# Knowledge, attitude, and practices of midwives on premature rupture of membranes (PROM): A cross-sectional study in Samosir and Toba, Indonesia

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## Abstract

Indonesia has a significantly higher maternal mortality ratio (MMR) than other countries in Southeast Asia, and infection is one of the most common causes of maternal deaths, of which premature rupture of membranes (PROM) can be the consequence of the infections. In primary healthcare settings, midwives play an important role in identifying and managing PROM appropriately; however, studies on their knowledge, attitudes, and practices related to PROM are limited. The aim of this study was to determine the midwives' knowledge, attitude and healthcare practice on PROM in Indonesia. A cross-sectional study was conducted among midwives at primary healthcare facilities in Samosir and Toba Regency, North Sumatra, Indonesia, from July to November 2022. The knowledge, attitude and practice towards PROM were assessed. Results showed that 57.5% of midwives had poor knowledge and 35.1% had poor attitude levels. There were 4.9% of midwives referred the patients immediately to the hospital. Our data indicated that aged 31–40 or 41–50 years, having a lower than bachelor degree and having a higher monthly number of referred PROM patients were significantly associated with poor knowledge compared to younger, having a bachelor degree, and lower monthly referral patient number, respectively. Similarly, younger, having higher degree and a having lower monthly referral number of PROM cases were associated with higher chances of having a sufficient-good attitude towards PROM. This study highlights that a significant percentage of midwives had poor levels of knowledge and attitude, and age, educational level and monthly referral number of PROM cases were associated with the level of knowledge and attitude.

**Keywords**: Premature rupture of membranes, midwives, maternal infection, knowledge level, attitude level

## Introduction

*T*he maternal mortality ratio (MMR) can determine the maternal health of a country. According to the World Health Organization (WHO), 94% of maternal mortality occurred in low-income countries and low-to-middle income countries [1]. Although there was a steep reduction between

the last two decades among South-East Asia region from 355 to 152 maternal deaths per 100,000 live births, the MMR is still significantly higher than in Europe or America [1,2]. Indonesia has a significantly higher MMR when compared to other countries in Southeast Asia and infection is one of the most common causes of maternal deaths [1,3]. Premature rupture of membranes (PROM) is one of the consequences of infection during pregnancy and childbirth and when it occurs during preterm bird, called preterm premature rupture of membranes (PPROM) [3]. The burden of PPROM extends beyond maternal and neonatal mortality and morbidity; it could result in national economic losses from medication expenses, hospitalization, and healthcare worker training programs [1,2].

PROM is defined as the rupture of the amniotic membranes during pregnancy before delivery, above 37 weeks of gestation, and is characterized by a painless fluid discharge from the vagina, while PPROM refers to PROM that occurs before 37 weeks of gestation. The incidence of PROM ranges from 5% to 15% of all pregnancies worldwide [4]. However, PROM contributes to more than 40% of preterm births and is associated with 20% of perinatal mortality and morbidity [4]. In addition to significant mortality, PROM also causes fetal respiratory distress syndromes and intraventricular hemorrhage [4-5]. It is also associated with adverse long-term neurodevelopmental outcomes such as visual or hearing impairment, intellectual disability, developmental and motor delay, and cerebral palsy [6]. Moreover, earlier rupture of the membrane among PPROM will eventually be related to its under-developing fetus plus sub-optimal condition to enter labor-stage, plus an increased risk of maternal complication e.g., intra-amniotic infection [7]. Therefore, clinical assessment is essential to confirm the diagnosis of PPROM and PROM including early and comprehensive the history taking and a physical examination [3].

In primary healthcare settings, midwives play an important role in identifying and managing PPROM and PROM appropriately. Midwives must also understand when and how to advise, refer and transfer the patients to an obstetrician from the primary healthcare facilities; therefore, knowledge of PROM is essential in midwives. Interventions provided by midwives could contribute to reducing maternal, neonatal, and intrauterine fetal deaths in low- and middle-income countries [6-8]. The aim of this study was to determine the level of knowledge, attitude and healthcare practice of midwives on PROM in North Sumatra, Indonesia.

