FACTORS INFLUENCING MECONIUM STAINED AMNIOTIC FLUID (MSAF)
DELIVERY OUTCOMES AT RIDGE HOSPITAL, ACCRA

BY
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LEGON IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE
AWARD OF MASTER OF PUBLIC HEALTH (MPH) DEGREE

JULY, 2017
DECLARATION

I, ALEXANDER BALINIA ADDA hereby declare that with the exception of the references made to other peoples’ work which I have duly acknowledged, this proposal which is my original work has neither in whole nor in part been presented to the University or elsewhere for another degree.

Signature ........................................

Date ..................................................

(ALEXANDER BALINIA ADDA)
(Principal Investigator)

Signature ........................................

Date ..................................................

Dr. Genevieve Cecilia Aryeetey
(Supervisor)
DEDICATION

I dedicate this thesis to my mother Mrs. Nelly N. Adda for her continuous support and believe in me.
ACKNOWLEDGEMENT

Indeed He who began a good work in me will bring it to an expected end; thanks to God almighty for His faithfulness through it all and great appreciation to my supervisor for the patience and knowledge impacted.

Great appreciations to Ridge Hospital especially Dr. Emmanuel Srofenyo the Acting Medical Director and Dr. Adeyemi Olufolabi of Kybele Worldwide, I am also most grateful to Ms. Rabi and her team at Ridge hospital Obstetrics and Gynecology Reception and data entry team for their assistance all throughout the data extraction period.
ABSTRACT

Introduction: The incidence of meconium in amniotic fluid (MAF) is between 10% and 16% of full-term births of women considered to be at normal risk. Meconium Aspiration Syndrome (MAS) is a complication present in MAF and constitutes an important cause of perinatal mortality.

Objectives: The study was to determine the factors influencing meconium stained amniotic fluid deliveries outcomes. Specifically, the study sought to assess factors influencing fetal outcomes of Meconium Stained Amniotic Fluid (MSAF) deliveries at the Greater Accra Regional hospital.

Methods: The study made use of a retrospective design. Similarly, mothers who had delivered at Accra Regional Hospital from June 2015 to June 2016 were selected from the records at the Department of Obstetrics and Gynecology. The Statistical Package for Social Sciences (SPSS) was used. More precisely, descriptive statistics of percentages and frequencies and inferential statistics of logistic regression were used.

Results: The results of the study revealed that most deliveries with the diagnosis of MSAF were grade three. Additionally, out of 7816 deliveries, only 8% was diagnosed with MSAF. Patients with gestational age of 38-42 (term) and greater than 42 (post term) had a statistically significant lower odds to have MSAF deliveries than patients with a gestational age of less than 38 (pre-term). In addition, as gravidity increases, the odds of having MSAF delivery decrease. Patients who were referred had a lower odds of MSAF delivery than patients who were clients of Accra Regional Hospital.

Recommendation: The study recommends that Ghana Health Services should ensure that Accra Regional Hospital put measures in place to enforce the referral policy of the service and to put in place measures to ensure that the occurrence of MSAF deliveries and associated consequences are reduced and future studies on this topic should include other hospital facilities to help make a better generalization of the results.
# TABLE OF CONTENTS

DECLARATION ........................................................................................................... i  
DEDICATION .............................................................................................................. ii  
ACKNOWLEDGEMENT ........................................................................................... iii  
ABSTRACT ................................................................................................................. iv  
LIST OF TABLES ...................................................................................................... v  
LIST OF FIGURES ................................................................................................... viii  
LIST OF ABBREVIATIONS ...................................................................................... ix  
DEFINITION OF TERMS ............................................................................................ x  

CHAPTER ONE .............................................................................................................. 1  
INTRODUCTION ......................................................................................................... 1  
1.1 Background to the study ....................................................................................... 1  
1.2 Problem Statement ............................................................................................... 3  
1.3 Justification .......................................................................................................... 4  
1.4 Objectives of the Study ........................................................................................ 5  
1.4.1 General Objective .......................................................................................... 5  
1.4.2 Specific Objectives ........................................................................................ 5  
1.4.3. Research Questions....................................................................................... 5  

CHAPTER TWO ........................................................................................................... 6  
LITERATURE REVIEW .............................................................................................. 6  
2.0 Introduction .......................................................................................................... 6  
2.1 Definition of Meconium Stained Amniotic Fluid (MSAF) .................................. 6  
2.2 Overview of Meconium Stained Amniotic Fluid Deliveries ............................... 7  
2.3 The effect of Meconium Stained Amniotic Fluid (MSAF) on mother and fetus 8  
2.4 The proportion or Incidence of deliveries diagnosed with Meconium Stained  
   Amniotic Fluid (MSAF) ........................................................................................... 10  
2.5 Proportion of Deliveries Diagnosed With Meconium Stained Amniotic Fluid .... 14  
2.6 Patient Level Factors Influencing Meconium Stained Fluid Deliveries ..........16  
2.7 Service Factors Influencing Meconium Stained Amniotic Fluid Deliveries ....... 19  
2.8 Conceptual Framework ...................................................................................... 22  

CHAPTER THREE ..................................................................................................... 23  
METHODS .................................................................................................................. 23  
3.1 Introduction ........................................................................................................ 23  
3.2 Study Design ...................................................................................................... 23  
3.3 Study Area .......................................................................................................... 23  
3.4 Variables ............................................................................................................. 24  
3.5 Study population ................................................................................................ 24  
3.6 Sample Size and Sampling strategy ................................................................... 24  
3.7 Case Definition ................................................................................................ 24  
3.7.1 Inclusion Criteria ........................................................................................... 24
LIST OF TABLES

Table 4.1: Patient level characteristic ................................................................................. 28
Table 4.2: Gravidity Level ......................................................................................................... 29
Table 4.3: History of antenatal ................................................................................................. 30
Table 4.4: Gestation age ............................................................................................................ 30
Table 4.5: Delivery method ....................................................................................................... 32
Table 4.6: Referral ..................................................................................................................... 32
Table 4.7: Grades of Meconium ............................................................................................... 33
Table 4.8: Percent distribution of meconium presents by patient characteristics ............... 35
Table 4.9: Gestational Age ....................................................................................................... 36
Table 4.10: Parity of meconium present .................................................................................. 37
Table 4.11: Gravidity ............................................................................................................... 38
Table 4.12: Logistics regression (patient level factor and presence of meconium) .......... 39
Table 4.13: Per cent distribution of meconium presence by service level characteristics ........................................................................................................ 40
Table 4.14: Delivery and meconium present .......................................................................... 41
Table 4.15: Logistics regression (service level factor and presence of meconium) ........... 42
LIST OF FIGURES

Figure 2.1: Conceptual Framework indicating factors influencing foetal outcomes of Meconium Stained Amniotic Fluid (MSAF) deliveries................................. 22

Figure 4.2: Parity level........................................................................................................ 28

Figure 4.3: Gravidity level.................................................................................................. 29

Figure 4.4: Patient history of antenatal............................................................................ 30

Figure 4.5: Gestation age ................................................................................................. 31

Figure 4.6: Delivery methods .......................................................................................... 32

Figure 4.7: Referral Cases............................................................................................... 33

Figure 4.8: Meconium grades ......................................................................................... 34

Figure 4.9: Percentage of MSAF .................................................................................... 34

Figure 4.10: Patients age ................................................................................................ 35

Figure 4.11: Gestational Age .......................................................................................... 36

Figure 4.12: Parity of meconium present ...................................................................... 37

Figure 4.13: Gravidity .................................................................................................... 38

Figure 4.14: Meconium Present ...................................................................................... 40

Figure 4.15: Delivery and meconium present ................................................................. 41
# LIST OF ABBREVIATIONS

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSAF</td>
<td>Meconium Stained Amniotic Fluid</td>
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<tr>
<td>MAS</td>
<td>Meconium Asphyxia Syndrome</td>
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<td>WHO</td>
<td>World Health Organizations</td>
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<td>NHI</td>
<td>National Health Insurance</td>
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<td>UNICEF</td>
<td>United Nations International Children’s Emergency Fund</td>
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<td>UNFPA</td>
<td>United Nations Population Fund</td>
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<tr>
<td>EDD</td>
<td>Expected date of delivery</td>
</tr>
<tr>
<td>EGA</td>
<td>Estimated Gestational Age</td>
</tr>
<tr>
<td>BP</td>
<td>Blood Pressure</td>
</tr>
<tr>
<td>NICU</td>
<td>Neonatal Intensive Care Unit</td>
</tr>
<tr>
<td>MSL</td>
<td>Meconium Stained Liquor</td>
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<td>Gr.</td>
<td>Grade</td>
</tr>
<tr>
<td>Pt</td>
<td>Patient</td>
</tr>
<tr>
<td>P</td>
<td>Pulse</td>
</tr>
<tr>
<td>C/S</td>
<td>Caesarean Section</td>
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<tr>
<td>BTL</td>
<td>Bilateral Tubal Ligation</td>
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<td>SVD</td>
<td>Spontaneous Vaginal Delivery</td>
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<td>Hyste</td>
<td>Hysterectomy</td>
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<tr>
<td>MAS</td>
<td>Meconium in Amniotic Fluid</td>
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DEFINITION OF TERMS

*Meconium Stained Amniotic Fluid (MSAF)* occurs when colonic contents of the foetus are released into the liquor surrounding the foetus.

*Meconium Asphyxia Syndrome (MAS)* refers to breathing problems that a newborn baby may have when there are no other causes, and the baby has passed meconium (stool) into the amniotic fluid during labor or delivery.

*Delivery* is defined as the process of giving birth.

*Hypoxia* refers to a condition where the body or part of the body is deficient of adequate supply of oxygen supply reaching the tissues.

