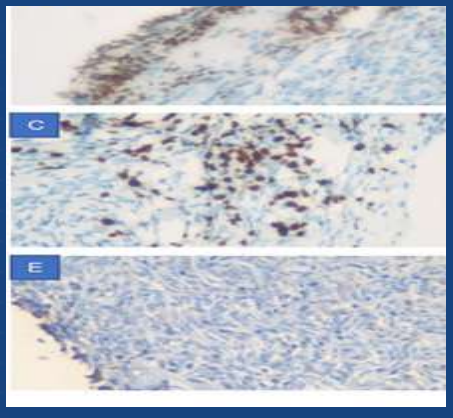
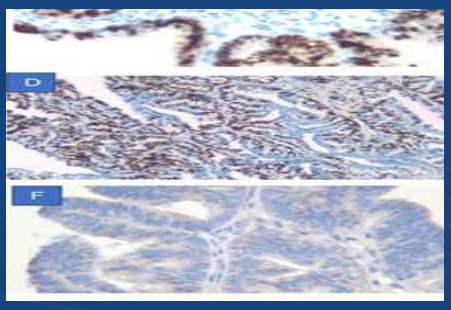
ETHIOPIAN JOURNAL OF REPRODUCTIVE HEALTH

EJRH

Visit us at www.ejrh.org

July, 2025 Volume 17, No. 3





ETHIOPIAN SOCIETY OF OBSTETRICIANS AND GYNECOLOGISTS

www.esog-eth.org

Ethiopian Journal of Reproductive Health (EJRH)

July, 2025

www.esog-eth.org

Ethiopian Society of Obstetricians and Gynecologists (ESOG)

Tel.: +251 115 506 068/069, Fax: +251 115 506 070
P.O. Box: 8731
Addis Ababa, Ethiopia
esogeth@gmail.com
newsletter@esog.org.et
www.esog-eth.org

www.ejrh.org

Address:
Head Office:
Ras Desta Damtew Avenue
Tsehafi Tízaz Teferawork Keda Building (Near Ghion Hotel)
East Wing, 2nd Floor, Room no 7
ESOG Project Office:
Kirkos District/ Kazanchis
Nigist Towers, 3rd floor

Ethiopian Journal of Reproductive Health (EJRH)

July, 2025

Table of Contents

PAGE

Editorial: Advancing Reproductive Health Through Context-Specific Research in Low-Resource Settings

In this issue, we present six original articles and two case reports. The original articles, spanning from Southern Ethiopia to Bangladesh and Uganda, shed light on the complex interplay of socio-cultural, economic, and health system factors influencing health behaviors, outcomes, and services. They also point out research gaps that could inspire other researchers' work.

In Ethiopia and Uganda, two studies highlight the importance of clinical tools/diagnostic methods in obstetric care. Admission cardiotocography (CTG) proves valuable in predicting perinatal outcomes in the Ethiopian study, while Uganda's implementation of the Labour Care Guide shows promise as a reliable method for reducing unnecessary urgent caesarean sections.

Obstetric morbidity is also addressed in a study from Arba Minch, Ethiopia, revealing a high prevalence of spontaneous perineal tears and associated risk factors, calling for strengthening preventive strategies through evidence-based obstetric care and targeted interventions addressing modifiable risk factors.

A study from Bangladesh explores fertility intentions among reproductive-age women, showing how education, income, and socio-cultural norms influence reproductive choices. Meanwhile, the study from Southern Ethiopia reveals that perceived HIV risk and social support significantly shape willingness to use pre-exposure prophylaxis for HIV.

Finally, a study from Wolaita Zone highlights the challenges faced by Podoconiosis patients in accessing sexual and reproductive health services, emphasizing the need for inclusive, gender-sensitive integrated care and efforts to address stigmatization against Podoconiosis patients.
Together, these studies underscore the need for context-specific, culturally sensitive interventions to improve reproductive and maternal health outcomes across diverse settings.

The case report on first-trimester uterine perforation from Ethiopia discusses a rare complication of a common procedure, emphasizing clinical vigilance in the assessment and management of patients with incomplete abortion. The second case report highlights a rare presentation of ovarian carcinoma following endometriosis with poor clinical outcome.

The editorial board believes this volume offers valuable lessons of clinical and public health significance for readers.

Wondimu Gudu
Editor-in-Chief
Ethiopian Journal of Reproductive Health

ASSESSING THE EFFECT OF THE LABOUR CARE GUIDE ON URGENT CAESAREAN SECTIONS AT A TERTIARY LEVEL HEALTH FACILITY IN UGANDA: AN INTERRUPTED TIME SERIES STUDY

Peter Gathoga[1], Romano N. Byaruhanga[1], Anthony Kayiira[1], Castro Kisuule[1], Deo Benyumiza[2]

ABSTRACT

BACKGROUND: The Labour Care Guide (LCG) has numerous benefits, including providing respectful care during labour and childbirth and reducing the rate of urgent caesarean sections. However, there is limited literature on the effects of the LCG in low- and middle-income settings in Africa. This study aimed to evaluate the impact of implementing the LCG on urgent caesarean section rates in a low-resource, tertiary health facility in Uganda.

METHODS: This Interrupted Time Series (ITS) study involved a retrospective review of medical records of pregnant women between July 1, 2021, and June 30, 2023. Data were collected from pregnant women admitted in labour and monitored using the modified WHO Partograph or the WHO Labour Care Guide at St. Francis Hospital Nsambya. Analysis was done using STATA 17/MP, with continuous variables presented as means ± SD and proportions for categorical variables. Linear segmental regression was used to analyse the outcome data, with a significance level set at ≤ 0.05.

RESULTS: A total of 2,451 pregnant women were included in the study, with no significant differences between the two groups monitored during labour. The ITS model showed a significant decrease in urgent caesarean section rates (0.80, p-value = 0.016) immediately after the introduction of the LCG, with no significant change in the slope post-intervention (0.015, p-value = 0.053). From the aggregated data, the LCG accounted for a 14.0% [95% CI: 17.2–10.8] risk difference in urgent caesarean section deliveries and an odds ratio (OR = 0.44 [95% CI: 0.36–0.53], p-value < 0.00). However, the study found no statistically significant difference in maternal complications or newborn outcomes immediately after delivery between the two labour monitoring tools (p-value > 0.05).

CONCLUSION AND RECOMMENDATION: This study highlights a significant reduction in urgent caesarean section rates following the implementation of the WHO Labour Care Guide. The adoption of the Labour Care Guide is recommended as a reliable method for decreasing urgent caesarean sections in Uganda.

KEYWORDS: Labour, Labour Care Guide, Caesarean section rate, Interrupted Time Series, Uganda, low-middle resource setting.

(The Ethiopian Journal of Reproductive Health; 2025; 17; 1-11)

1. Department of Obstetrics and Gynaecology, Mother Kevin Postgraduate School Nsambya, Uganda Martyrs University, Kampala City, Uganda.

2.Department of Midwifery, Faculty of Health Sciences, Lira University, Lira City, Uganda.

BACKGROUND

In sub-Saharan Africa, maternal mortality remains a critical issue for women of reproductive age. While there has been a global decrease in maternal mortality ratio (MMR) by 34.2% between 2000 and 2020, the African region still faces significant challenges, with 69% of maternal deaths occurring in sub-Saharan Africa[1, 2]. Uganda reports a current MMR of 189 maternal deaths per 100,000 births[3], with a majority of maternal deaths attributed to prolonged and obstructed labour. About 90% of perinatal mortality due to birth asphyxia is directly linked to obstructed labour[4].

To address these challenges, urgent caesarean sections are recommended when medically necessary, as they can effectively prevent maternal and perinatal morbidity and mortality[5]. However, it is important to note that there is no evidence supporting the benefits of caesarean delivery for women or infants who do not require the procedure[6].

Globally, 15% of women require caesarean sections for optimal maternal and perinatal outcomes[7]. Caesarean section rates below 5% are considered inadequate access to emergency obstetric care, while rates between 10% and 15% are deemed optimal[8,9]. Rates exceeding 15% do not show a reduction in maternal or newborn morbidity or mortality[5,7].

The introduction of the World Health Organization (WHO) Labour Care Guide (LCG) aims to improve intrapartum monitoring and support evidence-based, respectful care during labour and childbirth. The LCG replaces the traditional partograph for labour monitoring and addresses concerns over rising caesarean section rates without a corresponding improvement in maternal and newborn outcomes[10]. Implementing the LCG into routine intrapartum care is essential to enhance healthcare provider practices during labour and childbirth. This strategy can optimize the use of caesarean sections, improve maternal and perinatal health outcomes, and enhance women's overall care experience[11]. Recent studies have shown the positive impact of the WHO LCG on reducing primary caesarean deliveries. The use of the LCG resulted in a significant decrease in urgent caesarean section rates, leading to improved maternal and neonatal outcomes[12]. There is a lack of literature on the adoption and implementation of the Labour Care Guide in Africa, particularly in Uganda[13]. Thus, our study focuses on evaluating the effects of the Labour Care Guide on urgent caesarean sections at a tertiary-level facility in Central Uganda using an Interrupted Time Series study approach.

METHODS

Study Design and Setting

Evaluation of healthcare policies can present challenges, particularly when considering ethical concerns related to randomization. To address these challenges, this study utilized an Interrupted Time Series (ITS) approach. By constructing a time series of the outcomes and statistically testing for changes in outcome rates before and after the implementation of the Labour Care Guide, valuable insights were gained. The review was conducted over four months, from June 1, 2023, to September 30, 2023. This study was carried out at the Obstetrics and Gynaecology Department of St. Francis Hospital Nsambya. This is a private, not-for-profit hospital offering both inpatient and outpatient services. The hospital has two labour wards: a general and a private wing. The modified WHO Partograph has been used as the labour monitoring tool in the hospital since 1994, while the WHO Labour Care Guide was adopted as the sole labour monitoring tool from July 1, 2022. The hospital conducts an average of 3,600 deliveries per year (about 300 deliveries per month).

Study Population

The study reviewed files of all pregnant women who were monitored in labour using either the modified WHO Partograph or the LCG at St. Francis Hospital Nsambya during the study period between July 1, 2021, and June 30, 2023. All pregnant women's labour records that lacked minimum documentation (a single tracing of either the patient's name, fetal heart rate, cervical dilatation tracing, or missing labour outcomes) were excluded from the study.

Sample Size Considerations

Determining the appropriate sample size for an Interrupted Time Series study is essential, yet clear guidance on the exact formula remains lacking. The study power is optimized through a strategic trade-off between the number of time points and sample size per time point. To ensure stability in estimates and reduce variability and outliers within the ITS, a sample size of 100 at each time point is deemed desirable (1). Based on this recommendation, all mothers who were admitted to labour and monitored using either the Partograph or LCG were included in this study.

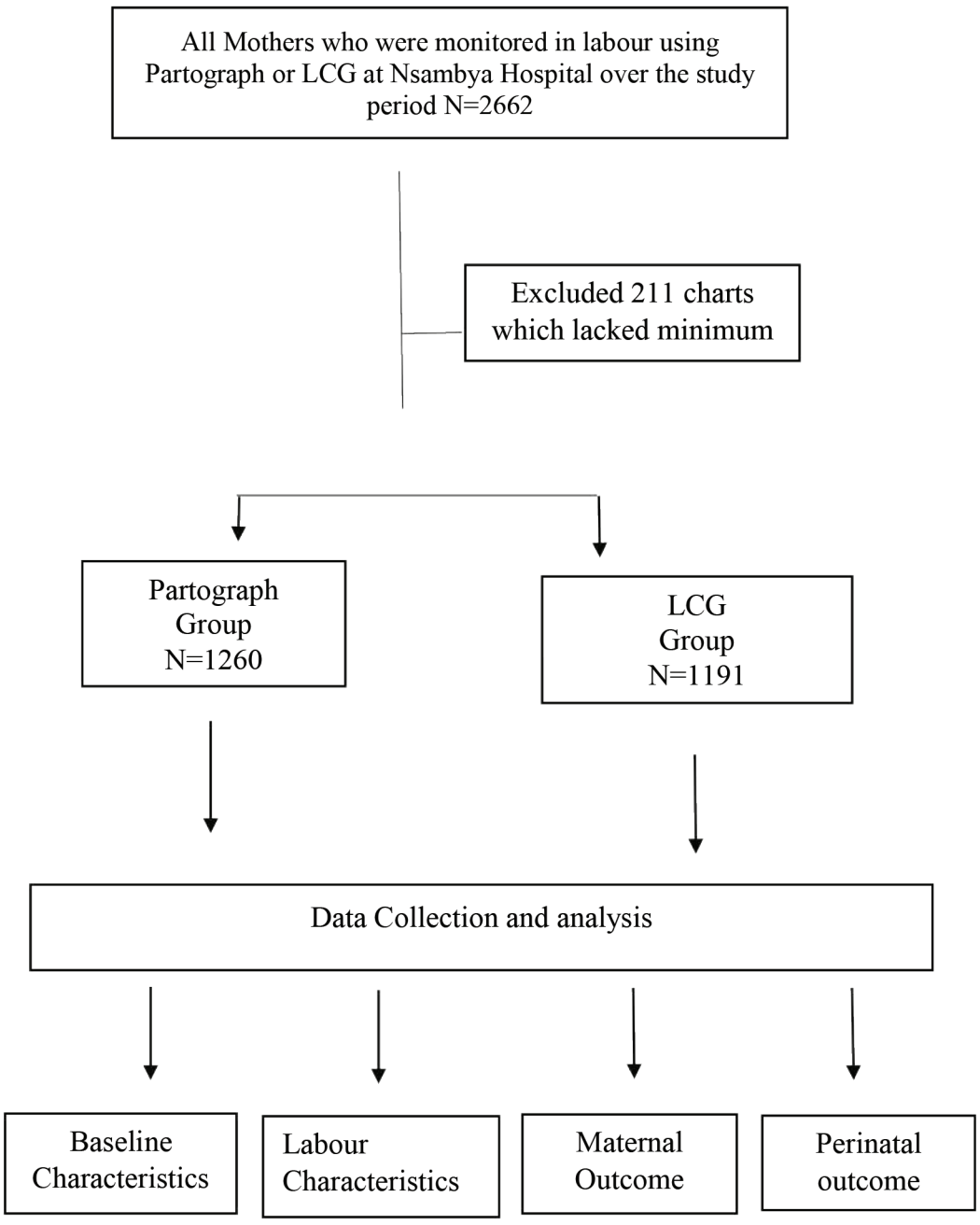


Figure 1: Showing Flow Chart of the Study.

Data Collection Tool

A pretested structured questionnaire was used to extract data from the patients' files. The questionnaire comprised five sections:

Section A: Socio-demographic information of study participants (maternal age, religion, education level);

Section B: Obstetric and medical history (gestational age, parity, HIV status, hypertensive disorders, diabetes in pregnancy, and urinary tract infection);

Section C: Labour characteristics (labour onset, artificial rupture of membranes, augmentation with oxytocin, duration of labour, mode of delivery, and indications for caesarean section);

Section D: Maternal complications after delivery (postpartum haemorrhage, peripartum hysterectomy, admission to high dependency unit/ critical care unit);

Section E: Newborn outcomes (live birth, stillbirth).

Data Collection

The data were collected by three research assistants who had a medical background. A total of 2,451 charts were included in the study; 1,260 were monitored using the WHO-modified Partograph, and 1,191 were monitored using the LCG. On completion of every data extraction session, questionnaires were checked for completeness. The filled data tools were then entered by the researcher into REDCap (Research Electronic Data Capture).

Data Management and Statistical Analysis

Data entry checks were created in REDCap to ensure that no missing or out-of-range data were entered. Data were imported into STATA 17/MP software for analysis. Continuous variables like age were summarised by mean ± SD, while proportions were used for categorical variables. Quantitative variables were compared using the Student t-test and qualitative variables using the Chi-square test. For statistical significance, a p-value of <0.05 was considered significant. A segmental regression analysis was performed to draw inferences about the effects of the Labour Care Guide on urgent caesarean section, duration of the active phase of labour, ARM, and oxytocin augmentation. The change in slope and intercept was used to define each segment of the ITS.

The regression model used was;

$$Logit\ Y_t = \beta_0 + \beta_1 t_i + \beta_2 X_{it} + \beta_3 ti*X_{it} + \beta_{4i}\text{-}n\ \Sigma\ (X_1 \text{ to } X_n)$$

Where β_0 represents the baseline outcome at T = 0, β_1 the change in outcome associated with a time unit increase (representing the underlying pre-intervention trend), β_2 the level change following the LCG adoption, and β_3 indicates the slope change following the intervention using the interaction between time and intervention: (t_i*X_t), and $\beta_{4i\text{-}n}$ represented the respective change on log odds associated with a unit change in the corresponding confounder variable adjusted for.

RESULTS

Demographic characteristics of the study participants

A total of 2451 participants were included in the study with a mean age of 29.75 years (SD ± 5.2). The age range of the participants was 15 to 45 years. The 2 groups of women had comparable social demographic characteristics as shown in Table 1 below.

Table 1: Socio-demographic characteristics of women monitored in Labour.

Demographic	Categories	Labour Monitoring tool		p-value
		Partograph Frequency (n, %)	Labour care guide Frequency (n, %)	
Maternal age	Mean, SD±	29.5±5.1	29.9±5.3	0.065
Maternal age	<19years	9(0.71)	12(1.01)	0.065
	20-34years	1019(80.87)	918(77.08)	
	≥35years	232(18.41)	261(21.91)	
Religion	Catholic	577(45.79)	520(43.66)	0.051
	Christian	296(23.49)	318(26.70)	
	Muslim	366(29.05)	283(23.76)	
	Others*	21(1.67)	70(5.85)	
Education level	No formal education	3(0.24)	5(0.42)	0.133
	Primary education	52(4.13)	61(5.12)	
	Secondary education	412(32.70)	427(35.85)	
	Tertiary education	798(62.740	698(58.61)	

*Others: these included Hindu and atheists

Obstetric and Clinical Characteristics of the Study Participants.

The mean gestation age at delivery was 39 ± 1.5 weeks. A total of 93 (3.9%) mothers had preterm births. The majority N = 1400 (57.1%) had a parity between 2-4. The two groups had comparable obstetric and clinical factors as shown in Table 2 below.

Table 2: Obstetric and Clinical Characteristics of the Study Participants.

Obstetric & clinical factors	Categories	Labour Monitoring tool		p-value
		Partograph Frequency (n, %)	Labour care guide Frequency (n, %)	
Gestational age	<37 weeks	46(3.65)	47(3.940)	
	37-42weeks above	1204(95.55)	1129(94.79)	
	≥42weeks	10(0.79)	15(1.25)	0.449
Parity	1	422(33.49)	388(32.58)	0.558
	2-4	708(56.19)	692(58.10)	
	5 +	130(10.32)	111(9.32)	
HIV status	Negative	1211(96.11)	1148(96.39)	0.143
	Not screened	5(0.40)	11(0.92)	
	Positive	44(3.49)	32(2.68)	
PIH	No	1132(89.84)	1070(89.84)	0.999
	Yes	128(10.16)	121(10.16)	
Hyperglycaemia in pregnancy	No	1242((98.57)	1169(98.15)	0.414
	Yes	18(1.43)	22(1.85)	
UTI in pregnancy	No	1251(99.29)	1188(99.75)	0.101
	Yes	9(0.71)	3(0.25)	
Mode of delivery	Vaginal Birth	890(70.63)	1008(84.63)	0.001
	Urgent C/Section	370(29.37)	370(29.37)	

A time series analysis of monthly fitted proportions of mothers delivered before and after the introduction of the labour care guide, showing a slow change in the slope before and an immediate significant (p=0.0015) change in the level after the intervention is shown in Figure 2 below.

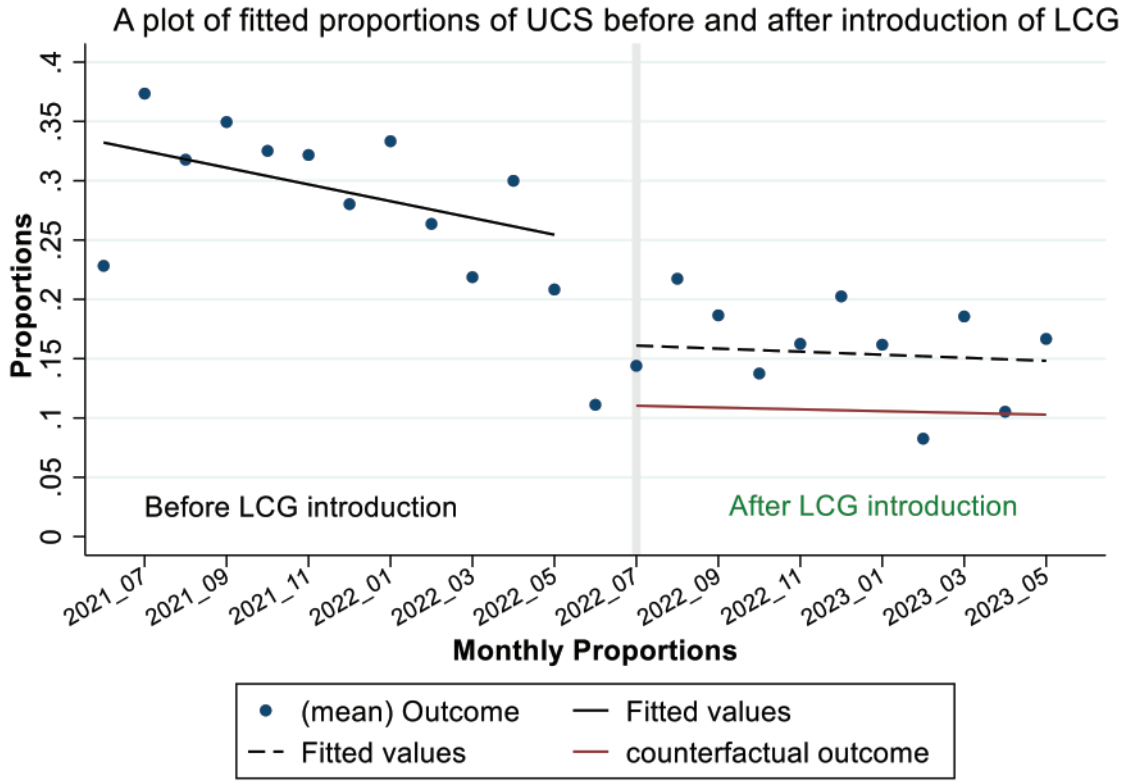


Figure 2: A plot of fitted proportions of patients who had an urgent caesarean section before and after the introduction of LCG.

Table 3: Interrupted Series Model for the Outcome

Change in proportion of UCS over time	Coefficient	P-value	95% CI
Before LCG	-0.071	0.031	-0.080 to -0.059
Immediately after the introduction of LCG	-0.80	0.016	-0.142 to -0.014
Interaction of outcome and time	-0.015	0.053	-0.006 to 0.017

There was an immediate change in the UCS (0.80) after the intervention (LCG). This effect is statistically significant, suggesting that right after the intervention, there was a significant abrupt change in the UCS (proportion of urgent caesarean sections performed). There was a slow negative trend in the outcome over time before the intervention (0.071). After the intervention, the slope of UCS changed by -0.015 compared to the pre-intervention trend.
From the aggregated data, the proportion of mothers delivered by urgent caesarean section using the partograph was 29.4% compared to 15.4% when the LCG was introduced. By adjusting for the years, LCG accounted for 14.0% [95% CI: 17.2 – 10.8] risk difference in urgent caesarean section deliveries and an odds ratio (OR = 0.44 [95% CI: 0.36-0.53], P<0.001) as shown in Table 3 above.
Maternal complications immediate post-delivery
The commonest complication was PPH in 130 (5.3%) of the participants followed by admission to HDU/ICU at 33 (1.4%). There was no significant difference between the labour monitoring tools used as shown in Table 4 below.

