

# Foetal Outcome in Women presenting with Meconium Stained Liquor at the University Teaching Hospital, Lusaka Zambia

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## ABSTRACT

**Objective:** The objective of the study was to determine the fetal outcome, magnitude of meconium stained amniotic fluid (MSAF) or meconium stained liquor (MSL), and risk factors responsible for MSAF at University Teaching Hospital in Lusaka, Zambia.

**Methods:** The study was a case control study conducted at University Teaching Hospital (UTH) in Lusaka Zambia from May to August 2018. Information was collected from a calculated sample size of 186 women using a structured interview schedule of which 93 were cases and another 93 were controls. Patient files were also used to collect data. In order to ensure that the findings were valid, the statistical significance was set at  $p < 0.05$

**Results:** The study found that the frequency of MSAF during the period under study at UTH was 10.2%. It also demonstrated no significant difference in terms of good Foetal outcome at 5 minutes in women with MSAF compared with those without MSAF. (Adjusted  $p$  value = 0.773). Most women (90.2%) with MSAF also had good outcome of Apgar score 7 or more at 5 minute though less when compared to those without MSAF at 97.8%. Caesarean section (C/S) rate was high (37.6%)

among women with MSAF versus 19.4 % among those without MSAF. There was also a strong association between MSAF and being delivered by C/S (Adjusted odds ratio = 4.579 and adjusted  $p$  value = 0.002) indicating that women with MSAF were 4.5 times more likely to be delivered by C/S as compared to those without MSAF. Electronic monitoring of patients with MSAF was low with only 33 (35.5%) of women with MSAF being monitored with cardiotocography (CTG). During the period under study, 30 (32%) women with MSAF had associated complications. However, there was no significant association between any demographic characteristic, and or investigated obstetric risk factor and MSAF

**Conclusion:** The frequency of MSAF at UTH was 10.2%. The study demonstrated no significant difference in Foetal outcome at 5 minutes in women with MSAF compared with those without MSAF. However, Caesarean rate was noted to be high at 37.6% in those with MSAF compared to those without MSAF at 19.4%. No investigated complication was significantly associated MSAF at UTH.

## INTRODUCTION

The detection of meconium stained amniotic fluid (MSAF) during labour often causes anxiety in the delivery room because of its association with increased perinatal mortality and morbidity.

**Key words:** meconium stained amniotic fluid (MSAF) or meconium stained liquor (MSL), risk factors and fetal outcome

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Meconium staining of the amniotic fluid has long been associated with Foetal distress. Meconium is greenish –yellowish liquid composed of small dried amniotic fluid debris, bile pigments, lanugo, epithelial cells and the residue from intestinal secretions. Although meconium is sterile, its passage into amniotic fluid is important because of the risk of meconium aspiration syndrome (MAS) and its sequelae. Infants delivered through meconium-stained amniotic fluid are more likely to be depressed at birth and to require resuscitation and neonatal intensive care. Meconium is graded into grade 1, 2 and 3 according to thickness. The higher the grade the poorer the outcome.<sup>1</sup> Therefore, detection of meconium stained liquor after rupture of membrane demands urgent intervention in terms of either continuing with vaginal delivery but with close Foetal monitoring if the Foetal heart pattern is reassuring or emergency delivery by Caesarean section. However, in resource limited institutions like University Teaching Hospital (UTH), with inadequate staffing in labour ward, inadequate electronic Foetal monitoring by cardiotocography (CTG) and lack of equipment for definitive diagnosis of Foetal distress through Foetal scalp sampling technique, it can be a challenge to adequately monitor these women and may result in poor outcome or unnecessary intervention through Caesarean sections.

Several studies globally have been done to determine the Foetal outcome in MSAF as well as to assess the risk factors. In a study conducted in Pakistan, it was found that MSAF was a common occurrence during labour and that electronic Foetal monitoring, timely obstetrical intervention and paediatric care can reduce associated complications and improve Foetal outcome.<sup>2</sup> Another study also found that meconium stained amniotic fluid was associated with higher rate of Caesarean delivery, increased need for neonatal resuscitation and meconium aspiration syndrome.<sup>3</sup> In India, Priyadharshini and Panicker found that meconium stained liquor alone was not associated with an adverse neonatal outcome and that 86% of babies remained asymptomatic in spite of MSAF and only required routine care.<sup>4</sup> The study also found that

increasing grade of MSAF was associated with increased adverse outcome and that MSAF with abnormal CTG was associated with poor outcome, increased Caesarean section rate and increased neonatal complications.<sup>4</sup> Ashfaq and Shah also found that meconium by itself was not always associated with poor Foetal outcome but that severe respiratory distress called meconium aspiration syndrome increased in cases of non-reassuring FHR.<sup>5</sup>

Studies of this nature however, had not been done previously in Zambia. Therefore, this study endeavored to explore this gap. The aim of this study was to determine the magnitude (frequency) of MSAF, Foetal outcome and risk factors responsible for MSAF at UTH.