## Methods

### Study design and respondents
A cross-sectional study was conducted among midwives at primary healthcare facilities in the Samosir and Toba Regency, North Sumatra, Indonesia, from July to November 2022. All active midwives with more than 12 months of work in the region were considered eligible to participate in this study.

### Sample size and sampling process
The sample size in this study was calculated using Slovin formula with margin of error 5% and based on the calculation, the minimal sample was 400 midwives. A convenience sampling method was used to recruit the sample.

### Study variables
The dependent variables of the study were knowledge, attitude and practice on PROM among midwives. These variables were assessed using a questionnaire. Knowledge was assessed using ten multiple-choice questions with four options per question related to risk factors, prevention efforts and initial management of PROM before referring the patients. There were five questions related to PROM and five questions specific related to PPROM and the correct answer was scored with one point. Attitude was assessed using a questionnaire consisting of 10 statements and the rating of each statement was provided using a Likert scale (scoring system using 1–5 scores per option, with the lowest score indicating the negative attitude). The assessed toward focused on infection as a risk factor of PROM. The practice was assessed using five questions about practice towards a PROM case. Good knowledge was determined by a score >7, sufficient with a score of

6–7 and inadequate <5. The score of the attitude level was accumulated and stratified into three categories: good (cumulative score >38), sufficient (score 28–38) and poor (score <27).

The independent variables were assessed in this study were age, educational attainment, training in the last year, type of workplace (grouped into government primary healthcare facility or private clinic, work experience length in years (divided into <5, 5–10 or >10 years) and the mean of PROM patients referred in each month to the obstetrician or referral health centers (divided into less or more than five patient a month).

### Data collection
The midwives were approached from primary healthcare facilities until the minimum number of samples was reached. The midwives were provided with a set of questionnaires assessing the knowledge, attitude and practice towards PROM as well as age, educational attainment, training in the last year, type of workplace, work experience length and the mean of PROM patients referred in each month to the obstetrician or referral health centers.

### Statistical analysis
All data was presented in descriptive using tables and percentages. Logistic regression analysis was used to determine the factors associated with knowledge and attitude. The data was analyzed using the Statistical Package for the Social Sciences (SPSS) version 24.0 (IBM, New York, US).

## Results

### Midwives' characteristics
A total of 767 midwives were included in the study, the characteristics of the midwives are presented in **Table 1**. 45.5% of midwives aged 31–40 years and the vast majority working in the government primary healthcare facilities (82%). More than half of midwives had a working experience of between 5–10 years (57.1%) and 60% had no minimum training in the last year. A large proportion of midwives referred less than five patients each month (87%).

Table 1. Midwives' characteristics included in the study (n=767)

| Characteristics | Frequency (Percentage) |
| --- | --- |
| Age (year) | |
|     21–30 | 187 (24.4%) |
|     31–40 | 349 (45.5%) |
|     41–50 | 177 (23.1%) |
|     51–60 | 52 (6.8%) |
|     >60 | 2 (0.2%) |
| Educational attainment | |
|     Associate degree (Diploma 2/3) | 616 (80.3%) |
|     Bachelor degree | 151 (19.7%) |
| Having training in the last year | |
|     Yes | 307 (40%) |
|     No | 460 (60%) |
| Type of workplace | |
|     Government primary healthcare facility | 629 (82%) |
|     Independent private clinic | 138 (18%) |
| Work experience | |
|     <5 years | 143 (18.6%) |
|     5–10 years | 438 (57.1%) |
|     >10 years | 186 (24.3%) |
| Mean number of PROM referred | |
|     <5 patients/month | 666 (87%) |
|     ≥5 patients/month | 101 (13%) |

### Level of knowledge and attitude in PROM
Midwives' knowledge was assessed on risk factors, prevention efforts and initial management of PROM before referring the patients. Our data indicated that 57.5% midwives had good knowledge level, followed by sufficient (32.2%) and poor (10.3%) (**Table 2**). The levels of attitude towards infection as a risk factor of PROM of the midwives were also assessed. More than half of the midwives (54.1%) had sufficient attitude and 10.8% had poor attitude (**Table 2**). Only a small proportion of midwives (35.1%) had good attitude (**Table 2**).

