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Meconium stained amniotic fluid in labour: A comparative study of maternal and foetal outcomes in a tertiary hospital, north-east Nigeria

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Abstract
The presence of meconium in Amniotic fluid has been associated with adverse labour outcome affecting both the mother and infant.
This study was conducted to determine the magnitude of the problem in our Hospital.
It was a prospective cohort study, 63 pregnant women who presented at term in active phase of labour with meconium stained amniotic fluid [MSAF] were enrolled as cases. Another 63 pregnant women with clear amniotic fluid [CAF] were taken as control.
The first minutes APGAR Scores of babies with MSAF were lower compared with those with CAF (P=0.001). There was increased Caesarean section rate, increased need for resuscitation and more neonatal intensive care admissions in babies with MSAF (p=0.04,0.001, 0.004 respectively.
It was concluded that MSAF is associated with adverse labour outcome. Hence Hospitals in our region should be equipped with facilities required to detect and manage MSAF when it occurs.

Keywords: Labour, meconium stained liquor, Apgar score, caesarean section

Introduction
Meconium is a viscous dark green substance composed of intestinal epithelial cells, lanugo, and mucus etc. Meconium is produced in the foetal gut in small quantities as early as the tenth week in-utero but is not excreted until about 34 weeks when the foetal gut has started to mature (Flick & Kahn, 2013) [8]. It has been suggested that it is also secreted in response to foetal hypoxia or reduced clearance due to impaired swallowing or placental dysfunction (Yurdakok, 2011; Meena & Seetha, 2013) [22, 11].
The incidence of MSAF varies from 5.5 to 20% depending on the gestational age and the study population (Tybulweicz, *et al*., 2004; David, *et al*., 2006; Meena & Seetha, 2013) [21, 7, 11].
Meconium stained AF portends danger to the foetus because it can be aspirated in utero or by the infant at the first breath after delivery. This may lead to several adverse effects the most important being Meconium Aspiration Syndrome [MAS] (Yurdakok, 2011) [22]. MAS complicates about 5% of labours with MSAF with a case fatality of 5-40% (Sheiner 2002; Yurdakok, 2011] [18, 22].
National Institute for Health and Care Excellence (NICE) has graded MSAF into three grades based on the amount of meconium, the volume of AF and the prognosis for the infant [NICE 2014]. Grade 1 is when there is only a tinge yellow discolouration of the AF. In grade 2 there clump of meconium in AF or brownish/greenish discolouration. In grade 3 AF is scanty and thick. Grades 2 & 3 are also called significant /thick MSAF and are associated with increasing adverse outcome. The diagnosis of MSAF is clinical as there are no laboratory test for its diagnosis (Tybulweicz, *et al*., 2004) [21].
Maternal effects include chorioamnionitis, increased rate of operative deliveries and puerperal sepsis (Yurdakok, 2011; Kumari, *et al*., 2012; Siriwachirachai, *et al*., 2014) [22, 15, 19]. The foetal effects include low Apgar scores, Birth Asphyxia, meconium aspiration syndrome (MAS), neonatal sepsis, Neonatal Intensive Care Unit admission and perinatal mortality (Narang *et al*., 1993; Hosna, *et al*., 2009) [12, 10].
Consequently, various modalities of treatment have been tried (Ahanya, *et al*., 2004) [1]. These include strict foetal surveillance with the use of cardiotocography, foetal scalp blood sampling a

and pH analysis for labours complicated by significant MSAF. Where foetal jeopardy is identified the labour is terminated either by vaginal instrumental delivery or caesarean section depending on the stage of labour this has been shown to improve outcome (Hofmeyr 2009) [9].

Intrapartum Amnioinfusion has also been shown to significantly improve neonatal outcome especially in settings lacking facility for foetal surveillance (Bansal *et al*. 2013) [2]. Good Intrapartum suctioning of the airways at the delivery of the head and direct laryngoscopy for non-vigorous babies born through thick MSAF improves outcome (Narang *et al*. 1993) [12]. The latter is a criterion for admission into the Neonatal intensive care unit (NICU) as these babies are more likely to develop MAS (Bodil S, 2010; NICE, 2014) [4, 13].

This study was undertaken to determine the magnitude of the adverse outcome associated with MSAF in our low resource settings and provide rationale for the development of a management protocol for MSAF. This is necessary because no such studies has been conducted in our area.

Materials and Methods

A prospective cohort study was conducted at the labour ward of the Department of Obstetrics and Gynaecology, Federal Teaching Hospital Gombe between April 10th and July 28th 2016. Ethical clearance was obtained from the Research and Ethics committee of the Federal Teaching Hospital Gombe.

During the study, pregnant women who fulfilled the following criteria were enrolled;

1. Visual observation of clumps of meconium or greenish/brownish discoloration of the AF.
2. Pregnancies between 37-42 weeks.
3. Cephalic presentation.
4. Pregnant women with medical or surgical conditions were excluded.

Those with obstetric complications, known gross congenital anomalies, intrauterine foetal death and induced labour were also excluded.