Table 4: Maternal complications after delivery of the 2451 study participants.

Maternal complication	Total	Partograph	LCG	P-value
PPH 130	66 (50.7)	64(49.2)	0.56	
Admission to HDU/ICU	33	20(60.6)	13(39.3)	0.862
Maternal Death	3	2 (66.6)	1 (33.3)	0.93

Newborn outcomes of the 2451 study participants

The commonest delivery outcome was live birth (n=2441, 99.6%), 3 (0.1%) were FSB and the rest were MSB. Of the live births, 1253 (51.3%) were delivered by monitoring using the Partograph and 1188 (48.7%) by LCG. There was no significant association between newborn outcomes and the labour monitoring tool as indicated in Table 5 below.

Table 5: Newborn outcomes of the 2451 study participants.

Outcomes	Total	Partograph	LCG	P-value
Live Birth	2441 (99.6)	1253 (51.3)	1188(48.7)	0.056
FSB	3 (0.1)	1 (33.3)	2 (66.7)	
MSB	7 (0.3)	6 (85.7)	1 (14.3)	

DISCUSSION

The implementation of the Labour Care Guide (LCG) at St. Francis Hospital Nsambya in Uganda resulted in a significant reduction in urgent caesarean rates. This innovative labour monitoring-to-action tool provides real-time monitoring of labour progress and prompts timely interventions, when necessary, ultimately improving maternal and newborn outcomes. The Labour Care Guide emphasizes the importance of individualized woman-centered care during labour and childbirth. It aims to reduce the unnecessary use of interventions such as artificial rupture of membranes and oxytocin augmentation in otherwise healthy pregnant women. Interventions are only recommended when there is a clear medical indication, leading to improved outcomes and reduced healthcare costs.

This interrupted time series study showed a significant immediate decrease in urgent caesarean section rates following the implementation of the Labour Care Guide (level change -0.80, p-value 0.016). The study revealed that there was no significant change in the overall trend of caesarean sections after the adoption of the LCG, indicating sustained benefits over time (-0.015, p-value 0.053). From the aggregated data, the LCG accounted for a 14.0% [95% CI: 17.2–10.8] risk difference in urgent caesarean section deliveries and an odds ratio (OR = 0.44 [95% CI: 0.36–0.53], $p < 0.001$). Similar results have been observed in other countries such as India, where the use of the Labour Care Guide resulted in a substantial reduction in caesarean section rates[12]. This decline may lead not only to a decrease in long-term maternal and newborn morbidity associated with caesarean deliveries but also allow resources to be redirected towards other healthcare needs and research initiatives.

The study also found no statistically significant difference in maternal complications or newborn outcomes immediately after delivery between the two labour monitoring tools. This implies that the impact of the LCG does not lead to a worse maternal or newborn outcome but a reduction in urgent caesarean section rates, which in the long run is beneficial.

Strengths of the study

When evaluating the impact of LCG on urgent caesarean sections, interrupted time series analysis proved to be a valuable tool. This method allows for a clear graphical representation of results, enabling the assessment of both intended and unintended consequences of the intervention[14].

Study Limitations

Despite the robust nature of quasi-experimental studies, certain limitations need to be acknowledged. These include autocorrelation, non-stationarity, and seasonality[14].

Furthermore, randomization is not conducted in interrupted time series analysis, leading to limited control over confounders. It is crucial to note that the interrupted time series is only valid if the program of interest is the sole factor that changes during the study period[14]. In our study, the assumption was made that the Labour Care Guide at St. Francis Hospital Nsambya was the only intervention introduced during the research period.

Conclusion

The Labour Care Guide is a valuable tool that has the potential to transform maternity care practices in Uganda and beyond. By promoting evidence-based interventions and individualized care, the LCG aims to improve maternal and newborn outcomes while reducing unnecessary healthcare costs.

With the results of this study showing much-needed care in line with the WHO intrapartum care guidelines, we strongly recommend the adoption of the Labour Care Guide as a policy tool in intrapartum care not just in the whole of Uganda, Sub-Saharan Africa, but the world over. The incorporation of respectful maternal care stands out in this tool and thus is highly recommended.

Declaration
This study was conducted following the Helsinki Declaration.

Ethics approval and consent to participate
Ethical approval for this study was obtained from the St. Francis Hospital Nsambya Research Ethics Committee with a clearance number: SFH-2023-84. A waiver of consent to access the charts was also sought from the REC (Research Ethics Committee, No.: SFH-2023-84). Administrative permission was sought from the Director of Clinical Services at St. Francis Hospital Nsambya to grant permission to access patients' files. During data collection, study identification numbers were used on all study-related documents to maintain confidentiality and privacy.

Consent for Publication
Not applicable

Data availability
The data sets used and/or analyzed during the study are available from the corresponding author upon reasonable request.

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

Funding
This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Authors contribution
Peter Gathoga, Romano N. Byaruhanga, Anthony Kayiira, Castro Kisuule, and Deo Benyumiza participated in topic development, protocol development, and data collection. Peter Gathoga., Romano N. Byaruhanga, Anthony Kisuule, and Deo Benyumiza participated in data analysis and manuscript writing. Peter Gathoga, Romano N. Byaruhanga, Castro Kisuule, Anthony Kayiira and Deo Benyumiza reviewed the manuscript.

Acknowledgment
Special gratitude goes out to the staff and management of St. Francis Hospital Nsambya for their support of this research project. We also acknowledge the management and staff of Uganda Martyrs University, particularly Mother Kevin Postgraduate School for their tireless efforts in training and mentoring postgraduate students through topic development, proposal writing, data collection, and manuscript writing.

Abbreviations

WHO:	World Health Organization
SFH:	St. Francis Hospital
LCG:	Labour care guide
HIV:	Human immune deficiency
ARM:	Artificial rupture of membranes
PIH:	Pregnancy induced Hypertension
UTI:	Urinary tract infection

Correspondence should be addressed to Peter Gathoga; pgathoga60@gmail.com

REFERENCES

1. Batist J. An intersectional analysis of maternal mortality in Sub-Saharan Africa: a human rights issue. J Glob Health [Internet]. 2019 [cited 2024 May 31];9(1). Available from: /pmc/articles/PMC6551548/
2. Musarandega R, Nyakura M, Machekano R, Pattinson R, Munjanja SP. Causes of maternal mortality in Sub-Saharan Africa: A systematic review of studies published from 2015 to 2020. J Glob Health [Internet]. 2021 [cited 2024 May 31];11. Available from: /pmc/articles/PMC8542378/
3. CHAMPIONING MATERNAL HEALTH: THE SAFE MOTHERHOOD CHALLENGE. - Ministry of Health | Government of Uganda [Internet]. [cited 2024 May 31]. Available from: https://www.health.go.ug/2023/10/19/championing-maternal-health-the-safe-motherhood-challenge/
4. Essential Maternal and Newborn Clinical Care Guidelines for Uganda, May 2022 | MOH Knowledge Management Portal [Internet]. [cited 2024 May 31]. Available from: http://library.health.go.ug/sexual-and-reproductive-health/essential-maternal-and-newborn-clinical-care-guidelines-uganda-may
5. Hussein AI, Kurtay S, Omar AA, Yusuf AA, Mohamud RYH. An Analysis of the Rate, Indications, and Associated Maternal Mortality for Cesarean Sections at a Tertiary Care Hospital, First Report from Somalia. Int J Womens Health [Internet]. 2023 [cited 2024 May 31]; 15:225. Available from: /pmc/articles/PMC9930581/
6. WHO Statement on Caesarean Section Rates.
7. Betran AP, Torloni MR, Zhang J, Ye J, Mikolajczyk R, Deneux-Tharaux C, et al. What is the optimal rate of caesarean section at population level? A systematic review of ecologic studies. Reprod Health [Internet]. 2015 Jun 21 [cited 2024 Feb 11];12(1):1–10. Available from: https://reproductive-health-journal.biomedcentral.com/articles/10.1186/s12978-015-0043-6
8. Pandey D, Bharti R, Dabral A, Khanam Z. Impact of WHO Labor Care Guide on reducing cesarean sections at a tertiary center: an open-label randomized controlled trial. AJOG global reports [Internet]. 2022 Aug 1 [cited 2024 May 31];2(3). Available from: https://pubmed.ncbi.nlm.nih.gov/36276791/
9. Atuheire EB, Opio DN, Kadobera D, Ario AR, Matovu JKB, Harris J, et al. Spatial and temporal trends of cesarean deliveries in Uganda: 2012-2016. BMC Pregnancy Childbirth [Internet]. 2019 Apr 16 [cited 2024 May 31];19(1):1–8. Available from: https://bmcpregnancychildbirth.biomedcentral.com/articles/10.1186/s12884-019-2279-6
10. Ghulaxe Y, Tayade S, Huse S, Chavada J. Advancement in Partograph: WHO's Labor Care Guide. Cureus [Internet]. 2022 Oct 13 [cited 2024 Jun 5];14(10). Available from: /pmc/articles/PMC9652267/
11. Vogel JP, Pingray V, Althabe F, Gibbons L, Berrueta M, Pujar Y, et al. Implementing the WHO Labour Care Guide to reduce the use of Caesarean section in four hospitals in India: protocol and statistical analysis plan for a pragmatic, stepped-wedge, cluster-randomized pilot trial. Reprod Health [Internet]. 2023 Dec 1 [cited 2024 May 31];20(1). Available from: /pmc/articles/PMC9862839/
12. Betran AP, Torloni MR, Zhang J, Ye J, Mikolajczyk R, Deneux-Tharaux C, et al. What is the optimal rate of caesarean section at population level? A systematic review of ecologic studies. Reprod Health [Internet]. 2015 Jun 21 [cited 2024 May 31];12(1):57. Available from: /pmc/articles/PMC4496821/
13. R. MG, K. BJ, Wilson T, C. AE, Fajardo YT. Customization and acceptability of the WHO labor care guide to improve labor monitoring among health workers in Uganda. An iterative development, mixed method study. PLOS Global Public Health [Internet]. 2024 May 13 [cited 2024 May 31];4(5): e0002780. Available from: /pmc/articles/PMC11090317/
14. Penfold RB, Zhang F. Use of interrupted time series analysis in evaluating health care quality improvements. Acad Pediatr [Internet]. 2013 Nov [cited 2024 Jan 26];13(6 Suppl). Available from: https://pubmed.ncbi.nlm.nih.gov/24268083/

FACTORS INFLUENCING FERTILITY INTENTIONS AMONG REPRODUCTIVE AGED WOMEN IN BANGLADESH

Md. Asadujjaman[1], Sourav Kumar Barman[1], Bristi Biswas[1]
Sarmistha Paul Setu[1], Bidduth Kumar Sarkar[2], Matrika Saha Roy[2]

ABSTRACT

INTRODUCTION: Fertility intention, as a crucial factor, affects the demographic composition of nations. Consequently, the factors associated with fertility intentions are essential for the formulation of suitable national policies, strategies, and programs. Our study aimed to examine the desire for having more children and its determinants among reproductive-aged Bangladeshi women.

METHOD: Data analysis was done using secondary data from the Bangladesh Demographic and Health Survey (BDHS) 2017–18, consisting of a total of 16,832 fertile, married, and sexually active women. A binary logistic regression model (LRM) was used to identify the determinants of fertility desire among Bangladeshi women.

RESULTS: Twenty-six percent of reproductive-age women expressed a wish for more children. Higher educated women (AOR: 1.79, 95% CI: 1.36–2.34), working women (AOR: 0.81, 95% CI: 0.73–0.89), rural women (AOR: 1.16, 95% CI: 1.03–1.30), women considering three or more children as the ideal number (AOR: 7.06, 95% CI: 6.11–8.15), women with three or more living children (AOR: 0.05, 95% CI: 0.02–0.09), women having their first cohabitation at age 25 or later (AOR: 1.88, 95% CI: 1.34–2.64), those not using contraceptive methods (AOR: 1.24, 95% CI: 1.12–1.38), and women with non-agricultural husbands (AOR: 1.17, 95% CI: 1.02–1.34) were associated with significantly higher fertility desire.

CONCLUSION: To support the maintenance of an ideal family size and control fertility desire, policymakers should promote gender-responsive family planning education, enhance workplace support for women, establish peer support and counseling services, and address entrenched cultural and social norms that shape reproductive choices.

KEYWORDS: Child; fertility; reproductive-aged women; Bangladesh; contraceptive.

(The Ethiopian Journal of Reproductive Health; 2025; 17; 12-24)

1 Statistics discipline, Khulna University, Khulna-9208, Bangladesh.
2 Department of Pharmacy, Jahangirnagar University, Savar, Dhaka- 1342, Bangladesh

INTRODUCTION

Fertility is one of the key demographic factors that helps to shape the dimensions and composition of a country's population. The total population size and composition of a country are determined by fertility trends, migration patterns, and mortality rates[1].

Swift expansion resulting from an elevated birth rate and desire for offspring may give rise to conflict, destitution, joblessness, rivalry for limited resources, and so on[2,3]. The continuous high fertility rate and desire for fertility will have detrimental impacts on the social and healthcare development of developing countries, leading to increased poverty[4,5]. A high fertility rate leads to a sizable population, which could potentially cause fierce competition for scarce resources that could be used for higher productivity and income development[6].

On the other hand, many countries of East Asia have reached such low levels of fertility that, if they stay that way for an extended length of time, there will be a significant decrease in population[7–9]. Furthermore, when these populations' age distributions shift, significant new issues for the design of social and economic well-being will arise. The most well-known issue raised by extremely low fertility is the aging of the population, which presents a whole new set of problems, such as rising old-age dependency ratios, funding old age and health care, continuing family support for the elderly, and elderly political participation[10].

In addition, the attainment of the Sustainable Development Goals (SDGs) bears relevance to the fertility rate. Specifically, the achievement of the first five SDGs—ending all forms of poverty, attaining gender equality and empowering all women and girls, guaranteeing healthy lifestyles and fostering well-being for everyone at all ages, and encouraging possibilities for lifelong learning for everyone through inclusive and equitable high-quality education—is linked to the fertility rate[6].

In 1990, the fertility rate was 3.2 births per woman worldwide[11], and by 2021, that number had declined to 2.31 births per woman[12], and 2.3 births per woman in 2023[13]. Many developing countries across the globe have experienced a demographic shift in the past decade, evident in the significant decline in fertility and death rates[6]. Similarly, over the last 45 years, Bangladesh has seen a notable decline in fertility, with the number of births per woman falling from 6.3 in 1975 to 1.93 in 2023[14]. The fertility rates in Asian countries exhibit significant variation, ranging from below one to over four births per woman[15,16].

Identifying the risk factors linked to high fertility as well as low fertility and offering assistance to support those individuals at risk is crucial. In order to devise efficient methods for fertility regulation, it is imperative to comprehend the variables that influence fertility preference. It is postulated that women belonging to vulnerable demographics, such as those who married at a young age, are illiterate, live in rural regions, experience extreme poverty, and possess awareness regarding contraceptives, exhibit elevated levels of fertility preference[16].

Reliable data regarding fertility intentions at different levels in Bangladesh is limited. Very few comprehensive analyses have been conducted to examine the fertility of reproductive Bangladeshi women simultaneously[17,18]. This study seeks to ascertain the frequency and percentage of some individual socio-demographic and economic characteristics of fertile Bangladeshi women and associated determinants of fertility preference. Besides, this study will provide valuable insights for reproductive health program designers and policymakers, enabling them to comprehend the multitude of factors that impact fertility. Furthermore, our findings will aid in the effective execution of reproductive health programs.

METHODOLOGY

Study design, setting and population

A secondary data analysis of BDHS was performed to capture a snapshot and a rapid assessment of prevalence and associations between fertility and factors that may influence the intention of females to conceive[8]. The data used in this study came from the nationally representative household-based

BDHS, which was carried out in 2017 and 2018 (BDHS, 2017).

Sampling technique

The BDHS in 2017 employed a two-stage sampling design. Initially, a total of 675 primary sampling units (PSUs) were built, with 250 located in metropolitan areas and 425 in rural areas. The PSUs were built based on data obtained from the 2011 Bangladeshi census. For the second step, an average of thirty households were assigned to each PSU using a systematic sampling method. The initial sample consisted of 20,250 residential households, 6,810 of which were located in urban districts and 13,440 in rural areas. Finally, 20,108 households were included. A total of 20,127 ever-married women between the ages of 15–49 years made up the study's sample. After excluding the missing values and anomalies, 16,832 reproductive-aged women were obtained for this study. Finally, 12,372 women did not prefer any child, whereas 4,460 women had a preference.

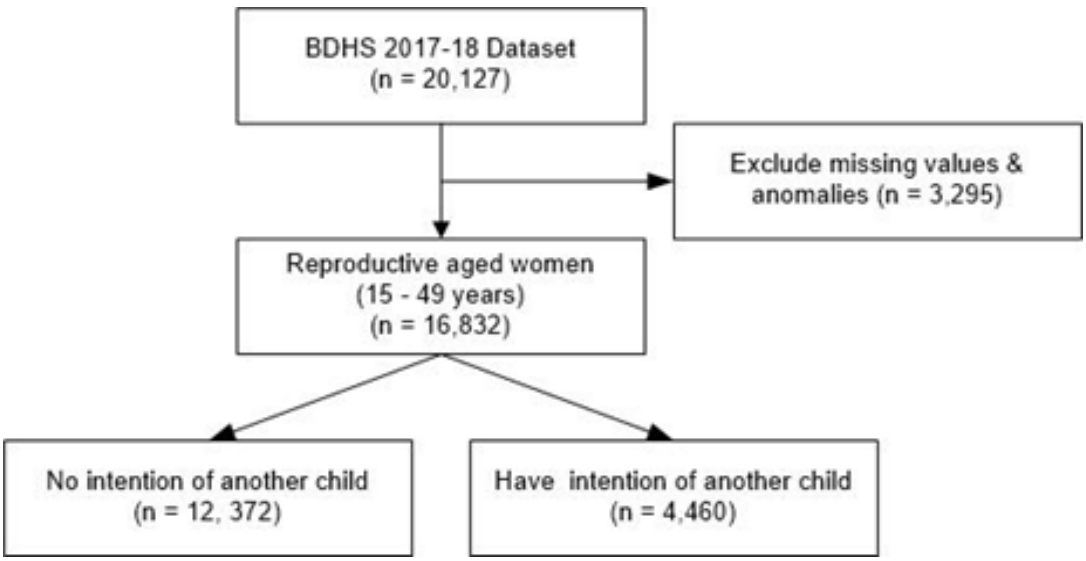


Figure 1: Sample Selection Flowchart: Fertility Intention Among Reproductive-Aged Women (BDHS 2017–18)

Outcome variables

In this study the outcome variable was Fertility intention of reproductive aged women in Bangladesh which is a dummy variable that provides binary outcome.The outcome variable was represented by

$$y_{ij} = \begin{cases} 0, No\ intention\ of\ another\ child \\ 1, Intention\ have\ another\ child \end{cases}.$$

This came from a question that "Have you any plan to have a (another) child with your husband/ partner, or what is your preference about having any more children with him?" [19]. In BDHS data set, Fertility intention was explained as a nominal variable having five options that are having another intention for fertility, undecided, no more intention, sterilized (respondent or partner) and declared infecund. In this study the women who responded as “undecided”, “sterilized (incapable for reproduction through surgical procedures)”, “infecund (incapable of producing offspring)”, and “no more” were categorized as ‘no intention’acccording to a previous literature[1]

Independent variable

There were several independent variables-respondent's current age, respondenteducational, respondent education, place of residence, wealth index, age at first cohabitation, contraceptive use and intention, ideal number of children, number of living children, birth order, husband's education,

husband occupation, number of household members.

Statistical analysis

The data analysis process involved two statistical method: bivariate, and multivariate. This was done using the Statistical Package for the Social Sciences (SPSS)software version 26. Bivariate was performed to analyze the association between fertility intention and the predictors using Chi-square test[20]. Following is the Chi- square formula:

$$\chi^2=\frac{(O_i-E_i)^2}{E_i} \quad \text{.....(1)}$$

Where refers the observed frequency, and refers the expected frequency. The above statistic is in equation follows the Chi-square distribution with n-1 degrees of freedom.

A binary LRM was performed to examine the association between the independent factors and the initiation towards having additional children[21]. The regression model which was applied in this study as follows:

$$logit(p) = b_0 + b_1x_1 + b_2x_2 + b_3x_3 + \cdots + b_kx_k \quad \text{.....(2)}$$

Where, p is the probability of presence of the characteristic of interest. The logit transformation is defined as the logged odds,

$$Odds = \frac{p}{1-p} = \frac{\text{Probability of presence of characteristics}}{\text{Probability of absence of characteristics}} \text{.....(3)}$$

$$logit(p) = log(\frac{p}{1-p}) \text{.....(4)}$$

To explore the unadjusted relationships, Crude Odds Ratios (COR) were calculated for each predictor in relation to women's fertility preferences[22].

$$logit(p) = b_0 + b_ix_i \quad \text{.....(5)}$$

The relationship between reproductive aged women desiring another child and various explanatory factors was determined using Adjusted Odds Ratios (AOR) with a 95% confidence level[1].

RESULTS

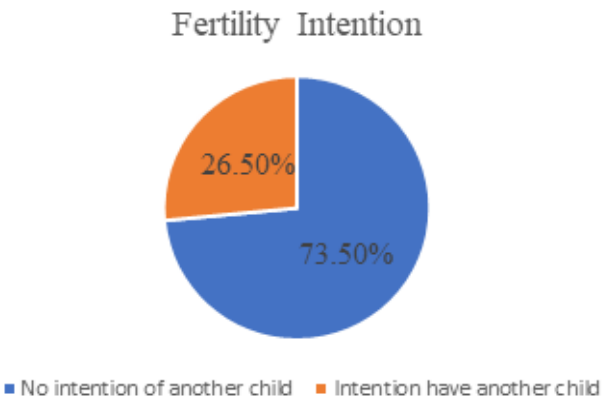


Figure 2: Percentage of the fertility intention

The study's findings regarding the fertility intentions of reproductive women across all explanatory variables are presented in Table-1.The chi-square test showed that age, highest educational level,working status, place of residence, wealth index, age at first cohabitation, contraceptive use and intention, ideal number of children, number of living children, birth order, husband education & occupation, household member had significant associations with the fertility intentions of women.

The pie chart shows that the desire for more children among reproductive women in Bangladesh was 4440 (26.5%, 95% CI: 25.83 - 27.17). We found that the desire for more children was high among women aged 15–24 (66.6%), richest women (29.6%), women with higher level of education (46.6%), urban residents (27.4%), women with first cohabitation aged ≥25(42.8%), those who used Contraceptive (32.8%), women with at most 2 ideal number of child had more intention of fertility (27.1%). Women with No living children exhibited higher intention (80%) compared to those with 1-2 children (41.2%) or 3+ children (24.4%). Similarly, first birth order showed the highest intention (77.1%), decline to just 2.1% for birth order 4+. Women whose husbands had higher education or non-agricultural occupations showed (36.1%) and (29.6%) increased intention compared to less educated and agricultural occupations respectively. Finally, women in large households of more than nine members exhibited higher intention (36.6%) than those in smaller households.

