

Research Article

Prevalence of Meconium Stained Amniotic Fluid and Predictors for Poor Fetal Outcomes Among Women Delivering at Bugando Medical Centre Mwanza Tanzania

Simon Malihu Kamuli^{1,*}, Innocent Lutakyamilwa Kaiza¹, Albert Kihunrwa², Elieza Chibwe², Ndakibae Gabriel Mabega³

¹Department of Obstetrics and Gynecology, SekouTouré Regional Referral Hospital, Mwanza, United Republic of Tanzania

²Department of Obstetrics and Gynecology, Bugando Medical Centre, Catholic University of Health and Allied Sciences, Mwanza, United Republic of Tanzania

³Department of Clinical Research, National Institute for Medical Research, Mwanza Research Centre, Mwanza, United Republic of Tanzania

Abstract

Background: Meconium stained amniotic fluid occurs in up to 20% of all deliveries and is reported to vary in different settings across the world. Babies delivered by these women are at high risk of low score and meconium aspiration syndrome. Limited studies have reported on the predictors for poor fetal outcomes in women presenting with meconium stained amniotic fluid. **Methods:** This was a cross sectional study involving 209 pregnant women with meconium stained amniotic fluid. Semi structured questionnaire was used for data collection. Data were analyzed using STATA version 12. **Results:** A total of 1202 women delivered during the study period from December 2017 to February 2018. Amongst, 209 (17.4%) women had meconium stained amniotic fluid. Of the 209 babies, 35 (16.7%) had low score, 41 (19.6%) were admitted due to meconium aspiration syndrome and 3 (1.4%) died due to meconium aspiration syndrome related complications. Predictors for poor fetal outcomes were found to be Thick meconium (Grade III), Meconium as a new event during labor monitoring and null parity. **Conclusion:** The prevalence of meconium stained amniotic fluid at Bugando Medical Centre was found to be 17.4%. Thick meconium, development of meconium as a new event and nullparous were found to predict for poor fetal outcomes. Immediate interventions are recommended for those with the identified predictors for poor fetal outcome.

Keywords

Meconium Stained, Fetal Outcomes, Women Delivering, Amniotic Fluid

*Corresponding author: smalihu@yahoo.com (Simon Malihu Kamuli)

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1. Introduction

Meconium stained amniotic fluid (MSAF) can occur in up to 20% of all deliveries [1-4]. The tendency to pass meconium increases with gestation age and is more marked at 40 weeks and above [2]. Passage of meconium in utero in most of cases is physiological, though for few may be a sign of fetal compromise. Fetuses may pass meconium in utero because of physiological maturation of the gastrointestinal tract or sometimes can be due to pathologic events like hypoxia posing a great dilemma in managing these women [5]. In the settings where there is no electronic fetal monitor or inadequate staff to provide close monitoring of laboring women, the rate of caesarian section in this group of women is very high [1]. Meconium stained amniotic fluid is associated with poor birth outcomes such as low APGAR score, need for resuscitation, meconium aspiration syndrome, increased hospital stays, and neurodevelopment delays [2, 6, 7]. Bugando Medical Center have a significant number of women with meconium stained amniotic fluid but the magnitude and fetal outcomes are yet to be documented. Neither amnioinfusion nor electronic monitors are in place for these women at BMC as recommended by most studies [8, 9]. As a way forward to improve outcomes in this group of patients, it was important to conduct a study to establish the magnitude and predictors for poor fetal outcomes among women presenting with meconium stained amniotic fluid at Bugando Medical Center.

2. Material and Methods

2.1. Study Design

A prospective cross-sectional design was used involving all women delivering at Bugando Medical Center from December 2017 to February 2018. Women with meconium stained amniotic fluid during a study period were selected to participate in the study.

2.2. Study Area and Setting

The study was conducted at BMC, BMC is a tertiary referral, consultant, and teaching Hospital in the Lake and Western zones of the United Republic of Tanzania. It is located along the shores of Lake Victoria in the City of Mwanza. BMC has 950 beds and 1500 employees. It is a referral hospital with various specializations.

2.3. Sampling Strategy and Sample Size

The participants were selected at the labor ward from December 2017 to February 2018, the inclusion criteria for participation were patient with Meconium stained amniotic fluid, adequate mental capacity and the ability and willingness to participate. A total of 209 women with meconium stained amniotic fluid were purposively selected from December

2017 to February 2018. The patients were managed according to the BMC management protocol for meconium stained amniotic fluid, which includes fluids resuscitation with ringer's lactate and continue monitoring for progress of labor if there is no indication for caesarian section. Women who were admitted for other reasons not labor pain were excluded from the study.

