 5000 Ethiopian Birr(185 United States Dollar)(AOR:2.03,95%CI were significantly associated with MSAF(23).

2.5. conceptual framework

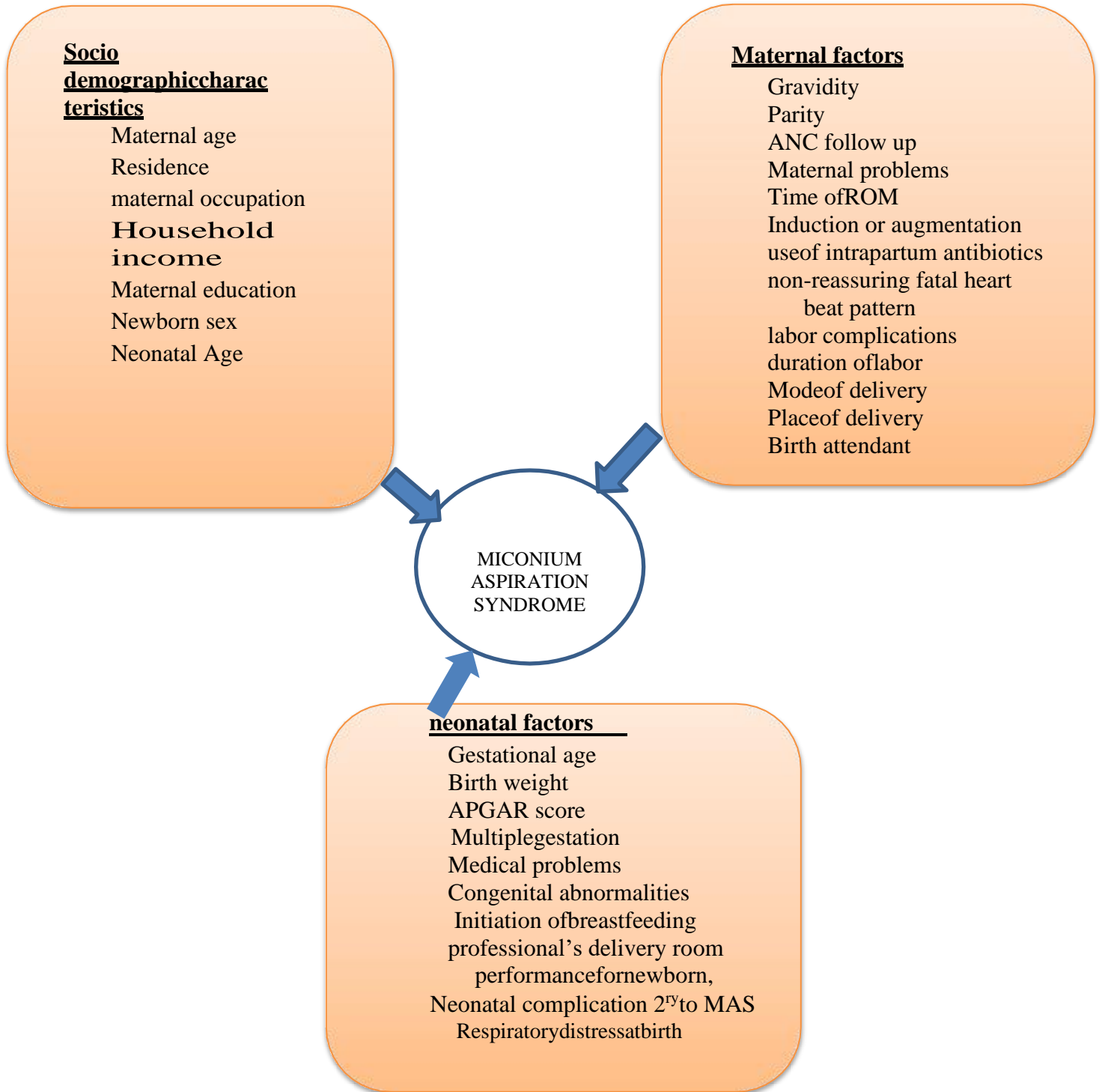


Figure 1. conceptual frame work adapted from different literatures (12,22,23)

3.OBJECTIVES

3.1General Objective

- To assess prevalence and associated factors of meconium aspiration syndrome among neonates admitted in NICU of governmental hospitals in Addis Ababa Ethiopia 2021.

3.2.Specific objectives

- To determine prevalence of meconium aspiration syndrome among neonates admitted in NICU of governmental hospitals in Addis Ababa Ethiopia 2021.
- To identify associated factors of meconium aspiration syndrome among neonates admitted in NICU of governmental hospitals in Addis Ababa Ethiopia 2021.

