



Birth preparedness and complication readiness among pregnant women in a population-based cohort in Eastern Uganda, 2006–2018

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Summary

Background: Uganda is one of the Sub-Saharan countries with a high maternal mortality ratio estimated at 336 deaths per 100,000 live births. Birth preparedness and Complication readiness (BPCR) is an effective strategy for reducing maternal and neonatal mortality. In Uganda, there is limited information on the level and factors associated with BPCR. We determined the level of Birth BPCR and associated factors among pregnant women in Eastern Uganda, 2006–2018 to inform programming.

Methods: We analyzed secondary data from the Iganga-Mayuge Health and Demographic Surveillance Site (IMHDSS) in Eastern Uganda. We extracted data on demographics and BPCR risk factors for pregnant women, 2006–2018. A woman was considered prepared for birth and its complication if she practiced at least 3 of the following during pregnancy: identified health facility for place of delivery, saved money for the purpose of pregnancy and childbirth, decided to deliver by skilled provider, and had made provision for baby's clothes. We evaluated factors associated with BPCR using multivariable logistic regression.

Results: We identified 4,472 pregnant women of which 3,800 (85%) were prepared for birth and its complications. The mean age of pregnant women was 28 years (range:13-47). Pregnant women aged ≥ 35 years (adjusted odds ratio (aOR)=1.5, 95%CI=1.0041-2.2), Antenatal care (ANC) attendance (aOR=1.3, 95%CI=4.5-40), wealth index (fifth quintile/wealthiest: aOR=2.7, 95%CI=1.8-4.2, fourth quintile: aOR=1.7, 95%CI=1.2-2.5, and third quintile: AOR=1.4, 95%CI=1.1-1.7), level of education (secondary education: aOR=1.6, 95%CI=1.1-2.3, tertiary education: aOR=4.1, 95%CI=1.8-9.4), residence (peri-urban: aOR 1.5, 95%CI=1.1-2.0), and male partner involvement in ANC (aOR=1.3, 95% CI=1.1-1.6) were associated with BPCR.

Conclusion: Most pregnant women were prepared for birth and its complications. Women with higher wealth index, secondary education and above, attended ANC visits, and those whose partners were involved were prepared for birth and its complications. We recommend promoting ANC attendance especially in areas with poor utilization of ANC services, and involving male partners in BPCR could help improve pregnancy outcomes. Promoting women's education and socioeconomic status may help improve BPCR.



Introduction

According to the World Health Organization (WHO), approximately 287, 000 women died during and following pregnancy and childbirth in 2020 globally and about 70% of the maternal deaths occurred in Sub-Saharan Africa(1). In 2020, the Maternal Mortality Ratio (MMR) in low-income countries was 430 per 100,000 live births (1). Uganda was one of the Sub-Saharan countries with a high maternal mortality ratio (MMR) estimated at 336 deaths per 100,000 live births (2).

Birth preparedness and complication readiness (BPCR) interventions in developing countries is associated with reduction in maternal and neonatal mortalities (3). BPCR refers to a plan organised during pregnancy in preparation for a normal birth and in case of complications. Birth preparedness for a woman entails identifying a skilled health provider, identifying a health facility for delivery, arranging means of transport and saving money for an obstetric emergency, and arranging blood donors during childbirth (4). BPCR is associated with factors such as age of the mother, level of education, antenatal care, knowledge of danger signs, delivery at a health facility, and assistance from community health workers. In 2022, Uganda developed the essential maternal and neonatal care clinical guidelines which provides for birth and emergency preparedness, and prevention and management of life-threatening complications of pregnancy and childbirth (5).

Though the benefits of BPCR in improving pregnancy outcomes in both mothers and newborns have been documented in several countries, little information is currently available on levels of BPCR among pregnant women and associated factors in Uganda. We assessed BPCR and associated factors among pregnant women in Eastern Uganda, 2006–2018 to inform programming.

Methods

Study design, data source, and setting

We analysed BPCR-related surveillance data from the Iganga Mayuge Health and Demographic Surveillance Site (IMHDSS) generated during 2006-2018. Iganga Mayuge Health and Demographic Surveillance Site was established in 2005. It is located in the Iganga and Mayuge districts in Eastern Uganda, approximately 120 km from Kampala city. The IMHDSS consists of 65 villages in seven sub-counties spread over a 155km² area with a population of 94,568 at the end of 2017. The average household size is five individuals, and the area is predominantly rural, with some peri-urban areas. Subsistence agriculture is the main occupation and sex distribution is roughly equal, with 51% female. Approximately 45% of the population is less than 15 years old and 27% of the population are adolescents aged 10-19. The IMHDSS is an open population cohort and collects longitudinal data on pregnancy outcome (live birth, still birth, abortion, miscarriage), attendance of antenatal care during pregnancy, place of delivery among others (6).