2.4. Data Collection

A semi structured questionnaire was used to select data from all women with meconium. After clinical assessment participants were monitored for progress of labor/instituted management according to the diagnosis made. Obstetric findings like cervical dilatation, time when meconium, grade of meconium and fetal outcomes were noted. All clinical information for each participant was recorded.

2.5. Data Analysis

All data were entered into the computer Microsoft excel 2007 and later transported to STATA version 12 for analysis. All deliveries during the study period were taken for calculation of prevalence of meconium stained amniotic fluid. Fetal outcomes were analyzed as proportional where as continuous variables were analyzed using mean. All independent variables were exposed to univariate logistic regression model and those with p value of 0.05 or less including age were exposed to multivariate logistic regression model. Independent variable with p value of less than 0.05 was considered a predictor for low score and or meconium aspiration syndrome.

2.6. Ethical Consideration

Ethical clearance for this study was sought from the Catholic University of Health and Allied Sciences (CUHAS)/Bugando Medical Centre (BMC) Joint Research and Ethical committee. Authorization to conduct the research was sought from the Director General and from the head of department of obstetrics and gynecology. Participants were asked to sign a written informed consent form before joining the study.

3. Results

3.1. Socio-Demographic Characteristics of Women Who Had Meconium Stained Amniotic Fluid

The participants characteristics are presented in the [Table 1](#) below. The mean age of women with meconium stained amniotic fluid was 27 ± 5 years and the mean gestation age

was 40 ± 2 weeks. Of the 209, 18 (8.4%) were the age between 16-20, 143 (68.4%) were 21-30, 46 (22.2%) were 31-40 and 2 (1%) were age between 41-43. Among them 196 (93.8%) were direct from home and 13 (6.2%) were referral from another facilities. Multigravida account for the highest number of patients, 134 (64.1%), followed by Primegravi-

dawhich account of 59 (28.2%). The parity of the participants was nullipara 62 (29.7%), Primepara 57 (27.3%), Multipara 87 (41.6%), Grandmultipara 16 (7.7%), and participants gestation age was Preterm 20 (9.9%), Early term 30 (14.4%), Full term 93 (44.4%) and Late term 66 (31.6%).

Table 1. Distribution of socio-demographic characteristics of the study participants.

Patients' characteristics	Number (n)	Percentage (%)
Age group in years		
16 – 20	18	8.4
21 – 30	143	68.4
31 – 40	46	22.2
41 – 43	2	1.0
Type of admission		
Direct from home	196	93.8
From another facility	13	6.2
Gravidity		
Primegravida	59	28.2
Multigravida	134	64.1
Grandmultigravida	16	7.7
Parity		
Nullpara	62	29.7
Primepara	57	27.3
Multipara	87	41.6
Grandmultipara	3	1.4
Gestation age		
Preterm	20	9.6
Early term	30	14.4
Full term	93	44.4
Late term	66	31.6

3.2. Clinical Information of Women with Meconium Stained Amniotic Fluid

Majority, (83.7%) of women with meconium stained amniotic fluid presented in active phase of labor and a significant number delivered few minutes after admission. Diagnosis of meconium stained amniotic fluid was made after artificial rupture of membrane in most of patients and the cervical dilatation was more than 6 in 76.6% for those artificially ruptured the membrane (Table 2).

Table 2. Clinical information of women who had meconium stained amniotic fluid.

Patient clinical characteristics	Number (n)	Percentage (%)
Stage/phase of labor on admission		
Latent phase	13	6.2
Active phase	175	83.7
Second stage	21	10.1
Grade of meconium		
Mild	63	30.1
Moderate	103	49.3
Thick	43	2.6
When was meconium noted		
On admission	37	17.7
Artificial rupture of membrane	137	65.5
New event during labor monitoring	35	16.8
Cervical dilatation when meconium was noted (cm)		
2-4	32	15.3
5-6	49	23.5
7-9	105	50.2
10	23	11.0
Duration of labor (hours)		
≤3	102	48.8
4-8	98	46.9
>8	9	4.3
Labor induction		
Yes	197	94.3
No	12	5.7
Labor augmented		
Yes	14	6.7
No	195	93.3
Model of delivery		
spontaneous vaginal delivery	144	68.9
Caesarean section	65	31.1

3.3. Fetal Outcome for Women Who Had Meconium Stained Amniotic Fluid

Of the 209 babies, 56 (26.8%) and 35 (16.7%) had low score in their first and fifth minute of life respectively. On the other hand, 41 (19.6%) babies were admitted due to meconium aspiration syndrome and 3 (1.4%) of them died. There was no still birth (Table 3).