## METHODS

This case control study was carried out at the labour ward of the University Teaching Hospital, in Lusaka, Zambia. It targeted pregnant women admitted to UTH labour ward. The study population included women who were diagnosed with MSAF as cases and another equal group of women with clear amniotic fluid and who met eligibility criteria as control. Purposeful sampling method was used to select 93 cases while 93 controls were selected using systematic random sampling method using a calculated sampling interval of 10. Purposeful sampling method was used to select the cases because meconium stained liquor is a rare occurrence. Data was analyzed using SPSS 25 and included bivariate analysis and multivariate logistic regression analysis model.

## RESULTS

During the period under study the total number of deliveries was 953 of which vaginal deliveries were 526 (55.2%) and Caesarean sections were 427 (44.8%).

Most participants on both the cases and control groups were aged between 20 to 29 years, 49 (52.7%) among cases and 51 (54.8 %) among controls. Majority of them were of single parity

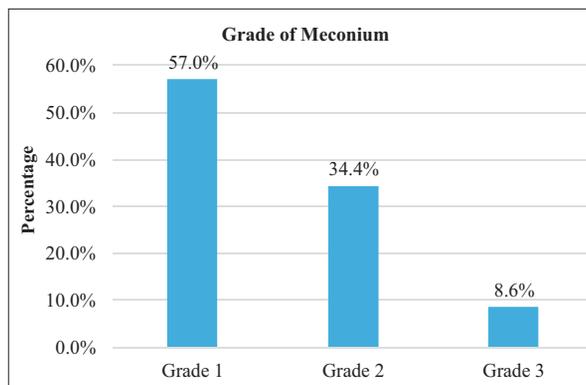
(para 1), 49 (52.7%) among cases and 43 (46.2%) among controls. Refer to Table 1.

**Table 1: Socio-demographic characteristics of women with and without MSAF who delivered at UTH labour ward from May to August 2018**

	Presented with Meconium			
	Yes		No	
	n	%	n	%
<b>Age</b>				
Less than 20	12	12.9%	18	19.4%
20 - 29	49	52.7%	51	54.8%
30 - 39	30	32.3%	18	19.4%
40 and above	2	2.2%	6	6.5%
<b>Parity</b>				
Para 1	49	52.7%	43	46.2%
2 - 4	36	38.7%	37	39.8%
≥ 5	8	8.6%	13	14.0%
<b>Gestation age</b>				
37 - 40	66	81.5%	74	86.0%
41 - 44	15	18.5%	12	14.0%
<b>Marital status</b>				
Single	22	23.7%	19	20.4%
Married	71	76.3%	74	79.6%
<b>Education</b>				
Primary	48	51.6%	49	52.7%
Secondary	32	34.4%	33	35.5%
Tertiary	13	14.0%	11	11.8%
<b>Occupation</b>				
Unemployed	66	71.0%	66	71.0%
Formal Employment	11	11.8%	12	12.9%
Informal Sector	16	17.2%	15	16.1%
<b>Residence</b>				
High Density	76	81.7%	80	86.0%
Medium Density	10	10.8%	7	7.5%
Low Density	7	7.5%	6	6.5%

**Burden (frequency) of meconium stained liquor at UTH**

During the period under study, the total number of deliveries was 953 and among these, the total number of women with meconium stained liquor was 97 giving a meconium frequency rate of 10.2%. Women with grade 1 MSAF were 53 (57%), while 32 (34.4%) had grade 2 and 8(8.6%) had grade 3. Refer to Figure 1.