Study population

We considered records for all women aged 13-47 years who got pregnant or gave birth irrespective of the outcome from 2006–2018 and lived in the Iganga and Mayuge Health Demographic Survey Site for at least 4 months. The 13-47year age-group was considered based on the available secondary data.



Study variables and data abstraction

We abstracted data from the paper based surveillance data. The dependent (outcome) variable was BPCR (Yes, No). A woman was considered prepared for birth and its complication if she practiced at least 3 of the following practices during pregnancy: identified health facility for place of delivery, saved money for the purpose of pregnancy and childbirth, decided to deliver by skilled provider, and had made provision for baby's clothes while those who had practiced less than 3 practices were considered not prepared (4). The independent variables included socio-demographic factors (age, marital status, level of education, residence), maternal factors (gravidity, parity, ANC attendance, pregnancy outcome), and male partner involvement in BPCR, and economic factors (Wealth index).

Data analysis

We exported data to STATA version 14 software for analysis. Categorical data was summarized as frequencies and proportions, and continuous data such as age was summarized in mean. To classify wealth index, principal components analysis (PCA) was run on the 11 household assets evaluated. The household items included owning: 1) a radio, 2) a television, 3) a mobile phone, 4) a bicycle, 5) a motorcycle, 6) a motor vehicle, 7) a piece of land, 8) large animals such as cattle, goats and sheep, 9) small animals such as poultry, 10) a manufactured bed, and 11) the nature of the walls of their house. The principal component on which most assets loaded was used to generate a wealth index score for each participant. Participants were then grouped into wealth quintiles (five quintiles in descending groups): the lowest quintile, representing the relatively poorest quintile of the participants and fifth quintile, representing the wealthiest participants.

Multivariable logistic regression analysis was used to determine the factors associated with BPCR among pregnant women in Eastern Uganda.

Ethical considerations

The Iganga Mayuge Health and Demographic Surveillance Site provided administrative clearance to conduct this study. In addition, we received a non-research determination clearance from the US Centers for Disease Prevention and Control (US CDC). This activity was reviewed by CDC and was conducted consistent with applicable federal law and CDC policy. § §See e.g., 45 C.F.R. part 46, 21 C.F.R. part 56; 42 U.S.C. §241(d); 5 U.S.C. §552a; 44 U.S.C. §3501 et seq. No informed consent from participants was sought since secondary data was used. We ensured confidentiality and the data were kept under lock and key to avoid disclosure of personal information of the respondents to members who were not part of the study.

Results

Socio-demographic characteristics of pregnant women in Iganga-Mayuge Demographic Surveillance Site, 2006–2018

A total of 4,472 women gave birth between 2006 and 2018. The mean age was 28±7 years with minimum and maximum ages of 13 and 47 years, respectively, and 10% were aged ≤19 years. Of the 4,472, the highest proportion were aged 25-35 years



2,202 (49%), followed by age-group of 20-24 years 983 (22%). The majority of the women were married 2,531 (57%) from rural areas 2,994 (67%) and had primary level education 2,535 (57%) (Table 1).

Table 1: Socio-demographic characteristics of the pregnant women in Iganga Mayuge Health and Demographic Surveillance Site (IMHDSS), 2006–2018, (N=4,472)

| Characteristic | Frequency(n) | % |
|-----------------------------|--------------|----|
| Age in years | | |
| 13-19 | 440 | 10 |
| 20-24 | 983 | 22 |
| 25-34 | 2,202 | 49 |
| 36-47 | 847 | 19 |
| Marital status | | |
| Never married | 431 | 10 |
| Married | 2,531 | 57 |
| Cohabiting | 1,247 | 28 |
| Formerly married | 263 | 6 |
| Education level | | |
| No formal education | 261 | 6 |
| Primary level | 2,535 | 57 |
| Secondary | 1,401 | 31 |
| Tertiary | 275 | 6 |
| Residence | | |
| Rural | 2,994 | 67 |
| Peri-urban | 1,478 | 33 |
| Wealth index | | |
| First quintile (poorest) | 933 | 21 |
| Second quintile | 1,069 | 24 |
| Third quintile | 924 | 21 |
| Fourth quintile | 744 | 17 |
| Fifth quintile (wealthiest) | 802 | 18 |

Level of birth preparedness and complication readiness among pregnant women, Iganga Mayuge Health and Demographic Surveillance Site, 2006–2018

Of the 4,472 pregnant women, 3,800 (85%) were birth prepared. The most common birth preparedness practice was making provision for buying baby clothes at 4,326/4,472 (97%). However, only 223 (5%) of the 4,472 mothers reported to have saved money for delivery or complications (Table 2).



