Original Article

Maternal and fetal outcomes in term premature rupture of membrane

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BACKGROUND: Premature rupture of membrane (PROM) is linked to significant maternal prenatal mortalities and morbidity. In Ethiopia, where maternal mortality is still high, the maternal and fetal outcomes in PROM is very important to decrease maternal and child mortality and for better management and prevention of complications. Thus, this study aimed to detect the maternal and fetal outcomes and associated factors in term PROM at Mizan-Aman General Hospital, south-west Ethiopia.

METHODS: A retrospective cross sectional study was conducted using data available at Mizan-Aman General Hospital during a period of 3 years (January 2011 to December 2013). We examined records of 4 525 women who gave birth in the hospital; out of these women, 185 were diagnosed with term PROM and all of them were included in the study. The data of these women were collected using a checklist based on registration books. The data were analyzed using SPSS version 20.0 statistical package. The association between independent and dependent variables was assessed by bivariate and multiple logistic regression analyses. 95%CI and *P* value less than 0.05 were considered statistically significant.

RESULTS: Of the 4 525 women who gave birth in the hospital, 202 were complicated by term PROM. About 22.2% of the women showed unfavorable maternal outcomes. The most common cause of maternal morbidity and mortality was puerperal sepsis. About 33.5% of neonates experienced unfavorable outcomes. The duration of PROM >12 hours (AOR=5.6, 95%CI 1.3–24.1) latency >24 hours (AOR=2.8, 95%CI 1.7–11.8), residing in rural areas (AOR=4.2, 95%CI 3.96–29.4) and birth weight less than 2 500 g were associated with unfavorable outcomes.

CONCLUSION: Women residing in rural areas, long latency, and neonates with birth weight less 2 500 g may have unfavorable outcomes. Therefore, optimum obstetric and medical care is essential for the reduction of the devastating complications related to disorders.

KEY WORDS: Premature rupture of membrane; Maternal outcomes; Fetal outcomes

World J Emerg Med 2016;7(2):147–152
DOI: 10.5847/wjem.j.1920–8642.2016.02.011

INTRODUCTION

Premature rupture of membrane (PROM)^[1] refers to the disruption of fetal membranes before the beginning of labor, resulting in spontaneous leakage of amniotic fluid. PROM, which occurs prior to 37 weeks of gestation, defined as preterm PROM as PROM that occurs after 37 weeks gestation defined as term PROM. PROM occurs

in approximately 5%–10% of all pregnancies, of which approximately 80% occur at term.^[2]

PROM is linked to significant maternal and fetal morbidity and mortality. It has been shown to be the cause of 18%–20% and 21.4% of prenatal mortalities and morbidity respectively.^[3,4] The three causes of fetal death associated with PROM are sepsis, asphyxia,

and pulmonary hyperplasia. Women with intrauterine infection deliver earlier than non-infected women, and infants born with sepsis have a mortality rate four times higher than those without sepsis do.^[5]

Maternal complications include intra-amniotic infection, which occurs in 13%–60% of women with PROM, placental abruption, and postpartum endometritis.^[6,7] Pre-term birth, infection, hypertensive disease, and asphyxia are cited as the most common contributors to maternal and fetal mortality in developing countries (LMICs).^[8,9]

Ethiopia and other five countries contribute to about 50% of the maternal deaths in the globe. Ethiopia has designed a number of policies and strategies to improve maternal health and reduce child mortality. However, Ethiopia still has the higher number of maternal mortality in the world. This poses the greatest challenge to attain the goal for maternal health (MDG5).^[10]

Evidence suggests that the rupture of membrane is related to infection,^[11] membrane dysfunction on a molecular level,^[12] collagen destruction, and programmed cell death in fetal membranes.^[13,14] The complication risk of PROM is increased if the mother has previous PROM, low body mass index, concomitant infection of the gestational tissues, and longer the time elapsed between the rupture and delivery.^[15]

Diagnosis and proper management is very important to limit various fetal and maternal complications generally due to infection. However, in countries like Ethiopia where health facilities not well organized with necessary manpower, a large number of mothers come to the facilities late.