Table 2. Midwives' knowledge in PROM and attitude infection as a risk factor of PROM (n=767)

| Domain | Frequency (Percentage) |
|---|---|
| Level of knowledge in PPROM/PROM | |
| Good | 441 (57.5%) |
| Sufficient | 247 (32.2%) |
| Inadequate | 79 (10.3%) |
| Level of attitude | |
| Good | 269 (35.1%) |
| Sufficient | 415 (54.1%) |
| Poor | 83 (10.8%) |

## Midwives' practices in PROM

Midwives' examinations on patients were assessed to reflect and evaluate how midwives implement their knowledge and attitude towards PROM. There were 70.3% of midwives that performed digital vaginal examination initially, 24.8% of midwives used speculum and litmus paper, and 4.9% referred patients immediately to the hospital (**Table 3**).

Table 3. Midwives' practices on patient with PROM (n=767)

| Examinations | Frequency (Percentage) |
|---|---|
| Digital vaginal examination | 539 (70.3%) |
| Speculum and litmus paper | 190 (24.8%) |
| Direct referral | 38 (4.9%) |

## Factors associated with knowledge and attitude

The study analyzed the impact of midwives' characteristics on their knowledge and attitude towards PROM. The findings revealed that younger midwives, having a bachelor's degree, had recent training, and more than five years of experience, working in independent setting and had fewer monthly referrals, were more likely to demonstrate better knowledge and attitude. The analyses indicated that those aged 31–40 ($p$=0.005) and 41–50 years ($p$=0.013), midwives with associate degree ($p$=0.013), and those with higher than five referred patients each month ($p$<0.001) had significant higher chance to have poor knowledge compared to those within 21–30 years group, had bachelor degree, and had fewer mean number of PROM referred patients/month, respectively (**Table 4**). Similarly, the chance of having a sufficient-good attitude towards PROM was lower among those within the 31–40 age group ($p$=0.016), midwives with associate degree ($p$=0.006), and those with higher referred patients each month ($p$<0.001) compared to those within 21–30 years group, had bachelor degree, and had the mean number of PROM referred ≥5 patients/month, respectively (**Table 5**).

Table 4. Factors associated with midwives' knowledge on PROM (n=767)

| Characteristics | Knowledge | | OR (95% CI) | $p$-value |
|---|---|---|---|---|
| | Sufficient-Good | Poor | | |
| Age (year) | | | | |
| 21–30 | 179 (96.2%) | 7 (3.8%) | Reference | |
| 31–40 | 306 (87.9%) | 42 (12.1%) | 0.23 (0.08–0.64) | 0.005* |
| 41–50 | 156 (88.1%) | 21 (11.9%) | 0.20 (0.06–0.71) | 0.013* |
| 51–60 | 45 (83.3%) | 9 (16.7%) | 0.23 (0.04–1.08) | 0.063 |
| >60 | 2 (100.0%) | 0 (0.0%) | 0.04 (0.00–0.06) | 1.000 |
| Educational attainment | | | | |
| Associate degree (Diploma 2/3) | 542 (88.0%) | 74 (12.0%) | Reference | |
| Bachelor degree | 146 (96.7%) | 5 (3.3%) | 4.14 (1.35–12.67) | 0.013* |
| Having training in the last year | | | | |
| Yes | 381 (82.8%) | 79 (17.2%) | 0.00 (0.00–0.00) | 0.993 |
| No | 307 (100.0%) | 0 (0.0%) | Reference | |
| Type of workplace | | | | |
| Government primary healthcare facility | 559 (88.9%) | 70 (11.1%) | Reference | |
| Independent private clinic | 129 (93.5%) | 9 (6.5%) | 1.281 (0.52–3.10) | 0.583 |
| Work experience | | | | |
| <5 years | 386 (87.9%) | 53 (12.1%) | Reference | |
| 5–10 years | 172 (92.5%) | 14 (7.5%) | 2.02 (0.87–4.72) | 0.101 |
| >10 years | 130 (91.5%) | 12 (8.5%) | 1.41 (0.52–3.81) | 0.498 |
| Mean number of PROM referred | | | | |