Table 1: Association between selected predictors and fertility intention among Reproductive aged Bangladeshi women

Variables Predictors	Fertility Intention No (%)	 Yes (%)	Chi-square (P-value)
Respondent's current age (Years)			
15-24	1258 (33.4%)	2513 (66.6%)	4830.35 (<0.001)
25-34	4738 (73.9%)	1673 (26.1%)	
35-49	6376 (95.9%)	274 (4.1%)	
Respondent education			
No education	2450 (92.3%)	204 (7.7%)	1242.24 (<0.001)
Primary	4471 (80.7%)	1071 (19.3%)	
Secondary	4328 (66.3%)	2204 (33.7%)	
Higher	1123 (53.4%)	981 (46.6%)	
Respondent Occupation			
Not-Working	5788 (71.2%)	2346 (28.8%)	44.43 (<0.001)
Working	6584 (75.7%)	2114 (24.3%)	
Place of residence			
Urban	4424 (72.6%)	1673 (27.4%)	4.36 (0.037)
Rural	7948 (74%)	2787 (26%)	
Wealth index			
Poorest	2473 (76.3%)	769 (23.7%)	46.80 (<0.001)
Poorer	2467 (76%)	781 (24%)	
Middle	2412 (73.7%)	862 (26.3%)	
Richer	2434 (71.7%)	960 (28.3%)	
Richest	2586 (70.4%)	1088 (29.6%)	
Age at first cohabitation (Years)			
≤18	10893(75.3%)	3571 (24.7%)	177.35 (<0.001)
19-24	1312 (63.2%)	764 (36.8%)	
≥25	167 (57.2%)	125 (42.8%)	
Contraceptive use and intention			
Not Using	8640 (76.6%)	2636 (23.4%)	170.75 (<0.001)
Using	3732 (67.2%)	1824 (32.8%)	
Ideal number of children			
At most 2	9427 (72.9%)	3508 (27.1%)	11.14 (0.001)
≥ 3	2945 (75.6%)	952 (24.4%)	
Number of living children			
0 18 (20%)	72 (80%)	3117.61 (<0.001)	
1-2	5957 (58.8%)	4182 (41.2%)	
≥ 3	6397 (96.9%)	206 (3.1%)	
Birth order			
1st birth	910 (22.9%)	3064 (77.1%)	7239.37 (<0.001)
2nd births	4363 (80.3%)	1071 (19.7%)	
3rdbirths	3398 (93.2%)	246 (6.8%)	
4th and above	3701 (97.9%)	79 (2.1%)	
Husband education			
No education	3315 (87.7%)	466 (12.3%)	625.15 (<0.001)
Primary	4004 (74.3%)	1386 (25.7%)	
Secondary	3269 (67.1%)	1600 (32.9%)	
Higher	1784 (63.9%)	1008 (36.1%)	
Husband occupation			
Agriculture	3543 (82.7%)	740 (17.3%)	250.72 (<0.001)
Other	8829 (70.4%)	3720 (29.6%)	
Number of household members			
1-4	5205 (71.6%)	2060 (28.4%)	158.51 (<0.001)
5-8	6121 (77.3%)	1796 (22.7%)	
≥91046 (63.4%)	604 (36.6%)		

Factors Associated with fertility intention among Reproductive aged Bangladish Women.

In table-2 the second column displays the unadjusted odds ratios or crude odds ratios (COR) for the socio-economic and demographic factors that affects the desire for more children among Bangladeshi womenof reproductive age. At the crude level, all the variables showed statistically significant relationships with the desire for more children. The thirdcolumn in Table-2 displays the outcomes of the logistic regression analysis that examines the socio-economic and demographic factors that influence fertility desires among women in Bangladesh.

In Table-2 compared to women aged 15-24, those aged 25-34 had 47% less odds (AOR: 0.53, 95% CI: 0.47 - 0.59) of intending fertility, while those aged 35-49 had 90% less (AOR: 0.10, 95% CI: 0.08 - 0.12) to intend have another child. Women with primary, secondary, and higher education had 1.37 (AOR: 1.37, 95% CI: 1.11 - 1.70), 1.46 (AOR: 1.46, 95% CI: 1.17 - 1.82), and 1.79 (AOR: 1.79, 95% CI: 1.36 - 2.34) times higher odds of fertility intention respectively compared to those with no education. Women who were employed had approximately 19% (AOR: 0.81, 95% CI: 0.73–0.89) lower odds of fertility intention compared to those who were not working. Rural women had 16% more (AOR: 1.16, 95% CI: 1.03 - 1.30) fertility intention than urban women. Women who began cohabiting at ages 19–24 and 25 or older had 21% (AOR: 1.21, 95% CI: 1.04–1.41) and 88% (AOR: 1.88, 95% CI: 1.337–2.643) higher odds of fertility intention, respectively, compared to those who started cohabiting at age 18 or younger. Non-contraceptive users had 1.24 (AOR:1.24, 95% CI: 1.12 - 1.38) times higher odds of fertility intention than contraceptive users. Women who considered 3 or more children as ideal number had 7.06 (AOR:7.06, 95% CI: 6.11 - 8.15) times higher odds of fertility intention than those who considered 2 or fewer as ideal. Having 1-2 and 3+ living children was associated with 77% (AOR: 0.23, 95% CI: 0.12 - 0.45) and 95% (AOR: 0.05, 95% CI: 0.02 - 0.09) lower odds of fertility intention compared to those having no children. Women with two, three, and four or more births had 91% (AOR:0.09, 95% CI: 0.08 - 0.10), 93% (AOR:0.07, 95% CI: 0.06 - 0.10), and 96% (AOR:0.04, 95% CI: 0.03 - 0.05) lower odds of fertility intention compared to those with one birth. Women whose husbands had primary, secondary or higher education showed 1.31 (AOR:1.31, 95% CI: 1.11 - 1.54), 1.29 (AOR:1.29, 95% CI: 1.08 - 1.54), and 1.26 (AOR:1.26, 95% CI: 1.02 - 1.57) times higher odds of fertility intention compared to those whose husbands had no education. Women whose husbands had occupation other than agriculture had 1.17 (AOR:1.17, 95% CI: 1.021 - 1.338) times higher odds of fertility intention. Finally, women living in households with 9 or more members had 1.20 (AOR:1.20, 95% CI: 1.01 - 1.42) times higher odds of fertility intention compared to households with 1-4 member.

Table 2: Binary Logistic Regression Analysis of factors associated with fertility intention among Reproductive aged Women.

Variable	Fertility Intention for Overall Women	
	COR (95% CI)	AOR (95% CI)
Respondent's current age		
15-24 (ref.)	1	1
25-34	0.18*** (0.16 - 0.19)	0.53*** (0.47 - 0.59)
35-49	0.02*** (0.02 - 0.03)	0.10*** (0.08 - 0.12)
Respondent educational		
No education (ref.)	1	1
Primary	2.88*** (2.46 - 3.37)	1.37** (1.11 - 1.70)
Secondary	6.12*** (5.26 - 7.12)	1.46** (1.17 - 1.82)
Higher	10.49*** (8.88 - 12.39)	1.79*** (1.36 - 2.34)
Respondent Occupation		
Not-workin (ref.)	1	1
Working	0.79*** (0.739-0.848)	0.81*** (0.73-0.89)
Place of residence		
Urban (ref.)	1	1
Rural	0.93* (0.86 - 0.99)	1.16* (1.03 - 1.30)
Wealth index		
Poorest (ref.)	1	1
Poorer	1.02 (0.91 - 1.14)	0.85 (0.72 - 1.00)
Middle	1.15* (1.03 - 1.29)	0.88 (0.741 - 1.04)
Richer	1.27*** (1.14 - 1.42)	0.90 (0.752 - 1.07)
Richest	1.35*** (1.22 - 1.51)	0.85 (0.70 - 1.04)
Age at first cohabitation (Years)		
≤18 (ref.)	1	1
19-24	1.78*** (1.61 - 1.96)	1.21* (1.04 - 1.41)
≥25	2.28*** (1.81 - 2.89)	1.88*** (1.34 - 2.64)
Contraceptive use and intention		
Using (ref.)	1	1
Not Using	1.60*** (1.49 - 1.72)	1.24*** (1.12 - 1.38)
Ideal number of children		
At most 2 (ref.)	1	1
≥ 3	0.87** (0.80 - 0.94)	7.06*** (6.11 - 8.15)
Number of living children		
0 (ref.)	1	1
1-2	0.18*** (0.11 - 0.30)	0.23*** (0.12 - 0.45)
≥ 3	0.01*** (0.005 - 0.014)	0.05*** (0.02 - 0.09)
Birth order number		
one birth (ref.)	1	1
two births	0.07*** (0.066 - 0.081)	0.09*** (0.08 - 0.10)
Three births	0.02*** (0.019 - 0.025)	0.07*** (0.06 - 0.10)
Four and above births	0.006*** (0.005 - 0.008)	0.04*** (0.03 - 0.05)
Husband education		
No education (ref.)	1	1
Primary	2.46*** (2.19 - 2.76)	1.31** (1.11 - 1.54)
Secondary	3.84*** (3.11 – 3.90)	1.29** (1.08 - 1.54)
Higher	4.02*** (3.55 – 4.55)	1.26* (1.02 - 1.57)
Husband occupation		
Agriculture (ref.)	1	1
Other	2.02*** (1.85 - 2.20)	1.17* (1.02 - 1.34)
Number of household member		
1-4 (ref.)	1	1
5-8	0.74*** (0.69 - 0.80)	1.02 (0.91 - 1.13)
9 and above	1.46*** (1.30 - 1.63)	1.20* (1.01 - 1.42)

Key note: ***P-value <0.001, ** P-value <0.010, * P-value <0.05, ref Reference, COR Crude Odds Ratio, AOR Adjusted Odds Ratio, CI Confidence Interval.

DISCUSSION

The rapid expansion of the population typically leads to adverse outcomes, including increased unemployment rates, larger family sizes, and heightened chances of maternal and child mortality[23]. Nevertheless, the primary cause of rapid population expansion is typically a strong desire for high reproduction rates[24,25]. Hence, to regulate population increase, it is crucial to concentrate on factors linked to the inclination towards having additional offspring. The current investigation focused on analysing the factors that influence women's inclination towards having more children in Bangladesh.

In this study, increasing women's age was more likely to lead to a desire for additional children. This finding aligns with prior research conducted by scholars[26,27]. Due to women's increasing age, couples are apprehensive about having children at a later stage in life. Therefore, it is crucial for them to cultivate a childbearing culture at the suitable moment[27].

According to the study's findings, working women are less likely than non-working women to want more children. This finding is in line with earlier studies[28] that suggested workplace obligations and work-family conflict could limit the desire to have children. Women in professional or administrative professions frequently face increased role incompatibility, which lowers fertility expectations, according to research by Yarger and Brauner-Otto[28]. According to Atif et al.[29], workplace demands and changing gender norms are the reasons why working women in Pakistan had fewer children on average than non-working women.

Rural women exhibited a greater propensity for desiring a larger number of offspring in comparison to their urban counterparts. This finding is consistent with prior research conducted in Rwanda[30], Niger[31], Ghana[32], Uganda[33], and Ethiopia[34], which demonstrated a relation between urban living and reduced fertility aspirations.

Mahmud et al.[35] found that women residing in urban settings exhibit higher levels of empowerment and reduced fertility desire compared to their counterparts in rural areas. Rural individuals frequently enter into marriage at an earlier age, resulting in a propensity for increased procreation[36]. Ifelunini et al.[37] contend that rural individuals view children as valuable assets and a workforce for their subsistence farming endeavours, leading to an escalation in their aspirations for fertility.

The findings of the study indicate that women belonging to the highest wealth quintile have a decreased inclination towards desiring additional offspring. This finding is consistent with prior research indicating a negative correlation between higher socio-economic status and fertility aspirations. Comparable results have been documented in Nigeria[38] and India[39]. In contrast, individuals in low socioeconomic status desire to have more children, believing that they will provide security in their old age[40,41].

This study demonstrated that the age at which women initially cohabitated had an impact on their inclination to have more children. Women aged ≤18 years exhibited a lower inclination towards desiring additional children in comparison to women aged ≥25 years. The desire for more children increases with the age at which women first cohabit. This conclusion is consistent with prior research indicating that individuals with higher socio-demographic characteristics exhibited a greater inclination towards having more children in Ethiopia[22], Rwanda[42], and Rakai[27]. Marriage holds great societal importance, particularly in Bangladesh, where it is obligatory for both genders to engage in sexual activity. This event has a huge impact on births, deaths, and the well-being of women and their children, particularly in relation to the age at which they enter into their first marriage[14].

Women who were utilizing a modern method of contraception, whether they were employed or not, had a considerably lower likelihood of wanting to have more children. This conclusion supports previous research indicating that women who utilise contraceptive methods to manage

their fertility are less likely to have a desire to have more children[27,43–45]. The probable cause for this phenomenon is that women who utilise contraceptives may have a desire to limit their number of children and will employ all means necessary to achieve this goal, including the use of contraceptives[46,47].

This study demonstrated that the desire for additional children is impacted by the number of desired children and the occupation of the partner. When the number of ideal children is limited to a maximum of two and the partner is employed in the agricultural sector, a significant correlation is observed between the desire for another child. This finding aligns with prior research conducted in Rwanda[30]. Livestock is one of the sources of income in developing countries, and having more children increases the perceived benefit of having more cattle caretakers[48].

The observation that women who had no children or had one or two children exhibited a higher inclination towards desiring children compared to women with more than two children aligns with previous research conducted in various countries[44,49–53]. This study found that women who did not have any living children had a higher likelihood of desiring to have a child compared to other women. Research indicates that in certain societies, societal expectations greatly impact a woman's inclination to have a child as the sole means of experiencing motherhood or meeting the criteria of being a "woman"[51,54]. In the specific context of Bangladesh, the presence of a child within a family is regarded as a blessing.

Our findings indicate a positive correlation between the highest educational level of the respondent and their partner and their desire for fertility. This suggests that individuals with greater levels of education tend to have higher levels of fertility desire. The present findings present a contrasting perspective to prior research indicating a negative correlation between greater education and reproductive desire[39,55]. Additional investigation is necessary to examine the correlation between educational attainment and fertility aspirations within this particular demographic[27].

Additionally, the research demonstrated a negative association between birth order and reproductive aspirations. Specifically, when birth order increases, women are less likely to express a desire for having more children. This finding aligns with prior research conducted in many nations, including China[56], Sri Lanka[57], and sub-Saharan Africa[44]. The probable explanation for this outcome is that a subset of these women may have achieved the desired number of offspring[9].Our findings indicate a positive correlation between the number of household members and reproductive want, suggesting that a higher number of household members is associated with higher levels of fertility desire. The present study's results diverge from prior research indicating a negative correlation between the number of household members and reproductive desire in Rakai,

Uganda[27]. Due to societal norms or the value placed on having more children for labor or support in old age, larger families are preferred in somecultures[58].

Strength and Limitation:

The study's findings are broadly applicable due to its large sample size, nationwide scope, and use of a standardized questionnaire. Despite these strengths, our study had several drawbacks. Being a cross-sectional study, it could not definitively establish the temporal relationship between explanatory and outcome variables. Additionally, certain cultural and health institution factors were not examined due to lack of information, unavailability of data, and missing observations. Further higher-level study is recommended to determine the higher-level variation among different factors of fertility intention.

Conclusion

To support the maintenance of an ideal family size and for controlling fertility desire, policymakers should promote gender-responsive family planning education, enhance workplace support for women, establish peer support and counseling services,

and address entrenched cultural and social norms that shape reproductive choices. Further research is recommended to explore the reasons behind the higher fertility intentions among women with higher education and income, and the role of gender norms and cultural values in shaping fertility preferences.

Glossary

BDHS - Bangladesh Demographic and Health Survey
SDGs- Sustainable Development Goals
LRM – Logistic Regession Model
SPSS - Statistical Package for the Social Sciences
AOR – Adjusted Odds Ratio
COR – Crude Odds Ratio
CI- Confidence Interval
PSU – Primary Sampling Units

Conflict of interest: The authors declare no conflict of interest

Contribution of authors: Md. Asadujjaman contributed to the design, data analysis, interpretation and writing of first and subsequent drafts of the paper. Sourav Kumar Barman contributed to data analysis and writing of first and subsequent drafts of the paper , Bristi Biswas contributed to data analysis and interpretation of the paper. Sarmistha Paul Setu contributed to the supervision, design, data analysis, interpretation and writing of first and subsequent drafts of the paper, Bidduth Kumar Sarkar and Matrika Roy Saha contributed to the design and writing of first and subsequent drafts of the paper.

Corresponding Author:
Bidduth Kumar Sarkar, Department of Pharmacy, Jahangirnagar University, Savar, Dhaka- 1342, Bangladesh, Phone: +8801310566746, E-mail: bidduthks@juniv.edu

REFERENCES

1. Tsegaye Negash B. Fertility intention among married women in Ethiopia: a multilevel analysis of Ethiopian demographic health survey 2016. Contracept Reprod Med [Internet]. 2023 Jan 18 [cited 2025 Jul 14];8(1). Available from: https://contraceptionmedicine.biomedcentral.com/articles/10.1186/s40834-022-00201-z
2. Elmi DA. Impact of population growth rate on unemployment: case study Kasanga Parish. 2012 Jun [cited 2025 Jul 14]; Available from: http://hdl.handle.net/20.500.12306/9364
3. (PDF) Population Growth and Indian Economic Development with Reference to Unemployment, Resource Scarcity, Inequality, and Poverty - An assessment [Internet]. ResearchGate. [cited 2025 Jul 14]. Available from: https://www.researchgate.net/publication/375962982_Population_Growth_and_Indian_Economic_Development_with_Reference_to_Unemployment_Resource_Scarcity_Inequality_and_Poverty_-_An_assessment
4. Matysiak A, Sobotka T, Vignoli D. The Great Recession and Fertility in Europe: A Sub-national Analysis. Eur J Population. 2021 Mar 1;37(1):29–64.
5. Eastwood R, Lipton M. The impact of changes in human fertility on poverty. Journal of Development Studies. 1999;36(1):1–30.
6. Odusina EK, Ayotunde T, Kunnuji M, Ononokpono DN, Bishwajit G, Yaya S. Fertility preferences among couples in Nigeria: a cross sectional study. Reprod Health [Internet]. 2020 Dec [cited 2025 Jul 14];17(1). Available from: https://reproductive-health-journal.biomedcentral.com/articles/10.1186/s12978-020-00940-9
7. Convergence to Very Low Fertility in East Asia: Processes, Causes, and Implications | Request PDF [Internet]. ResearchGate. [cited 2025 Jul 14]. Available from: https://www.researchgate.net/publication/345477051_Convergence_to_Very_Low_Fertility_in_East_Asia_Processes_Causes_and_Implications
8. Vollset SE, Goren E, Yuan CW, Cao J, Smith AE, Hsiao T, et al. Fertility, mortality, migration, and population scenarios for 195 countries and territories from 2017 to 2100: a forecasting analysis for the Global Burden of Disease Study. The Lancet. 2020 Oct;396(10258):1285–306.
9. Ultra-low fertility in East Asia: policy responses and challenges | Request PDF. ResearchGate [Internet]. [cited 2025 Jul 14]; Available from: https://www.researchgate.net/publication/332048277_Ultra-low_fertility_in_East_Asia_policy_responses_and_challenges
10. Very low fertility in Pacific Asian countries: Causes and policy respo [Internet]. [cited 2025 Jul 14]. Available from: https://www.taylorfrancis.com/chapters/edit/10.4324/9780203890066-9/low-fertility-pacific-asian-countries-causes-policy-responses-gavin-jones-paulin-tay-straughan-angelique-chan
11. Vandermotten C, Dessouroux C. Baisse massive de la fécondité mondiale en 20 ans, illustrée en cartes. Population & Sociétés. 2024 Jan 31;N° 618(1):1–4.
12. Matsuura H. Further acceleration in fertility decline in 2023: deviation of Recently published provisional fertility estimates in selected OECD countries from those in the 2022 revision of the world population prospects. Biodemography and Social Biology. 2024 Apr 2;69(2):55–6.
13. World Fertility Rate (1950-2025) [Internet]. [cited 2025 Jul 14]. Available from: https://www.macrotrends.net/global-metrics/countries/wld/world/fertility-rate
14. Alam MdR, Rahman MdA, Sawangdee Y. Factors Influencing the Number of Children Born to Working Women in Bangladesh: A Population-Based Study. J Pediatr Perinatol Child Health [Internet]. 2022 [cited 2025 Jul 14];06(04). Available from: https://www.fortunejournals.com/articles/factors-influencing-the-number-of-children-born-to-working-women-in-bangladesh-a-populationbased-study.html
15. Fertility rate in Asia [Internet]. TheGlobalEconomy.com. [cited 2025 Jul 14]. Available from: https://www.theglobaleconomy.com/rankings/Fertility_rate/Asia/
16. Dahal GP, Padmadas SS, Hinde PRA. Fertility-limiting behavior and contraceptive choice among men in Nepal. Int Fam Plan Perspect. 2008 Mar;34(1):6–14.
17. Nahar MZ, Zahangir MS. Determinants of Fertility in Bangladesh: Evidence From the 2014 Demographic and Health Survey. Int Q Community Health Educ. 2019 Oct;40(1):29–38.
18. Roy S, Hossain SMI. Fertility differential of women in Bangladesh demographic and health survey 2014. Fertil Res and Pract [Internet]. 2017 Oct 13 [cited 2025 Jul 17];3(1). Available from: https://fertilityresearchandpractice.biomedcentral.com/articles/10.1186/s40738-017-0043-z