Table 2: Birth preparedness and complication readiness among pregnant women, Iganga Mayuge Health and Demographic Surveillance Site, 2006–2018, (N=4,472)

| Component | Frequency | % |
|---|-----------|----|
| Identified a health facility | | |
| No | 575 | 13 |
| Yes | 3,897 | 87 |
| Identified skilled birth attendant | | |
| No | 603 | 13 |
| Yes | 3,869 | 87 |
| Bought child clothes | | |
| No | 146 | 3 |
| Yes | 4,326 | 97 |
| Saved money for delivery | | |
| No | 4,249 | 95 |
| Yes | 223 | 5 |
| Classification of BPCR | | |
| Not prepared (<3 preparations) | 672 | 15 |
| Well prepared (≥3 preparations) | 3, 800 | 85 |

Factors associated with birth preparedness and complication readiness among pregnant women, Iganga-Mayuge Demographic Surveillance Site, 2006–2018

At bivariate analysis level, age, marital status, residence, wealth index, level of education, parity, ANC attendance, male partner involvement in ANC were significantly associated with BPCR (Table 3).

At multivariate analysis, age of the pregnant woman, residence, education level, wealth index, ANC attendance, and male partner involvement in BPCR were significantly associated with BPCR. Pregnant women aged ≥35 years were 1.5 times more likely to be prepared for birth and its complications compared to teenage pregnant women aged 10-19 years (aOR 1.5; 95% CI 1.0041-2.3, p=0.048). Pregnant women with secondary level of education were 1.6 times (aOR 1.6; 95% CI 1.1-2.3, p=0.012), and tertiary level were 4 times (aOR 4.1; 95% CI 1.8-9.5, p=0.001) more likely to be prepared for birth and its complications compared to those with no formal education. Pregnant women from households in higher social economic status (SES) were more likely to be birth prepared compared to women whose households had a lower SES. Pregnant women in fifth quintile were 2.7 times (aOR 2.7; 95% CI 1.7-4.2, p=<0.001), fourth quintile were 1.7 times (aOR 1.7; 95% CI 1.2-2.55, p=0.002), and third quintile were 1.4 times (aOR 1.4; 95% CI 1.1-1.7, p=0.01) more likely prepared for birth and its complications compared to those in first quintile (poorest). Pregnant women who attended ANC were 13 times (aOR 13.4; 95% CI 4.6-39.6, p=<0.001) more likely prepared for birth and its complications compared to those who never attended ANC. Pregnant women residing in the peri-urban setting were 1.5 times (aOR 1.5; 95% CI 1.09-2.0, p=0.011) more likely prepared for birth and its complications compared to those who resided in rural setting. Pregnant



women who had their male partners involved were 1.3 times (aOR 1.3; 95% CI 1.08-1.6, $p=0.005$) more likely prepared for birth and its complications compared to those who had no male partners involved (Table 3).

Table 3: Factors associated with Birth Preparedness and complication readiness among pregnant women, Iganga Mayuge Health and Demographic Surveillance Site, 2006–2018