4. METHODS

4.1. Study setting

Addis Ababa is the capital city of Ethiopia. It is the largest city in Ethiopia, established in 1887 by emperor Menelik II. It has the status of both a city and a state. Addis Ababa has eleven sub-cities at which the City lies at an altitude of 7,546 feet (2,300 metres). The city is surrounded by Oromia special zones in all directions. The city has 13 governmental hospitals. Six hospitals owned by Addis Ababa health bureau, four by federal ministry of health (FMOH), one is under ministry of education (Addis Ababa university), two by defense force according to Addis Ababa health office. From the 13 governmental hospitals four of them Tikur Anbessa specialized hospital, Gandhi memorial hospital, Zewuditu hospital and Menelik II hospital are selected by simple random sampling. All these hospitals give NICU service. (24)

4.2. Study design and period

An institutional based retrospective cross-sectional study design was employed to collect data from charts of neonates admitted from January 1 2018 to Jan 1, 2021. The study was conducted from Jan 25-March 30 2021.

4.3. Populations`

4.3.1. Source population

All neonates admitted in NICU of governmental hospitals in Addis Ababa.

4.3.2. Study population

All neonates admitted in NICU of selected governmental hospitals from January 1, 2018 to Jan 1, 2021.

4.3.3. Sample population

Selected neonates who were admitted in NICU of selected governmental hospitals from January 1, 2018 to Jan 1, 2021 that fulfill Eligibility criteria.

4.3.4 study unit

Each selected neonatal cards of neonates who were admitted in NICU of selected governmental hospitals from January 1,2018 to Jan 1,2021 which fulfill the eligibility criteria.

4.4. Sample size Determination and Sampling Procedure

4.4.1. Sample size Determination

A single population proportion formula was used to calculate the sample with the following assumption: - p = proportion of neonates with meconium aspiration syndrome (22) 19.9% and by considering 95% confidence interval (CI) with level of precision $Z_{\alpha/2}=1.96$, p value 0.05, margin of error 0.05 and $q = 1-p$

$$n = \frac{(Z_{\alpha/2})^2 p * q}{d^2}$$

d^2

$$n = \frac{(1.96)^2(0.199)(0.801)}{(0.05)^2}$$

$$(0.05)^2$$

n= 244

by adding 10% non-respondent (by considering lost or incomplete sheets) the final sample size was estimated to be 268.

4.4.2. Sampling Procedure

Study populations was selected from charts of four randomly selected public hospitals in Addis Ababa having NICU by using simple random selection technique. To get the study participants , first the total number of neonates who were admitted from January 1,2018 to Jan 1,2021 were obtained from each hospital. And sampling units was selected from each hospital by allocating the total sample proportionately. Then the study units were determined by systematic random sampling technique after getting the sampling frame from the institutional list. Separate k interval has calculated to select sampling unit from each selected hospital as follows. Then the study units were determined by systematic random sampling technique after getting the sampling frame from the institutional lists. Separate K-interval was calculated to select sampling units from each selected hospitals.