The presence of meconium in the AF was determined by visual examination at the time of admission and 3 hourly subsequently during vaginal examinations. Artificial rupture of membranes (ARM) was performed for those with intact membranes at admission.

A control group was selected by assigning to each case the next woman who fulfilled the inclusion criteria but had clear amniotic fluid (CAF).

Information from the selected patients was obtained using a structured data form. Written consent was taken before enrolment. Information sought included socio-demographic characteristics, state of the AF-whether clear or meconium stained, mode of delivery with its indication and the Apgar scores of the babies, the need resuscitation and NICU admission.

During the first stage of labour, patients were monitored in the left lateral position, the uterine contractions were assessed and the foetal heart rates taken every 30minutes with the use of pinard or electronic foetal heart rate detector. Those with abnormal foetal heart rate [normal 120-160/minutes], were placed on continuous CTG monitoring. Those with MSAF who developed suspicious or abnormal CTG during labour were diagnosed to have foetal distress. They were reassessed and labour terminated by the most expedient route. Those in the first stage of labour had emergency caesarean section while those in the second stage of labour were delivered by either ventouse.

At the delivery of the foetal head, the face and mouth were cleaned with sterile dry gauze, and the baby handed over to the Neonatologist. Intrapartum suctioning was not done. Apgar scores at first and fifth minute were recorded and infants were assessed for admission and further care. Those who did not initiate respiration spontaneously with Apgar scores less than 7 at first minute had direct laryngoscopy to visualise for the presence of meconium below the cord. Where meconium was visualised endotracheal intubation and suctioning was done. The babies were resuscitated and admitted by the neonatologist. Birth asphyxia was diagnosed when the baby does not take spontaneous respiration at birth and Apgar score at 5 minutes was less than 7. All babies diagnosed to have Birth Asphyxia were admitted to NICU irrespective of the state of the liquor. Those with fifth minutes Apgar scores greater than or equal to 7 but born through MSAF were admitted with the mother for observation.

Gestational age was determined where the woman was certain of her last menstrual period or had an early ultrasound scan dating i.e. done in the first 24 weeks of pregnancy.

The data were entered and analysed using SPSS version 20.0. Results were tabulated and using student t-test for continuous variable and chi square for the categorical variables, the p-values were computed. The differences between the study group and control group were taken as significant if the P value was less than 0.05.

Results

Demography: During the study period 63 cases were enrolled as case and 63 were enrolled as control making a total of 126.

The mean age of the mothers in MSAF group was 26.73±5.55 years as against 28.02±5.89 years in the CAF group. The mean parity in the MSAF group was 2.10±1.98 while it was 2.11 ±1.80 in the CAF group. Forty one per cent of the women in the MSAF group while 38% CAF group had tertiary formal education.

Forty six (73%) of the women booked index pregnancy in the MSAF group and 52(82%) women booked their pregnancies in the CAF group.

Modes of delivery: Modes of delivery were significantly affected by the presence of meconium; there were 51(81%) normal deliveries in the MSAF group and 60(95%) in the CAF group (p=0.041). Caesarean delivery rate was also higher (15.8%) in the MSAF group while it was 3.2% in the CAF group. For the indications of the Caesarean sections; 5(50%) had it for foetal distress in the first stage of labour in the MSAF group, none had caesarean section for foetal distress in the CAF group.

Neonatal outcome: There were a total of 126 births, and 2 still births. The male to female ratio of the babies born in the MSAF group was 1:0.9 and 1:1.1 in the CAF group. The mean Birth weight of infants born in the MSAF was 3.06±0.50 and 3.03±0.38 in the CAF group.

During labour 5 women (7.8%) in the MSAF group had Foetal distress while only 1(1.6%) of the CAF group had foetal distress but the difference was not statistically significant (p=0.242).

Twenty babies (31.8%) in the MSAF group had APGAR scores at 1st minute of less than 7 while it was only 3(4.2%) in the CAF group which was statistically significant (p=0.001). At 5 minutes none of the babies in CAF group has Apgar score of less than 7, while 3(4.8%) in the MSAF group had Apgar less than 7 but is was not statistically significant (p=0.244).

Seven of the Babies in the MSAF group developed Birth

Asphyxia while none had it in the CAF group. The difference was however not statistically significant (p< 0.244).

The need for active resuscitation was more in the MSAF group 21(33.3%) compared with the CAF group 5 (8%), p values <0.001.

Discussion

This study was conducted to find out the labour outcome in labours associated with meconium staining of the amniotic fluid and determine foetal adverse outcome. The mean age of the study group was lower than that of the control but not statistically significant. Hosna *et al*. found the mean age of the case to be higher. This could be explain due to the younger age at which women at our hospital commence child bearing. The mean parity of both group was similar. There were more unbooked women in the study group than the control. Educational level and marital status does not affect the occurrence of MSAF.

There were more male infants in the study group than the control but not statistically significant.

The birth weights of the two group does not show significant difference, Hosna *et al.* and Sedaghatian *et al.* reported higher birth weight in the study group.