*Asphyxia* is of severe deficiency supply of oxygen to the body that arises from abnormal breathing.
CHAPTER ONE

INTRODUCTION

1.1 Background to the study

Dark green odourless material that comes about due to debris being stored up in the intestine of the foetus is known as meconium, and this is normally from the third month of gestation (Jose, 2012). There is a gradual reduction in the passage of meconium in the fetal intestines from sixteen (16) weeks of gestation until the twentieth (20th) week, when its production stops (Sienko & Altshuler, 1999). From this period, the next passage of meconium is usually in the first twenty-four hours of life for all full-term newborns (Sippola et al., 2006). However, it has been noticed that conditions that produce foetal distress such as foetal hypoxia and compression of the umbilical cord can lead to the production of meconium in utero between the twentieth (20th) week and the first day of life (Hutton & Thorpe, 2014).

Meconium can have a toxic effect on the foetus or newborn if aspiration of this material occurs in utero or with the first breaths taken after delivery (Moen, Hasaart & Kuppens, 2014). Aspiration of meconium in utero by the foetus has been linked to inflammation changes in tissues such as the foetal lung, umbilical vessels and chorionic plate. These may contribute to neonatal morbidity, independent of Meconium Aspiration Syndrome (MAS) (Lee et al., 2016).

Five (5) million neonatal deaths occur globally annually; out of these deaths, nineteen percent results from birth asphyxia and other difficulties associated with breathing (Lawn, Cousens & Zupan, 2005). According to Wiswell et al., (2000), meconium stained amniotic fluid (MSAF) is found in as many as 12 to 20% of women in labour. The presence of MSAF sometimes poses a dilemma to clinicians because it may result from either hypoxic or physiological harm to the foetus in utero. Davis and Shekerdemian (2001) have also observed that 20 to 33% of neonates whose mother experienced MSAF during the labour period end up
with birth depression. The production of MSAF in these neonates has been linked to chronic asphyxia and infection; the passage of meconium in utero leads to fetal aspiration and the vicious cycle continues (Davis & Shekerdemian, 2001). Hence, it has been suggested that MSAF should be considered as a symptom instead of a syndrome whose prevalence increases as the foetus reaches term and is related with greater rates of asphyxia and infection in the foetus or neonate (Monen, Hasaart & Kuppens, 2014).

The three commonest foetal conditions that have been found to be associated with MSAF are; infection of the foetus in utero, the response of the foetus to hypoxia, and the maturity of the gastrointestinal tract of the foetus (Poggi & Ghidini, 2009). The latter accounts for the reason why MSAF is common in term fetuses as compared to preterms. The presence of MSAF doubles the probability that the newborn will have an umbilical arterial blood pH < 7.1 and Apgar score of < 7 at 5 minutes, in comparison with a neonate born with clear amniotic fluid (Poggi & Ghidini, 2009). Additionally, the aspiration of meconium stained liquor by the foetus or newborn leads to well-known complication in the newborn referred to as meconium aspiration syndrome (MAS). This syndrome (MAS) has been found to be an important cause of perinatal mortality (Caughey & Musci, 2004). This syndrome results from the effects of meconium aspiration on the foetus, especially the respiratory tract. The aspiration of meconium by the foetus produces mechanical and chemical effects as well as the inflammatory reactions, especially on the respiratory tract of the foetus, which can make it difficult to the foetus to transit from the intrauterine life (where the fetal lungs were relatively inactive) to life outside the uterus where the lungs must be used for breathing (Usta, Zoorob, Abu-Musa, Naassan & Nassar, 2008). The transition is made difficult because the airways have been obstructed by the meconium that has been aspirated, the lung tissue have been damaged by the inflammatory process, surfactant has been inactivated; and these have
ultimately led to chemical pneumonitis and a decrease in arterial oxygen pressure (Usta, et al., 2008).

Hence, from all stated above, MSAF has a significant effect on the neonate as well as the birth outcome. This study sought to find out factors influencing meconium stained amniotic fluid delivery outcomes using the Accra Regional Hospital as a case study.

1.2 Problem Statement

Birth asphyxia has been found to be associated with neuro-developmental complications such as cognitive impairment, cerebral palsy, seizure disorder and some chronic diseases in later life (Tan, Schulze, O’Donnell & Davis, 2004). Meconium-stained liquor during labor affects 5%–25% of all deliveries (Wiswell, Tuggle & Turner, 1990). Incidence rates of the Meconium Asphyxia Syndrome in developing countries seem to be higher than in developed countries (Mitri, Hofmeyr & Van Gelderen, 1987; Nangia, Pal, Saili & Gupta, 2015). Wiswell et al., (2000) note that 13% of all live-birth newborns have meconium stained amniotic fluids, which subsequently leads to meconium aspiration syndrome (MAS) in about 5-12% infants. This will manifest as severe respiratory distress which requires careful management, out of these cases, in 5–40% may result in neonatal mortality (Fraser et al., 2005; Keenan, 2004; Wiswell, et al., 1990).

The presence of MSAF does not only pose a threat to the foetus or the neonate, it can also lead to serious maternal complications. These complications include; amnionic fluid embolism and puerperal endometritis, which has been found to be two-to-four weeks increase in these women as opposed to those with clear amniotic fluid (Dragaville & Copnell, 2006; Becker, Solomayer, Dogan, Wallwiener & Fehm, 2007). These cases are worse in these women as opposed to women with clear liquor since the amniotic fluid in these women are laden with meconium. The association of MSAF with these complications has also been found to increase the chances of operative deliveries (Dragaville & Copnell, 2006; Becker et
Osava et al., (2012) also observed that MSAF were associated with increased use of oxytocin, poor neonatal outcomes after the delivery and increased c-section rates.

The Ministry of Health and Ghana Health Services have been educating mothers at prenatal and antenatal clinics on the condition amongst others, at various healthcare institutions (Tayie & Lartey, 2008). The education provided by health facilities on antenatal health as noted Tayie and Lartey (2008), can lead to improvement in birth-weight and hemoglobin concentration of neonates.

However, there still exist relatively high prevalence of Meconium Aspiration Syndrome in our environment and the lack of well-equipped Neonatal Intensive Care Units (NICU) and also the burden of the huge doctor to patient ratio with the lack of adequate diagnostic facilities for identifying, preventing and managing this condition. Concerning service level factors, the availability of equipment and logistics encourage staff with the requisite training and skills to work effectively. This tends to improve the quality of services. However, the lack of equipment and logistics have a tendency to frustrate and weaken staff skills and capabilities. This leads to dissatisfaction on the part of clients. Patient level factors could determine foetal outcomes of Meconium Stained Amniotic Fluid (MSAF) deliveries. Even though a client may desire to use services, her low socio-economic status, in terms of age, income, and occupation and education level could contribute to the foetal outcomes of MSAF.

To this end, therefore, this research aimed to determine the proportion of deliveries with the diagnosis of MSAF, as well as patient level and service level factors that affected MSAF deliveries.

1.3 Justification

The review of literature revealed the unavailability of research conducted on MSAF deliveries Ghana. Additionally, MSAF is associated with surgical deliveries and meconium
asphyxia syndrome. Hence, results of the study would throw light on factors accounting for the condition. Thus, the findings of the study would add to the body of knowledge and serve as a valuable resource material for Accra Regional Hospital, Ghana Health Services, Ministry of Health, researchers, academicians and other interested health organizations. The findings will bring to light the incidence and risk factors of meconium stained amniotic fluid deliveries. This would assist the Ministry of Health and Ghana Service in policy direction and interventions relative to the health of women and children.

1.4 Objectives of the Study

1.4.1 General Objective

The general objective of the study was to assess factors influencing foetal outcomes of Meconium Stained Amniotic Fluid (MSAF) deliveries at the Greater Accra Regional hospital, Ridge.

1.4.2 Specific Objectives

The study explored the following specific objectives are:

1. To determine the proportion of deliveries with the diagnosis of MSAF.
2. To determine patient level factors that influence MSAF deliveries.
3. To determine service level factors that influence MSAF deliveries.

1.4.3 Research Questions

1. What is the proportion of deliveries with the diagnosis of MASF?
2. What are the patient level factors that influence MASF deliveries?
3. What are the service level factors that influence MASF deliveries?
CHAPTER TWO
LITERATURE REVIEW

2.0 Introduction

The literature review is done under the following themes or sub-themes: definition of meconium stained amniotic fluid (MSAF); overview of meconium stained amniotic fluid deliveries; effect of meconium stained amniotic fluid (MSAF) on mother and fetus; the proportion or incidence of deliveries diagnosed with meconium stained amniotic fluid (MSAF); proportion of deliveries diagnosed with meconium stained amniotic fluid; patient level factors influencing meconium stained amniotic fluid deliveries; and service level factors influencing meconium stained amniotic fluid deliveries.

2.1 Definition of Meconium Stained Amniotic Fluid (MSAF)

Meconium Stained Amniotic Fluid (MASF) has long been considered as an indication or sign of fetal distress. Even though there is no known cause, meconium is believed to be passed from the fetal gastro-intestinal tract (Wong, Chow & Ho, 2002). Meconium stained amniotic fluid (MSAF) is predominantly a condition of term and post term babies (Curtis, Matthews & Clarke, 2004; Ramin, Leveno & Kelly, 2000). According to Jane, Lee and Stark (2004), it happens in 10%-15% of live births, and it is not often seen prior to 37 weeks of gestation. This is in line with the views of Dawson, David and Foster (2013), claim that, Meconium Stained Amniotic Fluid (MSAF) comes about in around 10 to 15% of labours, and that it hardly ever takes place before 30 weeks gestation. While in the views of Green (2015), from as early as ten (10) to sixteen (16) weeks gestational age, meconium can be found in the gastrointestinal tract of the fetus.

Meconium is therefore, defined as a black-green, odourless material first noticeable in the fetal intestine during the third month of gestation, and it is as a result of the accumulation of debris (Antonowicz & Shwachman, 1979; Côté & Valet, 1976). According to Dawson et
al., (2013), even though 75% of meconium is water, the remaining 25% consists of gastric secretions, bile salts, mucous, vernix, lanugo, blood, pancreatic enzymes, free fatty acids and squamous cells.