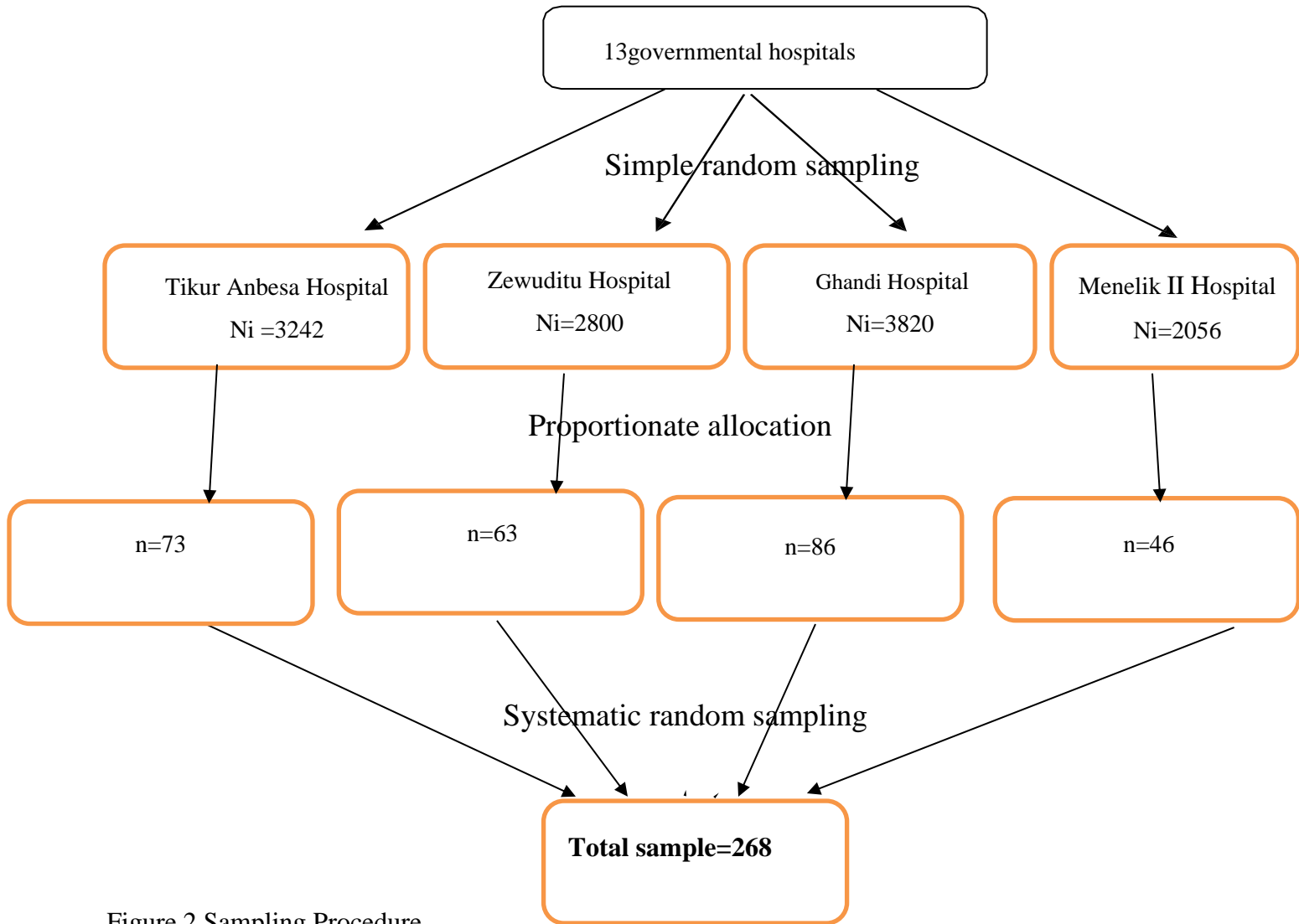


Figure 2.Sampling Procedure

4.5. Eligibility criteria

4.5.1. Inclusion criteria

All neonates who were admitted in NICU from January 1,2018toJan1, 2021.and whose medical charts contained at least patient identification maternal and neonatal birth history, medical diagnosis of neonate.

4.5.2. Exclusion criteria

Neonates who were referred from one to another of selected hospitals for the study to avoid the chance of repetition.

4.6. Study variables

4.6.1. Dependent variable

- Meconium aspiration syndrome

4.6.2. Independent variables

Sociodemographic characteristics of the neonate and the mother (Maternal age, Residence maternal occupation, Household income, Maternal education, Newborn sex and Neonatal Age at admission).

Neonatal factors (Birth weight, Gestational age, APGAR score, neonatal Medical problems, Multiple gestation, Congenital abnormalities, Initiation of breast feeding health professional's delivery room performance for new born, Neonatal complication secondary to MAS and Respiratory distress at birth).

Maternal factors (Gravidity, Parity, ANC follow up, Maternal problems, Time of ROM, induction or augmentation, Duration of labor, Mode of delivery, Place of delivery and Birth attendant).

4.7. Operational definitions

Incomplete sheet: it is a neonatal card that does not contain at least patient identification maternal and neonatal birth history medical diagnosis of neonate.

4.8. Data collection tools and procedures

Check list was adopted and modified from literatures (12, 22, 23) to collect data. Data was collected through record review using pre-tested structured check lists. The tool involves three sections. Section I involves questions about socio demographic characteristics of the mother and neonate, Section II involves questions neonatal factors and Section III involves questions related to maternal factor. Four health professionals with BSc degree and two supervisors with MSc degree who are working at NICUs from other hospitals out of the study units were recruited as data collectors. Charts was retrieved using the patient's registration number which is found in the electronic system data base and one data clerk in each hospital supports them by identifying the charts. Necessary data was extracted by

reviewing patient's cards.

4.9. Data quality assurance

The data collection process was guided by a chart review to gather information from card/charts of neonates. Data was checked for completeness every day and entered into computer. Four Bachelor of Science (BSC) nurses were recruited as data collector and were trained for one day, and the sampling procedures were also elucidated to them (Annex II). Pretest was done on 5% of the sample at hospital which is out of the study site. Data cleaning was done using Epi data manager version 4.2.0.0 software during data entry.

4.10. Data processing and Analysis

The data was entered into statistical software Epi Data version 3.1 upon creating the questionnaire template in the QES file of the software. The entered data was subjected to cleaning using simple frequency and tabulation to ensure the validity of the data. Then, the analysis was made with IBM SPSS version 24 after exporting the prepared data. Descriptive statistics such as frequency distribution was computed to describe the major variables of the study. Data was processed by carrying out simple descriptive statistics (mean and standard deviation) and frequency with percentage distribution. Significant variables at ($P < 0.25$) detected at bivariate level was subsequently entered into Multivariate Logistic Regression model to control for possible confounding variables and to examine association. Significant association was declared at p value less than or equal to 0.05. Strength of association was expressed using Odds Ratio (OR).

4.11. Ethical clearance

Ethical clearance for the start of the study was obtained from Research Ethical Committee of the school of nursing and midwifery, Addis Ababa University. Written informed consent was obtained from medical director of each hospital after a detailed explanation on the purpose and benefit of the study right before the data collection. After getting cooperativeness letter from medical director of each hospital, the department of neonatal intensive care unit was requested to confirm the applicability of study and gave the final permission.

No personal identifiers were used on the data collection form. The recorded data will not be accessed by a third person except the principal investigator and will be kept locked.