19. The DHS Program - Bangladesh: DHS, 2017-18 - Final Report (English) [Internet]. [cited 2025 Jul 14]. Available from: https://dhsprogram.com/publications/publication-FR344-DHS-Final-Reports.cfm
20. Fan Z, Zhao Y, Wang S, Zhang F, Zhuang C. Clinical features and outcomes of tetanus: a retrospective study . IDR. 2019 May;Volume 12:1289–93.
21. Wiltberger G, Muhl B, Benzing C, Atanasov G, Hau HM, Horn M, et al. Preoperative risk stratification for major complications following pancreaticoduodenectomy: Identification of high-risk patients. International Journal of Surgery. 2016 Jul;31:33–9.
22. Muluneh MW, Moyehodie YA. Determinants of desire for more children among women in Ethiopia. BMC Women's Health [Internet]. 2021 Dec [cited 2025 Jul 14];21(1). Available from: https://bmcwomenshealth.biomedcentral.com/articles/10.1186/s12905-021-01563-3
23. Ashraf QH, Weil DN, Wilde J. The Effect of Fertility Reduction on Economic Growth. Population & Development Rev. 2013 Mar;39(1):97–130.
24. Darroch JE, Singh S. Trends in contraceptive need and use in developing countries in 2003, 2008, and 2012: an analysis of national surveys. The Lancet. 2013 May 18;381(9879):1756–62.
25. Creanga AA, Gillespie D, Karklins S, Tsui AO. Low use of contraception among poor women in Africa: an equity issue. Bull World Health Organ. 2011 Apr 1;89(4):258–66.
26. Garenne M. Trends in marriage and contraception in sub-Saharan Africa: A longitudinal perspective on factors of fertility decline. 2014 Jan 1 [cited 2025 Jul 14]; Available from: https://dhsprogram.com/publications/publication-as42-analytical-studies.cfm
27. Matovu JKB, Makumbi F, Wanyenze RK, Serwadda D. Determinants of fertility desire among married or cohabiting individuals in Rakai, Uganda: a cross-sectional study. Reprod Health [Internet]. 2017 Dec [cited 2025 Jul 14];14(1). Available from: http://reproductive-health-journal.biomedcentral.com/articles/10.1186/s12978-016-0272-3
28. Yarger J, Brauner-Otto SR. Women's Work Characteristics and Fertility Expectations. Popul Res Policy Rev [Internet]. 2024 Apr [cited 2025 Jul 14];43(2). Available from: https://link.springer.com/10.1007/s11113-024-09866-7
29. Atif M, Ayub G, Zeb J, Farooq M, Ilyas M, Shafiq M, et al. Variability in Reproductive Choices: A Comprehensive Analysis of Women's Working Status and Fertility Behavior in Pakistan. INQUIRY [Internet]. 2024 Jan [cited 2025 Jul 14];61. Available from: https://journals.sagepub.com/doi/10.1177/00469580241237106
30. Niragire F, Ndikumana C, Nyirahabimana MG, Uwizeye D. Prevalence and factors associated with fertility desire among HIV-positive women in Rwanda in the context of improved life expectancy. Arch Public Health [Internet]. 2021 Dec [cited 2025 Jul 14];79(1). Available from: https://archpublichealth.biomedcentral.com/articles/10.1186/s13690-021-00742-w
31. Ahinkorah BO, Seidu AA, Budu E, Agbaglo E, Adu C, Dickson KS, et al. Which factors predict fertility intentions of married men and women? Results from the 2012 Niger Demographic and Health Survey. Ortega JA, editor. PLoS ONE. 2021 Jun 9;16(6):e0252281.
32. Ahinkorah BO, Seidu AA, Armah-Ansah EK, Ameyaw EK, Budu E, Yaya S. Socio-economic and demographic factors associated with fertility preferences among women of reproductive age in Ghana: evidence from the 2014 Demographic and Health Survey. Reprod Health [Internet]. 2021 Dec [cited 2025 Jul 14];18(1). Available from: https://reproductive-health-journal.biomedcentral.com/articles/10.1186/s12978-020-01057-9
33. Rutaremwa G, Galande J, Nviiri HL, Akiror E, Jhamba T. The contribution of contraception, marriage and postpartum insusceptibility to fertility levels in Uganda: an application of the aggregate fertility model. Fertil Res and Pract [Internet]. 2015 Oct 17 [cited 2025 Jul 14];1(1). Available from: https://fertilityresearchandpractice.biomedcentral.com/articles/10.1186/s40738-015-0009-y
34. Laelago T, Habtu Y, Yohannes S. Proximate determinants of fertility in Ethiopia; an application of revised Bongaarts model. Reprod Health [Internet]. 2019 Dec [cited 2025 Jul 14];16(1). Available from: https://reproductive-health-journal.biomedcentral.com/articles/10.1186/s12978-019-0677-x
35. Mahmud S, Shah NM, Becker S. Measurement of Women's Empowerment in Rural Bangladesh. World Development. 2012 Mar;40(3):610–9.
36. (PDF) Socio-cultural and economic determinants of fertility differentials in rural and urban Cross Rivers State, Nigeria [Internet]. [cited 2025 Jul 14]. Available from: https://www.researchgate.net/publication/330682906_Socio-cultural_and_economic_determinants_of_fertility_differentials_in_rural_and_urban_Cross_Rivers_State_Nigeria
37. Ifelunini IA, Ugwu SC, Ichoku HE, Omeje AN, Ihim E. Determinants of fertility rate among women in Ghana and Nigeria: Implications for population growth and sustainable development. APS [Internet]. 2018 Sep [cited 2025 Jul 14];32(2). Available from: http://aps.journals.ac.za/pub/article/view/1188
38. Modeling the Determinants of Fertility among Women of Childbearing Age in Nigeria: Analysis Using Generalized Linear Modeling Approach [Internet]. [cited 2025 Jul 14]. Available from: https://catalog.ihsn.org/citations/8229

39. Jiang L, Hardee K. Women's Education, Family Planning, or Both? Application of Multistate Demographic Projections in India. International Journal of Population Research. 2014 Jan 9;2014:1–9.
40. Caldwell JC. On Net Intergenerational Wealth Flows: An Update. Population & Development Review. 2005 Dec;31(4):721–40.
41. Caldwell JC. Mass Education as a Determinant of the Timing of Fertility Decline. Population and Development Review. 1980 Jun;6(2):225.
42. Niragire F, Ndikumana C, Nyirahabimana MG, Uwizeye D. Prevalence and factors associated with fertility desire among HIV-positive women in Rwanda in the context of improved life expectancy. Arch Public Health [Internet]. 2021 Dec [cited 2025 Jul 14];79(1). Available from: https://archpublichealth.biomedcentral.com/articles/10.1186/s13690-021-00742-w
43. Aylie NS, Dadi LS, Alemayehu E, Mekonn MA. Determinants of Fertility Desire among Women Living with HIV in the Childbearing Age Attending Antiretroviral Therapy Clinic at Jimma University Medical Center, Southwest Ethiopia: A Facility-Based Case-Control Study. International Journal of Reproductive Medicine. 2020 Aug 12;2020:1–10.
44. Ahinkorah BO, Seidu AA, Armah-Ansah EK, Budu E, Ameyaw EK, Agbaglo E, et al. Drivers of desire for more children among childbearing women in sub-Saharan Africa: implications for fertility control. BMC Pregnancy Childbirth [Internet]. 2020 Dec [cited 2025 Jul 14];20(1). Available from: https://bmcpregnancychildbirth.biomedcentral.com/articles/10.1186/s12884-020-03470-1
45. Yan X, Du J, Ji G. Prevalence and factors associated with fertility desire among people living with HIV: A systematic review and meta-analysis. Matovu JKB, editor. PLoS ONE. 2021 Mar 18;16(3):e0248872.
46. Islam A. Prevalence and Determinants of Contraceptive use among Employed and Unemployed Women in Bangladesh. Int J MCH AIDS [Internet]. 2016 [cited 2025 Jul 14];5(2). Available from: https://mchandaids.org/prevalence-and-determinants-of-contraceptive-use-among-employed-and-unemployed-women-in-bangladesh/
47. Babalola S, Figueroa ME, Krenn S. Association of Mass Media Communication with Contraceptive Use in Sub-Saharan Africa: A Meta-Analysis of Demographic and Health Surveys. Journal of Health Communication. 2017 Nov 2;22(11):885–95.
48. Belachew TB, Asmamaw DB, Negash WD. Short birth interval and its predictors among reproductive age women in high fertility countries in sub-Saharan Africa: a multilevel analysis of recent Demographic and Health Surveys. BMC Pregnancy Childbirth [Internet]. 2023 Jan 30 [cited 2025 Jul 14];23(1). Available from: https://bmcpregnancychildbirth.biomedcentral.com/articles/10.1186/s12884-023-05403-0
49. Mekonnen B, Minyihun A. Fertility Desire And Associated Factors Among HIV Positive Women Attending ART Clinics In Amhara Region Referral Hospitals In Northwest Ethiopia, 2017 . HIV. 2019 Oct;Volume 11:247–54.
50. Cooper D, Moodley J, Zweigenthal V, Bekker LG, Shah I, Myer L. Fertility Intentions and Reproductive Health Care Needs of People Living with HIV in Cape Town, South Africa: Implications for Integrating Reproductive Health and HIV Care Services. AIDS Behav. 2009 Jun;13(S1):38–46.
51. Wekesa E, Coast E. Fertility Desires among Men and Women Living with HIV/AIDS in Nairobi Slums: A Mixed Methods Study. Price MA, editor. PLoS ONE. 2014 Aug 29;9(8):e106292.
52. Melaku YA, Zeleke EG, Kinsman J, Abraha AK. Fertility desire among HIV-positive women in Tigray region, Ethiopia: implications for the provision of reproductive health and prevention of mother-to-child HIV transmission services. BMC Women's Health [Internet]. 2014 Dec [cited 2025 Jul 14];14(1). Available from: https://bmcwomenshealth.biomedcentral.com/articles/10.1186/s12905-014-0137-2
53. Ramos De Souza M, Do Amaral WN, Alves Guimarães R, Rezza G, Brunini SM. Reproductive desire among women living with HIV/AIDS in Central Brazil: Prevalence and associated factors. Ciccozzi M, editor. PLoS ONE. 2017 Oct 20;12(10):e0186267.
54. Biseck T, Kumwenda S, Kalulu K, Chidziwisano K, Kalumbi L. Exploring fertility decisions among pregnant HIV-positive women on antiretroviral therapy at a health centre in Balaka, Malawi: A descriptive qualitative. Malawi Med J. 2015 Dec;27(4):128–34.
55. Castro Martín T. Women's education and fertility: results from 26 Demographic and Health Surveys. Stud Fam Plann. 1995;26(4):187–202.
56. (PDF) Preference or Aversion? Exploring Fertility Desires among China's Young Urban Elite [Internet]. [cited 2025 Jul 14]. Available from: https://www.researchgate.net/publication/323749392_Preference_or_Aversion_Exploring_Fertility_Desires_among_China's_Young_Urban_Elite
57. Silva WID. Do fertility intentions and behaviour influence sterilization in Sri Lanka? Asia-Pacific Population Journal. 1992 Dec 31; 7(4):1–13.
58. Fadeyibi O, Alade M, Adebayo S, Erinfolami T, Mustapha F, Yaradua S. Household Structure and Contraceptive Use in Nigeria. Front Glob Womens Health [Internet]. 2022 May 10 [cited 2025 Jul 14];3. Available from: https://www.frontiersin.org/articles/10.3389/fgwh.2022.821178/full

MAGNITUDE OF SPONTANEOUS PERINEAL TEAR AND ASSOCIATED FACTORS AMONG WOMEN RECEIVING DELIVERY SERVICES AT ARBA MINCH GENERAL HOSPITAL, SOUTHERN ETHIOPIA

Awol Arega Yimer[1], Kassaw Beyene Getahun[1], Abel Belete Cherkos[1],
Berhanu Negesse Kebede[1], Biresaw Wassihun Alemu[1], Kassahun Fikadu Tesema[1],
Bezawit Afework Mesfin[1], Gebremaryam Temesgen Birgoda[1],
Solomon Seyife Alemu[2], Mesfin Difer Tetema[3], Seid Jemal Mohammed[3],
Negussie Boti Sidamo[4], Fitsum Wolde[1], Mesfin Kote[4]

ABSTRACT

BACKGROUND: Spontaneous perineal tears are a common complication of vaginal delivery, affecting approximately 79% of women. These tears can lead to pelvic floor dysfunction, chronic pain, and a decline in overall quality of life. Understanding the factors associated with spontaneous perineal tears is essential for guiding clinical practice and developing effective prevention strategies. Therefore, this study aimed to determine the magnitude of spontaneous perineal tears and identify the factors associated with their occurrence among women receiving delivery services at Arba Minch General Hospital.

MATERIALS AND METHODS: A facility-based cross-sectional study was conducted among 398 women receiving delivery services from April 1 to July 30, 2021. The participants were selected via a systematic random sampling technique. Data were collected using a structured interviewer-administered questionnaire and observation checklist. Binary logistic regression analysis was performed to identify factors associated with spontaneous perineal tears.

RESULTS: The magnitude of spontaneous perineal tears was 37.4% (95% CI: 32.7%, 42.2%). Applying fundal pressure (AOR = 7.65; 95% CI = 3.52–16.65), having female genital cutting scar (AOR = 5.23; 95% CI = 2.47–11.07), no mediolateral episiotomy (AOR = 4.63; 95% CI = 1.60–13.36), duration of the 2nd stage of labor >60 minutes (AOR = 4.55; 95% CI = 2.23–9.15), assisted vaginal delivery (AOR = 4.27; 95% CI = 1.21–15.01), no perineal support (AOR = 2.23; 95% CI = 1.1–4.54), and birth weight >3500 grams (AOR = 2.16; 95% CI = 1.10–4.26) were factors associated with spontaneous perineal tear.

CONCLUSIONS: The magnitude of spontaneous perineal tears in this study was high. Fundal pressure, female genital cutting, episiotomy, duration of the second stage of labor, mode of delivery, perineal support, and fetal birth weight were predictors of spontaneous perineal tears. Therefore, it is essential to strengthen preventive strategies through evidence-based obstetric care and targeted interventions addressing modifiable risk factors.

KEYWORDS: Arba Minch, associated factors, spontaneous perineal tear.

(The Ethiopian Journal of Reproductive Health; 2025; 17; 25-35)

1 Department of Midwifery, College of Medicine and Health Sciences, Arba Minch University, Arba Minch, Ethiopia
2 Department of Midwifery, College of Health Sciences, Madda Walabu University, Shashemene Campus, Shashemene, Ethiopia
3 Department of Midwifery, College of Medicine and Health Sciences, Wolkite University, Wolkite, Ethiopia
4 School of Public Health, College of Medicine and Health Sciences, Arba Minch University, Arba Minch, Ethiopia

INTRODUCTION

Worldwide, nearly 134 million women give birth each year[1]. Among these, approximately 80% of low-risk pregnant women deliver vaginally[2]. Perineal tear is very common during vaginal delivery, affecting up to 79% of such births, occurring either spontaneously or through a surgical incision known as an episiotomy[3]. Spontaneous perineal tears are any degree of damage to the perineal skin, muscles, external and internal anal sphincters, or rectal mucosa. The severity of the tear is classified as 1st-degree if it involves the perineal skin and/or vaginal mucosa, 2nd-degree if it affects the perineal muscles excluding the anal sphincter muscles, 3rd-degree if it involves the anal sphincter complex, and 4th-degree if it affects the anorectal mucosa beyond the anal sphincter complex[4].

Consequently, perineal tears during childbirth are a major concern globally, affecting up to 79% in high-income countries (HICs)[5] and over 70% in low- and middle-income countries (LMICs)[6]. In sub-Saharan Africa, like Ethiopia, up to 38.8% of women experience spontaneous tears during vaginal delivery[7].

Because perineal tears disrupt muscles, nerves, and blood supply, causing both short- and long-term complications such as pain, dyspareunia, incontinence, sepsis, and postpartum hemorrhage—key contributors to maternal death in LMICs[8]. Up to 85% of women with severe tears experience postpartum hemorrhage[9], and over 50% report pain and anal incontinence[10]. Long-term effects include pelvic floor disorders, impacting breastfeeding, mother–infant bonding, and sexual activity[11]. These issues often reduce quality of life due to stigma, marital rejection, and isolation[12]. Notably, women with severe first-time tears have a 5× higher recurrence risk and are 18× more likely to choose elective cesarean in the next birth[13].

Various studies have identified multiple factors that contribute to spontaneous perineal tears during childbirth. Maternal factors such as age, occupation, prolonged standing during professional activity, parity, birth interval, prior vaginal birth, previous history of perineal tear, and female genital cutting (FGC) play significant roles[14],[15]. Additionally, fetal factors such as birth weight, gestational age, head circumference, presentation, and position, and intrapartum factors, including antepartum and intrapartum perineal tear preventive techniques, fundal pressure, duration of the second stage of labor, oxytocin use, and mode of delivery, also contribute to the likelihood of perineal tearing[3],[16]. Despite the multifactorial nature of perineal tears, high-quality obstetric care, especially during the second stage of labor, can significantly reduce their incidence and severity[17]. In high-income countries, national guidelines promote evidence-based perineal management techniques such as antenatal perineal massage, warm compresses, hands-on support, Ritgen's maneuver, maternal positioning, and selective episiotomy[18]. As a result, the World Health Organization (WHO), American College of Obstetricians and Gynecologists (ACOG), and the Royal College of Obstetricians and Gynecologists (RCOG) recommend offering these approaches during late pregnancy and labor, tailored to women's preferences, to minimize perineal tear incidences[19]. Nevertheless, the global burden of spontaneous perineal tears remains substantial, with pooled prevalence estimates of 46% in LMICs[6] to as high as 85% in HICs[20]. In LMICs, including Ethiopia, the majority of studies are based on retrospective chart reviews or cross-sectional surveys that overlook key modifiable intrapartum factors[21]. To bridge this gap, the current study used real-time observational checklists during labor to accurately capture modifiable risk factors. Therefore, the study aimed to determine the magnitude and associated factors of spontaneous perineal tears among women giving birth at Arba Minch General Hospital, Gamo Zone, southern Ethiopia, to inform prevention strategies and enhance maternal care.

Materials and Methods

Study Area and Period

The study was conducted at Arba Minch General

Hospital, the only general hospital in the Gamo Zone, Southern Ethiopia, from April 1 to July 30, 2021. The hospital was established in 1969 in the town of Arba Minch, which is 500 km from Addis Ababa (the capital of Ethiopia). It serves about 3.8 million people, including over 880,000 women of reproductive age. In 2020, around 4,000 births occurred at the facility. The obstetrics and gynecology department is staffed by 76 professionals, including midwives, general practitioners, IESOs, and obstetricians/gynecologists.

Study Design

A facility-based cross-sectional study design was employed.

Populations

Source population

All laboring women who were receiving delivery services at Arba Minch General Hospital.

Study population

All laboring women who were receiving delivery services at Arba Minch General Hospital during the study period and fulfilled the eligibility criteria.

Eligibility criteria

Laboring women who were attending delivery services, who were in the active first stage of labor, and those admitted with the second stage of labor.

Sample Size and Sampling Technique

Sample size determination

The sample size was determined via the single population proportion formula on OpenEpi Stat Cal 384. Accordingly, after adding a 5% non-response rate, the final sample size was 403 laboring women.

Sampling technique and procedure

On the basis of the previous year (2020 G.C.) annual delivery report of Arba Minch General Hospital, the total number of deliveries was 4,022, with over 335 deliveries per month. The average expected number of vaginal deliveries in the study period (from April 1 to July 30, 2021) was 1,340, which resulted in a sampling fraction (k) = 1,340/403 = 3.33 ≈ 3. The study participants were selected via a systematic random sampling technique in which the first woman was selected via a lottery, and the next respondents were selected at an interval of 3, according to their order of admission to the labor and delivery ward with the diagnosis of the active first stage or second stage of labor.

Operational Definitions and Definitions of Terms

Spontaneous perineal tear is any degree of break in the continuity of the perineum, either the first, second, third, or fourth degree, according to the RCOG classification of perineal tears[4]. In this study, if a woman had any of the four-degree tears, she was considered to have spontaneous perineal tears. It is coded as (0 = no and 1 = yes) and was identified by trained data collectors via physical examination immediately after the complete delivery of the fetus and placenta.

Assisted vaginal deliveries: These are deliveries performed either with the help of instruments (forceps or vacuum devices) or assisted breech delivery maneuvers[22].

Spontaneous (non-operative) vaginal delivery: In this study, SVD refers to the delivery of a fetus through the vaginal route without the use of instruments like forceps or a vacuum extractor, as well as without employing assisted breech delivery maneuvers[14].

The fundal pressure/Kristeller maneuver involves the application of manual pressure to the uppermost part of the uterus directed toward the birth canal in an attempt to assist spontaneous vaginal birth and avoid a prolonged second stage or the need for operative birth[23]. However, its use is not supported in modern obstetrics due to insufficient evidence of benefit and concerns of potential risks.

Ritgen's maneuver is a manual perineal protection technique that involves applying pressure on the perineum with one hand and applying pressure to the baby's head with the other hand to slow the speed of the birth of the baby's head[24].

Directed pushing: A pushing method in the second stage of labor in which the laboring woman is told to take a deep breath at the start of the uterine contraction, hold it, and push it down throughout the contraction[25].

Spontaneous pushing is a pushing method in the second stage of labor in which the laboring woman pushes three to five times per contraction, just by following her instincts[25].

Shoulder dystocia: Shoulder dystocia is diagnosed clinically when there is a failure of delivery of the fetal shoulder(s) after initial attempts of downward traction of the fetal head and when ancillary obstetric maneuvers are used[26]. In this study, it was diagnosed clinically when the delivery attendant used either the suprapubic or McRoberts maneuver (tightly bending the mother's legs toward her abdomen) to deliver the fetal shoulder(s).

Digital stretching of the perineum: The use of one or two fingers to gently stretch and massage the perineal tissues after fetal crowning with the intent to increase elasticity and reduce the risk of perineal tear during vaginal delivery[18].

Results

Among the 403 recruited laboring women, 398 participated in this study, and the remaining 5 women were not volunteers, resulting in a response rate of 98.8%.

Sociodemographic characteristics of the study participants

More than half of the study participants (257; 64.6%) were urban dwellers. Two hundred forty-two (60.8%) participants performed their daily activities, mostly in a sitting position (Table 1).

Table 1 Sociodemographic characteristics of women who were receiving delivery services at Arba Minch General Hospital, southern Ethiopia, 2021 (N=398)

Variables	Frequency (n)	Percentage (%)
Age (in completed years)		
14 – 19	30	7.5
20 – 24	117	29.4
25 – 29	124	31.2
30 – 34	101	25.4
35 +	26	6.5
Marital status		
Married	372	93.5
Single	21	5.2
Divorced	3	0.8
Widowed	2	0.5
Current residence		
Rural	141	35.4
Urban	257	64.6
Occupation		
Employee	80	20.1
Day laborer	9	2.3
Farmer	41	10.3
Housewife	187	47.0
Merchant	51	12.8
Student	30	7.5
Most frequent body position		
Siting	242	60.8
Standing	48	12.1
Walking	108	27.1
Level of education		
No formal education	57	14.3
Primary education	118	29.6
Secondary education	128	32.2
Tertiary	95	23.9

Obstetrics-related characteristics of the study participants

Past and current obstetric history of the study participants

As shown in Table 2, Of the 398 respondents, 253 (63.6%) were multiparous, and among them, 244 (96.4%) had a previous history of vaginal birth. Approximately 3/4th of the participants (75.1%) gave birth after a birth interval of more than two years.

Regarding the current pregnancy, the majority (366; 92.0%) had attended antenatal care (ANC) visits, while 32 (8.0%) had not. In terms of ANC

visit frequency, nearly half (202; 50.8%) had four or more visits, 123 (33.6%) had three visits, and only 5 (1.4%) had a single visit. Concerning the gestational age at birth, 331 (83.2%) of the deliveries were at term, 42 (10.6%) were post-term, and 25 (6.3%) were preterm (Table 2).

Table 2 Past and current obstetric history of women who were receiving delivery services at Arba Minch General Hospital, Southern Ethiopia, 2021

Variables	Frequency (n)	Percentage (%)
Parity		
Primiparous	145	36.4
Multiparous	253	63.6
Previous vaginal delivery (n= 253)		
No	9	3.6
Yes	244	96.4
Perineal trauma in previous vaginal delivery/deliveries (n=244)		
No	41	16.8
Yes	203	83.2
Type of perineal trauma in previous delivery/deliveries (n=203)		
Episiotomy only	155	76.4
Spontaneous tear only	29	14.3
Both	19	9.3
Recurrence of perineal trauma in previous deliveries (n=92)		
No	66	71.7
Yes	26	28.3
Birth interval (in a year) (n =253)		
≤ 2 yrs.	63	24.9
>2 yrs.	190	75.1
FGC scar		
No	181	45.5
Yes	217	54.5
ANC		
No	32	8.0
Yes	366	92.0
Frequency of ANC visits (n= 366)		
Once only	5	1.4
Two times	52	14.2
Three times	123	33.6
Four and more	186	50.8
Medical/obstetric problems in this pregnancy		
No	324	81.4
Yes	74	18.6
Gestational age at birth (in weeks)		
Preterm (< 37 weeks)	25	6.3
Term (37 to <42) weeks	331	83.2
Post (≥ 42 weeks)	42	10.6
GA calculated from		
Last normal Menstrual Period	230	57.8
Early Sonography	87	21.9
Current Sonography	60	15.0
Fundal height	21	5.3

Labor- and delivery-related characteristics of the study participants

Among the 398 study participants, labor commenced spontaneously in 374 (94%) women, and labor was augmented in 54 (13.6%) women. In the second stage of labor, 229 women (57.5%) labored for 60 minutes or more. Digital stretching of the perineum was performed in 123 (30.9%), fundal pressure was applied in 95 (23.9%), the perineum was supported manually in 329 (82.7%), and Ritgen's maneuver was applied in 58 (14.6%) parturients during the second stage of labor. Mediolateral episiotomy was done in 153 (384%) participants (Table 3).