Table 3. Fetal outcome for women who had meconium stained amniotic fluid.

Babies' clinical characteristics	Number (n)	Percent (%)
First minute APGAR score		
Low score	56	26.8
Normal score	153	73.2
Five-minute APGAR score		
Low score	35	16.7
Normal score	174	83.2
Outcome of babies		
Healthy babies	160	76.6
Meconium aspiration syndrome	41	19.6
Birth asphyxia	5	2.4
Death related to MAS	3	1.4
Hospital stay beyond seven days	0	0.0

3.4. Predictors for Fetal Outcomes

On univariate analysis primiparous (OR 2.2; 95% CI [1.0 – 4.9]; p-value = 0.047), thick (grade III) meconium (OR 5.3; 95% CI [1.0 – 2.3]; p-value <0.001), meconium as a new event during labor monitoring (OR 3.5; 95% CI [1.3 – 9.0]; p-value 0.011), latent phase of labor (OR 3.5; 95% CI [1.1 – 11.3]; p-value = 0.032) and caesarian section (OR 1.9; 95%

CI [1.0 – 3.5]; p-value = 0.039) were statistically significant for low score and meconium aspiration syndrome. When these factors were exposed to multivariate analysis, Thick (grade III) meconium (OR 4.5; 95% CI [1.7 – 11.7]; p value 0.002), Meconium as a new event during labor monitoring (OR 4; 95% CI [1.3 – 12.4]; p-value = 0.015) and null parity (OR 4; 95% CI 2.5[1.0-6.5]; p-value = 0.047) remained statistically significant as predictors for low score and meconium aspiration syndrome (Table 4).

Table 4. Predictors for poor fetal outcomes among patient presented with meconium stained amniotic fluid.

Patient characteristics	Child health		Univariate		Multivariate	
	Poorn (%)	Goodn (%)	OR [95% CI]	p-value	OR [95% CI]	p-value
Age group						
16-20	4(22.2)	14(77.8)	1.0			
21-34	61(36.1)	108(63.9)	2[0.6-6]	0.247	2.2[0.6-8.4]	0.251
≥35	4(18.2)	18(81.8)	0.7[0.2-3.1]	0.751	1.1[0.2-6.9]	0.922
Type of admission						
From Home	65(33.2)	131(66.8)	1.0			
Referral	4(30.8)	9(69.2)	0.9[0.3-3]	0.859	-	-
Gravidity						
Prime	22(37.3)	37(62.7)	1.0			
Multigravidae	42(31.3)	92(68.7)	0.8[0.4-1.5]	0.420	-	-
Grandmultigravida	5(31.0)	11(67.0)	0.8[0.2-2.5]	0.656	-	-

Patient characteristics	Child health		Univariate		Multivariate	
Parity						
Prime para	14(24.6)	43(75.4)	1.0		-	-
Null para	26(42.0)	36(58.1)	2.2[1.0-4.9]	0.047	2.5[1.0-6.5]	0.047
Multipara	29(32.2)	61(67.8)	1.5[0.7-3.1]	0.321	1.5[0.6-3.7]	0.341
Gestation age						
Preterm	7(35.0)	13(65.0)	1.0			
Early term	10(33.3)	20(66.7)	0.9[0.3-3.1]	0.903	-	-
Full term	26(28.0)	67(72.0)	0.7[0.2-2.0]	0.531	-	-
Late term	26(39.4)	40(60.6)	1.2[0.4-3.4]	0.724	-	-
Anemia						
With anemia	43(29.0)	105(71.0)	1.0			
Without anemia	26(42.6)	35(57.4)	1.8[1-3.4]	0.059	-	-
Grade of meconium						
I	13(20.6)	50(79.4)	1.0			
II	30(30.0)	72(70.0)	1.7[0.8-3.5]	0.182	1.5[0.7-3.6]	0.628
III	25(58.1)	18(41.9)	5.3[2.3-12.6]	<0.001	4.5[1.7-11.7]	0.002
Time when Meconium was noted						
On admission	11(29.7)	26(70.3)	1.0			
Artificial rupture of membrane	37(27.0)	100(73.0)	0.9[0.4-1.9]	0.742	0.7[0.3-2.0]	0.628
New event	21(60.0)	14(40.0)	3.5[1.3-9]	0.011	4[1.3-12.4]	0.015
Stage of labor						
Active-second	61(31.1)	135(68.5)	1.0			
Latent	8(61.5)	5(38.5)	5[1.1-11.3]	0.022	3.0[0.9-12]	0.083
Labor induction						
Induced	4(33.3)	8(66.7)	1.0			
Not induced	65(33)	132(67.0)	0.5[0.3-3.4]	0.981	-	-
Labor Augmented						
Yes	7(50.0)	7(50.0)	1.0			
No	62(31.8)	133(68.2)	1.0[0.2-1.2]	0.170	-	-
Model of delivery						
SVD	41(28.5)	103(71.5)	1.0			
C/S	28(43.1)	37(56.9)	1.9[1-3.5]	0.039	1.5[0.7-3.2]	0.339
Cervical dilatation when meconium noted	7[5.5-8.0]	7[6.0-8.0]	1.0[0.8-1.1]	0.583	-	-