| Characteristic | Birth preparedness | | aOR(95%CI) | P value |
|---------------------------------------|--------------------|---------|-----------------|---------|
| | No (n) | Yes (n) | | |
| Age group, years | | | | |
| 13-19 | 71 | 369 | 1 | |
| 20-24 | 136 | 847 | 1.1(0.77-1.5) | 0.61 |
| 25-34 | 338 | 1,864 | 1.1(0.77-1.6) | 0.61 |
| 35-47 | 127 | 720 | 1.5(1.0041-2.2) | 0.048* |
| Residence | | | | |
| Rural | 561 | 2,433 | 1 | |
| Peri-Urban | 111 | 1,367 | 1.5(1.09-2.0) | 0.011* |
| Education level | | | | |
| None | 51 | 210 | 1 | |
| Primary | 473 | 2,062 | 1.1(0.76-1.5) | 0.76 |
| Secondary | 141 | 1,260 | 1.6(1.1-2.3) | 0.012* |
| Tertiary | 7 | 268 | 4.1(1.8-9.5) | 0.001* |
| Wealth index | | | | |
| 1 st quintile (poorest) | 206 | 727 | 1 | |
| 2 nd quintile | 204 | 865 | 1.2(0.97-1.5) | 0.090 |
| 3 rd quintile | 148 | 776 | 1.4(1.08-1.7) | 0.010* |
| 4 th quintile | 74 | 670 | 1.7(1.2-2.5) | 0.002* |
| 5 th quintile (wealthiest) | 40 | 762 | 2.7(1.7-4.2) | <0.001* |
| ANC attendance | | | | |
| No | 12 | 5 | 1 | |
| Yes | 660 | 3,795 | 13.(4.6-40) | <0.001 |
| Male partner involvement | | | | |
| No | 488 | 2552 | 1 | |
| Yes | 184 | 1248 | 1.3(1.08-1.6) | 0.005* |
| Parity | | | | |
| 1 | 102 | 680 | 1 | |
| 2-4 | 251 | 1665 | 0.94(0.71-1.25) | 0.68 |
| ≥5 | 319 | 1455 | 0.79(0.57-1.08) | 0.14 |

*statistically significant $p<0.05$



Discussion

The study revealed that 85% of pregnant women were prepared for birth and its complications. Higher education level, higher wealth index, older age, ANC attendance and male partner involvement in ANC were associated with BPCR.

The majority, 85% of the pregnant women were well prepared for birth and its complications. This proportion is higher than findings of previous studies in Ethiopia (30.6%), (7) Rwanda (22%) (8) and Uganda (28%)(9). The high proportion of well-preparedness could be attributed to adequate counselling on BPCR during ANC attendance(10).

We found that pregnant women who had attained secondary education and above were more likely to be birth prepared for birth and its complications than pregnant women who had no formal education. This finding is in consonance with findings of similar studies where education was found to be positively and significantly associated with BPCR (11). Educated women have good health seeking behaviour including increased utilisation of maternal health services, have adequate decision-making power in matters related to their health and are most likely to have fewer financial constraints in accessing healthcare (12).

Pregnant women aged ≥ 35 years were more prepared for birth and its complications compared to teenage women aged 13 to 19 years. This is in consistence with other studies where older women (≥ 35 years) were 2.6 times more likely to have adequate birth preparedness than their colleagues who were under 25 years of age (13). A possible explanation for this relationship may be that older women would have experienced complications on their previous pregnancies, thereby trying to prevent any such problems for the current pregnancy (14).

Pregnant women with higher socio-economic status were more likely prepared for birth and its complications than those in the lower socio-economic status. This finding coincides with a study conducted in Ethiopia, where mothers in the fourth quintile were more likely well prepared for birth and its complications than those in the third, second or first quintile (15). This might be due to the fact that women in the higher quintile have better opportunity for education, professional occupation and increased health seeking behavior (15, 16).

Pregnant women who attended ANC were more likely to be prepared for birth and its complications. This was in line with other studies conducted in Kenya, Tanzania and Ethiopia, where for instance in Ethiopia, mothers who attended ANC follow-up visit were 3.67 times more likely prepared for birth and its complications than those who had no ANC follow up visit.(11, 17). During routine ANC, women are counselled on the birth preparedness and its complications, and helped to plan their birth.

In this study, peri-urban residents were more prepared for birth and its complications than rural residents. This is supported by the study in Ethiopia (11, 18). This might be due to improved access to information, education, and availability of maternal health services (11).



Study limitations

We did not consider knowledge of obstetric danger signs while assessing BPCR because that information was lacking from the data collected at IMHDSS. There could also be information bias as the survey was conducted every after one year.

Conclusion

Overall, most pregnant women were prepared for birth and its complications in Iganga and Mayuge Districts. Age, level of education, wealth index, ANC attendance and male partner involvement were associated with BPCR. Improving the women's education and socio-economic status as well as encouraging ANC attendance could help improve BPCR. Involving male partners during BPCR could help improve the pregnancy outcome.

Conflict of interest

The authors declare that they have no conflict of interest.

Authors contribution

All authors contributed to the write-up and review of the bulletin. MK wrote the drafts of the manuscript and revised the paper for substantial intellectual content. BK, RM, IK, and ARA reviewed the bulletin for substantial intellectual content. MK collected secondary data. RM, BK, and ARA participated in the supervision of data collection and reviewed the draft bulletin for substantial intellectual content. All the authors read and approved the final version of the bulletin.

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