Table 3: Labor and delivery-related characteristics of women who were receiving delivery services at Arba Minch General Hospital, Southern Ethiopia; 2021

Variables	Frequency (n)	Percentage (%)
Method of induction (n= 24)		
Misoprostol	20	83.4
Oxytocin	2	8.3
Mechanically	2	8.3
Augmentation method (n=54)		
Oxytocin only	35	64.8
ARM* only	10	18.5
Both	9	16.7
Pushing methods in the 2nd stage of labor		
Directed	292	73.4
Spontaneous	106	26.6
Mode of delivery		
SVD	344	86.4
AVD	54	13.6
Maternal position during delivery		
Lithotomy	220	55.3
Dorsal recumbent	178	44.7
Time of Delivery/delivery shift		
Afternoon	121	30.4
Morning	121	30.4
Night	156	39.2
Place of delivery		
Bed	158	39.7
Delivery coach	240	60.3
Duration of the 2nd stage of labor		
< 60 min.	169	42.5
≥60 min	229	57.5
The total duration of labor (in hr)		
< 14 hr.	218	54.8
≥ 14 hr.	180	45.2
Length of time with ruptured membranes (in hr.)		
< 12 hr.	311	78.1
≥ 12 hrs.	87	21.9
Delivery attended by		
Diploma midwife	134	33.7
BSc Midwife	131	32.9
MSc Clinical Midwifery students	92	23.1
IESOs	29	7.3
Other*	12	3.0
Digital stretching of the perineum		
No	275	69.1
Yes	123	30.9
Fundal pressure applied		
No	303	76.1
Yes	95	23.9
Manual perineal support during fetal expulsion		
No	69	17.3
Yes	329	82.7
Ritgen's maneuver applied		
No	340	85.4
Yes	58	14.6
Oxytocin use without augmentation protocol		
No	351	88.2
Yes	47	11.8
Mediolateral Episiotomy		
Yes	153	38.4
No	245	61.6

SVD* = spontaneous vaginal delivery, AVD* = assisted vaginal delivery, ARM* = artificial rupture of membranes

Other* = general practitioners, medical interns, obstetricians, and gynecologists. IESOs = Integrated Emergency Surgery Officer

Fetal-related characteristics

Among the 398 newborns, 211 (53.3%) were male, 263 (80.2%) had a birth weight of 3500 grams or less, and more than half of the 234 (58.8%) had a head circumference of 35 cm or above (Table 4).

Table 4 Fetal-related characteristics of women who were receiving delivery services at Arba Minch General Hospital, southern Ethiopia; 2021

Variables	Frequency (n)	Percentage (%)
Baby sex		
Female	187	47.0
Male	211	53.0
Birth Weight (in grams)		
≤ 3500	263	66.1
> 3500	135	33.9
Presentation		
Cephalic	392	98.5
Breech	6	1.5
Among cephalic presentations (n = 392)		
Vertex	384	98.0
Nonvertex	8	2.0
Position in Vertex presentation (n= 384)		
Occipito-anterior	376	97.9
Occipito-posterior	8	2.1
Shoulder dystocia (Shoulder release maneuver used)		
Yes	41	10.3
No	357	89.7
Head Circumference		
< 35 cm	164	41.2
≥ 35 cm	234	58.8
156	39.2	

Magnitude of spontaneous perineal tear

Among all study participants, 149 (37.4%) experienced spontaneous perineal tears. Of these, 145 (97.3%) were 1st and 2nd degree, and 4 (2.7%) were OASIs.

Factors associated with spontaneous perineal tear

As presented in Table 5, The likelihood of experiencing a spontaneous perineal tear was significantly higher among participants exposed to certain obstetric factors. Women who delivered with the application of fundal pressure were 7.65 times more likely to sustain a tear compared to those without fundal pressure (AOR = 7.65; 95% CI: 3.52–16.65). Similarly, participants with a history of FGC had 5.23 times greater odds of developing spontaneous perineal tears than those without FGC (AOR = 5.23; 95% CI: 2.47–11.07). The absence of a mediolateral episiotomy was associated with a 4.63-fold increase in the risk of

perineal tears compared to those who underwent the procedure (AOR = 4.63; 95% CI: 1.60–13.36). Participants who spent 60 minutes or more in the second stage of labor had 4.55 times higher odds of experiencing a tear compared to those whose second stage lasted less than 60 minutes (AOR = 4.55; 95% CI: 2.23–9.15).

Furthermore, women who gave birth via AVD were 4.27 times more likely to develop spontaneous perineal tears than those who had SVD (AOR = 4.27; 95% CI: 1.21–15.01). Lack of manual perineal support during delivery was also significantly associated with tears, with a 2.23-fold increased risk (AOR = 2.23; 95% CI: 1.10–4.54). Lastly, delivering a neonate weighing more than 3500 g was linked to a 2.16 times higher likelihood of perineal tears compared to those delivering neonates weighing 3500 g or less (AOR = 2.16; 95% CI: 1.10–4.26).

Table 5:Results of the multivariable logistic regression analysis of factors associated with spontaneous perineal tear among women who gave birth at Arba Minch General Hospital, southern Ethiopia, 2021

Variables	Spontaneous Perineal Tear		Odd Ratio (95% CI)		p value for AOR
	Yes	No	Crude odds ratio	Adjusted odds ratio (AOR)	
History of prior perineal tear					
Yes	97	106	2.83 (1.31– 6.10)	2.04(0.71-5.84)	0.19
No	10	31	1	1	
Had FGC scar					
Yes	95	122	1.83 (1.23 - 2.84)	5.23 (2.47 – 11.07)	< 0.001*
No	54	127	1	1	
Onset of labor					
Induced	13	11	2.07 (0.90-4.7)	1.33(0.37 -4.83	0.67
Spontaneous	136	238	1	1	
Mode of delivery					
AVD	38	26	2.94 (1.72 – 5.13)	4.27(1.21 -15.01)	0.024*
SVD	111	223	1	1	
Oxytocin use without induction/augmentation protocol					
Yes	22	25	1.55(0.84 – 2.87)	1.79 (0.55 – 5.84)	0.34
No	127	224	1	1	
Duration of the 2nd stage					
≥ 60 min.	103	122	2.33 (1.52 - 3.63)	4.55(2.26 – 9.15)	< 0.001*
< 60 min.	46	127	1	1	
Digital stretching of the perineum					
Yes	58	65	1.80 (1.17 -2.79)	1.56(0.72 – 3.36)	0.26
No	91	184	1	1	
Perineal support					
No	36	33	2.09 (1.23 -3.52))	2.23(1.1 – 4.54)	0.024*
Yes	113	216	1	1	
Birth Interval					
≤ 2 yrs.	35	28	1.96 (1.10 – 3.49)	1.68(0.77 – 3.65)	0.19
>2 yrs.	74	116	1	1	
Ritgen's maneuver					
No	133	207	1.69 (0.94 - 3.14)	2.45 (0.88– 6.77)	0.08
Yes	16	42	1	1	
Fundal pressure applied					
Yes	60	35	4.12 (2.54 -6.69)	7.65 (3.52 -16.65)	< 0.001*
No	89	214	1	1	
Episiotomy					
No	116	129	3.27 (2.10 – 5.23)	4.63 (1.61 – 13.36)	0.005*
Yes	33	120	1	1	
Baby sex					
Female	56	131	1	1	
Male	93	118	1.84 (1.22 – 2.79)	1.43(0.73 – 2.80)	0.304
Birth weight					
>3500gms	74	61	3.04 (2.03 – 4.72)	2.16 (1.10 - 4.26)	0.027*
≤ 3500gms	75	188	1	1	
Shoulder dystocia					
Yes	24	17	2.62 (1.36 – 5.06)	1.40(0.45 – 4.41)	0.57
No	125	232	1	1	

Notes: * Indicates that the variables had a significant association, and 1 = the reference category in the model.

Discussion

The findings of the study demonstrated that spontaneous perineal tear was found in 37.4% of the respondents. Key factors that increased the likelihood of experiencing a spontaneous tear are applying fundal pressure, having an FGC scar, not doing a mediolateral episiotomy, duration of the second stage of labor exceeding 60 minutes, AVD, no perineal support during delivery, and birth weights greater than 3500 grams.

The 37.4% rate of spontaneous perineal tears in this study aligns with findings from Brazil (38%)[29], Iraq (33.3%)[30], Kenya (38.8%)[7], and Ethiopia (38.4%)[31]. However, it is lower than a Brazilian study reporting 79.7%[5], likely due to differences in study populations—our study included women with and without episiotomy, while the Brazilian study excluded those with episiotomy, which is known to reduce tear risk. A Swedish study[28] reported a 66.3% rate, possibly due to including only primiparous women, who are at higher risk of perineal tears. Variations in population characteristics, delivery protocols, and provider training may also explain these differences. The Swedish study included only primiparous women, and first-time mothers are at a greater risk of perineal tears than women who have had multiple vaginal births[14].

In contrast, our study's tear rate is higher than those reported in Portugal (31%)[27], Iran (16%)[15], Egypt (27%)[32], Cameroon (19.2%)[21], and South Africa (16.2%)[33]. These differences may stem from variations in participant selection. For example, the Egyptian study included only multiparous women with spontaneous vertex deliveries, excluding higher-risk cases. The Portuguese study excluded instrumental deliveries. In Iran, the high episiotomy rate—95% in primiparous and 43.9% in multiparous women—likely contributed to the lower tear rate compared to our study, where the episiotomy rate was lower.

In this study, fundal pressure was a strong factor that promoted the occurrence of spontaneous perineal tears. The odds of spontaneous perineal tears were 7.65 times greater for women who received fundal pressure than for those who did not. Studies done in Iran[15], Egypt[32], Ethiopia[31], and the 2017 Cochrane Review[23] reinforced these findings. Exerting pressure on the uterine fundus (Kristeller maneuver) may heighten the likelihood of a perineal tear. This is because the pressure applied can transfer to the perineum through fetal movement, causing it to stretch excessively beyond its capacity. On the basis of current evidence and the recommendations of obstetricians and gynecologists, avoiding the Kristeller maneuver during childbirth is advised to reduce the occurrence of spontaneous perineal tears.

Women who had FGC scars were more likely to experience spontaneous perineal tears, with a 5.23-fold greater chance than those who did not have FGC scars. These findings support those of a previous study conducted in Jigjiga, Ethiopia[34]. FGC scarring may decrease the elasticity and flexibility of the perineal skin and pelvic floor muscles, which can lead to a greater risk of tearing during labor and delivery.

Episiotomy was protective against spontaneous perineal tears. These findings concur with studies performed in Uganda[22], Ethiopia[31], and Sweden[28]. A possible explanation for this finding might be that the episiotomy incision in the tight perineum allows adequate space for the descending fetus, which could prevent further damage to the perineum. However, studies done in Cameroon[30] and Saudi Arabia[35] reported that making episiotomy incisions did not affect the magnitude of spontaneous tears. Another finding in Brazil[29] showed that episiotomy prevents only mild and moderate tears (first- and second-degree tears) but does not affect third- or fourth-degree tears. A similar finding was reported in studies performed in Iraq[30]. This increased risk of spontaneous tears in women undergoing episiotomy could be due to factors such as the small size of the incision, the timing of the procedure, or improper delivery technique.

Our research revealed that women who had second-stage labor lasting more than 60 minutes were 4.55 times more prone to perineal tears than those who had second-stage labor lasting 60 minutes or less. This finding agreed with studies performed in Uganda[22], Southampton[16], and Southeast England[14]. It is possible that women who labor for more than 60 minutes may have an increased likelihood of sustaining spontaneous perineal tears. This could be attributed to prolonged tension on the perineal tissue and resulting perineal edema, which can hinder the perineum's optimal elasticity as the fetus descends.

Assisted vaginal delivery (AVD), including instrumental and assisted breech delivery, significantly increases the risk of spontaneous perineal tears, with women undergoing AVD being 4.27 times more likely to experience tears than those with spontaneous vaginal delivery (SVD). This aligns with studies from Uganda[22], Sweden[28], and Southeast England[14]. The increased risk is likely due to mechanical pressure from instruments and maneuvers during fetal extraction. However, proper instrument selection, correct placement, and skilled use of instruments will decrease the risk.

Perineal support during the second stage of labor is a protective factor against spontaneous perineal tears, as supported by studies from Iran[15], Egypt[32], and the Cochrane Library[18]. This technique helps control fetal extension and slow expulsion, reducing perineal trauma. The WHO and ACOG recommend such techniques, which can be tailored to the woman's preference.

Women who delivered babies weighing over 3500 grams had a higher risk of spontaneous perineal tears compared to those with infants weighing 3500 grams or less. Similar findings were reported in studies from Uganda[22], Kenya[7], and Southeast England[14], likely due to fetopelvic disproportion causing perineal trauma. Estimating fetal weight before delivery may help prevent such tears, particularly in cases of macrosomia. However, studies from Brazil[29], Iran[15], and South Africa[33] found no such association, possibly due to lower birth weights or differing weight categorization.

Conclusions and Recommendations

The magnitude of spontaneous perineal tears in this study is notably high. Several contributing factors were identified, including assisted vaginal delivery, absence of episiotomy, fetal birth weight over 3500 grams, application of fundal pressure, presence of FGC scars, and lack of perineal support during fetal expulsion. To mitigate these risks, it is essential that midwives and obstetricians closely monitor women at high risk, implement evidence-based perineal tear prevention strategies, and avoid the use of fundal pressure. Moreover, evaluating the competency of birth attendants in vacuum-assisted and breech deliveries, and understanding their association with perineal trauma, is critical, as assisted deliveries were found to be a significant contributor to perineal tears in this setting.

Acknowledgments

We want to express our gratitude to the data collectors, supervisors, and study participants for their valuable contributions during the conduct of the study.

Declaration of conflicting interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Authors' Contributions

All authors contributed to data analysis, drafting, and revising the article, gave final approval for the version to be published, and agreed to be accountable for all aspects of the work.

Corresponding Author: Awol Arega Yimer
Email: - awolarega.aa@gmail.com
Tel: +251923514115

REFERENCES

1. United Nations Children's Fund, The State of the World's Children 2023: For every child, vaccination, UNICEF Innocenti – Global Office of Research and Foresight, Florence, April 2023. Available at: https://www.unicef.org/reports/state-worlds-children-2023.
2. WHO Recommendations: Intrapartum care for a positive childbirth experience. Geneva: World Health Organization; 2018.
3. Arnold MJ, Sadler K, Leli K. Obstetric lacerations: prevention and repair. American Family Physician. 2021 Jun 15;103(12):745-52.
4. (RCOG) RC of O and G. The Management of Third- and Fourth-Degree Perineal Tears. Green-top Guidline No. 29. 2015.
5. Maria V, Lins L, Barros F, Vasconcelos L, Coutinho I, Amorim M. Factors associated with spontaneous perineal lacerations in deliveries without episiotomy in a university maternity hospital in the city of Recife , Brazil. 2018;(March).
6. Aguiar M, Farley A, Hope L, Amin A, Shah P, Manaseki S. Birth-Related Perineal Trauma in Low- and Middle-Income Countries : A Systematic Review and Meta-analysis. Matern Child Health J. 2019;23(8):1048–70.
7. Kituku J, Getanda A, Mwangi A. Prevalence and Risk Factors for Perineal Trauma among Women at a Teaching and Referral Hospital in Kenya. Journal of Health, Medicine and Nursing. 2019;65(2012):66–72.
8. Alnakash AH, Jafar S, Abdul-raheem Y. Whether Selective or Routine Episiotomy is More Useful to Protect Anal Sphincter in Primiparous Women. THE IRAQI POSTGRADUATE MEDICAL JOURNAL. 2012;11(1):26–32.
9. Fukami T, Koga H, Goto M, Ando M, Matsuoka S, Tohyama A, Yamamoto H, Nakamura S, Koyanagi T, To Y KH. Incidence and risk factors for postpartum hemorrhage among transvaginal deliveries at a tertiary perinatal medical facility in Japan. PLoS One. 2019;14(1):1–8.
10. Sundquist J christer. Long-term outcome after obstetric injury : Acta Obstet Gynecol Scand. 2012;91(6):715–8.
11. Huebner M, Gramlich NK, Rothmund R, Nappi L, Abele H, Becker S. International Journal of Gynecology and Obstetrics Fecal incontinence after obstetric anal sphincter injuries. International Journal of Gynecology and Obstetrics. 2013;121(1):74–7.
12. Mota RL. Female urinary incontinence and sexuality. 2017;43(1):20–8.
13. Edozien LC, Gurol‐Urganci I, Cromwell DA, Adams EJ, Richmond DH, Mahmood TA van der MJ. Impact of third‐ and fourth‐degree perineal tears at first birth on subsequent pregnancy outcomes 2014.pdf. BJOG. 2014;121(13):1695–703.
14. Smith LA, Price N, Simonite V, Burns EE. Incidence of and risk factors for perineal trauma : a prospective observational study. BMC Pregnancy Childbirth. 2013;1–9.
15. Abedzadeh-kalahroudi M, Talebian A, Sadat Z. Perineal trauma : incidence and its risk factors. J Obstet Gynaecol (Lahore). 2018;0(0):1–6.
16. Souza JCD. Risk factors for perineal trauma in the primiparous population during non-operative vaginal delivery. 2019;
17. OECD (2019). Health at a Glance 2019: OECD Indicators, OECD Publishing. Paris; 2019.
18. Aasheim V, Nilsen AB, Reinar LM LM. Perineal techniques during the second stage of labour for reducing perineal trauma (Review). Cochrane Database of Systematic reviews. 2017;(6).
19. Library WRH. WHO recommendation on techniques for preventing perineal trauma during labour. Geneva: The WHO Reproductive Health Library; 2018. p. 1–14.
20. Frolich J, Kettle C. Perineal care Search date November 2013 Pregnancy and childbirth Perineal care. BMJ Clin Evid. 2015; (November 2013):1–23.
21. Egbe TO, Kadzem LN, Takang WA, Tchounzou R EE. Prevalence and Risk Factors of Perineal Tears at the Limbe Regional Hospital , Cameroon. International Journal of Reproduction, Fertility & Sexual Health (IJRFSH). 2016;3(3):70–8.
22. Mathias G, Lawrence K. Risk Factors for Perineal Tears Among Women Delivering at Kawempe National Referral Hospital , Uganda : A Case Control Study.
23. Gj H, Jp V, Cuthbert A, Singata M. Fundal pressure during the second stage of labour (Review). 2017;
24. Aquino CI, Saccone G, Troisi J, Guida M, Zullo F, Berghella V. Is Ritgen's maneuver associated with decreased perineal lacerations and pain at delivery? Journal of Maternal-Fetal and Neonatal Medicine. 2019;0(0):3185–92.
25. Lemos A, Amorim MM, Dornelas de Andrade A, de Souza AI, Cabral Filho JE, Correia JB. Pushing/bearing down methods for the second stage of labour. Cochrane Database of Systematic Reviews. 2017;2017(3).
26. Dystocia S. Practice Bulletin No. 178 Summary: Shoulder Dystocia. Obstetrics and gynecology. 2017;129(5):961–2.
27. Rodrigues S, Silva P, Agius A, Rocha F, Gross M, Calleja-agius J. Intact Perineum : What are the Predictive Factors in Spontaneous Vaginal Birth ? 2019;31(7):25–30.

28. Jansson MH, Franzén K, Hiyoshi A, Tegerstedt G, Dahlgren H, Nilsson K. Risk factors for perineal and vaginal tears in primiparous women – the prospective POPRACT-cohort study. BMC Pregnancy Childbirth. 2020;20(1):1–14.
29. Oliveira LS, Brito LG, Quintana SM, Duarte G MA. Perineal trauma after vaginal delivery in healthy pregnant women. Sao Paulo Medical Journal. 2014;132(4):231–8.
30. Ahmed HM, Abdollah WH. Prevalence and Risk Factors of Episiotomy and Perineal Tear in the Maternity Teaching Hospital of Erbil City, Iraq. Erbil Journal of Nursing & Midwifery. 2019;2(1):44–50.
31. Argaw M, Mesfin Y, Demissie E. Birth-Related Perineal Tear and Its Associated Factors Among Mothers Who Delivered in Atat Hospital. Int J Childbirth. 2022;12(2):107–13.
32. Hamed A, Mohamed G. Risk Factors for Birth Related Perineal Truama among Low Risk Parturient Women and Nursing Implications. 2016;5(1):40–8.
33. Naidoo TD, Moodley J. Obstetric perineal injury : risk factors and prevalence in a resource-constrained setting. Trop Doct. 2015;45(4):252–4.
34. Gebremicheal K, Alemseged F, Ewunetu H, Tolossa D, Ma A, Yewondwessen M, et al. Sequela of female genital mutilation on birth outcomes in Jijiga town , Ethiopian Somali region : a prospective cohort study. BMC Pregnancy Childbirth. 2018;18(1):305.
35. Al Hanouf Al Thaydi, Thamer Al Ghamdi ATC and EEM. Perineal Tears Incidence and Risk Factors ; A Four Years Experience in a Single Saudi Center. Interventions In Gynaecology And Women's Healthcare. 2018;1(5):100–3.

ADMISSION CARDIOTOCOGRAPHY AS A PREDICTOR OF PERINATAL OUTCOME AND ASSOCIATED FACTORS AMONG LABORING MOTHERS, AT A TEACHING HOSPITAL, NORTH WEST ETHIOPIA

Dr.Tsegaye Gizaw, MD[1]; Dr.Atirsaw Ebaby, MD[2]; Dr.Solomone Berhe, MD[2];
Dr.Zelalem Mengistu, MD[2]; Mr.Tesfaye Hambesa,[3]

ABSTRACT

BACKGROUND: Worldwide, more than 2.6 million stillbirths occur annually, with birth asphyxia being one of the causes. Among the proposed methods to reduce birth asphyxia is the use of admission cardiotocography. However, literature demonstrating its effectiveness in predicting perinatal outcomes is scarce. Hence, this study aims to evaluate its effectiveness in predicting perinatal outcomes and associated factors.

OBJECTIVE: To assess the perinatal outcome of laboring mothers with admission cardiotocography, its predictive power for perinatal outcomes, and associated factors.

METHODS: A prospective single-center observational study was conducted among 385 laboring mothers with admission cardiotocography admitted to the University of Gondar Hospital labor ward. The data were coded and entered using EpiData version 4.6. Data analysis was done using STATA version 14. Descriptive and bivariate statistical analyses were conducted using the chi^2 test. Variables with a p-value < 0.2 were subjected to multivariate analysis to identify independent factors associated with outcome variables. A p-value < 0.05 was considered statistically significant.