On the other hand, Mahapatro and Ghose (2014) observe that, meconium, the first sterile intestinal discharge of newborn, is a sticky dark green substance composed of intestinal epithelial cells, lanugo, mucus, bile, mucosal cells and solid elements of amniotic fluid.

2.2 Overview of Meconium Stained Amniotic Fluid Deliveries

Production of meconium by the gastro-intestinal tract of the foetus begins by early 14-16 weeks of gestation (Ahanya, Lakshmanan, Morgan & Ross, 2005). The main composition of meconium (75%) is water, the other 25% is made up of gastric secretions, bile salts, mucus, vernix, lanugo, blood, pancreatic enzymes, free fatty acids as well as squamous cells. Of all pregnancies globally, 15% are complicated by MSAF (Green, 2015). MSAF usually occurs in term fetuses, hence, it is rare to find it before 38 weeks of gestation (Green, 2015). Wiswell (2001), noted that at week 42, about 30% of infants have MSAF, and this comes about when there is an upsurge in MSAF along with gestational age from week 38.

Conditions such as chronic hypoxia, acidaemia or infection produces stress on the foetus, which leads to intrauterine production of meconium (Wiswell, 2001). Many conditions may be associated with the passage of meconium in utero, but the most severe of them all is meconium aspiration syndrome (MAS), which develops in 2 to 5% of neonates with MSAF (Wiswell, 2001). The diagnosis of MAS is usually based on the clinical history of a neonate delivered with meconium stained amniotic fluid who develops respiratory distress and whose chest x-ray reveals coarse opacification. The severity of the condition does not correlate with chest x-ray findings. The presence of acidosis and meconium suctioned from below the vocal cords further supports the diagnosis of MAS. It has been
found that routine induction of labour before 41 weeks gestation deceases perinatal mortality and may also lead to a decrease in MAS (Crowley, 2000).

Some clinicians advocate for amnioinfusion for meconium stained amniotic fluid during labour; this may lead to a reduction in the number of neonates that develop MAS but has been found to be associated with serious maternal side effects and hence, more research have to be carried out to investigate the benefits of this procedure before it is rolled out (Hofmeyr, 2002). The prevention of MAS post-delivery has been mainly tackled by adequate suctioning. The belief is that suctioning oropharynx and trachea diligently at delivery may reduce the rate of MAS. However, several studies revealed that early oropharyngeal suctioning and/or endotracheal suctioning of the trachea does not have any association a decrease in the rate of severe MAS with (Wiswell et al., 2000; Vain et al., 2004; Halliday, 2001). In addition, several studies have challenged the association between meconium aspiration and severe MAS, these studies suggest that other events may account for the syndrome and the presence of meconium in the lungs may just be a co- accompanying finding (Ghidini & Spong, 2001; Pinar, 2004).

2.3 The effect of Meconium Stained Amniotic Fluid (MSAF) on mother and fetus

In the branch of medicine and surgery concerned with pregnancy, during childbirth and the postpartum period, the goal is to have safe delivery and healthy mother and baby, and meconium stained amniotic fluid has long been regarded as one of the conditions in this particular branch of medicine and surgery (Smith & Nelson, 1976). According to Hackey (1999), the risk factors for meconium stained amniotic fluid are both maternal and fetal. The maternal factors are hypertension, gestational Diabetes mellitus, maternal chronic respiratory or cardiovascular diseases, post term pregnancy, pre-eclampsia and eclampsia. The fetal factors consist of oligohydramnios, intrauterine growth restriction and poor bio-physical profile (Hackey, 1999). Concerning the effect of meconium stained amniotic fluid, Meis,
Hall, Marshall and Hobel (1978) indicate that there have been inconsistent reports on the outcomes, and this primarily is as a result of the varying degree of meconium stained amniotic fluid.

Vijayasree, Geetha, Kumar, Murthy and Prasad (2014) studied of maternal and fetal outcome of parturient with meconium stained amniotic fluid (MASF), using a descriptive case control approach. The study specifically looked at the maternal and fetal outcome of 50 women in labour with meconium stained amniotic fluid at Mamata General Hospital in Telangana, Khammam, India. According to the study, normal delivery was significantly higher (58%) in clear liquor group as compared to MSAF group (22%).

Further findings showed that Caesarean section was more frequent in MSAF group (66%). Concerning MSAF on mother and fetus, the study revealed fetal heart rate abnormality, perinatal complications and infant mortality as the prominent effects. In a prospective study, Gupta, Bhatia and Mishra (1996) researched on the incidence, outcome as well as antenatal, intrapartum and neonatal attributes of meconium stained amniotic fluid (MSAF) at the Neonatal Unit of Sir Sunderlal Hospital, Banaras Hindu University, Uttar Pradesh, India. Out of 1426 live births occurring in 1500 consecutive deliveries, 204 (14.3%) deliveries had MSAF of which thick meconium was found in 141. According to the study, hepatitis in mother, fetal distress during labour and intrauterine growth retardation were noteworthy factors related to MSAF. Significantly, it was revealed that one fifth of babies born through MSAF had severe birth anoxia compared to 5.6% in non-MSAF group. Other effect indicated was severe birth asphyxia (SBA), severe birth asphyxia (SBA) which happened in 27% and 6.3% of babies with thick and thin meconium stained amniotic fluid, respectively.
A similar prospective observational study, by Mundhra and Agarwal (2013), examined fetal outcome in 165 MSAF cases at the North Eastern Indira Gandhi Regional Institute of Health And Medical Sciences, Shillong, India. According to the study, pregnancies complicated with pregnancy induced hypertension had statistically significant higher incidence of meconium stained amniotic fluid cases (16.97%). Concerning MSAF on fetus, the study revealed birth asphyxia, Meconium Aspiration Syndrome (MAS) as the noticeable effects.

2.4 The proportion or Incidence of deliveries diagnosed with Meconium Stained Amniotic Fluid (MSAF)

Meconium stained amniotic fluid (MSAF) occurs in 12 to 20% of laboring mothers and it is a confusing issue because it can be due to either physiologic or a hypoxic insult to the fetus (Sori, Belete & Wolde, 2016). Meconium is detected in the gastrointestinal tract of the fetus as early as 10-16 weeks of gestational age and represents material accumulated during fetal life. It is blackish-green, odorless and varies in amount from 60 to 200g (Salvesen, 2010). Sori et al., (2016) addressed the factors affecting maternal and perinatal outcomes and indicated that Meconium is not only a potential sign of fetal hypoxia but is also a potential toxin if the fetus aspirates particulate matters with a gasping breath in utero or when it takes its first breaths following birth.

These researchers study used a hospital based cross-sectional descriptive study on laboring mothers with meconium stained amniotic fluid who delivered in the labor ward of Jimma University Specialized Hospital during, 2012 to December 30, 2012. The study revealed that the overall rate of meconium stained amniotic fluid was 15.4% (151/979) and 74.8% of the cases had moderate to thick meconium stained amniotic fluid. Similarly, the 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 grade 1 staining. The rate of meconium stained amniotic fluid is below 20%. Thus, this depicts that in this study the rate was very low.

Naveen, Kumar, Ritu, and Kushla (2006) identified risk factors for meconium stained amniotic fluid (MSAF). The study collected maternal and neonatal data prospectively for consecutive singleton deliveries as well as using univariate and logistic regression analysis to reveal predictors of MSAF. The results from the study showed that MSAF was present in 159 (15.76%) of the 1009 deliveries studied. These results support previous findings by Sori et al., (2016), that the incidence of MSAF was less than 20%. In addition, Naveen et al (2006), revealed that thin and thick MSAF constituted 39% and 61% cases respectively.

In a study by Osava et al., (2012), on meconium-stained amniotic fluid and maternal and neonatal factors used 2,441 births in a hospital birth center located in the city of São Paulo, Southeastern Brazil, in March and April, 2005. The researchers identified the frequency and maternal and neonatal factors associated with meconium-stained amniotic fluid at birth. The study revealed that meconium-stained amniotic fluid was verified in 11.9% of the births. From the study, 68.2% of these cases were normal births and 38.8% C-sections. This study also depicts that the level of incidence of MSAF was below 20%. Similarly, the study revealed that meconium was associated with: primiparity, gestational age ≥ 41 weeks, oxytocin in labor, C-section and Apgar scores less than 7 at the 5th minute. Furthermore neonatal mortality was 1.6/1,000 live births. Likewise meconium-stained amniotic fluid was found in 50% of neonatal deaths and it was associated with higher rates of surgical deliveries.

Mahapatro and Ghose (2014), studied the prevalence, risk factors, mode of delivery, and perinatal outcome in meconium stained amniotic fluid (MSAF) during delivery at term pregnancy. A retrospective study was conducted in MGMC and RI, Puducherry with women at 37 to 42 weeks of gestation were meconium stained amniotic fluid during labour and
delivery. The study revealed that the prevalence of meconium stained amniotic fluid during labour and delivery was 12.42%. Moreover, most of the cases were primigravida (85%) with mean age and gestational age of 24.99 years and 39.44 weeks respectively. Likewise postdated pregnancy (32.85%) and oligo hydramnios (18.57%) were the two major risk factors for meconium stained amniotic fluid. The study further revealed that Caesarean section (C.S) was the most common mode of delivery (84.28%) due to fetal distress and thick meconium stained liquor (40.71). Additionally, the study revealed that 20% of cases were admitted to Neonatal Intensive Care Unit (NICU) for low Apgar score at birth. Fifty percent (50%) of NICU admissions were due to MAS and its complication. There were two (7.14% of NICU admission) neonatal death due to MAS and its complication (Mahapatro & Ghose, 2014). This study also showed that the prevalence of meconium stained amniotic fluid was below 20%.