PROM has essential significance for the further fate of pregnancy. Late diagnosis means wasted opportunity of appropriate intervention. In most cases, the diagnostics does not cause bigger problems, but in some situations it may not be easy to make the right diagnosis.^[16]

The maternal and fetal outcome in PROM is very important to decrease maternal and child mortality and for better management and prevention of complications. Thus, this study aims to determine maternal and fetal outcomes in PROM among term pregnant women who were admitted to the maternity or labor ward in the Mizan-Aman General Hospital.

METHODS

Study area and design

This retrospective cross sectional study used the data from the Mizan-Aman General Hospital (MAGH)

during a 3-year period (January 2011 to December 2013). The hospital is located in Bench Maji zone, southwest Ethiopia about 574 km from Addis Ababa. The Mizan-Aman General Hospital is a public health facility and run by the government. It gives services for a population in Bench Maji zone and its surrounding areas. The average delivery services of a month in 2011 are about 100. Established in 1979, the MAGH is the only general hospital in the zone. It has 136 beds for labor and delivery rooms, and provides free of charge services for parturient mothers.

Study sample

The study sample included all medical records of 185 pregnant women diagnosed with term PROM and gave birth in the hospital in the period of 2011–2013. However, incomplete records, twin pregnancy, PROM before 37 weeks, and any co-morbidity with term PROM were excluded.

Study variables

The outcome variables for this study were maternal and fetal outcomes, grouped as favorable (when the mother discharged with improvement from the hospital and neonate without complications) and unfavorable (when the mother or neonate died or experienced complications). Besides, age of mother, place of residence, gravidity, parity, duration of hospital stay, duration of PROM to delivery, history of previous PROM, mode of delivery, onset of labor, color of liquor, baby's birth weight, ICU admission, activity, pulse rate, grains, appearance, and respiratory rate were extracted from the records as independent variables.

PROM is a rupture of the membranes prior to the onset of labor at or beyond 37 weeks of gestation.

Data extraction

The records included information on subjects' demographics, vital signs, laboratory test result, prescribed drugs list, history of PROM, duration of PROM, hospital stay, mode of delivery, weight of baby at birth, etc.

To extract data from the records, we developed a checklist containing four parts, namely socio-demographic variables, obstetric history, maternal and fetal outcomes. Then four trained health professionals extracted data from the records related to each item in the checklist.

To ensure the quality and consistency, we trained researchers on the meanings of each item on the checklist and how to extract data.

Statistical analysis

Descriptive analyses of frequencies, median, mean, minimum and maximum for continuous variables and percentages for categorical variables were performed using SPSS version 20.0. Then, univariate logistic regression analysis was used to examine the relationship between the proposed predictors and maternal and fetal outcomes. Those variables, which revealed a statistically significant association in univariate logistic regression analysis, were entered into multivariable logistic regression to identify variables independently associated with maternal and fetal outcomes. Ninety-five percent *CI* with a respective odd ratio was used to assess the statistical significance of association among the variables. *P* value less than 0.05 was used as a cut off point to see the presence of statistically significant association.

Ethical considerations

Ethical clearance for the study was obtained from the ethics committee of Jimma University College of Health Science. To protect patient confidentiality, the name of mothers on the record was excluded from the extracted data. Thus, the information obtained from the records was anonymous.

RESULTS

During the 3-year period, a total of 4 525 women gave birth at Mizan Aman General Hospital. Of these women, 3 389 (74.9%) had spontaneous vaginal delivery (SVD), 917 (20.3%) caesarian section (C/S), 77 (1.8%) early fetal death (ENND), 427 (9.4%) stillbirth, and 22 maternal mortality. A total of 202 women had term pregnancy complicated by PROM, and 17 of them who had incomplete records were not included in the analysis. Thus only 185 women were included in the analysis.