RESULTS: Among the 385 laboring mothers with admission cardiotocography, 82% had normal results, 14% had suspicious cardiotocography, and the remaining 4% had pathological admission cardiotocography. Mothers with abnormal admission cardiotocography had higher rates of low Apgar scores. Similarly, NICU admissions, development of ominous or non-reassuring fetal heart rate patterns, and meconium-stained liquor were more common in the abnormal cardiotocography group. The sensitivity, specificity, positive predictive value, negative predictive value, and diagnostic accuracy of admission cardiotocography for ominous or non-reassuring fetal heart rate patterns in labor were 42.9%, 86%, 34.2%, 89.8%, and 79.7%, respectively. For low Apgar scores, these values were 75%, 82.4%, 4.3%, 99.6%, and 82.3%. For NICU admission, the corresponding values were 23%, 82.3%, 15.7%, 88.3%, and 75%. Maternal risk was the only significant factor associated with NICU admission. Decision-to-delivery interval and admission cardiotocography patterns were independent factors associated with ominous or non-reassuring fetal heart rate patterns in labor.

CONCLUSION: Admission cardiotocography is a specific screening test with good negative predictive value for detecting ominous or non-reassuring fetal heart rate patterns, development of meconium-stained liquor, predicting NICU admission, and low Apgar scores, but it has poor sensitivity and fair diagnostic accuracy. Clinical vigilance regarding the pattern of admission cardiotocography at the time of labor ward admission is warranted.

KEYWORDS: labor admission test, stillbirth, cardiotocography, birth asphyxia, perinatal outcome

(The Ethiopian Journal of Reproductive Health; 2025; 17; 36-511)

[1] Department of obstetrics & gynecology, Eka Kotebe General Hospital, Addis Ababa, Ethiopia

[2] Department of obstetrics & gynecology, School of Medicine, University of Gondar, Gondar, Ethiopia

[3] Department of public health, University of Gondar, Gondar, Ethiopia

INTRODUCTION

In an attempt to describe fetal heart rate sounds, Anton Friedrich Hohlt designed a fetal stethoscope in 1834, which was further modified by DePaul in 1847. Later, in 1876, Pinard's stethoscope, which is still used today, was introduced[1,2]. Following that, in 1968, cardiotocography (CTG), a new technology that uses electronic methods to acquire fetal heart rate and uterine contraction signals, was introduced[2].

Admission cardiotocography, or labor admission test (LAT), is a 20-minute CTG performed when a woman is admitted to the labor ward. An observational study by Ingmerson et al. served as the first scientific evidence for its introduction. It has two potential roles: to serve as an early screening test to detect compromised fetuses and to help select women who need continuous electronic fetal monitoring during labor[3,4].

Currently, more than 2.6 million stillbirths occur annually, with an estimated stillbirth rate of 18.4 per 1,000 live births. Middle- and low-income countries are responsible for 98% of stillbirths, with more than three-quarters occurring in two regions: South Asia and Sub-Saharan Africa[5,6]. Stillbirths can be antepartum or intrapartum, with intrapartum deaths accounting for nearly half of the cases, especially in developing countries where over one million fetuses die annually. In response, the World Health Organization (WHO) released the Every Newborn Action Plan (ENAP) in 2014, targeting a national stillbirth rate of 12 or fewer per 1,000 births in every country by 2030[7–9].

LAT, or admission cardiotocography, is one of the fetal monitoring tools used to reduce intrapartum deaths associated with asphyxia (10). Despite being a relatively inexpensive test, it is not widely practiced in developing countries. Additionally, literature on the efficacy of admission cardiotocography in predicting perinatal outcomes and associated factors is scarce[1,11,12].

Methods and Materials

Methods and Materials

Study Design

Prospective single-center observational study.

Study Setting

The study was conducted in one of the tertiary hospitals in Ethiopia, located in Gondar town in the northwest part of the country, 727 km from Addis Ababa. The Department of Obstetrics and Gynecology at the University of Gondar Hospital provides specialty and subspecialty services to over 7 million people and manages more than 10,000 annual deliveries. The labor ward has 9 beds and a separate labor OPD for triage, where admission CTGs are performed.

Study Period

The study was conducted from June 1 to August 1, 2022, at the University of Gondar Hospital.

Inclusion Criteria: All laboring mothers with spontaneous onset of labor, cephalic presentation, term pregnancies, and admission CTG.

Exclusion Criteria: Mothers with congenital fetal anomalies, malpresentations, preterm pregnancies, prior sedative use (diazepam or narcotics), multiple gestations, intrauterine fetal death, cord prolapse, or false labor.

Study Population

All laboring mothers admitted to the University of Gondar Hospital labor ward with admission CTG during the study period who met the inclusion criteria.

Sample Size and Sampling Technique

To determine the maximum sample size, a single population proportion formula was used with the following assumptions: 95% confidence interval, 5% margin of error, and 50% estimated proportion due to lack of comparable studies. This yielded a sample size of 385.

Sampling Technique and Procedures

Participants were selected using systematic random sampling. At the labor ward, 10–15 laboring mothers with admission CTG are admitted daily. From the delivery registration book, chart numbers of mothers meeting the inclusion criteria were selected beginning with the first case each day and including odd-numbered cases (7–8 cases per day) until the sample size was met.

Tool/Method and Data Collection

Upon arrival at the labor OPD, a detailed obstetric history and general physical and pelvic examinations were conducted to determine the stage of labor. Using a Philips Goldway CTG monitor at a paper speed of 1 cm/min, admission CTGs were performed to record fetal heart rate and uterine contractions. The 2017 National Institute for Health and Care Excellence (NICE) guideline was used to categorize admission CTGs as follows:

Table 1: Description and category of CTG traces for intrapartum care (NICE guideline 2017) (13, 14, 15).

Description	Baseline (Beats/min)	Base line variability (beats/min)	Feature Decelerations
Reassuring	110 to 160	5 to 25	None or early variable with no concerning characteristics for < 90 min
Non-reassuring	100 to109 or 161 to 180	<5 for 30 to 50 min or >25 for 15 to 25 min	Variable with no concerning characteristics for > 90 min or Variable with any concerning characteristics in up to 50% of contractions for > 30 min or variable with any concerning characteristics in > 50%of contractions for < 30 min or late deceleration in over 50% of contractions for < 30 min or with maternal or fetal risk factor.
Abnormal	Below 100 or above 180	<5 for> 50 minor>25 for >25min or sinusoidal.	Variable with any concerning characteristics in > 50% of contractions for > 30 minor late deceleration for over 30 min or acute bradycardia or single prolonged deceleration for > 3 min

Reactive/Normal: All features are normal.

Equivocal/Suspicious: One non-reassuring feature and two reassuring features.

Ominous/Pathologic: One abnormal feature and two non-reassuring features.

After this, mothers were admitted to the labor ward for follow-up. Those with normal admission CTG were monitored via intermittent auscultation or CTG, depending on their risk, while those having suspicious CTG were initially resuscitated to correct for possible underlying causes by intranasal oxygen supplementation, IV fluid administration, and changing position, and the CTG was repeated at the labor ward. For those who had pathologic CTG, they were evaluated immediately to exclude acute events like cord prolapse, abruption, or uterine rupture. Then, in the absence of these acute events, resuscitation was started to correct underlying causes, and if it was still pathologic despite these efforts, delivery of the baby was made by cesarean

section or instrumental delivery, depending on the stage of labor.

Data was collected from patients' charts by three midwives after necessary training was given, using a structured English version questionnaire, which was adapted from similar studies. Validity of the questionnaire was established by conducting a pretest on 5% of the sample and through discussions with experts (specialists, subspecialists, and public health experts). The laboring mothers were admitted to the labor ward and followed until delivery based on existing protocol. The neonatal outcomes immediately after delivery and during the first seven days were accessed from maternal charts or clinical records of neonates admitted to the NICU. When appropriate, phone numbers from patients' charts were used to extract necessary information after explaining the research and obtaining their consent.

Data Quality Assurance

The study protocol was approved by the ethical review board of the University of Gondar. Groups of experts were involved to validate the questionnaire. In addition, training was given to data collectors, and the collected data were checked daily for consistency and completeness by supervisors.

Data Analysis

The data collected were coded and entered into EpiData version 4.6 and then exported to STATA version 14 for analysis. The data were analyzed using descriptive statistics such as frequency, percentages, sensitivity, specificity, NPV, PPV, and diagnostic accuracy. Cross-tabulation was conducted to check the relationship between dependent and independent variables. After checking validity, a chi-square test and bivariate analysis were conducted to identify explanatory variables for multivariate regression with a p-value of < 0.2.

Biologically plausible explanatory variables were entered into multivariate logistic regression to identify independent factors associated with the outcome variable, and those variables with a p-value of < 0.2 were subjected to multivariate analysis to identify independent factors associated with outcome variables. The findings were presented in p-values and confidence intervals. A p-value of < 0.05 was set for statistical significance.

Ethical Consideration

Ethical clearance was obtained from the Ethical Review Committee of the University of Gondar under IRB number SOM/1467/2022 of UOG COM. A letter of permission and a support letter were obtained from the UOG administrative unit to commence the study at the labor ward.

When needed, patients were communicated with by phone on a voluntary basis, respecting their right not to give information. They were also assured that all data collected from them would be used for research purposes only. Confidentiality was maintained by omitting the names of respondents.

Results

Socio-demographic characteristics of laboring mothers with admission CTG

Among 385 laboring mothers having admission CTG majority 90% were in the age group 19-34. About 88.83 % were urban dwellers. Regarding educational status 33.77% were educated up to secondary school, 26.75 % up to primary level, 22.60% up to bachelor's degree & 10.90% couldn't read & write. Majority of the participants were housewives representing 76.88% followed by civil servants accounting for 15.06 %. Also, most of the laboring mothers 98.96% were married. (table2)

Table 2: The socio demographic characteristics of laboring mothers with admission CTG admitted to UOG hospital L/W, North West Ethiopia from June 1 to August 1, 2022 G.C.

Socio demographic characteristics.	Frequency.	Percentage (%)	Cumulative.
Age of laboring mothers.			
≤ 18	1	0.40	0.26
19 – 34	347	90.00	90.4
≥ 35	37	9.60	100
Total	385	100	
Occupation of laboring mothers.			
Housewife	296	76.88	76.88
Civil servant	58	15.06	91.95
Merchant	21	5.45	97.40
Student	4	1.04	98.44
Daily laborer	3	0.78	100
Total	385	100	
Marital status of laboring mothers.			
Married	381	98.96	98.96
Single	2	0.52	99.48
Divorced	1	0.26	99.47
Widowed	1	0.26	100
Total	385	100	
Educational status of laboring mothers.			
Can't read & write	42	10.91	10.91
Read & write only	22	5.71	16.62
Primary education	103	26.75	33.37
Secondary education	130	33.77	77.14
Bachelor's degree	87	22.60	99.74
Others	1	0.26	100
Tota	385	1001	
Place of residence of laboring mothers			
Urban	342	88.83	88.83
Rural	43	11.17	100
Total	385	100	

Pattern of admission CTG of laboring mothers admitted to GUH L/W, North West Ethiopia, from June 1 to August 1, 2022 G.C.

As shown in figure 1below most of the laboring mothers 82% were having normal admission CTG, 14 % were having Suspicious CTG & 4% were noted to have pathologic admission CTG.

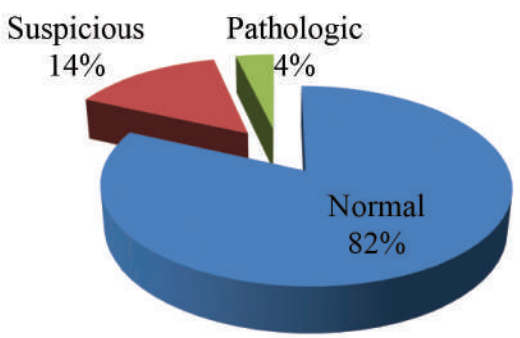


Figure 1: Pattern of admission CTG of laboring mothers admitted to UOG hospital L/W, North West Ethiopia, from June 1to august 1 2022.

Pattern of admission CTG & risk of laboring mothers admitted to UOG hospital

Among 246 high risk laboring mothers 205(83%) & among 139 low risk mothers110 (79 %) had normal admission CTG .It means 17% of high risk & 21 % low risk laboring mothers had abnormal admission CTG. Showing almost comparable result between low and high risk mothers.

Pattern of admission CTG and perinatal out come with 1st min Apgar score

Among 315 laboring mothers with normal admission CTG 1(0.3%), among 56 laboring mothers with suspicious admission CTG 1(2%) and from14 laboring mothers with pathologic admission CTG 2(14%) developed low Apgar score, clearly showing increased risk of low Apgar score with the degree of **abnormal admission CTG.**

Pattern of admission CTG & perinatal outcome with meconium -stained liquor

Of 315 laboring mothers with normal admission CTG 29(9%), of 56 laboring mothers with suspicious admission CTG12(14%) and from 14 laboring mothers with pathologic admission CTG 4(21%) developed meconium - stained liquor in labor, showing increased risk of developing meconium-stained liquor with the degree of abnormal admission CTG.

Pattern of admission CTG and perinatal out come with NICU admission

Similarly, among 315 laboring mothers with normal admission CTG 37(12%),among 56 laboring mothers with suspicious admission CTG 8(14%) and among 14 laboring mothers with pathologic admission CTG 3(21%) were admitted to NICU, implying the risk of NICU admission increases with the degree of abnormality of admission CTG.

Pattern of admission CTG and perinatal out come with ominous/Non-reassuring fetal heart rate pattern in labor.

Finally the data also shows that, among 315 laboring mothers with normal admission CTG 32(10%), from 56 laboring mothers with suspicious admission CTG 14(25%) and among 14 laboring mothers with pathologic admission CTG 10 (71%) developed ominous/NRFHRP in labor, indicating again the risk of developing ominous/NRFHRP in labor increases with the degree of abnormality in pattern of admission CTG.

Relationship between admission CTG and mode of delivery

We can also see from figure 2 below percentage of operative delivery increased with increase in degree of abnormality of admission CTG, while that of vaginal delivery showed a decreasing pattern with increase in the abnormality of admission CTG.

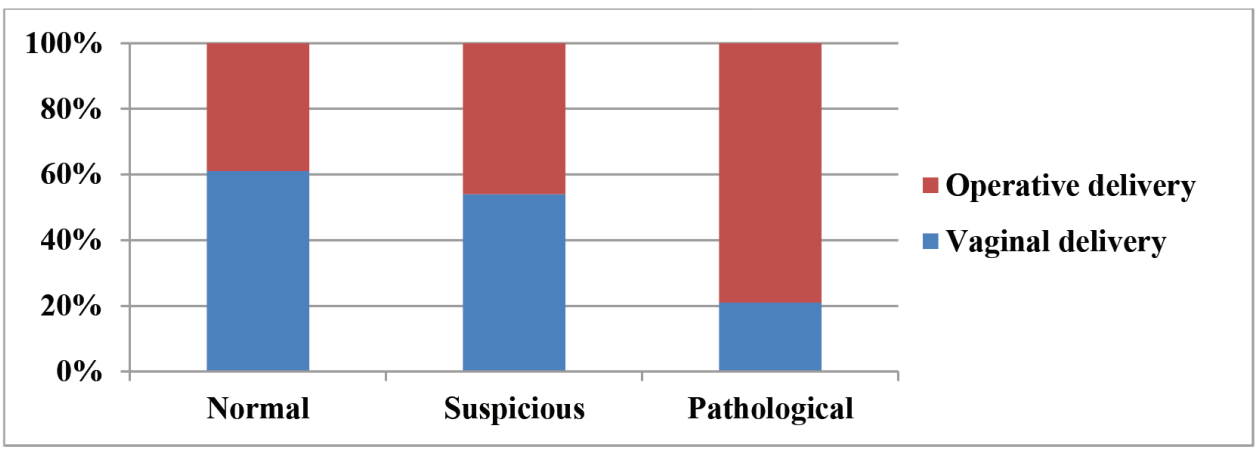


Figure 2: Graph showing the relationship between admission CTG and mode of delivery of laboring mothers admitted to UOG hospital L/W, North West Ethiopia, from June 1to august 1 2022.

Neonatal outcome of laboring mothers with admission CTG admitted to UOG hospital L/W

As depicted in table 2 below all of the laboring mothers admitted to labor ward & included in the study delivered live neonates. About 48 (12.47%) of neonates were transferred to NICU for evaluation & treatment. Most of these neonates stayed for less than a day. Among 18 neonates who stayed in NICU more than a day and only two neonates died.

Table 2: The socio demographic characteristics of laboring mothers with admission CTG admitted to UOG hospital L/W, North West Ethiopia from June 1 to August 1, 2022 G.C.

	Frequency.	Percentage (%)	Cumulative.
Neonatal outcome			
Alive	385	100	100
Still birth	0		100
Total	385	100	
Apgar score at 1st min			
<7	4	1.04	1.04
≥7	381	98.96	100
Tota	385	1001	
Neonates transferred to NICU			
Yes	48	12.47	12.47
No	337	87.53	100
Total	385	100	
Days spent at NICU			
< a day	30	62.50	62.50
1-4 days	18	37.50	100
Total	48	100	
Neonatal condition at discharge			
Improved	45	93.75	93.75
Deteriorated/crossed	1	2.10	95.85
Died	2	4.20	100
Total	48	100	

The sensitivity, specificity, positive predictive value, negative predictive value and diagnostic accuracy of admission CTG

As shown in table 3 below, admission CTG has Sensitivity (Sn) of 42.90%, Specificity (Sp) of 86%, Positive predictive value (PPV) of 34.30%, Negative predictive value (NPV) of 89.80% and diagnostic accuracy of 79.70% for detecting fetal distress in labor. Similarly, admission CTG has Sn of 75%, Sp of 82.40%, PPV of 4.30%, NPV of 99.65 and diagnostic accuracy of 82.3% for detecting low 1st minute Apgar score. Also it has Sn of 23%, Sp of 82.30%, PPV of 15.70%, NPV of 88.30% and diagnostic accuracy of 75% for predicting NICU admission.

Table 3: The sensitivity, specificity, positive predictive value, negative predictive value and diagnostic accuracy of admission CTG for fetal distress in labor, NICU admission & low 1st min Apgar score of mothers with admission CTG admitted to UOG hospital L/W North West Ethiopia, from June 1 to August 1 2022G.C.

	Sensitivity	Specificity	PPV	NPV	Diagnostic accuracy
Fetal distress	42.90%	86%	34.30%	89.80%	79.70%
Apgar score	75%	82.40%	4.30%	99.60%	82.30%
NICU admission	23%	82.30%	15.7%	88.30%	75%

Bivariate analysis using Pearson's chi^2 test was done to see the relationship between independent variables and outcome of interest.

Pearson's chi^2 test was done to see the relationship between independent variables & the development of meconium stained liquor in labor. It showed significant association for the following six variables Marital status chi^2 (3) = 7.9598, Pr=0.047,Parity chi ^{2}(2) = 19.7348, Pr=0.000,Quality of care chi ^{2}(1)=8.8538,Pr=0.000,decision to delivery interval chi ^{2}(2) =32.1237,Pr=0.000,insicion to delivery interval chi ^{2}(1)=37.2572, Pr=0.000 and finally the pattern of admission CTG chi^2(2)=10.893,Pr=0.04. And of these six variables, only two variables showed significant association during multivariate analysis. These includes decision to delivery interval P > [t] 0.011., 95 CI [-0.0481,-0.00612], incision to delivery interval P> [t] 0.000., 95 CI [0.0263, 0.0729].

Similarly bivariate analysis using Pearson's chi ^{2} was done to see variables independently associated with the NICU admission (table 4). The analysis revealed only four variables were associated with NICU admission .These includes gestational age of laboring mothers chi ^{2}(2) =10.4709, Pr=0.033, the risk of the patient chi ^{2}(1) =7.1588, Pr=0.007, the decision to delivery interval chi ^{2}(3) =8.1670, Pr=0.043, the incision to delivery interval chi ^{2}(2) =7.4389, Pr =0.024.Among these four variables on multivariate analysis only the risk of the patient showed significant association. That is P> [t] 0.02., 95 CI [0.0134, 0.1533].

Table 4: Summary of factors affecting NICU admission among the laboring mothers with admission CTG admitted to UOG hospital L/W, North West Ethiopia, from June 1 to August 1 2022 G.C.

Variables	NICU admission of the neonates			Pearson's chi ² test	Probability
	Yes	No	Total		
Age of laboring mothers					
≤ 18	0	1	1	$X^2(2) = 0.375$.	0.033
19 – 34	43	304	347		
≥ 35	5	32	37		
Total	48	337	385		
Marital status					
Married	48	333	381		
Single	0	2	2		
Divorced	0	1	1	$X^2(3) = 0.5757$	0.902
Widowed	0	1	1		
Total	48	337	385		
Educational status					
Can't read & write	5	37	42		
Read & write	1	21	22		
Primary education	17	89	103		
Secondary education	16	114	130	$X^2(5) = 8.4231$	0.134
Bachelor's	11	76	87		
Others	1	0	1		
Total	48	337	385		
Place of residence					
Urban	41	301	385		
Rural	7	36	43	$X^2(1) = 0.644$.	0.422
Total	48	337	385		
ANC booking					
Yes	46	332	378		
No	2	5	7	$X^2(1) = 1.6943$.	0.193
Total	48	337	385		
Parity					
Primiparous	22	154	176		
Multiparous	20	167	187	$X^2(2) = 4.9572$.	0.084
Grand multiparous	6	16	22		
Total	48	337	385		
Gestational age					
Early term	1	39	52		
Full term	15	127	142		
Late term	4	35	39	$X^2(4) = 10.4709$.	0.033 **
Post term	0	16	16		
9 months of amenorrhea	16	120	136		
Total	48	337	385		
Iron supplementation					
Yes	46	2	48		
No	318	19	337	$X^2(1) = 0.1764$.	0.675
Total	364	21	385		
Deceased fetal movement					
Yes	2	4	6		
No	46	333	379	$X^2(1) = 2.4316$.	0.119
Total	48	337	385		
Risk of the patient					
High	39	207	246	$X^2(1) = 7.1588$.	0.007 **
Low	9	130	139		
Total	48	337	385		
Oxytocin use					
Yes	8	35	43	$X^2(1) = 1.6706$	0.196
No	40	302	342		
Total	48	342	385		
Decision to delivery interval					
10 – 20 min	1	12	13	$X^2(2) = 8.167$.	0.043 **
21 – 50 min	25	116	141		
51 – 90 min	1	1	2		
Total	27	129	156		
Incision to delivery interval					
< 10 min	23	98	121	$X^2(2) = 7.4389$.	0.024 **
10 – 30 min	2	33	35		
Total	25	131	156		
New onset of complication					
APH	3	5	8		
Shoulder dystocia	0	1	1	$X^2(2) = 4.8219$.	0.09
None	45	331	376		
Total	48	376	385		
Pattern of admission CTG					
Normal	37	278	315		
Suspicious	8	48	56	$X^2(2) = 1.35$.	0.509
Pathologic	3	11	14		
Total	48	337	335		

** Variables which showed significant association.

Finally bivariate analysis using Pearson's chi^2 test was done to see the association between the independent variables and the development of fetal distress in labor, the result showed that eight variables were associated with the development of fetal distress in labor. These were educational status $chi^2(5) = 9.2428$, Pr=0.1, parity $chi^2(2) = 5.9823$., Pr=0.05, inter delivery interval chi $^2(1) = 13.384$., Pr=0.02, marital status chi $^2(3) = 8.113$, Pr=0.04., risk of the patient $chi^2(1) = 6.1179$, Pr=0.013. , decision to delivery interval chi $^2(2) = 111.55$, Pr=0.000., incision to delivery interval chi $^2(1) = 103.0764$, Pr=0.000. And pattern of admission CTG chi $^2(2) = 46.2455$ Pr=0.000. (Table 5)Among these five variables, on multivariate analysis, only two variables were significantly associated with the development of fetal distress in labor these are, decision to delivery interval P > [t] 0.001., 95 CI [0.0392, 0.1507], and the pattern of admission CTG P > [t] 0.000., 95 CI [-0.2426,-0.1196].