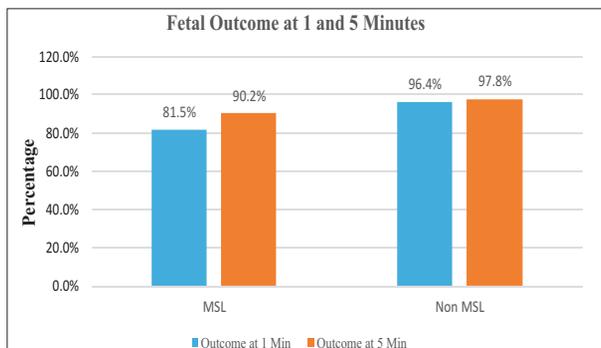


**Figure 1: Burden of meconium stained liquor according to the grade for women at UTH from May to August 2018**

**Foetal outcome in MSAF Vs Non MSAF at one and five minute Apgar score**

There was no significant difference in Foetal outcome at 1 minute in women with MSAF verses women without MSAF. (Adjusted P value = 0.062.) However, more women without MSAF had good outcome with Apgar score of 7 or more at 96.4% compared to those with MSAF at 81.5%.

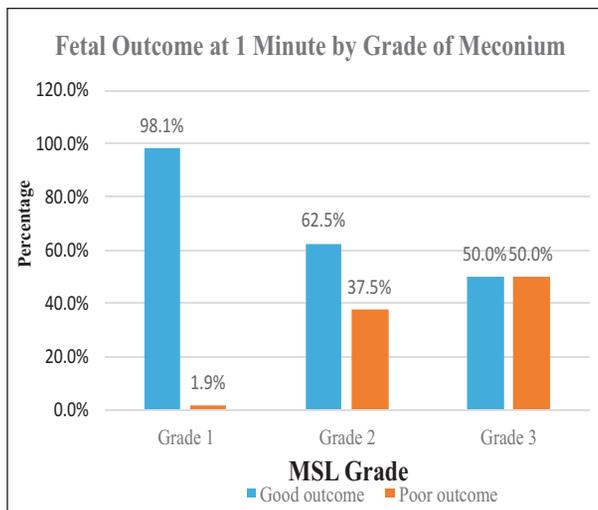
Also at 5 minutes, more women without MSAF had good outcome of 97.8% compared to those with MSAF at 90.2%, but there was no significant difference in outcome in those with MSAF versus non MSAF (adjusted p value =0.773). Refer to Figure 2.



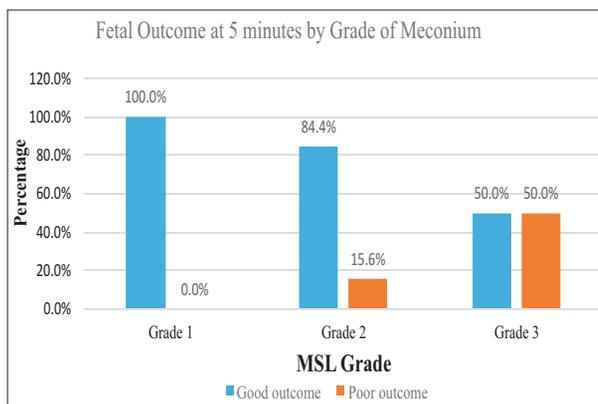
**Figure 2: Foetal outcome in MSAF and non MSAF at 1 and 5minutes in women at UTH from May to August 2018**

### Foetal outcome by grade of meconium

At 1 minute, more women with poor outcome were from those with grade 3 at 50% followed by grade 2 at 37% with the least among those with grade 1 at 1.9%. At 5 minutes most, women with good outcome were from those with grade 1, 53 (100%) followed by grade 2, 27 (84.4%) with the least among grade 3, 4 (50%). Refer to Figures 3 and 4.



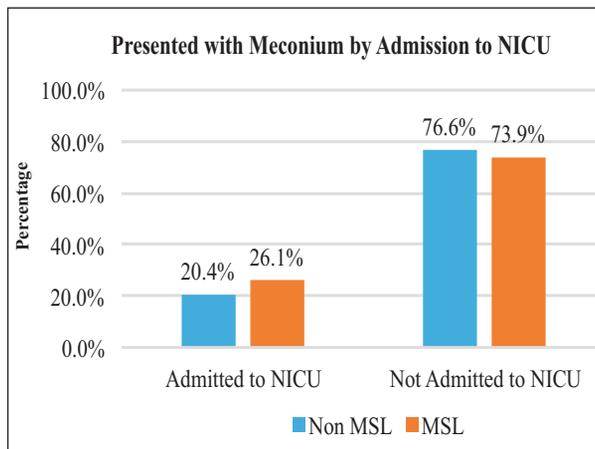
**Figure 3: Foetal outcome according to grade of meconium at 1 minute for women at UTH from May to August 2018**