Socio-demographic and obstetric profiles of participants

Of the 185 women, 70.3% were rural dwellers and 29.7% were urban dwellers. The mean maternal age was 24.6 years (range 16–41 years). One hundred-twenty nine (69.7%) of the women were primigravida, and 23 (12.5%) had a history of PROM (Table 1).

Maternal and fetal outcomes

Of the 185 women with term PROM, 21 (11.4%) developed puerperal sepsis, 11 (6.0%) and 7 (3.7%) had wound infection and hemorrhage, respectively (Table 2). Among the 185 women, 3 (1.6%) died but 182 (98.4%) were

alive. Of the 22 maternal deaths, 2 were due to puerperal sepsis and 1 was due to wound infection post operation.

Among the 185 neonates delivered, 87 (47%) had first minute Apgar score below normal. Seven (3.8%)

Table 1. Socio-demographic and obstetric profiles of women diagnosed with term PROM at Mizan-Aman Hospital from January 1, 2011 to December 31, 2013

Variables	Frequency	Percent
Age (years)		
<18	22	11.9
18–35	138	74.6
≥36	25	13.5
Residence		
Rural	130	70.3
Urban	55	29.7
ANC follow up		
Yes	54	29.8
No	131	70.2
Gravidity		
Primi	129	69.7
Multi	56	30.3
Duration of PROM		
<12 hours	118	63.8
≥12 hours	67	36.2
Previous history of PROM		
Yes	161	87.5
No	23	12.5
Onset of labour		
Spontaneous	158	85.4
Induced	27	14.6
Indication for C/S		
NRFHRP	14	7.6
Failure to progress	6	3.2
Other	5	2.7
Duration of PROM to delivery		
<24 hours	87	47.0
≥24 hours	98	53.7
Duration of hospital stay		
<3 days	101	54.6
3–7 days	60	32.4
>8 days	24	13.0

Table 2. Maternal and fetal outcomes of pregnancy complicated by term PROM at Mizan-Aman General Hospital, January 2011–December 31, 2013, southwest Ethiopia

Variables	Frequency	Percent
Postpartum complication experienced by mothers		
Puerperal sepsis	21	11.4
Wound site infection	11	6.0
Hemorrhage	7	3.7
Others	2	1.1
Outcome of neonates		
Alive	123	66.5
Alive with complication	40	21.6
Still birth	7	3.8
ENND	15	8.1
Apgar score at 1st minute		
<7	87	47.0
≥7	98	53.0
Apgar score at 5th minute		
<7	44	23.8
≥7	141	76.2
Weight of fetus		
<2 500 g	18	9.7
≥2 500 g	167	90.3
Fetus need ICU		
Yes	47	25.4
No	138	74.6

Table 3. Multi-logistic regression of factors associated with maternal outcomes at Mizan-Aman General Hospital, January 2011 to December 2013, south-west Ethiopia

Variables	Maternal outcomes		COR	AOR
	Favorable, <i>n</i> (%)	Unfavorable, <i>n</i> (%)		
ANC follow up				
Yes	41 (28.5)	13 (31.7)	1	1
No	103 (78.6)	28 (68.3)	4.7 (1.1–20.8)**	0.7 (0.08–5.6)
Residence				
MizanAman	52 (36.1)	3 (7.3)	1	1
Outside Mizan Aman	92 (63.9)	38 (92.7)	7.2 (2.1–24.3)*	4.2 (3.96–29.4)*
Duration of PROM				
<12 hours	111 (68.1)	7 (31.8)	1	1
≥12 hours	52 (31.9)	15 (68.2)	4.6 (1.76–11.89)**	5.6 (1.3–24.1)*
Presence of chorioamnionitis				
Yes	18 (11.0)	13 (59.1)	11.6 (4.4–31.0)**	16.6 (2.8–99.4)*
No	145 (89.0)	9 (40.9)	1	1
Latency				
<24 hours	75 (52.1)	12 (29.3)	1	1
≥24 hours	69 (47.9)	29 (70.7)	2.6 (1.2–5.5)*	2.8 (1.7–11.8)**
Duration of hospital stay				
≤3 days	95 (66.0)	6 (14.6)	1	1
≥4 days	49 (31.9)	35 (34.1)	4.8 (1.7–13.3)*	8.7 (2.6–29.6)**