Table 5: Summary of factors affecting the development of fetal distress in labor among the laboring mothers with admission CTG admitted to GUH L/W, North West Ethiopia, from June 1to August 1 2022 G.C.

Variables	Development of fetal distress in labor			Pearson's chi ² test	Probability
	Yes	No	Total		
Age of laboring mothers					
≤18	1	1	1		
19 – 34	49	298	347	$X^2(2) = 1.4175.$	0.701
≥ 35	7	30	37		
Total	56	329	385		
Marital status					
Married	54	327	381		
Single	1	1	2	$X^2(3) = 8.113.$	0.044 **
Divorced	0	1	1		
Widowed	1	0	1		
Total	56	329	385		
Educational status					
Can't read & write	5	37	42		
Read & write	6	16	22		
Primary education	15	88	103	$X^2(5) = 9.2428.$	0.1**
Secondary education	17	113	130		
Bachelor's	12	75	87		
Others	1	0	1		
Total	56	329	385		
Place of residence					
Urban	51	291	342	$X^2(1) = 0.3315.$	0.565
Rural	5	38	43		
Total	56	329	385		
ANC booking					
Yes	55	323	378	$X^2(1) = 0.0004.$	0.984
No	1	6	7		
Total	56	329	385		
Inter delivery interval					
≤ 33 months	14	221	235		
>33	8	68	76	$X^2(1) = 13.384.$	0.02 **
Total	22	189	211		
Parity					
Primiparous	34	142	176	$X^2(2) = 5.9823.$	0.05**
Multiparous	20	167	187		
Grand multiparous	2	20	22		
Total	56	329	385		
Gestational age					
Early term	7	45	52		
Full term	17	125	142		
Late term	9	30	39	$X^2(4) = 3.2312.$	0.52
Post term	2	14	16		
9 months of amenorrhea	21	115	136		
Total	56	329	385		
Iron supplementation					
Yes	53	311	364		
No	3	18	21	$X^2(1) = 0.0012.$	0.972
Total	56	329	385		
Deceased fetal movement					
Yes	2	4	6		
No	54	325	379	$X^2(1) = 1.7309.$	0.188**
Total	56	329	385		
Risk of the patient					
High	44	202	246	$X^2(1) = 6.1179.$	0.013 **
Low	12	127	139		
Total	56	329	385		
Oxytocin use					
Yes	6	37	43	$X^2(1) = 0.0136.$	0.907
No	50	229	342		
Total	56	342	385		
Decision to delivery interval					
10 – 20 min	10	4	14	$X^2(2) = 111.552.$	0.000 **
21 – 50 min	43	97	140		
51 – 90 min	1	1	2		
Total	54	102	156		
Incision to delivery interval					
< 10 min	50	71	121	$X^2(1) = 103.076.$	0.000 **
10 – 20 min	3	32	35		
Total	53	103	156		
New onset of complication					
APH	1	7	8		
Shoulder dystocia	0	1	1	$X^2(2) = 0.1992.$	0.905
None	55	321	376		
Total	56	329	385		
Pattern of admission CTG					
Normal	32	283	315	$X^2(2) = 46.2455.$	0.000 **
Suspicious	14	42	56		
Pathologic	10	4	14		
Total	56	329	385		

** Variables which showed significant association.

Discussion

This study shows that about 82% of laboring mothers had normal admission CTG, 14% had suspicious, and the remaining 4% had pathologic admission CTG. A somewhat comparable finding was reported in a study done in the Department of Obstetrics & Gynecology in India, where a 20-minute admission CTG done on 500 laboring mothers showed a normal admission CTG in 80.20%, suspicious in 12.40%, and pathologic in 7.40%[3]. Similarly, a study done in Pakistan in 2006 on 100 high- and low-risk laboring mothers revealed normal admission CTG in 75%, suspicious in 22%, and pathologic in 3% of laboring mothers[16]. However, somewhat different results were noted in another study done in the Department of Obstetrics & Gynecology in India, where 67% of laboring mothers had normal admission CTG, 21% had suspicious, and 12% had pathologic tracing[15]. Also, a prospective study done in India in 2020 showed that about 68% of laboring mothers had normal admission CTG, 21% suspicious, and 11% pathologic admission CTG[17]. Therefore, in the last two studies, we see that the proportion of abnormal admission CTG—which includes suspicious and pathologic—accounts for 33% and 32%, respectively, somewhat higher than the value observed in our study. This difference could be attributed to variations in interpretation of CTG among health professionals. It could also be due to the small number of laboring mothers included in the studies or the sampling methods they used.

The collected data also tend to show that laboring mothers with abnormal admission CTG have a higher rate of operative delivery. For example, about 79% of mothers with pathologic admission CTG, 46% of those with suspicious CTG, and 39% of those with normal CTG ended up in operative delivery. One study conducted in 2019 in Karachi, Pakistan, also showed comparable results: operative delivery was 41% among mothers with normal admission CTG, 57% among those with suspicious CTG, and 92% among those with pathologic CTG. The incidence of vaginal delivery appeared to be higher in the normal group compared to the abnormal group[18].

Regarding the sensitivity, specificity, positive predictive value, negative predictive value, and diagnostic accuracy of admission CTG for ominous or NRFHRP in labor: sensitivity was 42.90%, specificity 86%, PPV 34.30%, NPV 89.80%, and diagnostic accuracy 79.70%. For prediction of low Apgar score, admission CTG had a sensitivity of 75%, specificity of 82.40%, PPV of 4.30%, NPV of 99.60%, and diagnostic accuracy of 82.30%. For NICU admission, CTG had a sensitivity of 23%, specificity of 82.30%, PPV of 15.70%, NPV of 88.30%, and diagnostic accuracy of 75%. Somewhat comparable findings were reported in a study conducted in one of the medical colleges in India, which showed a sensitivity of 53.9%, specificity of 93.35%, PPV of 75.76%, and NPV of 84.04%. This shows that admission CTG can be used with good reliability to detect fetuses who are hypoxic and need continuous monitoring and immediate intervention[6]. Supporting this, a study done in Andhra Pradesh, India, showed the sensitivity, specificity, PPV, NPV, and diagnostic accuracy of admission CTG in detecting fetal distress in labor were 37.20%, 91.62%, 51.60%, 85.60%, and 81.08%, respectively. This shows that CTG has high specificity in predicting fetal distress and good NPV to enable clinicians to accurately exclude fetal distress in an individual patient[17].

The results of this study also appear to show that among patients with normal admission CTG, 0.32% developed low Apgar score, 9.20% developed MSL in labor, 11.70% were admitted to NICU, and 10.20% developed ominous or NRFHRP in labor. Among the 56 patients with suspicious admission CTG, 1.8% developed low Apgar score, 21.4% developed MSL in labor, 14.30% were admitted to NICU, and 25% developed ominous/NRFHRP in labor. Among the pathologic group, 14.30% developed low Apgar score at the first minute, 28.60% developed MSL in labor, 21.45% were admitted to NICU, and 71.40% developed ominous/NRFHRP in labor. The observed findings also show statistically significant associations: development of low Apgar

score with $\chi^2(2) = 25.7923$, $p = 0.000$; development of ominous or NRFHRP in labor with $\chi^2(14) = 41.43$, $p = 0.000$; development of MSL in labor with $\chi^2(2) = 10.89$, $p = 0.04$. However, the findings for NICU admission were not statistically significant: $\chi^2(2) = 1.35$, $p = 0.509$. These findings are comparable to other studies done in India, which showed that fetal distress was common among the pathologic group, accounting for 51.60%, followed by 40% in the suspicious group and 14% in the reactive or normal group. Moderate to thick meconium was seen in 48.38% of the pathologic admission CTG group compared to 33.30% in the suspicious and 10.47% in the normal group, with the association being statistically significant. NICU admission was also higher in the pathologic group (25.80%), followed by 18.33% in the suspicious and 8.90% in the normal group. Similarly, the first-minute Apgar score was <7 in 22.60% of the pathologic group, 15% of the suspicious group, and 6.80% of the normal group (18). Supporting this, another study showed that among patients in the normal admission CTG group, 10.40% developed MSL in labor, 7.4% developed low Apgar score at the fifth minute, and were admitted to NICU. In the suspicious group, 33.30% developed MSL in labor, 28.60% developed low Apgar score, and were admitted to NICU. The pathologic group developed MSL in 75% of cases, and 66.70% developed low Apgar score and NICU admission (19). Hence, similar to these studies, the findings of our study show that occurrence of MSL in labor, development of low Apgar score, and NICU admission appear to be more common in the suspicious and pathologic groups compared to the normal (reactive) group.

Findings of this study show that risk of the patient is associated with NICU admission. This finding is supported by a study done in India in 2021, which showed that high-risk pregnancies are associated with high rates of low Apgar scores and neonatal deaths in the NICU. Similarly, a study done in the Department of Obstetrics & Gynecology in India in 2024 showed that NICU admissions were more frequent in high-risk pregnancies, reaching up to 60%. Another study done in Bengaluru, Karnataka, revealed that the rate of early neonatal death in NICU and long hospital stays were high in high-risk pregnancies [20,21,22]. These findings together support that the risk of the patient at the time of admission is strongly associated with NICU admissions.

Results of this study also found that the pattern of admission CTG is associated with NRFHRP in labor requiring intervention. A study conducted in Nigeria similarly found that CTG abnormalities in labor were more common among mothers with non-reactive admission CTG. Another study done in Sri Lanka stated that mothers with non-reactive admission tests were more likely to develop fetal distress. Supporting this, a study done in India reported that the incidence of fetal distress worsens with abnormal admission tests (23, 24, 25). Therefore, these findings suggest that admission CTGs at the time of admission to the labor ward require due emphasis.

In addition, results of this study suggest that inter-delivery interval is associated with the development of NRFHRP requiring intervention in labor. This finding might be explained by the fact that mothers with short inter-delivery intervals are at risk of developing many adverse pregnancy outcomes such as low birth weight, intrauterine growth restriction, pregnancy-induced hypertension, gestational diabetes, obstetric cholestasis, and scar dehiscence, as evidenced by a study done in New Delhi in 2023[26].

The study also indicated that the decision-to-delivery interval was associated with the development of meconium-stained liquor. In line with this finding, a study done in the northwest part of Ethiopia showed that among the different factors associated with the development of meconium-stained amniotic fluid, one was prolonged labor. A prolonged stressful environment for the fetus might result in increased peristalsis of the fetal gastrointestinal tract and relaxation of the anal sphincter, leading to the passage of meconium[27]. Therefore, this finding might suggest that delay in delivery of the fetus after the decision to deliver

might worsen the fetal condition, as evidenced by the presence of meconium-stained liquor at the time of delivery.

Conclusion and Recommendation

Suspicious and pathologic admission CTG groups had higher rates of meconium-stained liquor, abnormal fetal heart rate patterns, lower Apgar scores, and NICU admissions compared to normal CTG groups. Admission CTG is a useful screening test with good ability to rule out problems but limited sensitivity. It is recommended to do admission CTG for all laboring mothers to identify those needing closer monitoring. Additional tests like fetal scalp pH can help improve detection and reduce unnecessary surgeries. In developing countries like ours, where the issue of availing continuous electronic fetal monitoring for all laboring mothers is difficult, doing admission CTG for all laboring mothers helps in identifying mothers who really need close monitoring in labor.

Abbreviations

CTG – cardiotocography
ENAP – Every Newborn Action Plan
EFM – Electronic Fetal Monitor
FHR – fetal heart rate
IV – intravenous
LAT – labor admission test
L/W – labor ward
NICE – National Institute for Health and Care Excellence
NICU – neonatal intensive care unit
NRFHRP – non-reassuring fetal heart rate pattern
SB – stillbirth
SBR – stillbirth rate
Sn – sensitivity
Sp – specificity
PPV – positive predictive value
NPV – negative predictive value
WHO – World Health Organization
UOG – University of Gondar

Declarations

Data availability

Data sets used or analyzed during this study are available from the corresponding author upon reasonable request.

Competing interest

Authors have no conflict of interest to declare in this study.

Author's contribution

All authors (TG, AE, SB, ZM & TH) participated in the conception, formal analysis, interpretation, supervision, writing of the original draft, and approval of the final manuscript.

Acknowledgement

We would like to thank the University of Gondar, all participants of the study, data collectors, and seniors involved in giving their valuable comments.

Corresponding author:

Tsegaye Gizaw, MD, obstetrics & gynecology
Department of obstetrics & gynecology Eka kotebe General hospital, Addis Ababa, Ethiopia
E-mail:engmedtse@gmail.com

REFERENCES

1. Donald Gibb, Sabaratnum Arulkumaran. Fetal monitoring in practice Toronto; Elsevier, 2008:3rd edition.
2. DiogoAyres-de-campose M, PHD. Electronic fetal monitoring or cardiotocography,50yr's later:. American journal of obstet & gynecol. June 01,2018;218(6):545 -6.
3. R . Kansal, G.Goel, D Mangala,P. Gorg,K.verma,Geetika. Correlation of admission test with neonatal outcome. People's journal of scientific research. 2014;7(1):27- 30.
4. Ingermarson I AS, Ingemarson E,Tambyraja RL,Ratnam SS. :Admission Test:a screening test for fetal distress in labour:. Obest Gynecol. 1986;68(6):800- 6.
5. BlencoweH CS, jassir FB,Say L,Chou D,Mathers C,Hogan D,,Shiekh S,Qureshi ZU,You D,Lawn JE. National ,Regional, and worldwide estimates of stillbirth rates in 2015,with trends from 2000: a systematic analysis. Lancet Glob Health.4:98 -108.
6. Tsegaye Lolaso, Fekede Weldekidan, Tesfaye Abera,Tilahune Mekonnen,Lalisa Chewaka. Stillbirth and associated factors among women delivered in public hospitals,Southwest Ethiopia. Ethiopian Journal of Reproductive Health (EJRH). 2021;13:46-54.
7. Sintayehu Mengesha, Mesay Hailu. Burden of stillbith and associated factors in yigalem hospital,southern Ethiopia. BMC pregnancy and child birth. 2020;20:591. https://doi.org/10.1186/s12884-020-03296-x
8. Lawn J, Shibuya K, Stein C. No cry at birth: global estimates of intrapartum stillbirths and intrapartum-related neonatal deaths. Bulletin of the World Health Organization. 2005;83:409-417.
9. WHO, UNICEF. Ending preventable new born deaths and stillbirths by 2030 Moving faster towards high-quality universal health coverage in 2020-2025.WHO.2020 1(1)
10. Friday Saidi, Grace Chiudzu, Maganizo Chagomerana,Beteniko Milala,Jennifr H Tang. Factors associated with stillbirth among women delivering at a resource limited hospital in Malawi. Obste Gynecol International journal. 2021;12(5):289 -295. DOI: 10.15406/ogij.2021.12.00594
11. Graham EM PS, Christ DK,Fox HE. Intrapartum electronic fetal heart rate monitroring and the prevention of brain injury. Obstet gynecol. 2006;108:656.
12. Joel D.Larma, AnadirM.Silva, Cynthia J.Holcroft, Richard E. Thompson, Pamela etal. Intrapartum electronic fetal monitoring and the identification of metabolic acidosis & HIE. American journal of Obstetrics & Gynecol. 2007; 197(3):301
13. R Kansal, G.Goel, D Mangala,P Gorg. Correlation of admission test with perinatal ootcome. Poeples jounal of scientific research. 2014;7(1):27- 30.
14. Roger k.Freeman,Thomas J.Garite,Michael P.Nageotte,Lisa A.miller.Fetal heart rate monitoring.Philadelphia,PA19103 USA;Lippincot williams & wilkins,2012,4th ed.
15. Dr.Hrishikes Joshi , Dr Akanksha Singh. Role of admission test by CTG as predictor of perinatal outcome: a prospective study. International journal of clinical obstetrics and gynecology 2019;3(2):128- 131. DOI: https://doi.org/10.33545/gynae.2019.v3.i2c.21
16. Shakira perveen Haleema Hashm. Effectiveness of adission test. JDUHS.2007;1 (1):20-25.
17. P.SreeSailaja Ss, R.V.Mansa,Chaduvula Suresh Babu. Admission CTG a screening test to predict perinatal outcome in High & low risk pregnancies. J Evid Based Med healthC 2020;7(37):2000-2004. DOI: 10.18410/jebmh/2020/416
18. Aparna Hegde SK, Sushma Srikishna,V>R Ambiye,P>R.Vaidya. Admission Test: Screening test for prediction of Fetal outcome in Labour. journal of obst. & gyn. of india. 2001;51(2):40-43.
19. Manisha Gupta ,Teena Nagar, Punit Gupta. Role CTG to improve perinatal outcome in high risk pregnancy. International journal of contemporary Medical research. 2015;4(4):853-856.
20. R.Krishaveni.K Saraswathi.Study of maternal& neonatal outcome in high risk pregenancy.Journal of research in medicl & dental scincies.2021;9(6):392-402.
21. Christy Mant,Avita Rose jhonson,Salakha.T.prevalence of high risk pregnancy and its association with adverse maternal & perinatal outcome: a longtudnal study in 25 villages under Sajapur primary health center near Bangalore,India.Int J Reprod Contracept Obstet Gynecol:2025 14(4):1119-1128.
22. Nazish Ali,Syeda Fariha Hussain et al.Perinatal outcome in high risk pregnancy.PJMHS.2020;14(3):1495-1497
23. J.O.Imanulu,F.I.Ani,A.O.olalege,J.O.Sotunsa,A.Akadri,O.O.Adebawojo.patterns of admission cardiotcographyDecisions & associated perinatal outcome in a southern Nigerian teaching Hospital.Annual research & Review in Bilogy,2019;33(2):1-11
24. Edirisuriye Arachihige Dilan Tharindu.Admission CTG:its role in predicting perinataloutcome in Term;uncomplicated(low risk) pregnant womenin spontaneos labor.open journalof obstetrics and Gynecology,2023;12(10):2986-2992

25. Dr.G.P.Nkarunavathi,DR.V.Revathi.DR.k.shymala.Admission test is an evidince based predictor for the assessment for the Feto-maternalwell being and Mode of delivery.IOSR-JDMS.2015;14(30):45-48
26. hetan T.Jani,Shalinisud,Shanti Jeyaseelam.Impact of inter pregnacy interval on maternal & perinatal outcome.International journal of Reproduction,Contraception,obstetrics and gynecology.2023;12(10):2986-2992
27. Dagne Addisu,Azezu Asres,GetnetGedefaw,Simegnew Asmer.Prevalence of meconeium-stained amniotic fluid and its associated factorsamong women who gave birth at term in Felege Hiwot Comprhensive specialized hospital,North west ethiopia:a facillity based cross-sectional study.BMCpregnancy and childbirth.2018;18:249

THE INFLUENCE OF PERCEIVED HIV RISK AND SOCIAL SUPPORT ON WILLINGNESS TO USE PRE EXPOSURE PROPHYLAXIS AMONG PASTORALIST YOUTH IN SOUTHERN ETHIOPIA

Sultan Hussen Hebo[1,2], Mark Spigt[2], Francine Schneider[3]

ABSTRACT

BACKGROUND: Pastoralist youth, whose mobile livelihoods often restrict access to consistent healthcare, face elevated risk of HIV acquisition yet limited engagement with conventional prevention services. Pre-exposure prophylaxis (PrEP) offers a promising biomedical prevention option; however, little is known about the factors influencing PrEP willingness in this marginalized population.

OBJECTIVES: This study aimed to: (i) examine whether HIV risk status, derived through latent class analysis (LCA), predicts willingness to use PrEP; (ii) assess whether perceived HIV risk mediates this association; and (iii) determine whether social support moderates the mediation pathway.

METHODS: A community-based cross-sectional survey was conducted among 638 randomly selected pastoralist youth aged 15–24 years in Southern Ethiopia (April–May 2024). HIV risk status (independent variable) was generated using LCA based on nine HIV risk indicators. Perceived HIV risk (mediator), social support (moderator), and willingness to use PrEP (dependent variable) were measured using interviewer-administered questionnaires. Hypothesized pathways were tested using Hayes' PROCESS macro (Model 4 for mediation; Model 15 for moderated mediation) with 5,000 bootstrap samples.

RESULTS: Overall, 40.4% of participants reported definite willingness to use PrEP. High-risk youth showed significantly greater PrEP willingness than low-risk youth (direct effect, $\beta = 0.92$, $p < 0.001$). Perceived HIV risk partially mediated the association between high HIV risk and PrEP willingness (indirect effect, $\beta = 0.20$, 95% CI 0.10–0.35). Furthermore, social support significantly moderated the perceived-risk PrEP willingness pathway among the high-risk group (index of moderated mediation = 0.21, 95% CI 0.03–0.43), with the mediated effect increasing from 0.12 to 0.35 as social support improved.

CONCLUSION: Our findings indicate that PrEP willingness is higher among pastoralist youth at higher objective HIV risk. This association is partly explained by their perceived HIV risk. Crucially, stronger social support enhances the likelihood that youth who perceive themselves at risk express willingness to use PrEP. These findings underscore the importance of integrating targeted risk communication with community-based support systems to enhance accurate risk perception and promote PrEP uptake among pastoralist youth.

KEYWORDS: HIV prevention; Pre-exposure prophylaxis; Pastoralist youth; HIV risk perception; Social support; Ethiopia

(The Ethiopian Journal of Reproductive Health; 2025; 17; 52-651)

1 Department of Reproductive Health, School of Public Health, Arba Minch University, Arba Minch, Ethiopia

2 Department of Family Medicine, Care and Public Health Research Institute, Maastricht University, Maastricht, Netherlands

3 Department of Health Promotion, Care and Public Health Research Institute, Maastricht University, Maastricht, Netherlands

INTRODUCTION

The global fight against human immunodeficiency virus (HIV) has seen significant advancements, yet the epidemic continues, particularly among adolescents and young people (AYP). Youth aged 15–24 years constitute 22% of the global population yet accounted for over 36% of all new HIV infections in 2022.[1–3] These challenges are particularly acute in sub-Saharan Africa (SSA).[4,5] Ethiopia mirrors this pattern; youth aged 15–24 years comprise 75% of new infections.[6] Progress lags for youth—since 2010, new HIV infections declined just 36% (versus 45% nationally), and AIDS-related deaths fell 50% (versus 82% in adults),[6] underscoring the imperative for youth-specific prevention strategies.