Five foetuses developed distress during labour in the study group and none in the control. Foetal distress defined here as foetal heart rate abnormalities with a suspicious or pathological CTG in the presence of MSAF. Many studies have shown a strong correlation between MSAF associated with CTG abnormalities and foetal distress (Narang *et al*., 1993, Becker *et al*. 2007, Hosna *et al*. 2009) [12, 3, 10].

More women with clear AF had spontaneous vaginal delivery compared with the study group which was statistically significant. More women in study group had interventions for delivery in form of vaginal instrumental delivery and caesarean sections. Similar findings were reported by Ziadeh & Sunnah, Hosna *et al.* and Kumari *et al*. Ten women had caesarean section in the study group 5 of which were for foetal distress. Foetal blood gasses analysis or Foetal scalp pH were not done in this study. However even in places where these are available the rate of Caesarean sections are still high in labours with MSAF (Hosna *et al.*). This is because despite of the debate on the safety or otherwise of MSAF most Obstetricians will rather not take the risk.

In this study the MSAF group had significantly lower one minute APGAR scores compared with the CAF group. But at the fifth minutes only 3 had APGAR scores less than 7 while non in the CAF group. But this is not significant. The one minute Apgar score is used to assess the need for resuscitation while five minutes Apgar score is used to diagnose Birth asphyxia in the absence of facilities to measure infant blood p H or blood gasses (Thorn-Jerneck & Herbst, 2001) [20]. This could be explained by the fact that the resuscitation given to these babies with low APGAR scores at one minutes may improve their wellbeing leading to higher APGAR scores at five minutes (Cowles *et al*., 2007) [6].

In this study 3 infants had Birth Asphyxia in the MSAF group none in the CAF group? Cecil *et al.* reported similar findings. Other studies showed lower APGAR scores at both first and fifth minutes (Ziadeh *et al*., 2000; Meena *et al*., 2013) [23, 11].

The need for active resuscitation (including Ambu bagging, oxygen supplementation endotracheal intubation etc.) was more in the study group and it was statistically significant. NICU admissions were also significantly increases in the MSAF group. This finding was corroborated by Hosna *et al*., 2009 [10] and Khatum *et al*., 2005 [14]. The increased need for resuscitation and NICU admission would suggest the need for managing MSAF at facilities with ability for advanced neonatal resuscitation.

There were 2 (3.2%) perinatal mortalities in the MSAF group non in the CAF but it was not statistically significant, p = 0.496. Khatum *et al.* reported 2.9%, Cecil *et al*. 5.8%, Gupta *et al.* 4.9%; all showed significant association. All the mortalities were diagnosed to have foetal distress. One had intrauterine foetal death while preparations were being made for caesarean section while the other died shortly after Ventouse delivery. A further research should be carries out to determine how many of the babies actually developed meconium aspiration syndrome and how many died from it at our centre.

Study limitations

The detection of MSAF is clinical as there are no laboratory methods for detecting meconium in liquor hence some cases may be missed. This has been reduced by holding a practical session with the research team to reduce bias by demonstrating practically what should be recorded as MSAF. Women with undiagnosed medical or obstetric conditions, especially among the unbooked may be included. Assessment of Apgar scores is susceptible to inter-observer differences. Recording the Apgar as less than 7 and 7 or more is likely to reduce this error.

Conclusions and Recommendations

This study showed that labour complicated with meconium staining of the liquor is associated with increased operative delivery, low Apgar scores at first minute and increased need for active resuscitation and NICU admissions.

It is there recommended that the Neonatologist be involved in the management of labour complicated by MSAF so as to offer resuscitation promptly when needed and these labour should be managed as facilities where obstetrics intervention can be employed. A standard operating protocol for the management of MSAF in labour is also recommended.

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Table 1: Age group distribution of the patients

Age YRS	Study GRP	control GRP
≤18	3(4.8%)	1(1.6%)
19-24	20(31.8%)	16(25.4%)
25-29	21(33.3%)	25(39.7%)
30-34	12(19%)	12(19%)
≥35	7(11.1%)	9(12.7%)

Table 2: Comparative of Age, Parity, and Birth weight.

Variable	Study GRP mean	Control GRP mean	P value
Mothers Age	26.73	28.02	0.210
Parity	2.10	2.11	0.963
Birth weight	3.06	3.02	0.675

Table 3: Modes of Delivery of the patients.

Mode of delivery	Study GRP	Control GRP	P Value
SVD	51(81.0%)	60(95.2%)	0.041
Caesarean section	10(15.9%)	2(1.6%)	
Ventouse	2(3.2%)	1(1.6%)	

Table 4: Neonatal outcome.

Outcome	Study GRP	Control GRP	P value
Apgar score <7			
At 1st minute	20(31.8%)	3(4.2%)	0.000
At 5th minutes	3(4.8%)	0(0.0%)	0.244
Active Resuscitation	21(33.3%)	5((8.0%)	0.001
NICU Admission	13(20.6%)	2(3.2%)	0.004

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