4.12. Dissemination of the result

The thesis will be submitted to Addis Ababa University, college of health science, school of nursing and midwifery and selected governmental hospitals. The paper will also be disseminated to concerned body accordingly. Attempts will be made to present the finding at national and international conference. Finally, efforts will be made to get this paper published in reputable and peer-reviewed journal

4. RESULT

5.1. Socio demographic characteristics of the mothers and neonates

A total of 268 neonatal charts were reviewed in the four selected governmental hospitals and there was no incomplete sheet or missed cards from the selected sample neonates. From total included participants nearly three fourth of neonates, 175 (65.3%) were born from mothers with a mean age of 27.2 years.

More than half of the neonates, 155(57.8%) were male and Majority of the neonates, 216(80.6%) were born in health institution with a skilled health professional and nearly all neonates, 254(94%) were born in urban residency mothers. From a total 268 nearly half of them, 119(44.4%) were in age range of up to three days and about 117(43.6%) were between three to seventh days.

Table 1. Socio demographic characteristics for neonates and mothers at NICU of selected governmental hospitals in Addis Ababa, Ethiopia, 2021

S.no	Variable		Frequency	Percent
1	Maternal age	<19 years	6	2.2
		20-29 years	175	65.3
		30-34 years	49	18.3
		35-39 years	33	12.3
		>=40 years	5	1.9
2	Sex	Male	155	57.8
		Female	113	42.2
3	Residency	Urban	254	94.8
		Rural	14	5.2
4	Place of delivery	Healthcenter	46	17.2
		Governmental hospital	216	80.6
		Privatehospital	3	1.1
5	Birth attendant	Skilledhealth professional	263	98.1
		Healthextension worker	2	.7
		Untrainedbirth attendant	3	1.1
6	Age of neonate	Up to three days	119	44.40
		3to 7 days	32	11.94
		7 days and above	117	43.66

5.2. Neonatal characteristics

Out of the total samples three fourth of neonates, 253 (75.7%) were born as term while 25(9.3%) of them as post term and less than one fifth of neonates, 27(10.1%) was born with birth defect. For

neonates whose APGAR score done nearly half of the neonates,114(48.3%) had a first minute APGAR score of greater than 7 and more than three fourth, 179(75.9%) had fifth minute APGAR score of greater than 7and only 2 (0.8%) had less than three. Of included samples about three fourth of them,186(69.4%) was on oxygen treatment.

Table 2. Neonatal characteristics for neonates and mothers at NICU of selected governmental hospitals in Addis Ababa, Ethiopia, 2021.

S.no	Variable		Frequency	Percent
1	Was APGAR score done	Yes	236	88.1
		No	32	11.9
2	First minute APGAR score	<=3	9	3.8
		4-6	113	47.9
		7-10	114	48.3
3	Fifth minute APGAR score	<=3	2	0.8
		4-6	55	23.3
		7-10	179	75.9
4	Gestational age	pre term	40	14.9
		Term	203	75.7
		post term	25	9.3
5	Was the current pregnancy multiple	Yes	15	5.6
		No	253	94.4
6	Birth defect or congenital anomaly	Yes	27	10.1
		No	241	89.9
7	Oxygen treatment	Yes	186	69.4
		No	82	30.6

5.3. Maternal characteristics

From the total samples only 123(6.7%) of mothers was multigravida and nearly half123(45.9%) of them were primigravida's. furthermore, 244(91%) of mothers had ANC follow up and of these almost all, 241 (98.7%) had full followed up during their pregnancy. During their ANC follow up, 232(91.8%) were diagnosed as RH positive and about 7.8% diagnosed as having medical problem during pregnancy with leading medical problem diabetes followed by HIAIDS 42.8% and 38% respectively.

From all mothers of neonates 11.9% of mothers were diagnosed as having pregnancy related complication with the leading complication of pregnancy related hypertension.

Table 3. Maternal characteristics of neonates in Addis Ababa city at NICU of selected governmental hospitals 2021.

S.no	Variable		Frequency	Percent
1	Gravidity	<=1	123	45.9
		2-4	127	47.4
		>=5	18	6.7
2	Antenatal care follow-up	Yes	244	91.0
		No	24	9.0
3	ANC frequency	less than 4	3	1.2
		4 and above	241	98.7
4	Was the mothers had been diagnosed with preexisting medical problem during pregnancy	Yes	21	7.8
		No	247	92.2
5	Diabetes	Yes	9	3.4
		No	259	96.6
6	HIV ADIS	Yes	8	3.0
		No	260	97.0
7	Cardiac disease	No	268	100.0
8	Other pre existing maternal medical problems	Yes	4	1.5
		No	264	98.5
9	Mothers blood group	A	58	21.6
		B	59	22.0
		AB	38	14.2
		O	103	38.4
		unknown	10	3.7
10	Rh factor	positive	232	91.8
		negative	26	11.2
11	Pregnancy complication	Yes	32	11.9
		No	236	88.1
12	Abruption placenta	yes	4	1.5

		No	264	98.5
13	Pregnancy induced hypertension	yes	10	3.7
		No	258	96.3
14	Chronic hypertension	No	268	100.0
15	Placenta previa	yes	1	.4
		No	267	99.6
16	Amniotic fluid related problem	yes	11	4.1
		No	257	95.9
17	Intrauterine growth restriction	yes	2	.7
		No	266	99.3
18	Anemia	yes	1	.4
		No	267	99.6
19	Other	yes	5	1.9
		No	263	98.1

5.4Other maternal characteristics

In this study of 268 mothers of neonate's rupture of membrane in more than half of mothers of neonates was intrapartaland nearly one fifth of them was PPRM. For about 257(95.9%) of mother's ROM was occurred spontaneously, about 7.8% of mothers was induced and nearly three fourth of the mothers 176 (65.7%) was delivered through SVD and more than half of the mothers, 141 (52.6%) had taken intrapartum antibiotics.