*and ** statistically significant at the probability level of less than 5% and 1% respectively.

Table 4. Multi-logistic regression of fetal outcomes and associated factors of pregnancy complicated by term PROM at Mizan-Aman General Hospital, January 2011–December 2013

Variables	Fetal outcomes		COR	AOR
	Favorable, <i>n</i> (%)	Unfavorable, <i>n</i> (%)		
ANC follow up				
Yes	41 (28.5)	13 (31.7)	1	1
No	103 (78.6)	28 (68.3)	4.7 (1.1–20.8)*	0.7 (0.08–5.6)
Duration of PROM				
<12 hours	111 (68.1)	7 (31.8)	1	1
≥12 hours	52 (31.9)	15 (68.2)	4.6 (1.76–11.89)*	12.0 (2.8–51.7)*
Latency				
<24 hours	75 (52.1)	12 (29.3)	1	1
≥24 hours	69 (47.9)	29 (70.7)	2.6 (1.2–5.5)*	1.4 (0.56–3.46)
Color of liquor				
Clear	145 (89.0)	9 (40.9)	1	1
Meconium stained	18 (11.0)	13 (59.1)	11.6 (4.4–31.0)**	9.9 (3.3–33.7)**
Apgar score at 5th minute				
<7	24 (14.7)	20 (90.9)	57.9 (12.7–263.9)**	16.6 (1.3–21.2)*
≥7	139 (85.3)	2 (1.4)	1	1
Weight				
<2 500 g	14 (8.6)	6 (27.3)	3.99 (1.3–11.8)*	7.8 (1.2–51.2)*
≥2 500 g	149 (91.4)	16 (72.7)	1	1
Fetus need ICU admission				
Yes	27 (16.6)	20 (90.9)	50.4 (11.1–228.3)**	11.3 (6.8–188.9)**
No	136 (83.4)	2 (9.1)	1	1

*and ** indicate statistical significance at the probability level of less than 5% and 1% respectively.

neonates were stillbirth, and 22 (11.9%) died. The deaths (54.8%) were caused by fetal infection followed by birth asphyxia (27.4%) and low birth weight (9.7%) and the rest are unknown causes.

Factors associated with maternal and fetal outcomes

Multivariate logistic regression analysis showed that women who come from a rural area had an increased risk of unfavorable maternal outcome 4.2 times higher than those from an urban area (AOR=4.2, 95%CI 3.96–29.4). The risk of unfavorable maternal outcome was 5.6 times

higher in women with a duration of PROM greater than 12 hours (AOR=5.6, 95%CI 1.3–24.1). Women with a duration of PROM in delivering greater than 24 hours were 2.8 times more likely to experience unfavorable outcome than those with a duration of PROM in delivering less than 24 hours (AOR=2.8, 95%CI 1.7–11.8) (Table 3).

Fetal outcomes and associated factors

ANC follows up had a statistical significant association with fetal outcomes (Table 4). Neonates whose mothers had not attended any antenatal care

visits had a risk of unfavorable fetal outcome 3.5 times higher than those who had attended antenatal care visits (AOR 3.5, 95%CI 1.4–8.6). Compared to neonates with rupture of membranes in less than 12 hours, those with a duration of PROM greater than 12 hours were 12 times more likely exposed to unfavorable outcomes (AOR=12.0, 95%CI 2.8–51.7). Neonates with birth weight less than 2 500 g were 7.8 times more likely to experience unfavorable outcomes than those with birth weight greater than 2 500 g (AOR=7.8, 95%CI 1.2–51.2).