**Figure 4: Foetal outcome according to grade of MSAF at 5 Minutes for women at UTH from May to August 2018**

### Admission to Neonatal Intensive Unit (NICU)

More admissions were seen in babies with MSAF 24 (26.1%) vs those without MSAF (20.4%). The reasons for admission included: low A/S (41.4%), meconium aspiration (27.6%), poor breathing (22.7%) & low birth weight (13.8%). Refer to Figure 5.



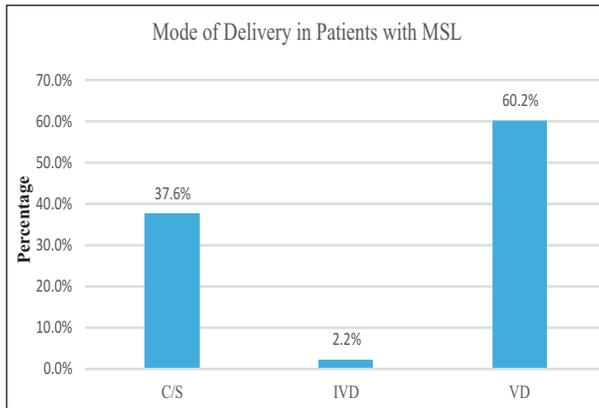
**Figure 5: Admission to NICU**

### Mode of delivery in women with MSAF

More 34 (37.6%) women with MSAF were delivered by Caesarean section versus (18) 19.4% in women without MSAF, while 2(2.2%) of women among those with MSAF were delivered through instrumental vaginal delivery. There was also a significant association between MSAF and being delivered by Caesarean section (Adjusted odds ratio 4.579, Adjusted p value = 0.002, 95% CI 1.727 - 12.137).

In women with MSAF, 60.2 % were delivered by spontaneous vaginal delivery while 37.6% delivered by Caesarean section and 2.2% were delivered through instrument vaginal delivery.

More Caesarean sections were observed in those with grade 3 (62.5%) followed by those with grade 2 (58%) with the least been those with grade 1 (19.4%). Refer to Figures 6.



**Figure 6: Mode of delivery in patients with MSAF at UTH from May to August 2018**

**Complications (risks) for MSAF**

Out of the 93 women with MSAF, 29 (31%) had associated investigated complications.

Among the first five common risk factors, pregnancy induced hypertension (PIH)/Preeclampsia was the leading risk factor at 15%, followed by prolonged labour (8.6%), then anaemia (5.4%), VBAC (4.3%), and then chronic hypertension (3.2%). Refer to Table 3. No investigated complication was significantly associated with MSL. Refer to Tables 2 and 3.

**Table 2: Frequency of complications (risk factors) in women with MSAF**

Investigated complication or risk factor	Presented with Meconium				
	Total	Yes		No	
		n	%	n	%
Anaemia	7	5	5.4%	2	2.2%
Hypertension	9	3	3.2%	6	6.5%
PIH/Eclampsia	24	14	15.1%	10	10.8%
Gestational Diabetes	0				
Fever	1	1	1.1%	0	0.0%
Respiratory Problems	4	2	2.2%	2	2.2%
Prolonged Labour	8	8	8.6%	0	0.0%
Augumentation of labour with Oxytocin	5	3	3.2%	2	2.2%
Cardiac Problems	3	1	1.1%	2	2.2%
IUGR	2	1	1.1%	1	1.1%
Polyhydramnios	0				
Oligohydramniosis	0				
Uterine Hyperstimulation	0				
Sickle Cell	0				
Vaginal Birth After Cesarean Section	9	4	4.3%	5	5.4%
Obstruction of Labour	3	2	2.2%	1	1.1%

**Table 3: Logistic regression model of Age, Gestation Age, Parity, Marital Status, Education, Occupation, Residence, Labour Type, PIH/Eclampsia, Mode of Delivery, Birth Weight, Apgar at 1 minute, Apgar at 5 minutes and Sex of Baby by Presence of Meconium**