A study conducted by Roopashree and Shylaja (2016), example the obstetric and perinatal outcome of low-risk pregnancies with term labour and meconium-stained amniotic fluid. The researchers used 200 women with meconium-stained amniotic fluid in labour at the St. Philomena’s Hospital. Moreover all low-risk pregnancies were included in the study from September 2010 to August 2012. The study revealed that of the 200 cases, 147 had caesarean delivery (73.5%) and 53 had vaginal delivery (26.5%). The study also revealed that the incidence of Lower Segment Caesarean Section (LSCS) was found to be the maximum in the thick MSAF group (54.5%), 14% in moderate and 5% in thin MSAF group. From the study, in moderate MSAF group, 2.17% had less than 7, 1 minute Apgar. In thick MSAF group, 3.33% had less than 7 Apgar; in thin MSAF group, 11.76% had less than 7 Apgar at 1 minute.

Manohar and Kavyashree (2013) studied the various maternal factors responsible for meconium stained amniotic fluid (MSAF), intrapartum complications and outcome of labor
in cases of meconium stained amniotic fluid and its impact on perinatal morbidity and mortality. It was a retrospective study of 2840 cases of consecutive deliveries from January 2013 to June 2013 in Mandya Institute of Medical Sciences, Mandya, India. Also, the incidence of meconium stained amniotic fluid was 20.1%. This study depicts that the level of incidence was more than 20%. The study revealed that incidence of MSAF was more commonly seen in pregnancy with crossed EDD (>40 weeks), oligohyramnios, preeclampsia, Premature rupture of membranes (PROM), anaemia. Seventy-seven cases of Meconium aspiration syndrome (MAS) were admitted to NICU out of which there were 15 perinatal mortality and 13 cases of MAS were associated with thick meconium while 2 cases were moderately thick meconium stained liquor. In addition, severe perinatal asphyxia (8 cases) was the most common cause for perinatal mortality followed by hypoxic ischaemic encephalopathy (4), respiratory distress syndrome (2) and septicaemia (1).

Singh and Soren (2017), examined the incidence, the mode of delivery, relationship between meconium staining and fetal heart rate abnormality and clinical correlation of perinatal outcome with thin and thick meconium stained amniotic fluid. The study was carried out in the department of Obstetrics and Gynecology of MKCG Medical College Hospital, Berhampur, India from December 2014 to September 2016. The study employed 912 patients with meconium stained amniotic fluid detected during labour and their perinatal outcome was analysed keeping the type of meconium as the principal variable. From the study, out of 912 cases, thin meconium staining was seen in 63.82% and thick in 36.18%. The study also revealed that 66.43% of cases of MSAF were associated with high risk factors. Furthermore, fetal heart rate abnormality was seen in 32.24% cases, more in cases of thick meconium. The mode of delivery in majority of cases (46.5%) was spontaneous vaginal, 11.18% was assisted by forceps or ventouse and % needed LSCS. At 1 minute, 65.79% babies had Apgar score >7. At 5 minute, % babies had Apgar score >7. When heart
rate abnormality was present along with meconium, 71.43% had Apgar score <7. % required NICU admission. % developed perinatal morbidity. MAS was the leading cause of death in 3.95% (Singh & Soren, (2017).

2.5 Proportion of Deliveries Diagnosed With Meconium Stained Amniotic Fluid

Osava, da Silva, and colleagues (2012), investigated the maternal and neonatal factors associated with meconium-stained amniotic fluid, using a cross-sectional study. The reviewed 2,441 births at an in hospital birth center in the city of São Paulo, Brazil. The study found that 11.9%, % of the total births was diagnosed with meconium-stained amniotic fluid. The study revealed that most (of these diagnostics were normal deliveries and 38.8% Caesarean sections. Significantly, the study revealed that primiparity, gestational age, oxytocin in labour, Caesarean section and Apgar were factors associated with meconium. To add, meconium-stained amniotic fluid was diagnosed in 50% of neonatal deaths and it was linked to higher occurrences of surgical deliveries.

In a descriptive cross-sectional study, Sori, and associates (2016) looked at the factors affecting 979 mothers with MSAF who gave birth in a hospital in Ethiopia. The study found that the general incidence of MSAF was 15.4%, and out of these, 74.8% had moderate to thick MSAF. Further findings revealed that a higher risk of operative delivery, Apgar score and MAS were factors that caused moderate to thick meconium stained amniotic fluid in mothers at Jimma University Specialized Teaching Hospital, South West Ethiopia

In a retrospective study, Mahapatro and Ghose (2014) investigated the prevalence, risk factors, mode of delivery and perinatal outcome in MSAF during delivery at term pregnancy. Findings from the study revealed that the prevalence of MSAF during labour and delivery was 12.42% for the period of the study. In addition cases diagnosed in MSAF were primigravida (85%) and gestational age respectively. Concerning the risk factors for MSAF
during delivery at term pregnancy, postdated pregnancy (32.85%) and oligohydramnios (18.57%) were most prominent. Further findings revealed Caesarean section as the most common mode of delivery (84.28%). According to the study, this was as a result of fetal distress and thick meconium stained liquor (40.71%).

Lee, Lee, and colleagues (2011), examined the relationship between frequency of MSAF and the duration of labor in term singleton births. Using the clinical characteristics of women who delivered term singleton live newborns between 2001 and 2006, the study revealed that MSAF occurred in 18.4% term pregnancies, as well as in 2.85% of women who underwent elective caesarean delivery. The study results also showed that 23.1% women who delivered after onset labour had MSAF. In light of this, there was a major link regarding MSAF prevalence and labour duration in term singleton gestation.

Heirsch, and associates (2016), analysed all singleton deliveries that underwent a trial of labor in a single hospital (2007-2013). Out of the total 28,248 deliveries, 3,399 (12.0%) were diagnosed with meconium stained amniotic fluid, and they were grouped into full term, early term and late term. According to the study, the full term deliveries were 2,413 while early term deliveries were 405. Late term deliveries were 581. Further findings indicated that neonatal jaundice, need for phototherapy, and neonatal sepsis were related to MSAF at early term.

A cross-sectional study was carried out by Patil, Swamy and Samatha (2006) on protocols of management of MSAF and perinatal outcome and found that the prevalence of meconium stained amniotic fluid was 249 (8.3%). On the other hand, the study also showed that 12.9% infants had Meconium Aspiration Syndrome (MAS). Significantly, the study revealed that there was a higher prevalence of MAS in thick meconium stained liquor (19%) than in thin meconium stained liquor.
Ali, Anbreen and Yasir (2014), examined the pregnancies with meconium stained liquor in the Department of Obstetrics and Gynaecology Unit IV, Lyari General Hospital Karachi, Pakistan, from April 2010 to March 2011. Out of 908 total deliveries, 7.7% women had MSAF. Furthermore, the study showed that 15(21%) women had Grade I meconium, while 19(27%) women had Grade II meconium. The study also showed that 36(51%) women had Grade III meconium.

Firdaus, Ali and Sachdeva (2013) investigated the maternal and neonatal factors associated with Meconium Stained Amniotic Fluid. Out of the total 172 infants with Meconium Stained Amniotic Fluid (MSAF), meconium aspiration syndrome occurred in 31, while 141 infants did not have meconium aspiration syndrome. The study significantly revealed that MSAF was 9.8% prevalent, while meconium aspiration syndrome was about 1.8%.

2.6 Patient Level Factors Influencing Meconium Stained Fluid Deliveries

Naveen, et al (2006), employed univariate and logistic regression model to analyze predictors of meconium stained fluid. According to the 159 deliveries, representing 15.76% had Meconium Stained Amniotic Fluid (MSAF). Significantly, the study identified eight risk factors, including postdated pregnancy, anaemia, chorioamnionitis, prolonged labour, fetal distress, cord problems and fetal growth retardation as determinants of MSAF deliveries.

Mundhra and Agarwal (2013), explored fetal outcome in MSAF deliveries at Department of Obstetrics and Gynaecology, North Eastern Indira Gandhi Regional Institute of Health and Medical Sciences, Shillong, India, from January 2010 to June 2011. Findings from the study revealed that pregnancies complicated with pregnancy induced hypertension was the most prominent determinant of higher rates of MSAF at the North Eastern Indira
Gandhi Regional Institute of Health and Medical Sciences, in Shillong, India. Other factors identified were foetal heart rate abnormalities and presence of foetal bradycardia.

Lee, Lee, et al (2011), found that the lengthier the period of labour, the greater the occurrence of meconium stained amniotic fluid (MSAF). In other words, the risk of MSAF was higher if the labour duration was longer. That was to say that the duration of labour influenced Meconium Stained Amniotic Fluid (MSAF) deliveries.

Sundaram and Murugesan (2016) explored the risk factors for MSAF and its implications among 100 patients at a tertiary hospital. Concerning the risk factors for MSAF, the study revealed caesarean section as noticeably greater in a tertiary hospital. However, other factors identified were preeclampsia, fetal growth restriction and dystocia.

Chakraborty, and colleagues (2013) studied the risk factors of meconium stained amniotic fluid in a tertiary care hospital at Kolkata. According to the study, MSAF was 30.6% prevalent at the tertiary care hospital in Kolkata. Furthermore, findings from the study revealed that anaemia, antenatal checkup, parity, dysfunctional or prolonged labour, use of oxytocin or prostaglandin, urinary tract infection and antepartum hemorrhage had no connection with MSAF. However, the study identified fetal distress, cord problems and maternal hypertension as risk factors of meconium stained amniotic fluid (MSAF).

Studies carried out on the factors that are associated with meconium stained amniotic fluid (MSAF) deliveries among patients have reported that parity, gravidity, history of antenatal, gestation age were associated with MSAF (Naqvi & Manzoor, 2011; Oyelese et al., 2006). Sundaram and Murugesan (2016) studied the risk factors for meconium stained amniotic fluid and its implications. The study was a prospective case control study among 100 patients carried out in a tertiary care hospital over a period of six months. Also, fifty patients with meconium stained amniotic fluid found during labour or prior to labour were
included in the study group. The study observed that gestational age and parity were not statistical significant between the study and control groups. The study further found that among antepartum and intrapartum risk factors included preeclampsia, fetal growth restriction, fetal distress, and labour dystocia.