4. Discussion

Prevalence of meconium stained amniotic fluid.

The prevalence of meconium stained amniotic fluid was

found to be 17.4% [95% CI: 15.2% - 19.5%] slightly higher compared to the study done in Ethiopia where they noted the prevalence to 15.4% [1]. Studies from different parts of the world show a great variation regarding the prevalence of meconium stained amniotic fluid. Studies from, India, Brazil

and London reported the prevalence of 9.8%, 11.9% and 16.5% respectively which is lower than that of the present study [7, 10, 16]. In the current study, the mean gestation age was 40 ± 2 weeks higher than the mean age in the studies reported above. This high gestation age may explain the high prevalence of meconium stained amniotic fluid in the current study. A mature gastrointestinal tract will allow movement of its contents with the aid of peristaltic waves to propel intestinal contents to the rectum and once it is full sensation to defecate is stimulated and the fetus empties the rectum. Several studies have reported that the tendency to pass meconium in-utero increase with increasing gestation age [4, 15, 16]. Furthermore, 48.8% patients in our study presented with advanced stage of labor and upon rupturing membrane delivery took place in less than 2 hours. This may mean that labor started at home and no close monitoring of labor progress to early identify fetal compromise that lead to meconium passage. Stress that may be due to intermittent cord compression or chronic hypoxia may trigger release of catecholamine that stimulates parasympathetic system of the fetus leading to utero passage of meconium [14]. A study on meconium stained amniotic fluid as a function of duration labor was done at Seoul National University College of Medicine, Korea reported prevalence of MSAF of 2.8% in patient who delivered by elective caesarian section compared to 23% for patient who delivered after the onset of labor. They also noted that, the longer the duration of labor the greater the frequency of MSAF [17]. Further explanation for the variation of prevalence of meconium stained amniotic fluid may be related to the diagnostic means for meconium stained amniotic fluid. In most case this is by observation, that is, observer dependent. For this reason, there may be overestimation or underestimation of slight meconium.

Fetal outcomes.

In our study, 160 (76.6%) babies had good health, 35 (16.7%) had low score, 41 (19.9%) got meconium aspiration syndrome, 5 (2.4%) 3.8% got birth asphyxia and 3 (1.4%) died of meconium aspiration syndrome related complications. A similar study done 6 years ago at Gandhi Regional Institute of Health and Medical Sciences, India reported 21.2% of low apgar score, increased incidence of birth asphyxia, and a 5% rate of meconium aspiration syndrome for deliveries complicated with meconium stained amniotic fluid [2]. Many other studies across the world have reported similar outcomes among women whose delivery is complicated by meconium stained amniotic fluid [7, 12, 16, 24, 25]. In most cases as also shown in the current study passage of meconium in utero is a physiological phenomenon; however, few fetuses can pass meconium as a result of compromise leading to poor fetal outcomes as demonstrated in the current study. Meconium aspiration, one of the complications of meconium stained amniotic fluid contribute high in perinatal morbidity and mortality [11-23]. In our study 3 (1.4%) babies died of meconium aspiration syndrome related complications.

Predictors for poor fetal outcomes.