Variable	OR	95%CI		p	AOR	95%CI		p.Adjust
		Lower	Upper			Lower	Upper	
<b>Age</b>								
<20	2.000	0.344	11.615	0.440	1.321	0.133	13.165	0.812
20 - 29	2.882	0.555	14.973	0.208	2.027	0.262	15.688	0.499
30 - 39	5.000	0.910	27.470	0.064	3.416	0.491	23.780	0.215
≥40 (Ref)	1.000	-	-	-	-	-	-	-
<b>Parity</b>								
Para 1	0.540	0.204	1.426	0.214	0.455	0.085	2.435	0.358
2 - 4	0.632	0.234	1.707	0.366	0.505	0.107	2.387	0.389
≥5 (Ref)	1.000	-	-	-	-	-	-	-
<b>Gestation Age</b>								
37 - 40 Months	0.714	0.312	1.634	0.425	0.755	0.264	2.159	0.600
41 - 44 Months (Ref)	1.00	-	-	-	-	-	-	-
<b>Marital Status</b>								
Single	1.207	0.602	2.418	0.596	1.690	0.611	4.676	0.312
Married (Ref)	1.000	-	-	-	-	-	-	-
<b>Education</b>								
Primary	0.829	0.338	2.031	0.681	1.056	0.224	4.971	0.945
Secondary	0.821	0.321	2.098	0.680	0.846	0.206	3.475	0.817
Tertiary (Ref)	1.000	-	-	-	-	-	-	-
<b>Occupation</b>								
Unemployed	0.938	0.429	2.051	0.872	0.832	0.238	2.910	0.773
Formal	0.859	0.292	2.530	0.783	0.427	0.076	2.401	0.334
Informal (Ref)	1.000	-	-	-	-	-	-	-
<b>Residence</b>								
Low Density	0.814	0.262	2.533	0.723	0.294	0.049	1.753	0.179
High Density	1.224	0.285	5.255	0.785	0.374	0.053	2.652	0.325
Low Density (Ref)	1.000	-	-	-	-	-	-	-
<b>Type of Labour</b>								
Spontaneous	2.384	0.707	8.034	0.161	42.237	2.565	69.559	0.009
Induced (Ref)	1.000	-	-	-	-	-	-	-
<b>PIH/Eclampsia</b>								
Yes	1.471	0.617	3.504	0.384	3.338	0.635	17.531	0.154
No (Ref)	1.000	-	-	-	-	-	-	-
<b>Mode of Delivery</b>								
Caserean	2.569	1.320	5.002	0.005	4.579	1.727	12.137	0.002
Vaginal (Ref)	1.000	-	-	-	-	-	-	-
<b>Birth Weight</b>								
<2.5	0.275	0.098	0.772	0.014	0.332	0.072	1.518	0.155
2.5 - 3.5	0.578	0.255	1.312	0.190	1.052	0.328	3.379	0.932
>3.5 (Ref)	1.000	-	-	-	-	-	-	-
<b>Apgar Score at 1m</b>								
Good Outcome	0.251	0.088	0.712	0.009	0.164	0.025	1.094	0.062
Poor Outcome (Ref)	1.000	-	-	-	-	-	-	-
<b>Apgar Score at 5m</b>								
Good Outcome	0.205	0.043	0.976	0.047	1.477	0.104	20.953	0.773
Poor Outcome (Ref)								
<b>Sex of Baby</b>								
Male	0.468	0.258	0.849	0.013	0.324	0.149	0.703	0.004
Female (Ref)	1.000	-	-	-	-	-	-	-

No demographic factor was significantly associated with MSAF. Gestation age and parity was also not significantly associated with MSAF.

There was however significant association between MSAF and risk of being delivered by Caesarean section (adjusted odds ratio 4.579, adjusted p value 0.002).

Apgar score at both one minute and five minute showed no significant association in terms of good outcome with adjusted p value 0.062 and adjusted p value 0.773 respectively. Sex of the baby however showed significant association with MSAF with male babies being at less risk, adjusted odds ratio 0.324, adjusted p value 0.004.

PIH/ Preeclampsia did not show significant association with MSL with adjusted p value of 0.154.