A study was conducted to establish whether there is a relationship between the severity and timing of onset of hypercholanemia and the risk of meconium-stained amniotic fluid (MSAF) and adverse neonatal events (Estiu et al., 2017). The study was carried out between June 2009 and December 2013 and included three hundred and eighty-two (382) pregnancies complicated by ICP managed at a referral hospital in Buenos Aires, Argentina. The study found an increase in the frequency of MSAF to be associated with higher serum levels at diagnosis of alanine transaminase, alkaline phosphatase and direct bilirubin (Estiú Marin et al., 2017).

Hanoudi, Murad and Ali (2014) identified the frequency of meconium aspiration syndrome among the total births that had risk of meconium staining of amniotic fluid. The study also examined out the risk factors during pregnancy. The study was a retrospective one carried out between 1st of December 2009 to 31st of May 2010, at AL-Yarmouk Teaching Hospital. In all, 286 births with meconium staining of amniotic fluid were included in the study. It was found that abnormal presentation is an important risk factor for MASF.

Ali, et al (2014), did a descriptive case series study to evaluate the incidence of meconium stained liquor and its related factors. The study area was the department of Obstetrics & Gynaecology Unit IV, Lyari General Hospital Karachi, Pakistan. The study was carried out from April 2010 to March 2011. Results indicated that obese multigravidae account for majority of cases of MSAF as compared to primigravidae. It was also observed that gestational age and postdate pregnancies had no significant impact on MSAF.
Naveen, et al (2006), classified risk factors for meconium stained amniotic fluid using prospective, maternal and neonatal data. The study found risk factors for thick MSAF to include maternal age, primigravidity, postdated pregnancy, prolonged labour, foetal distress, and cord problems. On the other hand, Logistic regression analysis found risk factors for MSAF to include postdated pregnancy, foetal distress, cord problems, and fetal growth retardation.

2.7 Service Factors Influencing Meconium Stained Amniotic Fluid Deliveries

Globally, each day over a 1,000 women, this makes a total of about 358,000 annually from complications of pregnancy and childbirth (WHO, World Bank, UNICEF & UNFPA, 2010). The main causes of these mortalities according to WHO, World Bank, UNICEF and UNFPA (2010), include inability to gain access to effective interventions; only 60% of women globally receive skilled care during childbirth and only a small percentage of women (less than 40 per cent) have access to postnatal care. The survival of a neonate is highly dependent upon the condition under which he or she is born. Niermeyer et al. (2000), observed that newborn babies, especially asphyxiated babies (which may be as a result of MAS) might find it difficult to tolerate cold environment. Hence, when the neonate is continuously exposed to cold environment, it results in decreased arterial oxygen tension and increased metabolic acidosis, which may worsen the newborn's condition. To prevent the cold stress from compounding the birth asphyxia from the MAS, evaporate heat loses can be reduced by keeping the delivery room at room temperature (25 °C), maintaining closed doors and windows, resuscitating the baby under a pre-heated radiant warmer, and quickly drying the baby immediately it is delivered.

Gaps in the home-to-hospital continuum have been found by International Federation of Red Cross and Crescent Societies (2013) to lead to maternal and child health challenges. One of these gaps is a shortage in health workforce shortages and limited task shifting. It was
found that only 28% of the countries included in the research had an adequate ratio of a minimum health worker/per 10,000 people needed for the delivery of essential health services. Another factor contributing to the low quality of care can be linked to poor infrastructure due to inadequate supply of commodities and medical equipment due to unavailability of funds or lack of government interest in the health sector. Furthermore, due to the process of cash-and-carry (paying for services straight out of the pocket), the poor attitude of health workers, low health education and awareness which lead to local beliefs and misconceptions about health issues, there is a general low demand for healthcare and services, especially in developing countries. These factors are also compounded by the ineffective and inefficient referral systems between facility-based staff and community-based workers.

Ganle, Parker, Fitzpatrick and Otupiri (2014) conducted a qualitative study in Ghana on barriers of accessibility and utilization of maternal and newborn healthcare services. This study was conducted after the abolition of user-free, and it showed that maternity care services were limited and unequally distributed. The study also revealed the following; women feel intimated in healthcare facilities, the health staff are unfriendly, there is also cultural insensitivity, there is a long waiting time before a patient is attended to, the choices of delivery are limited, healthcare is of poor quality, patients lack privacy in health facilities, and there is a general difficulty in arranging for suitable transportation. All these issues were seen to serve as barriers to the accessibility and utilization of maternal and newborn healthcare services.

Some research has been carried out on clinical factors that influence MSAF. For instance, Deshpande, Deshpande and Kumari (2015), did a prospective observational study of 150 cases of meconium stained amniotic fluid. They reported that MSAF case were higher. This was attributed to increased awareness of patients for ANC checkup. It was also indicated
that increased incidence of caesarean section was significantly associated with grades of MSAF.

A study was carried out by Osava et al., (2013), ascertained the incidence and maternal and neonatal factors associated with meconium-stained amniotic fluid at birth. A cross-sectional study was conducted from March to April, 2005. In all, two thousand four hundred forty-one (2,441) births were studied at an in-hospital birth centre in the city of São Paulo, Southeastern Brazil. The study reported that meconium-stained amniotic fluid was found in 50% of neonatal deaths and it was associated with higher rates of surgical deliveries.

A hospital based cross-sectional descriptive study was done in Ethiopia by Sori, et al. (2016) to examine the meconium stained amniotic fluid and its associated factors affecting maternal and perinatal outcomes at Jimma University Specialised Teaching Hospital, Ethiopia. The study employed labouring mothers with meconium stained amniotic fluid who delivered in the labor ward of the hospital from October 1, 2012 to December 30, 2012. A pretested questionnaire was used to collect data for the study on history of the patient, patient specific demographics and obstetric information. The study results showed that moderate to thick meconium stained amniotic fluid was associated with increased risk of operative delivery, low 5th minute Apgar score and Meconium Aspiration Syndrome.
2.8 Conceptual Framework

Figure 2.1: Conceptual Framework indicating factors influencing foetal outcomes of Meconium Stained Amniotic Fluid (MSAF) deliveries

Meconium Stained Amniotic (MSAF) deliveries have been attributed to the condition of the mother, suitability of health institutions environments and healthcare policies as influential or risk factors that predisposes mothers. The researcher intends to assess the proportion of MSAF among neonatal deliveries. Patient factors include gestational age, gravidity, history of antenatal and parity. Service related factors considered include delivery methods and referrals.
CHAPTER THREE

METHODS

3.1 Introduction

This chapter presents the various methods that were used to answer the research questions. The covers the study design, study area, variables, study target population, sample size and sampling strategy, case definition, inclusion criteria, exclusion criteria, data collection technique and tools, data quality control, data processing and analysis, analysis plan, limitations of to the methodology and ethical consideration.

3.2 Study Design

The study adopted a retrospective study design in the review of labour records from January 2016 to December, 2016 at Ridge Regional Hospital. A retrospective study looks backwards and examines exposures to suspected risk or protection factors in relation to an outcome that is established at the start of the study. This method is adopted because it better helps to answer the research questions.

3.3 Study Area

The current study was conducted at Greater Accra Regional Hospital commonly referred to as the Ridge Hospital situated in the Osu Korley Klottey Sub-Metro, administratively under the Accra Metropolitan Assembly. The hospital is one of the leading health care providers located in the center of Accra with a current capacity of 191 bed facility but undergoing major expansion to a 600 bed capacity. The Ridge Hospital was built in 1929 to provide healthcare for British Colonials during the precolonial era. Since its inception in 1930, the hospital has provided quality health care to the general populace of the region. The study area was chosen because the hospital is a secondary tertiary hospital serving as a referrals center to the Greater Accra catchment area including referral from all over the country. Also, the Department of Obstetrics and Gynecology provides service to an average
of 15,600 birth a year. The Hospital provides antenatal services to an average of 1000 patients per week. The hospital is suitable for the study owing to the antenatal services it renders to pregnant women.

3.4 Variables

The dependent variable was Meconium Stained Amniotic Fluid and the independent variables are patients factor (Parity, Gravidity, History of antenatal and, Gestation age) and service provider factors (Delivery method and Referral)

3.5 Study population

The population of the study included mothers who had delivered at Accra Regional Hospital from January 2016 to December 2016 and had been diagnosed with Meconium Stained Amniotic Fluid.

3.6 Sample Size and Sampling strategy

The sample size considered was all deliveries between January 2016 and December 2016. In all deliveries were examined

3.7 Case Definition

It included all reported mothers who had delivered at the Accra Regional Hospital from January 2016 to December 2016.

3.7.1 Inclusion Criteria

- Mothers who had delivered at the Accra Regional Hospital from January 2016 to December, 2016.
- Mothers with demographic details and diagnosis information available at the hospital.
• Gestational age >37 weeks, cephalic presentation, pregnancy in patients with meconium stained liquor (grade I, II, III) after spontaneous or artificial rupture of membranes during labour.

3.7.2 Exclusion criteria

• Mothers who delivered at the Accra Regional Hospital either before January 2016 or after December 2016.
• Mothers whose demographic details and diagnosis were unavailable at the hospital.
• The exclusion criteria are gestational age <37 weeks, malpresentation (like breech transverse lie and compound presentation).

3.8 Data collection technique and tools

The researcher collected data on mothers who had delivered from the Department of Gynecology, Accra Regional Hospital. Data extraction guide was developed. The categories of interest were age, gravidity, parity, gestational age, meconium stain and birth out, ANC attendance, mode of delivery among others.

3.9 Data Quality Control

The information retrieved from the records at the department of Gynecology, Accra Regional Hospital was perused and analyzed to check its veracity. Additionally, information retrieved was examined to check for any omissions or errors that might arise from the records.