| Characteristics | Knowledge | | OR (95% CI) | *p*-value |
| --- | --- | --- | --- | --- |
| | Sufficient-Good | Poor | | |
| <5 patients/month | 51 (50.5%) | 50 (49.5%) | 15.97 (8.47–30.11) | <0.001* |
| ≥5 patients/month | 637 (95.6%) | 29 (4.4%) | Reference | |

* Statistically significant at *p*=0.05
** Statistically significant at *p*=0.001

Table 5. Factors associated with midwives' attitude towards PROM (n=767)

| Characteristics | Attitude | | OR (95% CI) | *p*-value |
| --- | --- | --- | --- | --- |
| | Sufficient-good | Poor | | |
| Age (year) | | | | |
| 21–30 | 177 (95.2%) | 9 (4.8%) | Reference | |
| 31–40 | 304 (87.4%) | 44 (12.6%) | 0.31 (0.12–0.80) | 0.016 |
| 41–50 | 156 (88.1%) | 21 (11.9%) | 0.31 (0.09–1.03) | 0.057* |
| 51–60 | 45 (83.3%) | 9 (16.7%) | 0.37 (0.08–1.72) | 0.206 |
| >60 | 2 (100.0%) | 0 (0.0%) | 0.06 (0.00) | 1.000 |
| Educational attainment | | | | |
| Associate degree (Diploma 2/3) | 538 (87.3%) | 78 (12.7%) | Reference | |
| Bachelor degree | 146 (96.7%) | 5 (3.3%) | 4.89 (1.56–15.31) | 0.006* |
| Having training in the last year | | | | |
| Yes | 377 (82.0%) | 83 (18.0%) | 0.00 (0.00–0.00) | 0.993 |
| No | 307 (100.0%) | 0 (0.0%) | Reference | |
| Type of workplace | | | | |
| Government primary healthcare facility | 557 (88.6%) | 72 (11.4%) | Reference | |
| Independent private clinic | 127 (92.0%) | 11 (8.0%) | 0.94 (0.40–2.20) | 0.892 |
| Work experience | | | | |
| <5 years | 385 (87.7%) | 54 (12.3%) | Reference | |
| 5–10 years | 169 (90.9%) | 17 (9.1%) | 1.88 (0.82–4.33) | 0.134 |
| >10 years | 130 (91.5%) | 12 (8.5%) | 1.89 (0.69–5.19) | 0.215 |
| Mean number of PPROM/PROM referred | | | | |
| <5 patients/month | 47 (46.5%) | 54 (53.5%) | 20.64 (10.83–39.31) | <0.001** |
| ≥5 patients/month | 637 (95.6%) | 29 (4.4%) | Reference | |

* Statistically significant at *p*=0.05
** Statistically significant at *p*=0.001

## Discussion

Most of the midwives in the study demonstrated sufficient knowledge levels regarding PPROM, but exhibited poor attitude levels. Factors hypothesized contributing to knowledge and attitude levels include education level, social and cultural aspects, economic status, environment, working experience, and age. Upon analyzing the difference in knowledge and attitude across the groups, midwives in the age groups 31–40 and 41–50 had significantly lower change to have sufficient-good knowledge, compared to the 21–30 age group. Additionally, there was a significant lower in the knowledge level of midwives aged 41–50 better than midwives in the 21–30 age group. This indicates that the younger (21–30) age group has a better knowledge and attitude about PROM. Furthermore, those with a bachelor degree had 4.14 times chance to have sufficient-good knowledge and 4.89 times higher chance to have better attitude than midwives with an associate educational degree. Midwives with less than five referrals PROM cases a month demonstrated 15.97 times chance to have better knowledge and 20.64 times higher chance to have sufficient-good attitude. This indicates that the fewer the referrals, the better knowledge and attitude the midwives have about PROM.