Meconium stained amniotic fluid is really worrisome from both, obstetrician's and pediatrician's points of view as it is associated with poor fetal outcome [2]. Predictors for poor fetal outcomes among patients with meconium stained amniotic fluid if known can help improve the fetal outcomes in this population group. In our study, we found grade three (thick) meconium, development of meconium as a new event during labor monitoring and null parity as significant predictors for poor fetal outcomes.

In this study we found that, thick meconium (grade III) was significantly associated with low score and meconium aspiration syndrome. Similar results were reported in other studies from Thailand, USA and India in which thick meconium was significantly associated with low Apgar score in both first and fifth minute of life and meconium aspiration syndrome [18, 20, 26]. Prevalence of meconium was high in our study; therefore, it is not surprising to have a significant number of women with thick meconium. Labor by itself is a stressful condition such that some fetus may not withstand leading to passage of thick meconium as a sign of fetal distress than maturity [17]. Thus, these fetuses score low and they are likely to aspirate meconium than those fetuses that pass meconium just because of maturity. Furthermore, many women come for admission while in the advanced stage of labor this means that labor started at home where no means to properly monitor the wellbeing of the fetus, this can explain as to why despite doing caesarian section the outcome was not good to most of fetus [17]. Moreover, high concentration of chemicals like bile salts in thick (grade III) meconium such that even little aspirate will cause more harm than the Moderate to thin meconium [19].

This study also found a significant association between poor fetal outcome and development of meconium as a new event during labor monitoring. This predictor has not yet reported by any study from literature. These are women who on admission had clear liquor just to develop meconium while in the ward monitored for labor. We speculate that some fetuses cannot withstand the stress of labor thus passage of meconium at an advanced stage of labor is the indication of fetal distress. As reported by one study in Ohio, USA, many fetuses passed meconium as the labor advances [18]. The situation may be worsened by our means of monitoring labor whereby fetostethoscope (Pinard) is applied to monitor fetal heart rate. By this mean it may be difficult to timely identify the features of non-reassuring fetal status.

Our study also noted that null parity was a predictor for poor fetal outcomes, a finding that has not yet been documented in literature. Women with no previous history of birth have been associated with most of obstetric complications. Furthermore, these women are also likely to have prolonged labor as compared to multiparous [17]. For this reason, their fetuses are at increased risk of passing meconium as a sign of fetal distress. The tendency of in-utero passage of meconium was associated with null parity in one study done in Brazil [7]. In our study more,

women with meconium stained amniotic fluid delivered by caesarian section than spontaneous vaginal delivery with an indication of non-reassuring fetal status. A study in Brasil also reported similar findings suggesting that whenever the incidence of meconium stained amniotic fluid is high, the fetal vitality may also be worse giving out a poor fetal outcome [7]. This may help to explain as to why this group of women in our study was associated with poor outcome. However more studies are needed to investigate the reasons behind this.

5. Conclusion

The prevalence of meconium stained amniotic fluid was found to be 17.4%. Predictors for poor fetal outcomes were found to be; thick (grade III) meconium, development of meconium as a new event during labor monitoring and null parity. Immediate interventions are recommended for those with predictors for poor birth outcome. Women should continue to deliver at the hospital so that if complications emerging during labor will be easy to be discovered and managed accordingly to improve birth outcome. Also, we recommend more studies to be done to find scientific interventions that will improve fetal outcomes among women who develop meconium during labor.

Abbreviations

MSAF	Meconium Stained Amniotic Fluid
BMC	Bugando Medical Centre
CUHAS	Catholic University of Health and Allied Sciences

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Author Contributions

Simon MalihuKamuli: Conceptualization, proposal writing, data collection, analysis and manuscript writing

EliezaChibwe: Designed, executed the study and prepared manuscript which was reviewed and approved by all authors

Albert AlbertKihunrwa: Proposal writing, data collection, analysis and manuscript writing

Innocent Lutakyamilwa Kaiza: Reviewed the study and manuscript development

Ndakibae Gabriel Mabega: Proposal writing, data collection, analysis and manuscript writing

Declaration

Ethics Approval and Consent to Participate All methods were carried out in accordance with relevant guidelines and regulations, informed consent was obtained from all subjects and/or their legal guardian(s). This study was approved by BMC/CUHAS ETHICS. Permission for conducting the research was granted by the Director of Bugando Medical Centre. The consent was also sought from the participants before recruitment.

Consent for Publication

All authors read the manuscript and approved it for Publication.

Data Availability Statement

The database used and analyzed during the current study is available from the corresponding author and will available on request.

Conflicts of Interest

The authors declare no conflicts of interest.

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