3.10 Data processing and analysis

Data was processed with SPSS V 21 (statistical package for social sciences). In analyzing the data descriptive and inferential statistics were used. Thus the study used frequencies and percentages as well as logistics regression (p>0.05 and odd ratio). The output
of the analysis produced tables which were further enhanced in Microsoft Office Excel 2010. Charts were also generated from the output information from the statistical tool.

3.11 Analysis Plan

Data analysis began when all relevant data from the computerized Health Information systems from the Hospital were obtained. Information extracted included, patient age, gravidity, parity, delivery method and referral

3.12 Ethical Consideration

3.12.1 Approval from study area

The researcher sought clearance and permission from University of Ghana School of Public Health College of Health Sciences. With the aid of an introductory letter from the University of Ghana, the researcher sought permission and access to records of mothers who had delivered the Accra Regional Hospital. Furthermore, the ethical research committee of the University of Ghana examined and approved the research in order to ensure its viability and practicality given the time frame and resources available.

3.12.2 Potential risks/benefits

The result of the study has the potential to benefit patients, medical practitioners and various health institutions.

3.12.3 Privacy/confidentiality

The names of the participants were not included in the study. Thus, their privacy was fully catered for.

3.13 Summary

This chapter outlined the various methods adopted to help achieve the objectives of the study. The chapter the study design, study area, variables, study target population, sample
size and sampling strategy, case definition, inclusion criteria, exclusion criteria, data
collection technique and tools, data quality control, data processing and analysis, analysis
plan, limitations of to the methodology and ethical consideration. The next chapter presents
the results of the study.
CHAPTER FOUR

RESULTS

4.1 Introduction

This chapter presents the results obtained from analysis of the data in the study. The patient and Service level characteristics are first presented followed by the proportion of deliveries with the diagnosis of MSAF, patient level factors that influence MSAF deliveries and service level factors that influence MSAF deliveries.

4.2 Patient characteristics

This section presents patients characteristics. The patients’ characteristics which comprises of parity, gravidity, antenatal history and gestational age is covered in the section. The tables and graphs are used to present the various results.

Table 4.1: Patient level characteristic

<table>
<thead>
<tr>
<th>Parity</th>
<th>Frequency (N=7,816)</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>2645</td>
<td>33.8</td>
</tr>
<tr>
<td>1</td>
<td>2101</td>
<td>26.9</td>
</tr>
<tr>
<td>2</td>
<td>1556</td>
<td>19.9</td>
</tr>
<tr>
<td>3</td>
<td>931</td>
<td>11.9</td>
</tr>
<tr>
<td>4</td>
<td>406</td>
<td>5.2</td>
</tr>
<tr>
<td>5</td>
<td>177</td>
<td>2.3</td>
</tr>
</tbody>
</table>

Figure 4.2: Parity level
As indicated in figure 4.1, most of the patients had zero parity while the least parity was 5.

**Table 4.1: Gravidity Level**

<table>
<thead>
<tr>
<th>Gravidity</th>
<th>Frequency (N=7,816)</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt;5</td>
<td>687</td>
<td>8.8</td>
</tr>
<tr>
<td>1</td>
<td>1595</td>
<td>20.4</td>
</tr>
<tr>
<td>2</td>
<td>1915</td>
<td>24.5</td>
</tr>
<tr>
<td>3</td>
<td>1663</td>
<td>21.3</td>
</tr>
<tr>
<td>4</td>
<td>1179</td>
<td>15.1</td>
</tr>
<tr>
<td>5</td>
<td>758</td>
<td>9.7</td>
</tr>
<tr>
<td>N/R</td>
<td>19</td>
<td>.2</td>
</tr>
</tbody>
</table>

**Figure 4.3: Gravidity level**
As illustrated in figure 4.3, most 1915 (24.5%) of the patients had gravidity of 2, while 758 (9.7%) had a gravidity of 5.

Table 4.2: History of antenatal

<table>
<thead>
<tr>
<th>History of antenatal</th>
<th>Frequency (N=7,816)</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not applicable</td>
<td>279</td>
<td>3.5</td>
</tr>
<tr>
<td>Non Attendant</td>
<td>168</td>
<td>2.1</td>
</tr>
<tr>
<td>Regular</td>
<td>65</td>
<td>0.8</td>
</tr>
<tr>
<td>Attendant</td>
<td>7304</td>
<td>93.4</td>
</tr>
</tbody>
</table>

Figure 4.4: Patient history of antenatal

As revealed in figure 4.4, most 7304 (93.4%) of the respondents had attended antenatal care, while 168 (21.0%) had no antenatal care.

Table 4.3: Gestation age

<table>
<thead>
<tr>
<th>Gestation age</th>
<th>Frequency (N=7,816)</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 38 (pre-term)</td>
<td>2182</td>
<td>27.9</td>
</tr>
<tr>
<td>38-42 (term)</td>
<td>5543</td>
<td>70.9</td>
</tr>
<tr>
<td>Greater than 42 (post term)</td>
<td>91</td>
<td>1.2</td>
</tr>
</tbody>
</table>
Figure 4.5: Gestation age

As revealed in figure 4.5, 7819 (70.9%) patients had a gestational age of 38-42 weeks, while 2182 (27.9%) had a pre-term which is less than 38, and 91 (1.2%) had a post term which was greater than 42.

4.3 Service level characteristics

This section presents service level characteristics. The service level characteristics which comprises of deliver mode and referrals are presented. Both tables and graphs are used to present the results.
Table 4.4: Delivery method

<table>
<thead>
<tr>
<th>Delivery</th>
<th>Frequency (N=7816)</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>C/S</td>
<td>3262</td>
<td>41.7</td>
</tr>
<tr>
<td>C/S + BTL</td>
<td>263</td>
<td>3.4</td>
</tr>
<tr>
<td>Caesarean Hysterectomy</td>
<td>33</td>
<td>.4</td>
</tr>
<tr>
<td>SVD</td>
<td>4226</td>
<td>54.1</td>
</tr>
<tr>
<td>SVD &amp; C/S</td>
<td>21</td>
<td>.3</td>
</tr>
<tr>
<td>Vacuum</td>
<td>11</td>
<td>.1</td>
</tr>
</tbody>
</table>

Figure 4.6: Delivery methods

Figure 4.6 shows that most 4226 (54.1%) out of 7819 deliveries were done by SVD while the least (0.1%) delivery method was Vacuum.

Table 4.5: Referral

<table>
<thead>
<tr>
<th>Referral</th>
<th>Frequency (N=7816)</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ridge</td>
<td>1122</td>
<td>14.4</td>
</tr>
<tr>
<td>Others</td>
<td>6694</td>
<td>85.6</td>
</tr>
</tbody>
</table>
Figure 4.7: Referral Cases

As indicated in figure 4.7 most, 6694 (85.6%) out of 7819 patients were referred from the health facilities while 1122 (14.4%) were patients of Ridge Hospital.

4.4 The proportion of deliveries with the diagnosis of MSAF

This section presents the proportion of deliveries with the diagnosis of MSAF. The section first presents the grades of meconium and subsequently the proportion of deliveries with the diagnosis of MSAF.

Table 4.6: Grades of Meconium

<table>
<thead>
<tr>
<th>Grades of Meconium</th>
<th>Frequency (N=7816)</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade 1</td>
<td>145</td>
<td>1.9</td>
</tr>
<tr>
<td>Grade 2</td>
<td>116</td>
<td>1.5</td>
</tr>
<tr>
<td>Grade 3</td>
<td>386</td>
<td>4.9</td>
</tr>
<tr>
<td>No Meconium</td>
<td>7169</td>
<td>91.7</td>
</tr>
</tbody>
</table>
Figure 4.8: Meconium grades

Figure 4.8 shows that 386 (4.9%) deliveries with the diagnosis of MSAF were grade three followed by grade one 145 (1.9%), then grade two 116 (1.5%).

Figure 4.9: Percentage of MSAF

Figure 4.9 shows the proportion of deliveries with the diagnosis of MSAF. As depicted, out of 7816 deliveries, 647 (8%) were diagnosed with MSAF.
4.5 Patient level factors that influence MSAF deliveries.

This section presents the patient level factors that influence MSAF deliveries. The section considers characteristics like age, gestational age, parity and gravidity.

Table 4.7: Percent distribution of meconium presents by patient characteristics (n = 7816)

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Number of cases</th>
<th>Meconium present</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number of cases</td>
<td>No meconium</td>
<td>Presence of meconium</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24 and below</td>
<td>1580</td>
<td>1446</td>
<td>134(8.5%)</td>
</tr>
<tr>
<td>25-29</td>
<td>2355</td>
<td>2165</td>
<td>190</td>
</tr>
<tr>
<td>30-34</td>
<td>2276</td>
<td>2079</td>
<td>197</td>
</tr>
<tr>
<td>35-39</td>
<td>1270</td>
<td>1175</td>
<td>95</td>
</tr>
<tr>
<td>40 and above</td>
<td>335</td>
<td>304</td>
<td>31</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Percentage</th>
<th>24 and below</th>
<th>25-29</th>
<th>30-34</th>
<th>35-39</th>
<th>40 and above</th>
</tr>
</thead>
<tbody>
<tr>
<td>91.5%</td>
<td>91.9%</td>
<td>91.3%</td>
<td>92.5%</td>
<td>90.7%</td>
<td></td>
</tr>
<tr>
<td>8.5%</td>
<td>8.1%</td>
<td>8.7%</td>
<td>7.5%</td>
<td>9.3%</td>
<td></td>
</tr>
</tbody>
</table>

Figure 4.10: Patients age

Figure 4.10 shows that out of 1580 patients who were 24 years and below, 134 (8.5%) were diagnosed with MSAF. Additionally for patients who were from 25 years to 29 years,
190 (8.1%) were diagnosed with MSAF while 30-34 years, 197 (8.7%), 35-39 years, 95 (7.5%) and 40 and above, 31 (9.3%) were diagnosed with MSAF.