Table 4. Other maternal characteristics of neonates in Addis Ababa city at NICU of selected governmental hospitals 2021.

S.no	Variable		Frequency	Percent
1	Time of rapture of membrane	PPROM	33	12.3
		PROM	97	36.2
		intrapartal or within one hour	138	51.5
2	How rapture of membrane was occurred	Spontaneously	257	95.9
		ARM	11	4.1
3	Was the mother induced	Yes	21	7.8
		No	247	92.2
4	Was the mother augmented	Yes	2	.7
		No	266	99.3
5	Use of intrapartum antibiotics	Yes	141	52.6
		No	127	47.4
6	Mode of delivery for this pregnancy	spontaneous vaginal delivery	176	65.7
		cesarean section	84	31.3
		Instrumental	8	3.0

5.5 Prevalence of MAS

According to this study from enrolled 268 neonates the overall prevalence of meconium aspiration syndrome was eighty (30.6%) and 188 (69.4%) of them had no MAS.

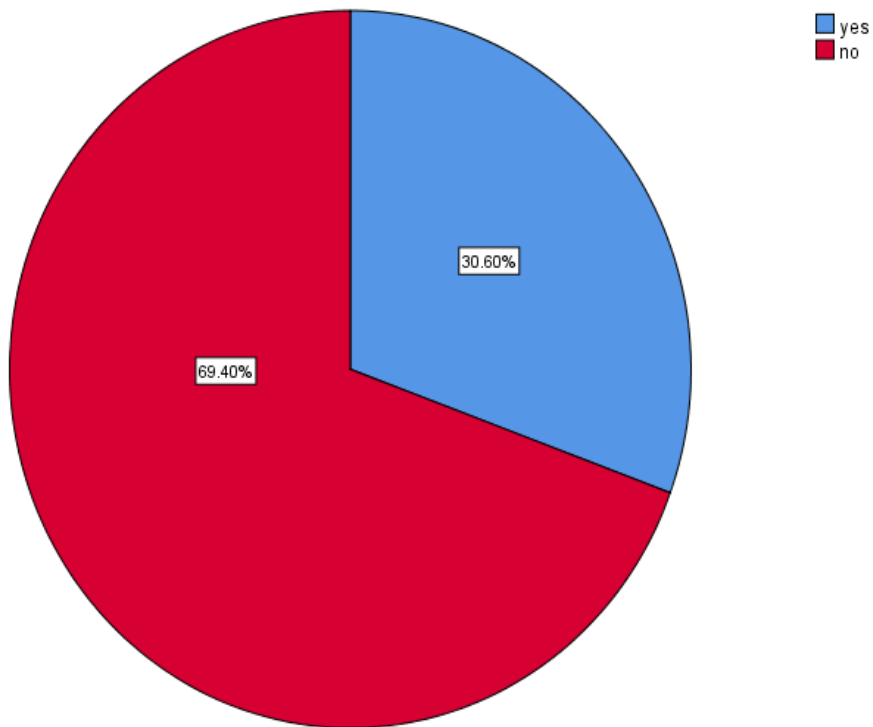


Figure 3 Prevalence of meconium aspiration syndrome among neonates admitted in public hospitals of Addis Ababa city at NICU of selected governmental hospitals 2021.

5.6. Factors associated with presence of meconium aspiration syndrome

On bivariate analysis, factors from socio-demographic neonatal age, from maternal factor gravidity, parity, presence of other medical complication, duration of labor and maternal blood group ad from

neonatal factor gestational age birth weight, first minute APGAR score and breast feeding at first one hour were significantly associated with the outcome variable.

Out of the twelve associated risk factors found on bivariate analysis, being post term (Adj OR=17.548 95% CI (2.894,106.413)), first minute APGAR score of 7-10 (Adj OR=17.548 95% CI (2.894,106.413)), duration of labor from 12-24 hour (Adj OR=4.98 95% CI (1.677, 14.792)) and maternal blood group of AB (Adj OR=0.118 95% CI (0.029, 0.470)) were found as an independent associated risk factors for meconium aspiration syndrome after controlling for multiple potential confounders.