## DISCUSSION

The study found that MSAF was common at UTH and most of the patients with MSAF had grade 1 meconium with the least being grade 3. There was no significant difference in Foetal outcome at 1 minute in women with MSAF verses women without MSAF. However, more women without MSAF had good outcome (Apgar score of 7 and more) compared to those with MSAF. Also at 5 minutes, more women without MSAF had good Foetal outcome compared to those with MSAF but there was no significant difference in Foetal outcome in those with MSAF versus non MSAF (adjusted p value =0.773). More admissions to NICU were among those with MSAF compared to those without MSAF. Only 35.5% of women with MSAF were monitored using CTG. Caesarean section rate among women with MSAF was twice high as compared to those without MSAF. About 31% of women with MSAF had at least a risk factor. However, there was no association between MSAF and the investigated risk factors. The five common risk factors identified included PIH/ Preeclampsia followed by prolonged labor, then anemia, VBAC, and chronic hypertension.

The result showed that the frequency of MSAF in labour at UTH is 10.2 %. This finding though slightly higher is similar with the study which was conducted at *Karachi General Hospital in 2011 in which it was found that out of 908 deliveries, MSAF was found in 7.7% cases.*<sup>5</sup> The finding however does not agree with the study conducted at Nigerian teaching hospital by David, Njokonma and Iroha in which it was found that the prevalence of MSAF was as high as 20.4%.<sup>6</sup> The differences in the frequencies of MSAF in different areas could be due to various factors prevailing in different hospitals, different clinical practices, level of hospital care and different demographic characteristic of women being attended to by various hospitals. The study also showed that majority (57%) of women with MSAF was of grade one followed by those with grade 2 at 34.4% with the least being grade 3 at 8.6 %.

At 1 minute, more women without MSAF had good outcome with Apgar score of 7 or more at 96.4% compared to those with MSAF at 81.5% and there was no significant difference in Foetal outcome in women with MSAF verse women without MSAF (Adjusted P value = 0.062.) . Also at 5 minutes, more women without MSAF had good outcome of 97.8% compared to those with MSAF at 90.2%, but there was no significant difference in outcome in those with MSAF versus non MSAF (adjusted p value =0.773). The outcome at 5 minutes could be attributed to additional effective neonatal resuscitative measures leading to improved Apgar score. The findings above agree with two separate studies by Priyadharshini and Panicker, and **Rokadel J et al** in which it was found that *meconium stained liquor alone was not associated with an adverse neonatal outcome but good outcome of 86% and 82% respectively.*<sup>4,7</sup>

In this study it was demonstrated that the higher the grade of MSAF, the poorer the outcome at both 1 and 5 minute Apgar's score. For example at 5 minute Apgar score, the women with grade one meconium had the highest good Foetal outcome of 100% followed by those with grade 2 meconium at 84.4 %

with the least good Foetal outcome of 50% seen among those with grade 3. These findings are in line with Deepak et al who found that the higher the grade of MSAF, the poorer the outcome.<sup>1</sup> The above findings however do not agree with Shaikh et al and Kumar et al who found that MSAF was associated with very high adverse Foetal outcome of 22% and 38.3% respectively.<sup>3,8</sup> In this study, poor outcome was only demonstrated in 9.8%. The good outcome in patients with MSAF observed at UTH could be attributed to the good clinical practice that follows effective hospital treatment protocols in patients presenting with MSAF as well as effective neonatal resuscitative skills resulting in good outcome especially at 5 minutes Apgar's score. Good outcome could also be attributed to increased use of emergency Caesarian section rather than spontaneous vaginal delivery as a mode of delivery in most women presenting with MSAF.

There was more admission to NICU among babies born from women with MSAF (26.1%) as compared to babies born from women without MSAF at 20.4%. This shows that more adverse outcomes were among those with MSAF as compared to those without MSAF. These admissions to NICU in this study among babies born to women with MSAF are however lower than the findings by the study conducted by Rasheed et al in which it was found out that about 38.3% of babies born to women with MSAF were admitted to NICU.<sup>9</sup> This could be attributed to a comparable good Foetal outcome even in babies born to women with MSAF as seen in this study.

The study found out that 33 (35.5 %) patients with MSAF were monitored with CTG and that there was no association between being monitored with CTG and good Foetal outcome (i.e. 94 % in CTG monitored versus 87 % in non CTG monitored, p value = 0.594). However, 31 (94%) who were monitored with CTG had good outcome compared with 52 (86.6%) without CTG monitoring though not statistically significant.