Table 4.8: Gestational Age

<table>
<thead>
<tr>
<th>Gestational age</th>
<th>Meconium present</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No meconium</td>
</tr>
<tr>
<td>Less than 38 (pre-term)</td>
<td>2182 (94.9%)</td>
</tr>
<tr>
<td>38-42 (term)</td>
<td>5543 (90.7%)</td>
</tr>
<tr>
<td>Greater than 42 (post term)</td>
<td>91 (78.0%)</td>
</tr>
</tbody>
</table>

As revealed in figure 4.11, the p-value of 0.00 shows a statistically significant relationship between gestational age and presence of meconium. Out of 2182 patients who had a gestational age of less than 38 (pre-term), 112 (5.1%) were diagnosed with MSAF. In addition, out of 5543 patients who had a gestational age of 38-42 weeks, 515 (9.3%) were diagnosed with MSAF. Similarly, Out of 91 patients who had a gestational age greater than 42 (post term), 20 (22.0%) were diagnosed with MSAF.
### Table 4.9: Parity of meconium present

<table>
<thead>
<tr>
<th>Parity</th>
<th>No meconium</th>
<th>Presence meconium</th>
<th>of</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>2645</td>
<td>2372 (89.7%)</td>
<td>273 (10.3%)</td>
</tr>
<tr>
<td>1</td>
<td>2101</td>
<td>1956 (93.1%)</td>
<td>145 (6.9%)</td>
</tr>
<tr>
<td>2</td>
<td>1556</td>
<td>1460 (93.8%)</td>
<td>96 (6.2%)</td>
</tr>
<tr>
<td>3</td>
<td>931</td>
<td>857 (92.1%)</td>
<td>74 (7.9%)</td>
</tr>
<tr>
<td>4</td>
<td>406</td>
<td>364 (89.7%)</td>
<td>42 (10.3%)</td>
</tr>
<tr>
<td>5</td>
<td>117</td>
<td>160 (90.4%)</td>
<td>17 (9.6%)</td>
</tr>
</tbody>
</table>

### Figure 4.12: Parity of meconium present

As shown in figure 4.12, out of the patients who had a parity of two, majority 1460 (93.8%) had no presence of meconium, whiles 96 (6.2%) had presence of meconium. Furthermore for patients who had a parity of the least four parity, 367 (89.7%) had no presence of meconium and 42 (10.3%) had presence of meconium.
Table 4.10: Gravidity

<table>
<thead>
<tr>
<th>Gravidity</th>
<th>No meconium</th>
<th>Presence meconium</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1419 (89.0%)</td>
<td>176 (11.0%)</td>
</tr>
<tr>
<td>2</td>
<td>1763 (7.9%)</td>
<td>152 (7.9%)</td>
</tr>
<tr>
<td>3</td>
<td>1540 (92.6%)</td>
<td>123 (7.4%)</td>
</tr>
<tr>
<td>4</td>
<td>1087 (92.2%)</td>
<td>92 (7.5%)</td>
</tr>
<tr>
<td>5</td>
<td>701 (92.5%)</td>
<td>57 (7.5%)</td>
</tr>
<tr>
<td>&gt;5</td>
<td>641 (93.3%)</td>
<td>46 (6.7%)</td>
</tr>
</tbody>
</table>

As shown in figure 4.13, the results of the p-value (0.002) shows a significant relationship between gravidity and presence of meconium. Similarly, out of the patients who had gravidity greater than five, 641 (93.3%) had no meconium and 46 (6.7%) presence of meconium, while those who had one gravidity recorded a low 1419 (89.0%) had no meconium and 176 (11.0%) had presence of meconium.
As shown in table 4.12 the multiple logistic regression revealed that the odds of patients to be diagnosed with MSAF in terms of parity was 1.068. The results were however, not statistically significant (p-value= 0.363)

Moreover, the odds of patients with gestational age of 38-42 (term) and greater than 42 (post term) compared to patients with a gestational age of less than 38 (pre-term) to be diagnosed with MSAF was 0.203 and 0.434 respectively. The results were statistically significant at the p-value of 95% CI=0.05 significance level.

Furthermore the odds of patients aged 25-29, 30-34, 35-39 and 40 years, and above compared to patients aged 24 year and below to be diagnosed with MSAF was 0.889, 0.817, 0.954 and 0.866 respectively. The results were however, not statistically significant.

The odds of patients to be diagnosed with MSAF in terms of gravidity was 0.865. The results were statistically significant as the p-value of 0.00 and 0.00 was less that 0.05.

As shown in table 4.12 the multiple logistic regression revealed that the odds of patients to be diagnosed with MSAF in terms of parity was 1.068. The results were however, not statistically significant (p-value= 0.363)

Moreover, the odds of patients with gestational age of 38-42 (term) and greater than 42 (post term) compared to patients with a gestational age of less than 38 (pre-term) to be diagnosed with MSAF was 0.203 and 0.434 respectively. The results were statistically significant at the p-value of 95% CI=0.05 significance level.

Furthermore the odds of patients aged 25-29, 30-34, 35-39 and 40 years, and above compared to patients aged 24 year and below to be diagnosed with MSAF was 0.889, 0.817, 0.954 and 0.866 respectively. The results were however, not statistically significant.

The odds of patients to be diagnosed with MSAF in terms of gravidity was 0.865. The results were statistically significant as the p-value of 0.00 and 0.00 was less that 0.05.
4.6 Service level factors that influence MSAF deliveries.

This section presents the service level factors that influence MSAF deliveries. The section covers factors such as delivery bases on a referrals and mode of delivery. The percentage distribution of results for the various characteristics is first presented and examined using chi square and Fisher exact test followed by the logistic regression. The Fisher’s exact test was used for entries with values less than 10.

Table 4.12: Per cent distribution of meconium presence by service level characteristics
(n = 7816)

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Number of cases</th>
<th>Meconium present</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No meconium</td>
<td>Presence of meconium</td>
</tr>
<tr>
<td>Referral</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ridge</td>
<td>1122</td>
<td>1057</td>
</tr>
<tr>
<td></td>
<td>(94.2%)</td>
<td>(5.8%)</td>
</tr>
<tr>
<td>Other hospitals</td>
<td>6694</td>
<td>6112</td>
</tr>
<tr>
<td></td>
<td>(91.3%)</td>
<td>(8.7%)</td>
</tr>
</tbody>
</table>

Figure 4.14: Meconium Present
Figure 4.14 shows that there is a statically significant relationship (p=0.01). Similarly, out of 1122 patients who were regular ANC attendants at Ridge, 65 (5.8%) were diagnosed with MSAF. Additionally, out of 6694 patients who were referred from other hospitals, 582 (8.7%) were diagnosed with MSAF.

### Table 4.13: Delivery and meconium present

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Number of cases</th>
<th>No meconium</th>
<th>Presence of meconium</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Delivery</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C/S</td>
<td>3262</td>
<td>2820 (86.5%)</td>
<td>442 (13.5%)</td>
<td></td>
</tr>
<tr>
<td>C/S + BTL</td>
<td>263</td>
<td>239 (90.0%)</td>
<td>24 (9.1%)</td>
<td>0.00</td>
</tr>
<tr>
<td>Caesarean Hyste</td>
<td>33</td>
<td>31 (93.9%)</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>SVD</td>
<td>4226</td>
<td>4052 (95.9%)</td>
<td>174 (4.1%)</td>
<td></td>
</tr>
<tr>
<td>SVD &amp; C/S</td>
<td>21</td>
<td>17 (81.0%)</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Vacuum</td>
<td>11</td>
<td>10 (90.9%)</td>
<td>1 (9.1%)</td>
<td></td>
</tr>
</tbody>
</table>

Figure 4.15: Delivery and meconium present

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As shown in Figure 4.15, the results of the Fisher’s exact test shows a significant (p=0.00) relationship. Similarly, out of 3262 patients who had C/S, 442 (13.5%) were diagnosed with MSAF. Also, out of 263 patients who had a C/S + BTL, 24 (9.1%) were diagnosed with MSAF. Similarly, Out of 33 patients who had Caesarean Hyste, 2 (6.1%) were diagnosed with MSAF.

Additionally, out of 4226 patients who had a SVD, 174 (4.1%) were diagnosed with MSAF. Moreover, out of 21 patients who had a SVD and C/S, 4 (19.0%) were diagnosed with MSAF. Furthermore, out of 11 patients who had a vacuum aided delivery, 1 (9.1%) was diagnosed with MSAF.

### Table 4.14: Logistics regression (service level factor and presence of meconium)

<table>
<thead>
<tr>
<th>Variables</th>
<th>Odds Ratio</th>
<th>95% CI</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Lower</td>
<td>Upper</td>
<td></td>
</tr>
<tr>
<td>Delivery</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C/S (ref)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C/S+BTL</td>
<td>1.667</td>
<td>1.667</td>
<td>.208</td>
</tr>
<tr>
<td>Caesarean Hyste</td>
<td>.867</td>
<td>.867</td>
<td>.099</td>
</tr>
<tr>
<td>SVD</td>
<td>1.128</td>
<td>1.128</td>
<td>.089</td>
</tr>
<tr>
<td>SVD &amp; C/S</td>
<td>.435</td>
<td>.435</td>
<td>.054</td>
</tr>
<tr>
<td>Vacuum</td>
<td>3.727</td>
<td>3.727</td>
<td>.350</td>
</tr>
<tr>
<td>Referral</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ridge (ref)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Others</td>
<td>.611</td>
<td>.611</td>
<td>.461</td>
</tr>
</tbody>
</table>

As shown in table 4.15 in the multiple logistic regression the odds of patients who had C/S+BTL, Caesarean Hyste, SVD, SVD and C/S and Vacuum deliveries compared to patients who had C/S to be diagnosed with MSAF is 1.667, 0.867, 1.128, 0.435 and 3.727 respectively. The results were however not statistically significant.
In addition, the odds of patients who were clients of Accra hospital compared to patients who were referred from other hospitals to be diagnosed with MSAF was 0.611. The results were statistically significant under the p value of 95% CI 0.05 significance level.
CHAPTER FIVE
DISCUSSIONS OF FINDINGS

5.1 Introduction

This chapter presents the discussion of the study. A discussion on the patient and service level characteristics is first presented followed by a discussion on the proportion of deliveries with the diagnosis of MSAF. Subsequently, a discussion on the patient level factors that influence MSAF deliveries and service level factors that influence MSAF deliveries is presented.