Table 5. bi variate and multi variate association of meconium aspiration syndrome and independent factors

Variables		Prevalence of MAS		COR (95% CI)	AOR (95% CI)	P-value
		Yes	No			
Gestational age	Preterm	5	35	1	1	
	Term	60	143	2.937(1.098,7.860)	2.016(.536, 7.592)	.300
	Post term	17	8	14.875(4.225,52.370)	17.548(2.894,106.413) *	.002
Neonatal age	Up to three days	45	74	1.615(.932,2.800)	1	
	3-7 days	5	27	.492(.174,1.388)	1	
	7 days and above	32	85	1	1	
Birth weight	<1500 gram	3	16	1	1	
	15001-2499 gram	5	45	.593(.127,2.767)	1	
	2500-3999 gram	71	115	3.293(.926,11.703)	1	
	>=4000 gram	3	10	1.600(.269,9.533)	1	
First minute APGAR score	<=3	5	4	.1	1	
	4-6	49	64	.612(.156,2.402)	.546(.110,2.707)	.459
	7-10	21	93	.181(.045,.731)	.093(.017,.504) *	.006
Gravidity	<=1	45	78	1	1	
	2-4	30	97	.536(.309,.929)	1	
	>=5	7	11	1.103(.399,3.047)	1	
Parity	<=1	50	88	1.894(.498,7.205)	1	
	2-4	29	88	1.098(.283,4.266)	1	
	>=5	3	10	1	1	
Presence of other medical complication	Yes	59	147	.681(.375,1.237)	1	
	No	23	39	1	1	
Respiratory distress at birth	Yes	55	99	1.790(1.0403,0.82)	1	
	No	27	87	1	1	
Delivery room performance	Routine newborn care	45	121	.653(.385, 1.109)	1	
	Oropharyngeal aspiration	37	65	1	1	
Duration of labor	<=6 hours	12	49	1	1	
	6-12 hrs	35	93	1.537(.732,3.225)	1.038(.376,2.861)	.943
	12-24 hrs	33	39	3.455(1.579,7.562)	4.980(1.677,14.792) *	.004
	>=24 hrs	2	5	1.633(.282,9.467)	.501(.052,4.850)	.551
Breast feeding at the first one hour	Yes	65	161	.594(.301,1.1722)	1	
	No	17	25	1	1	
Maternal blood group	A	23	35	1	1	
	B	18	41	.668(.311,1.434)	.543(.190,1.550)	.254
	AB	6	32	.285(.103,.790)	.118(.029,.470) *	.002
	O	32	71	.686(.350,1.342)	.551(.223,1.360)	.196
	Unknown	3	7	.652(.153,2.784)	1.238(.152,10.108)	.842

*- significant

6. DISCUSSION

According to different studies there is marked improvement in neonatal morbidity and mortality associated with MAS due an advancement of practice towards maternal obstetric and neonatal health care practice but target had not reached. Neonates are exposed to meconium aspiration syndrome and death since they are vulnerable to congenital malformation, environmental change, maternal and neonatal complications in neonatal period several contributing factors involved for MAS. This study assesses the prevalence of meconium aspiration syndrome and determines its predicting factors.

According to this study the prevalence of meconium aspiration syndrome is 30.6 %. This result is higher when compared with the study done in Jimma in which the prevalence of meconium aspiration syndrome was 19.9% (22). This may be reasoned as this study is done in different sites referral and tertiary hospitals in which the likely hood for referral of complicated case is higher and such studies cover large study area.

In this study, those newborns with first minute APGAR score of 7-10 are less likely to develop meconium aspiration syndrome which is similar with the study conducted in jimma Ethiopia in which new-borns with first minute Apgar score <7 had three times increased risk of MAS and the study done in Anantapuramu. In Andhra pradesh sixty-nine percent had an Apgar score < 7 at 1 minute and 23.6 % an Apgar score < 7 at 5 minutes and on the study done in India the mortality in MAS cases was significantly low at five minute APGAR score (22,19,18). It is because the severity of meconium aspiration syndrome is high in those neonates with low APGAR score and as an increase in APGAR score there will be low prevalence of MAS. This shows that those neonates who had good APGAR has better chance to survive and less likely to have MAS and related complications.

In this study being post term is positively related with prevalence of meconium aspiration syndrome than those neonates who are post term are 17.7 times more likely to develop meconium aspiration syndrome and the study done at tertiary hospital of northwest Ethiopia also showed on MAS prevalence to a positive association with post term pregnancy (4.5, times more likely to develop MAS(23). This may be because of that physiological induced changes and risks after the fetus gets greater than 40 weeks. Meconium aspiration syndrome is developmentally mechanized event and its passage after 40 weeks of gestations has been credited to gastrointestinal advancement and

aspiration of meconium in to amniotic fluid can be occurs when fetus gasps or during first breaths of newborn after delivery. So as the fetus gets 40weeks and above there will be gastro intestinal system advancement and the fetus will have the chanceto develop meconium aspiration syndrome. So being post term had a negative effect on neonate.

In this study those neonates whose mothers with a duration of labor 12-24 hr. were 4.9 times more likely to develop meconium aspiration syndrome and this finding is supported by the study done at tertiary hospital of northwest Ethiopiaas time of labor increases there will be a high chance of developing meconium aspiration syndrome and the study showed those neonates of mothers with duration of labor more than 15 hours 2.83 are more likely to develop meconium aspiration syndrome. this may be because of that as duration of labor increases there will be an increasing stressing factors for neonates which are the reason for passing meconium which resulted in the chance for aspirating meconium. So duration of labor increases the chance of MAS also increase and those risky neonates least for the first 24 hours, risky neonates especially infants born with meconium-stained amniotic fluid and those delivered from mothers with prolonged labor should be monitored for any signs of respiratory distress. (23).