The risk factor for PROM is an infection that spreads from the vagina. In addition, several conditions such as polyhydramnios, incompetent cervix and placental abruption are often associated with PROMs. A study reported that the risk factors for PROM were BMI <18.5 kg/m², history of PROM, nulliparity, gestational diabetes, low educational level, standing at work, and insulin use [12]. Other parameters such as low annual income, smoking, maternal age, and increased BMI were independent risk factors for PPROM [12]. The most frequent initial examination conducted by the midwives on PROM/PRPOM cases was the digital vaginal examination (70.3%). In cases of PROM and PPROM, digital vaginal examination should be

avoided unless active management is needed. According to a guideline provided by the Society of Obstetricians and Gynecologists of Canada (SOGC), in cases of PROM, it should be avoided to perform digital vaginal/cervical examinations because it shortens the latency period and increases the risk of infection [11]. A study reported that digital cervical examination was significantly associated with a shorter latency period in PROM patients [12]. Another study also found that patients who underwent digital vaginal examination had a shorter mean latency when compared with sterile speculum examinations [13]. A systematic review and meta-analysis study of four trials reported that the prevalence of maternal infectious morbidity was higher in patients who had a digital examination than in those who had a speculum examination (33% versus 26%) [14]. The mean duration of latency in PPROM patients was longer in patients that only underwent a speculum examination than with a digital examination [14].

The speculum examination with litmus paper was another examination carried out by midwives in this study. The piece of litmus or nitrazine paper will change color from red to blue if the cervicovaginal pH is alkaline. According to the guideline, this method can be used to diagnose cases of PROM/PPROM by determining the vaginal pH of the amniotic fluid. Differences in the pH of vaginal secretions and amniotic fluid will increase the pH of vaginal secretions due to amniotic fluid leak contaminations [15, 16]. Unfortunately, this study found that few midwives used this examination method. Vaginal pH testing is the preferred test in low-resource settings because of its accessibility [17].

This study showed that most midwives had a referral rate of less than five patients per month (87%), which is considerably low due to PROM/PPROM cases are supposed to be referred to the secondary healthcare facilities to improve the outcomes. In contrast, a study reported that the number of referrals in Indonesia was considered high. Obstetric patients were the top three referred cases in Dr Cipto Mangunkusumo General Hospital, Jakarta, Indonesia, in both 2013 and 2014 and among the obstetric cases, PPROM, followed by severe pre-eclampsia and preterm labor were the most frequent [18]. This indicated that there was still a high number of inappropriate referrals from primary health care facilities. Immediate and appropriate referrals of PROM/PPROM to secondary healthcare facilities is important because it allows the administration of dexamethasone to stimulate the maturation of fetal lungs if the premature rupture of membranes occurs between 24–33 weeks. These referrals are vital to decrease the risk of infections, such as intra-amniotic infection, post-partum infection, endometriosis; neonatal risks, including respiratory distress syndrome, sepsis, intraventricular hemorrhage; and the risk of maternal and fetal death [19].

## Conclusion

There are still significant percentages of midwives who have poor levels of knowledge and attitude towards PROM among midwives in Samosir and Toba Regency, North Sumatra. Having younger age, higher educational attainment and fewer monthly referral number of PROM cases are associated with better level of knowledge and attitude. Inappropriate healthcare practices by the midwives and low referral rates of PPROM might contribute to the increased the risk of maternal infections. It is expected that future study will analyze other factors that influence the incidence of complications of PROM.

**Underlying data**

Derived data supporting the findings of this study are available from the corresponding author on request.

# How to cite

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