DISCUSSION

This study investigated maternal and fetal outcomes of term PROM and associated factors. According to our findings, the incidence of term PROM was 6%, which is within the range of 5%–10% reported elsewhere.^[1]

Similar to the previous finding,^[17] 69.7% of the women who experienced term PROM were in primigravida. Those who come from rural areas were more likely to have unfavorable. This may be due to poor hygienic conditions; there are more chances of infection.

In the present study, the duration of PROM and latency were significantly associated with unfavorable maternal outcome. Mothers with a duration of PROM greater than or equal to 12 hours were more likely to experience unfavorable outcome than those with a duration of PROM less than 12 hours. This finding corroborates the results of studies conducted in Karnataka and India.^[18,19]

A latency period of 24 hours and above was associated with approximately a threefold increase in unfavorable maternal outcome. This confirms the finding of a previous study,^[20] where an increasing risk of complications was observed with a prolonged PROM. However, our finding is inconsistent with the result of the previous study, that there was no statistically significant increase in the risk of unfavorable outcomes like maternal infection with longer latencies, compared to less than 24 hours.^[21]

The presence of chorioamnionitis increased maternal unfavorable outcome by 11.6 times as compared to the non presence of chorioamnionitis (AOR=16.6, 95%CI 2.8–99.4) in the Sagameshwar Hospital, India (AOR=3.0, 95%CI 1.2–7.0).^[15,20] The difference was due to the longer latency period that aggravated the chance of infection.

In this study, a longer duration of hospital stay was associated with increased likelihood of unfavorable maternal outcome. This is consistent with the findings

from a previous study.^[19] This may be due to the increased risk of nosocomial infection, which may complicate the situation.

In our study, the maternal mortality was 1.6%, which was higher than that (0.26%) reported from Gujarat, India.^[19] This may be due to difference in management of PROM. The most common cause of maternal morbidity and mortality was puerperal sepsis.

Similarly, there was an association between increased likelihood of fetal outcomes and longer duration of PROM, and the presence of meconium stained color of liquor was also reported previously.^[22,23]

In this study, birth weight less than 2 500 g was approximately associated with an 8-fold increase in unfavorable fetal outcomes. Low birth weight (LBW) was considered as an important predictor of infant mortality, especially in the first month of life.^[24] Fetuses in need of ICU admission were more likely to experience unfavorable outcomes. Such an association has been reported elsewhere.^[24] In pregnancies complicated by term PROM, the mortality was 11.9%, which was higher than that (2.86%) of another study from India.^[19] The difference may be due to the quality of health care provided.

Our study has some limitations. Due to incomplete documentation and inappropriate chart keeping, some important outcome indicators were not included in the study. The sample size of this study was small. Besides, the study did not include a non-PROM group for comparison with the PROM group. Therefore, the results should be interpreted cautiously.

In conclusion, the findings of this study showed that duration of PROM, maternal residence and latency are associated with unfavorable maternal outcomes. Besides, birth weight less than 2 500 g, ICU admission, duration of PROM, and meconium-stained color of liquor are associated with unfavorable fetal outcomes.

ACKNOWLEDGMENTS

The authors would like to thank the pregnant women participated in the study. They are also grateful to Jimma University for funding the study.

Funding: None.

Ethical approval: Ethical clearance for the study was obtained from the ethics committee of Jimma University College of Health Science.

Conflicts of interest: The authors declare that they have no competing interests.

Contributors: TE conceived, designed the study, participated in the data collection, analysis, and interpretation of data. DH, NF and MA participated in designing the study, data analysis, interpretation of data, revised, draft and edited the manuscript. All authors read and approved the final version of the manuscript.

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Received December 6, 2015

Accepted after revision March 26, 2016