5.2 Patient and Service level characteristics

Parity refers to the condition of having given birth to an infant or infants, alive or dead and gravidity refers to the number of times the female has been pregnant. Parity and gravidity plays an essential role in MSAF occurrence. Most (33.8%) of the patients considered for this study had a zero parity. Similarly, 24.5% of the patients had gravidity of 2 whiles 9.7% had a gravidity of 5. Attendance to ANC services also influences MSAF deliveries. Additionally, almost all (93.4%) of the respondents were attendants of antenatal. Most (70.9%) of the patients had a gestational age of 38-42 weeks. Similarly, most deliveries were done by SVD while the least (0.1%) delivery method was Vacuum. A study by Osava, et. al (2012) revealed that most (68.2%) of these diagnostics were normal deliveries and 38.8% Caesarean sections. Additionally, most (85.6%) of the patients were referred cases.

5.3 The proportion of deliveries with the diagnosis of MSAF.

Patil, et al (2006) found that the incidence of meconium stained amniotic fluid was 8.3% (249/3002). Thus, there is generally a low reported MSAF deliveries. Similar to the results of the study, most 36 4.8%) of the deliveries with the diagnosis of MSAF was grade three followed by grade one (1.9%) then grade two (1.5%). Again, the results of the study showed that 8% of deliveries was diagnosed with MSAF. The low rate is similar to reported
studies by other researchers (Mitri, et. al., 1987; Nangia, et. al, 2015). These researches), incidence rates of the Meconium Asphyxia Syndrome in developing countries seem to be higher than in developed countries Thus MSAF occurs in about 13% of all live-birth infants (Wiswell et al., 2000).

5.3 Patient level factors that influence MSAF deliveries.

Patient level factors like age, parity, gravity, and gestation influence MSAF deliveries. As revealed by the study, in terms of patients who were 24, years and below, (8.5%) was diagnosed with MSAF. Furthermore for patients who were from 25 years to 29 years, (8.1%) was diagnosed with MSAF while 30-34 year (8.7%), 35-39 years (7.5%) and 40 and above (9.3%) were diagnosed with MSAF, respectively.

Wiswell (2001) observed that MSAF usually occurs in term fetuses, hence, it is rare to find it before 38 weeks of gestation. Consequently, in relation regarding patients who had a gestational age of less than 38 (pre-term), (5.1%) was diagnosed with MSAF. Also, out of 5543 patients who had a gestational age of 38-42 weeks, 515 (9.3%) were diagnosed with MSAF. Similarly, concerning patients who had a gestational age greater than 42 (post term), (22.0%) was diagnosed with MSAF.

The results of the study showed that the odds of patients to be diagnosed with MSAF in terms of parity was 1.068. Thus, as parity of a patient increases, the odds of MSAF increases. However, the results were statistically insignificant. Similarly, when Sundaram and Murugesan (2016) explored the risk factors for MSAF and its implications among 100 patients at a tertiary hospital they found that parity showed no statistical significance. This finding may be so because Heirsch, et. al, (2016), revealed that gestational age was associated with specific complications in deliveries complicated by MSAF and otherwise low-risk deliveries.
In addition Mahapatro and Ghose (2014) revealed that the risk factors for MSAF during delivery at term pregnancy, postdated pregnancy (32.85%) and oligohydramnios (18.57%) were most prominent. As revealed by this study, the odds of patients with gestational age of 38-42 (term) and greater than 42 (post term) compared to patients with a gestational age of less than 38 (pre-term) to be diagnosed with MSAF were 0.203 and 0.434 respectively. Thus, the odds of patients with gestational age of 38-42 (term) and greater than 42 (post term) to have MSAF were lower than patients with gestational age of less than 38 (pre-term). The p-value (state it) showed that gestational age was statistically significant at determining the occurrence of MSAF delivery. Similarly, Heirsch, et al., (2016), to examined all singleton deliveries that underwent a trial of labor in a single hospital and, found that gestational age was associated with specific complications in deliveries complicated by MSAF and otherwise low-risk deliveries. However, Wiswell (2001), observed that the incidence of MSAF increases with increased gestational age from the 38th week. Additionally, the odds of patients aged 25-29, 30-34, 35-39 and 40, years and above to have MSAF were lower than patients aged 24, year and below.

The odds of patients to be diagnosed with MSAF in terms of gravidity decreases as gravidity increases. The p-value (0.02) showed that gravidity was statistically significant at determining the occurrence of MSAF delivery. However, the study by Sundaram and Murugesan (2016), revealed that gravidity had no statistical significance.

5.4 Service level factors that influence MSAF deliveries.

The results of the study showed that in terms 1122 patients who were regular ANC attendants at Accra Regional Hospital, 65 (5.8%) was diagnosed with MSAF. Furthermore, relating patients who were referred from other hospitals, (8.7%) was diagnosed with MSAF. Likewise, with reference patients who had C/S, 442 (13.5%) were diagnosed with MSAF.
study by Osava, et al. (2012) revealed that caesarean section was a factor associated with meconium. Moreover, in terms of patients who had a C/S + BTL, (9.1%) was diagnosed with MSAF. Similarly, regarding patients who had Caesarean Hyste, (6.1%) was diagnosed with MSAF.

In addition, concerning patients who had a SVD, (4.1%) was diagnosed with MSAF. Likewise, relating to 21 patients who had a SVD and C/S, (19.0%) was diagnosed with MSAF. Additionally, interim of patients who had a vacuum aided delivery, (9.1%) was diagnosed with MSAF. Osava, et al. (2012) study revealed that, most (68.2%) of these diagnostics were normal deliveries and 38.8% Caesarean sections.

The results of the study revealed that the odds of patients who had C/S+BTL had a higher odds of having MSAF deliveries than patients who had only C/S. Furthermore, patients who had Caesarean Hyste had a lower odds of having MSAF deliveries than patients who had C/S. The odds of SVD, SVD and C/S and Vacuum deliveries compared to patients who had C/S to be diagnosed with MSAF were 1.667, 0.867, 1.128, 0.435 and 3.727 respectively. Additionally, patient who had SVD had higher odds of having MSAF than patients who had C/S. Patients who had SVD and C/S had lower odds of having MSAF deliveries than patients who had C/S. Moreover, patients who had vacuum aided delivery had higher odds of MSAF delivery than patients who had C/S.

The results of the study revealed that patients who were referred had a lower odds of MSAF than patients who were clients of Accra Regional hospital. The p-value (0.001) shows that referral was statistically significant at determining the occurrence of MSAF delivery. Thus, ineffective and inefficient referral systems can have a detrimental consequence in pregnancy outcomes.
CHAPTER SIX
SUMMARY, CONCLUSION AND RECOMMENDATION

6.1 Introduction

This chapter presents the summary conclusions and recommendation based on the findings for the study. The conclusion for the various specific objectives is first presented followed by the recommendations made on the results of the study.

6.2 Summary of the study

The study aimed at determining the proportion of deliveries with the diagnosis of MSAF, the patient level factors that influence MSAF deliveries; and the service level factors that influence MSAF deliveries. The study adopted a retrospective study design in the review of labour records from January 2016 to December, 2016 at Accra Regional Hospital. The sample size considered for the stated time periods was 7816 deliveries.

6.3 Conclusion

Most deliveries with the diagnosis of MSAF were grade three followed by grade one then grade two. Additionally, out of 7816 deliveries, only (8%) was diagnosed with MSAF. Patients with gestational age of 38-42 (term) and greater than 42 (post term) had statistically significant lower odds of having MSAF deliveries than patients with a gestational age of less than 38 (pre-term). In addition as gravidity increases the odds of having MSAF delivery decrease. Thus, gestational age and gravity were patient level factors that influenced MSAF deliveries.
Patients who were referred had lower odds of MSAF delivery than patients who were clients of Accra Regional hospital. Thus, referral was a service factor that influenced MSAF deliveries.

6.4 Recommendation / Contribution to knowledge

Based on the results of the study the following recommendations are made;

1. The results of the study revealed that referral was a service factor that influenced MSAF deliveries. The study therefore recommends that, Ghana Health Service should review its referral policy which will help the Accra Regional Hospital to put measures in place to ensure that the occurrence of MSAF deliveries and associated consequences were reduced.

2. The results of the study also revealed that gestational age played, a significant role in influencing MSAF deliveries. The study therefore, recommends that, the monitoring of pregnancy during the various gestational stages to be carried out effectively to mitigate the harmful effects of MSAF deliveries.

3. The study also recommends that future studies on this topic should include other hospital to make generalization of the results significant.

6.5 Limitations to the Study

The disadvantage of retrospective design is that is information is limited to only available data and might ignore other influential factors which will lead to information bias. The findings will only provide a snapshot of what is happening and might not be able to generalize it to the whole population (mothers in Ghana).
REFERENCES


Crowley, P. (2000). Interventions for preventing or improving the outcome of delivery at or beyond term. *Cochrane Database Systematic Reviews, (2):*CD000170


58


<table>
<thead>
<tr>
<th>Age</th>
<th>Parity</th>
<th>Gravida</th>
<th>Gestation</th>
<th>Obstetric History</th>
<th>Antenatal History</th>
<th>Delivery Method</th>
<th>Referral</th>
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