This study also showed that neonates whose mothers blood group AB are 0.11 times less likely to develop meconium aspiration syndrome as compared to others but other literatures had not related development meconium aspiration syndrome with AB maternal blood group and this may be made this research exceptional and physiologically neonates of mothers with AB blood group may had risk for MAS.

7. STRENGTH AND LIMITATION OF THE STUDY

3. Strengths

Since study was conducted on secondary data of admitted neonates it was easy to get documented neonatal medical, surgical problems or other important predictors which are diagnosed during hospital stay.

Data were collected by health professionals working in NICU which had an important role in the quality of the data.

4. Limitations:

Despite the effort made to do this thesis it was difficult to get important socio demographic predictors like maternal educational status and occupation, house hold income because it had not documented this information on nursing care plan.

It was also difficult to collect the data as usual because of novel covid19 which restricts the data collectors to go to hospital and to travel by taxi.

8. CONCLUSION AND RECOMMENDATION

8.1. Conclusion

According to this study the prevalence of meconium aspiration syndrome was high (30.6%). Factors associated with meconium aspiration syndrome were post term, first minute APGAR score of 7-10, duration of labor from 12-24 hour and maternal blood group of AB. Being post term and prolonged labor was significant and highly likely to have meconium aspiration syndrome.

8.2. Recommendation

Federal ministry of health should focus on standardizing NICU facility including oxygen management protocol in order to minimize MAS related neonatal mortality.

All health professionals should have awareness towards following risky neonates at least for the first 24 hours, especially infants born with meconium-stained amniotic fluid and those delivered from mothers with prolonged labor should be monitored for any signs of respiratory distress and delivery is better to be initiated before 40 weeks of gestation.

Further researches are intended to be done via prospective study with the same title.

Further predictors of MAS need to be studied with prospective study design.

NICU nurse should fill nursing care plan properly to get necessary personal information.

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10. ANNEXS

Annex1: Information sheet

Title of the Research Project:To assess prevalence and associated factors of meconium aspiration syndrome among neonates admitted in governmental hospitals in Addis Ababa Ethiopia 2021. retrospective cross-sectional study

Name of Investigator: Soliyana Mihret (BSc in Nursing)

Name of the Organization: Addis Ababa University, College of health science, school of nursing and midwifery and department of nursing.

Name of the Sponsor: Addis Ababa University.

Introduction: This information sheet will be prepared for administration and NICU coordinating offices of selected governmental hospitals in Addis Ababa. The aim of the form is to make the above-concerned offices clear about the purpose of research, data collection procedures and get permission to conduct the research.

Purpose of the Research Project: To determine prevalence and associated factors of meconium aspiration syndrome among neonates admitted in governmental hospitals in Addis Ababa Ethiopia 2021. retrospective cross-sectional study.

Procedure: In order to achieve the above objective, information which is necessary for the study was taken from neonatal medical record form.

Risk and/or Discomfort: Since the study will be conducted by taking appropriate information from medical chart, it does not inflict any harm on the patients. The name or any other identifying information will not be recorded on the questionnaire and all information will be taken from the chart was kept strictly confidential and in a safe place. The information retrieved will only use for the study purpose.

Benefits: The research has no direct benefit for one whose document/record is included in this research and already died. But it could have indirect benefit for other clients in the program. This is because if program planners are preparing predicted plan there is a benefit for clients in the program of getting appropriate care and treatment services for those survived and other newly born ones. In all, the research work has a paramount direct benefit for healthcare planners and managers.

Confidentiality: To assure confidentiality the data on the chart will be collected without the name of the clients and the information collected from this research project will be kept confidential and stored in a file cabinet. In addition, it will not be revealed to anyone except the investigator and it will be kept in a key and locked system with computer pass word.

Person to contact: This research project will be reviewed and approved by the institutional review board of College of Health Science, school of nursing and midwifery and department of nursing, Addis Ababa University. If you have any question you can contact any of the following individuals (Investigator and Advisors) and you may ask at any time you want.

1. soliyamihret, Addis Ababa University, College of Health Science, school of Nursing and midwifery and Department of Nursing: principal investigator

Cellphone: +251-912650689, E-mail: solikikoget@gmail.com,

Annex2:Datacollectionchecklist

Code-----

Table 6. A checklist to assess the prevalence and associated factors of MAS in neonates admitted at NICU from 2018-2021 in selected governmental hospitals in Addis Ababa Ethiopia, 2021.

s.no	Section 1.sociodemographic factors of Neonateand mother	Possible choices
101	Maternal agein years	-----years
102	Residence	1.urban 2.rural
103	Maternal education	1. Illiterate 2. Primary 3. Secondary 4. Diploma 5. Degree and above
104	Maternal occupation	1. Housewife 2. Governmental employee 3. Private worker 4. Other
105	Household income	
106	Ageofneonate	-----days
107	Sex of neonate	1. Male 2. Female
108	Placeofdelivery	1. Health center 2. Governmental hospital 3. Private hospital 4. Home 5. Other
109	Birth attendant	1. Skilledhealthprofessional 2. Healthextensionworker 3. Untrainedbirthattendant