About 56 (60.2%) of women with MSAF delivered via spontaneous vaginal delivery while (34) 37.2% delivered by Caesarian section and 2 (2.2%) by vaginal instrument delivery. Caesarian section rate was twice high among those with MSAF at 37.2% compared with those without MSAF at 19.4% respectively. The risk for Caesarian section was also seen to be more in those with grade three 5 (62.5 %) followed by those with grade two 18 (58.1%) and least Caesarian sections were seen in those with grade one 12 (19.3%) The findings are in line with the studies conducted by Deepak et al and by Rajput et al in which it was found that the mode of delivery was significantly associated with MSAF and that Caesarian section rate among women with MSAF was 66%, and 85% respectively.<sup>1,10</sup> In this study, Caesarian section rate was 37.2%. The Caesarian section rates among patients with MSAF is likely to be high especially in institution that lack resources for effective Foetal monitoring like shortage of midwives, CTG machines, scalp sampling for pH etc. Therefore, high Caesarian section observed in this study could be attributed to lack of resources for effectively monitoring of women with MSAF such as CTGs and other equipment for definitive diagnosis of Foetal distress hence subjecting most of the patients with MSAF especially those with grade 2 and 3 to Caesarian section in order to avoid poor outcomes.

The study also investigated various demographic and some common obstetric factors and risk for meconium stained liquor (MSAF). Some obstetric factors investigated included PIH/pre-eclampsia and eclampsia, prolonged labour, oligohydramnios, anaemia, vaginal birth after cesarean section (VBAC), intrauterine growth restriction (IUGR) etc. About 29 (31%) of those with MSAF had the associated investigated complications. The study however did not demonstrate any significant association between demographic characteristic or any investigated obstetrics complications and MSAF. The study also showed no significant statistical association between the level of parity and

MSAF (p value = 0.450). PIH and preeclampsia also did not show a significant association with MSAF (adjusted p value = 0.154). The weight of the baby was also not significantly associated with MSAF. Sex of the baby was however significantly associated with MSAF. Women carrying male babies were less at risk of MSAF by about 67.8% (adjusted odds ratio 0.322, CI 0.156 to 0.665 and p value 0.002). This is in contrast to the study conducted by Rajput et al in which it was found that the prevalence of MSAF in male neonates was high with an incidence of 65.2%.<sup>10</sup> Other obstetrics factors like gestation age and postdate did not show significant association. This finding agrees with the study conducted by Lubna et al in which it was found that there was no association between gestation age or postdates with MSAF.<sup>5</sup> Other risk factors observed in some previous studies such as PIH, Pre-eclampsia, oligohydramnios, prolonged labour etc., were also not associated with MSAF in this study. However, the five common frequent risk factors noted in this study though not statistically significant included PIH/pre-eclampsia at 15%, followed by prolonged labour (8.6%), then anaemia (5.4%), VBAC (4.3%), and chronic hypertension (3.2%).

## CONCLUSION

The prevalence (frequency) of MSAF in labour at UTH was 10.2%. There was no significant difference in Foetal outcome at 5 minutes in women with MSAF compared with those without MSAF. However, Caesarean rates were noted to be higher in those with MSAF as compared to those without MSAF. No obstetric complication was significantly associated with MSAF.

## STUDY LIMITATIONS

Apgar scoring and grading of meconium, are variables that are subjective to inter and intra observer variations. Therefore, some babies could have been given a wrong Apgar score which could have affected the results. Equally meconium could

also have been graded wrongly hence affecting results.

Possibilities of incorrect gestation age as a considerable number of women were not sure of their last normal menstrual period (LNMP) and hence could have led to wrong calculation of the gestational age. To mitigate this, gestational age of the pregnancy was estimated using early trimester scan in women that presented with first trimester scan as it is more reliable and accurate than LNMP.

## ACKNOWLEDGEMENT

All pregnant women that unconditionally accepted to participate in the study

## RECOMMENDATIONS

Based on this study, it is recommended that the University Teaching Hospital (UTH) administration provides equipment to labour ward such as Foetal scalp pH and Foetal scalp electrodes for definitive diagnosis of Foetal distress especially in women with grade 2 and 3 MSAF as this could lead to avoidance of possible unnecessary Caesarian sections. Also all women with meconium grade 2 and 3 in labour in which decision to deliver vaginally is made, should be monitored closely possibly with continuous electronic Foetal monitoring or Foetal scalp pH monitoring in order to avoid poor outcome.

In addition, UTH through the ministry of health (MoH) to help make policy recommendation for the whole country on management of MSAF using the available UTH treatment protocols as management of a woman with MSAF is the same whether at tertiary or lower level.

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