		4. Other
Section 2. neonatal factors		
201	Gestational age	1. preterm 2. term
202	Birth weight	-----grams
203	Was APGAR scoredone	1. Yes 2. No
204	If yes for question no 203 what was 1 st minute and 5 th minute APGAR score	1 st minute..... 5 th minute.....
205	Was the current pregnancy multiple (twin?)	1. Yes 2. No
206	Does the newborn had birth defect or any Congenital anomalies?	1. Yes 2. No
207	If yes for question no 206 which birth defect or Congenital anomalies does the child had	1. Neural tube defect 2. Congenital heart disease 3. Omphalocele 4. TEF 5. Gastroschiasis 6. Down syndrome 7. Other specify
208	Was the neonate been diagnosed with MAS	1. Yes 2. No

209	Was there any other medical complication that was the medical diagnosis?	<ol style="list-style-type: none"> 1. no complication 2. Pneumothorax 3. Intracranial hemorrhage 4. Oliguria
-----	--------------------------------------------------------------------------	--------------------------------------------------------------------------------------------------------------------------------------------------------

		<ol style="list-style-type: none"> 7. other specify 8. death
--	--	--------------------------------------------------------------------------------------

210	If yes for Q-211 which one?	<ol style="list-style-type: none"> 1. Jaundice 2. Perinatal Asphyxia 3. Hypoglycemia 4. Hypothermia 5. Sepsis 6. Others
-----	-----------------------------	-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

211	Was the newborn resuscitated	<ol style="list-style-type: none"> 1. YES 2. NO
-----	------------------------------	-------------------------------------------------------------------------

212	Health professionals Delivery room performance For new born	1. Routine new born care 2. Oropharyngeal aspiration
213	Was the neonate been on oxygen treatment at birth?	1. Yes 2. No
	Was the neonate initiated breastfeed within 1hr.?	1. yes 2. no
Section 3. Maternal factors		
301	No of Gravidity	-----
302	No of Parity	-----
303	Inter pregnancy interval < 2 years	1. Yes 2. No
304	Does the mother have ANC follow up?	1. Yes 2. No
305	If yes for Q-304 how many times?
306	Which medical problem had the mother been diagnosed during pregnancy?	1. Yes 2. No
307	If yes for question no 306 which medical problem does the mother has?	1. Diabetes 2. HIV/AIDS 3. Cardiac diseases 4. Other specify.....

308	What was mothers blood group?	<ol style="list-style-type: none"> 1.A 2. B 3.AB 4. O 5.unknown
309	What was mothers RH?	<ol style="list-style-type: none"> 1.postive 2. negative
311	Was mother had been diagnosed with preexisting medical pregnancy	<ol style="list-style-type: none"> 1. Yes 2. No
312	If yes, for Q-311 Which among the following the mother had diagnosed?	<ol style="list-style-type: none"> 1. Abruptio placenta 2. Pregnancy induced hypertension 3. Chronic hypertension 4. Placenta previa 5. Amniotic fluid related problem 6. Other....
313	What was Time of ROM?	<ol style="list-style-type: none"> 1. PPROM 2. PROM 3. INTRAPARTAL
314	How ROM was occurred?	<ol style="list-style-type: none"> 1. Spontaneously 2. ARM

315	Was the mother induced?	1. Yes
316	Was the mother augmented?	1. Yes 2. No
317	Duration of labor	-----hours
318	Use of intrapartum antibiotics	1. Yes 2. No

319	What was her mode of delivery for this pregnancy?	<ul style="list-style-type: none"> 1.spontaneousvaginaldelivery 2.cesarean section 3. Instrumental
320	If the answer for Q 321 is 2 what was the indication?	<ul style="list-style-type: none"> 1. CPD 2. NRFHRP 3. Failed instrumentaldelivery 4. ElectiveC/S 5. Others....
321	If the answer for Q 322 is 3 what was the indication?	<ul style="list-style-type: none"> 1. Poor maternal uterine contraction 2. Failuretoprogress 3. Prolonged2ndstageoflabor 4. Otherspecify

Annex3: Training module for data collectors and supervisors

Instruction

Identify target chart to be checked.

Procedures to be followed during extraction of data from the chart.

When to collect data/safe time.

When to start data collection and when to end (total period).

II. Methods of training

Passthroughtheinstrumentordatacollectiontoolwithdatacollectorstopointout specific instructions.

Provide an example of a completed instrument for the data collectors.

Allow data collectors to practice with the tools

Table 7. training module manual

Data collection method	Data collector and supervisors	Training needs	Training activities
Orinstruction			
Chart review	BSc Nurses	observation and distribution techniques Howto follow and feel theinstrument	Observation instruction Howto collect data Trainer observation practice

APPENDIX4:APPROVALSHEET
ADDIS ABABA UNIVERSITYCOLLEGE OF
HEALTH SCIENCES SCHOOL OF
NURSING AND MIDWIFERY
DEPARTMENT OF NURSING GRADUATE STUDIES
APPROVAL BY THE BOARD OF EXAMINATION

This thesis by Soliyana Mihret is accepted in its present form by the board of examiners as satisfying thesis requirement for the degree of masters in pediatrics and child health nursing.

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