Crucially, HIV risk is not uniformly distributed; marginalized subgroups frequently confront compounded HIV vulnerability due to structural and behavioral factors.[6] Pastoralist youth in Ethiopia—who engage in livestock herding across remote lowland regions—are one such group. Although pastoralist communities inhabit the majority of Ethiopia's landmass, they remain underserved by the national health system.[7] Evidence consistently shows that pastoralist populations experience structural exclusion due to geographic remoteness, livelihood-related mobility, limited formal education, and systemic neglect.[8] These barriers contribute to persistently low access to HIV services and poor intervention coverage. For instance, mobility and weak health infrastructure have contributed to stagnating antiretroviral therapy (ART) coverage in the pastoralist areas.[9,10] Additionally, studies report disproportionately low HIV testing rates and limited comprehensive HIV knowledge among pastoralist youth, indicating reduced engagement in HIV prevention and awareness efforts.[7,8]

Against this backdrop, effective HIV prevention tools like pre-exposure prophylaxis (PrEP) are needed. PrEP—antiretroviral medication taken by HIV-negative individuals—has emerged as a highly effective biomedical intervention for populations at elevated risk.[11] Reflecting its effectiveness, the World Health Organization (WHO) recommends offering PrEP to individuals at substantial risk of HIV acquisition.[12] This strategy is especially relevant for populations with limited autonomy over traditional prevention approaches.[13,14] For pastoralist youth, PrEP offers a uniquely suitable option: an individually controlled prevention method that aligns with their mobility patterns and socio-cultural constraints. However, the success of PrEP relies on consistent adherence, which in turn depends on individuals' willingness to initiate and maintain use.[15] Studies across diverse high-risk populations report widely varying levels of PrEP willingness—from 22% to 90.4%—depending on context-specific barriers and facilitators.[16–25]

Studies show that perceived HIV risk (an individual's belief about their own risk) significantly influences PrEP willingness among youth but often diverges from objective HIV risk (actual HIV risk status measured based on epidemiological risk indicators placing someone at high likelihood of acquiring HIV). For instance, in Malawi, only 26% of adolescent girls and young women (AGYW) with high objective HIV risk perceived themselves at high risk, even though 68% expressed PrEP willingness/interest.[23] This mismatch between objective and perceived risk—well-documented in general youth populations[18,21–24]—likely extends to pastoralist youth, who face elevated actual risks due to factors like mobility, limited healthcare access, and certain socio-cultural practices, yet frequently have low HIV knowledge and misconceptions.[7,10] Among pastoralist communities, commonly held beliefs that HIV is an urban disease, coupled with poor comprehensive knowledge and entrenched misconceptions[25]—such as fears of transmission through casual contact—might create a dangerous cognitive gap: individuals at high objective risk may still perceive low personal risk. This subjective underestimation, more than actual risk, likely diminishes their willingness to use PrEP. Therefore, assessing whether high-risk pastoralist youth perceive their HIV risk is vital; without that awareness, even accessible biomedical interventions may have limited impact.

In influencing youth to perceive their HIV risk and engage in HIV prevention behaviors, social support—encompassing emotional, informational, tangible, and appraisal assistance from family, peers, and the community—plays a vital role.[26] Evidence demonstrates that social support is pivotal in strengthening individuals' understanding of their own HIV risk and motivating protective action.[27] This function is especially crucial where formal healthcare access and information are limited, as supportive networks facilitate the timely exchange of accurate HIV-related information, enabling informed prevention decisions.[28] Given that social support is a malleable factor proven to strengthen networks and improve the uptake of other HIV interventions,[26,29] we hypothesize it will act as a moderator on the pathway from objective HIV risk to PrEP willingness, primarily by enhancing accurate HIV risk perception. Understanding this moderating role holds significant importance for pastoralist youth, who face limited access to conventional prevention services,[7,30] and whose decisions are likely influenced by their collectivist social structures (e.g., clan networks, tribal hierarchies).[31] Consequently, leveraging these existing social dynamics through culturally congruent strategies is essential for designing effective PrEP promotion in pastoral settings.

Taken together, the existing literature reveals three key gaps. First, pastoralist youth remain largely absent from HIV prevention research: little is known about their HIV risk status, perceptions, or intervention access, despite their clear vulnerabilities. Second, even for general youth populations, the misalignment of objective versus perceived HIV risk is a critical problem, which is particularly unaddressed among Ethiopian pastoralists. Finally, the hypothesized influence of social support on the pathway from objective HIV risk to perceived risk and then to PrEP willingness, though critically important, is poorly understood. To fill these gaps, we conducted this study among pastoralist youth in Southern Ethiopia. The overall aim was to understand the interplay of objective HIV risk, risk perception, and social support in shaping PrEP willingness. Specifically, this study aimed to (i) determine if HIV risk status, as derived from latent class analysis, predicts PrEP willingness; (ii) assess whether perceived HIV risk mediates the relationship between HIV risk status and PrEP willingness; and (iii) evaluate if social support moderates the mediation pathway.

Overall, Figure 1 depicts the hypothesized pathways. By clarifying these psychosocial mechanisms in this hard-to-reach population, our purpose is to inform culturally tailored strategies addressing both individual cognition and social context, thereby enhancing PrEP uptake among pastoralist youth.

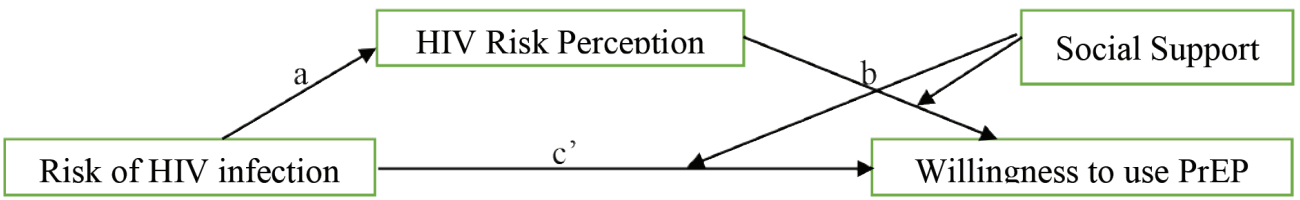


Figure 1: The hypothesized relationships of the study variables and paths (Hayes' PROCESS model 15).

Materials and Methods

Study Design and Period

This study was conducted using a community-based cross-sectional survey between April 1, 2024, and May 28, 2024. This timeframe was chosen because pastoralist communities in the study area tend to be less mobile during this period, making data collection more feasible.

Study Setting and Population

The research took place in the Hammer district, a pastoralist setting in Southern Ethiopia. Pastoralist communities here face unique challenges due to their seasonal movements with livestock. The district includes a mix of livelihoods—pastoral, semi-pastoral, and agrarian—which made it a suitable location for capturing diversity within the broader pastoralist context. From a young age, youth in these areas are involved in herding cattle, sheep, and goats across extensive semi-arid lands, which frequently impacts their ability to access healthcare services.[32]

Our study population comprised pastoralist youth residing in selected kebeles (the smallest administrative units) within the Hammer district. To be included, participants had to: (1) be 15 to 24 years old; (2) identify as part of a Hammer pastoralist community; (3) have lived in a selected kebele for at least the past six months; and (4) provide informed consent (if 18 or older) or assent with parental consent (if under 18). We excluded individuals who were too ill to participate or were not considered members of the pastoralist community.

Sample Size Calculation

The overall target sample size of 641 participants was calculated using the Statulator sample size calculator.[33] This calculation took into account several key parameters to ensure the statistical validity and reliability of our findings. We aimed for a 95% confidence level. We set a margin of error of ±5%, balancing the desire for precision with the practical constraints of data collection. Given the absence of prior studies on similar topics in this specific setting, we assumed a 50% prevalence for our outcome variable, as this maximizes the required sample size for a given level of precision. A design effect of 1.5 was incorporated into the calculation to account for the potential clustering effect inherent in our multi-stage sampling design. Finally, we included a 10% adjustment for potential non-response, anticipating that some selected individuals might refuse to participate or be unavailable for the study.

Sampling Method and Procedure

To ensure a representative sample of pastoralist youth in the Hammer district, we employed a multi-stage stratified sampling design. The Hammer district is comprised of 35 kebeles (administrative units). These kebeles were stratified into three distinct groups based on their primary livelihood type: nomadic, semi-nomadic, and agrarian. This stratification was a critical step, as it allowed us to create homogeneous subgroups within the larger population. We categorized 20 kebeles as nomadic, 10 as semi-nomadic, and 5 as agrarian based on the information we got from the district municipality. Nomadic kebeles are characterized by the constant movement of people and their livestock in search of pasture and water resources. Semi-nomadic kebeles involve seasonal movement, with partial settlement during certain periods of the year, often dictated by agricultural cycles or access to resources. Agrarian kebeles, in contrast, primarily focus on crop cultivation, with limited reliance on livestock herding.[34] Within each of these livelihood strata, we employed a simple random sampling method, using a lottery technique, to select the specific kebeles to be included in our study.

Then, the overall sample size was proportionally allocated to each of the 13 selected kebeles based on their respective youth population sizes. To identify eligible youth within the selected kebeles, we utilized the existing family folders. These folders represent a comprehensive household registry maintained by the local health system and provide detailed demographic information about households in the

area. These family folders served as our sampling frame, providing a list of households within each selected kebele. From the list of eligible households (those containing youth aged 15–24), we employed simple random sampling to select households with eligible youth. In situations where multiple eligible youth resided within a single household, a lottery method was used to randomly select one participant, ensuring that each eligible individual had an equal chance of being included in the study.

Data Collection Methods and Procedures

Data were collected by thirteen trained enumerators and three supervisors, all fluent in the local Hamar language. Prior to fieldwork, they completed a two-day training on the questionnaire, ethical conduct, cultural sensitivity, and handling sensitive topics neutrally. We gathered data using structured questionnaires administered through face-to-face interviews. The questionnaire was initially developed in English, translated into the local language, and then back-translated by an independent expert to check for consistency. The final interviews were conducted using the local language version. Interviews were scheduled at times and places convenient for the participants to foster comfort and open dialogue. To maximize participation, data collectors often visited early in the morning before youth left for herding and in the evening upon their return. Up to three follow-up visits were made for initially unavailable respondents.

Variables and Measurements

Independent Variable: HIV Risk

To identify the participant's objective HIV risk status, we developed a composite measure using latent class analysis (LCA). LCA is a statistical technique that identifies hidden subgroups within a population based on their responses to risk indicators.[35] This approach captured the complex, interrelated nature of HIV risk beyond single HIV risk indicators. Using LCA, we identified three subgroups of HIV risk based on nine HIV risk indicators informed by literature and expert input. The risk indicators included marital status, school enrollment, mobility, HIV knowledge, healthcare access, livelihood type, gender norms (GEM Scale, $\alpha = 0.84$), monthly income, and living arrangement. Based on these, participants were categorized into three HIV risk groups—high, precarious, and low.

Dependent Variable: Willingness to Use PrEP

We measured willingness to use PrEP by presenting a hypothetical scenario where PrEP was available. Participants were then asked: "If PrEP were available to you, how likely would you be willing to use it?" Response options were straightforward: "definitely willing to use" or "definitely not willing to use."[24]

Mediator Variable: Perceived HIV Risk

Perceived HIV risk was measured by asking participants to rate their lifetime chance of getting HIV: "high chance," "small chance," or "no chance."[23]

Moderator Variable: Social Support

We measured social support using the Multidimensional Scale of Perceived Social Support (MSPSS), a widely used and validated instrument in studies involving youth, sexual health, and HIV risk.[36–38] The MSPSS includes 12 items rated on a 5-point Likert scale (1 = strongly disagree to 5 = strongly agree). It assesses perceived support from three sources: family (e.g., "My family is willing to help me make decisions"), friends (e.g., "I can talk about my problems with my friends"), and community/significant others (e.g., "There is a community group that makes me feel valued"). We calculated an overall mean score, with higher scores indicating higher perceived social support. The reliability (Cronbach's alpha) for the MSPSS in our sample was excellent at 0.88.

Data Analysis

All statistical analyses were conducted using IBM SPSS version 28.0 (IBM, Armonk, New York, USA). We began with descriptive statistics (proportions for categorical data, means and standard deviations [SD] for continuous data) and bivariate correlations. Pearson's correlation was used for relationships

between continuous variables, while Spearman's rho was used when categorical variables were involved.

Subsequently, we performed mediation and moderated mediation analyses using the PROCESS macro (v4.2) for SPSS, a powerful tool developed by Andrew Hayes for testing complex models.[3] Specifically, we utilized PROCESS Model 4 to test the mediating role of perceived HIV risk and Model 15 to test the moderated mediation hypothesis involving social support. The moderated mediation analysis examined whether social support influenced the path from perceived risk to PrEP willingness. To illustrate the moderation effect, we examined the relationship at three levels of social support: low (1 SD below the mean), average (mean), and high (1 SD above the mean). We also visualized the interaction effects to show how the influence of HIV risk and perceived risk on PrEP willingness changed across different levels of social support.

To ensure the robustness of our findings, especially for the indirect effects, we employed bootstrapping with 5,000 resamples. This technique provides more reliable confidence intervals (CIs) for mediation and moderated mediation effects. We considered effects statistically significant if their 95% bootstrap CIs did not include zero.

Results

Descriptive results

Our final analysis included 638 pastoralist youth who provided complete data, achieving a high response rate of 99.5% (638/641). The participants' average age was approximately 19 years (Mean = 18.75, SD = 2.9), with a majority (61%) falling in the 15-19 age bracket. The gender distribution was fairly balanced, with 51.7% male and 48.3% female participants. Regarding perceived social support (from family, friends, and community), the average score was 3.25 (SD = 0.62). While 48.6% reported low social support, 47.2% high support, and the remaining 4.2% moderate support.

Strikingly, although latent class analysis classified nearly 40% of pastoralist youth as high HIV risk, only 3.1% perceived themselves to be at high chance of HIV acquisition—revealing a profound disconnect between objective HIV risk status and personal risk awareness. Interestingly, even with this low perceived HIV risk, a substantial proportion (40.4%) stated they would be definitely willing to use PrEP if it were available. (See Table 1)

Table 1 Frequency distribution of participant characteristics (n=638).

Variable	Frequency (%) or Mean (SD)
Age in years (Mean (SD)	18.75 (2.91)
15-19	389 (61.0)
20-24	249 (39.0)
Gender	
Male	330 (51.7)
Female	308 (48.3)
Social support mean score (SD)	3.25 (0.62)
Low social support	310 (48.6)
Medium social support	27 (4.2)
High social support	301 (47.2)
HIV risk perception	
High chance	20(3.13)
Small chance	132(20.69)
No chance	486(76.18)
Willingness to use PrEP	
Definitely willing	258 (40.4)
Definitely not willing	380 (59.6)
HIV risk status	
High-risk	253 (39.7)
Precarious-risk	268 (42.0)
Low-risk	117 (18.3)

Bivariate correlations of main variables

Our analysis of correlations revealed significant positive associations. Willingness to use PrEP was positively correlated with both HIV risk status ($r = 0.18$, $p < .01$) and perceived HIV risk ($r = 0.21$, $p < .01$). Furthermore, HIV risk status was positively correlated with perceived HIV risk ($r = 0.20$, $p < .01$), suggesting some alignment, albeit imperfect, between actual risk status and personal risk perception. Conversely, social support showed significant negative correlations with both perceived HIV risk ($r = -0.10$, $p < .01$) and HIV risk status ($r = -0.11$, $p < .01$). This indicates that youth with higher social support tended to have both lower risk status and lower perceived risk. Notably, there was no significant direct correlation between social support and willingness to use PrEP ($r = 0.02$, $p = .63$). (See Table 2)

Table 2 Bivariate correlations

	1	2	3	4
1) Willingness to use PrEP	-			
2) HIV risk	0.18**	-		
3) HIV risk perception	0.21**	0.20**	-	
4) Social Support	0.02	-0.11**	-0.10**	-

Note: *p < .05; **p < .01; aCorrelations between PrEP interest and risk subgroup membership with other variables were conducted using Spearman's rho. Correlations between all other variables were conducted using Pearson's r.

Mediation effect analysis

We tested a mediation model (Hayes' PROCESS model 4) where perceived HIV risk potentially explains the relationship between HIV risk status and willingness to use PrEP. The results (Table 3) show that being in a higher HIV risk group significantly predicted higher perceived HIV risk. This was true for both the high-risk group (= 0.26, p < 0.001) and the precarious-risk group (= 0.30, p < 0.001), compared to the low-risk group. In turn, higher perceived HIV risk significantly predicted greater willingness to use PrEP, again for both the high-risk group (β = 0.81, p < 0.001) and the precarious-risk group (β = 0.85, p < 0.001).

Examining the direct effect, we found that being in the high-risk group had a significant direct positive effect on willingness to use PrEP (direct effect = 0.92, p < 0.001), even after accounting for perceived risk. However, the direct effect of being in the precarious-risk group on PrEP willingness was not statistically significant (direct effect = 0.33, p = 0.20).

Crucially, the indirect effect of HIV risk on PrEP willingness through perceived HIV risk was significant for both the high-risk group (indirect effect = 0.20, 95% CI: 0.10, 0.35) and the precarious-risk group (indirect effect = 0.23, 95% CI: 0.13, 0.35). These results confirm that perceived HIV risk acts as a mediator. For high-risk individuals, their elevated risk influences PrEP willingness both directly and indirectly through increased risk perception. For those in the precarious-risk group, the link to PrEP willingness operates primarily indirectly – their HIV risk status increases their perceived risk, which then increases their willingness to use PrEP.

Table 3: Mediation Model Estimates (Hayes' PROCESS Model 4) (n = 638).

HIV risk	a (HIV risk→ HIV risk perception)	b (HIV risk perception → PrEP willingness)	c' (HIV risk→ PrEPwillingness)	Mediated effect
	Estimate	Estimate	Estimate	Estimate (95% CI)
Precarious risk	0. 30 ***	0.85 ***	0.33	0.23 (0.13, 0.35)
High risk	0.26 ***	0.81 ***	0.92 ***	0.20 (0.10, 0.35)

Note: CI, 95% confidence interval; result controlled for age and sex; *p < 0.05, **p < 0.01, ***p<0.001.

Moderated mediation effect analysis

We then tested a moderated mediation model (Hayes' PROCESS model 15) to see if social support influenced the relationships found above, specifically the link between perceived risk and PrEP willingness (path b) and the direct link between objective risk and PrEP willingness (path c'). The analysis revealed a significant interaction effect: social support moderated the impact of perceived HIV risk on PrEP willingness (interaction = 0.70, p = 0.01). Social support also moderated the direct effect of being in the high-risk group on PrEP willingness (interaction = 1.12, p < 0.01).

The moderated mediation results (Table 4) further clarified this. Using the index of moderated mediation, we quantified the extent to which the size of the indirect effect (mediation) depends on the level of a moderator variable. The overall index of moderated mediation was significant for both the high-risk group (index = 0.21, 95% Boot CI: 0.03 to 0.43) and the precarious-risk group (index = 0.18, 95% Boot CI: 0.03 to 0.40). Since zero is not included in these confidence intervals, it confirms that social support significantly alters the strength of the indirect effect (mediation) of perceived HIV risk.

Looking at the conditional indirect effects provides more detail. For the high-risk group, the mediating effect of perceived risk was strongest among those with high social support (1 SD above mean; effect = 0.40, 95% Boot CI = 0.22, 0.65) and weaker, though still significant, among those with low social support (1 SD below mean; effect = 0.14, 95% Boot CI = 0.01, 0.28). A similar pattern emerged for the precarious-risk group: the positive influence of perceived risk on PrEP willingness was amplified at higher levels of social support. Figure 3 visually confirms these patterns, illustrating that as social support increases, the pathway from HIV risk status through perceived risk to PrEP willingness becomes stronger for both high-risk and precarious-risk youth.

Table 4: Moderated Mediation Model Estimates (Hayes' PROCESS Model 15) (n = 638)

	Willingness to use PrEP	
	Precarious risk group	**High-risk group**
Conditional direct effects	**Effect**	**Effect**
Low social support	1.16**	1.63***
Medium social support	0.47	1.12***
High social support	-0.22	0.61
Conditional indirect effects	**Effect (95% CI (Boot))**	**Effect (95% CI (Boot))**
Low social support	0.14 (0.01, 0.28)	0.12 (0.01, 0.27)
Medium social support	0.27 (0.015, 0.42)	0.23 (0.11, 0.40)
High social support	0.40 (0.22, 0.65)	0.35 (0.16, 0.62)
Index of moderated mediation	**Index (95% CI (Boot))**	**Index (95% CI(Boot))**
Social support	0.21 (0.03, 0.43)	0.18 (0.03, 0.40)

Note: Medium social support is indicated by the mean, while low social support is one standard deviation below the mean, and high social support is the maximum value 1; CI, 95% confidence interval; Boot, Bootstrap sample size = 5,000; Results controlled for age and sex; *p < 0.05, **p < 0.01, ***p<0.001.

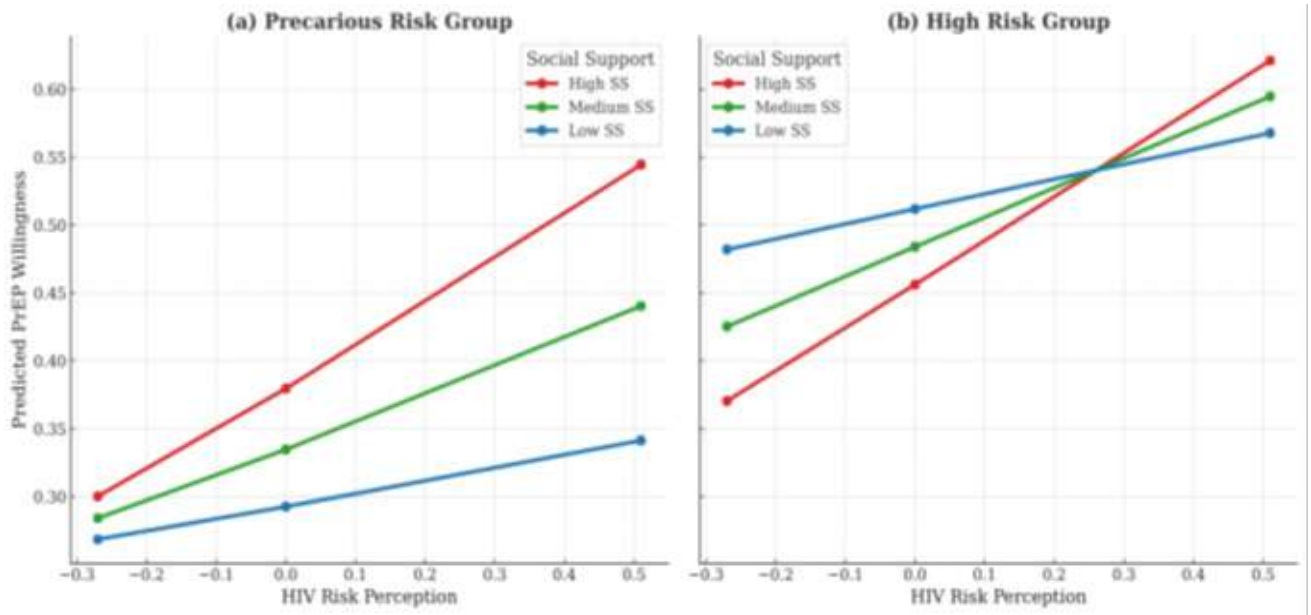


Figure 2: Predicted PrEP willingness as a function of HIV risk perception at different levels of social support in the precarious risk group (a) and high-risk group (b) of pastoralist youth in southern Ethiopia, 2024.

Note: Social support levels are defined as low ss (1 SD below the mean), medium ss (mean), and high ss (1 SD above the mean).

Discussion

This research assessed the factors influencing PrEP willingness among pastoralist youth in Southern Ethiopia, focusing on perceived HIV risk and social support. Our key findings indicate that a considerable portion (40.4%) of these young people expressed willingness to use PrEP. Those objectively classified as having higher HIV risk were indeed more inclined to consider PrEP, and this link was partly channeled through their personal perception of risk. Importantly, social support emerged as a crucial amplifier: higher levels of support strengthened the connection between perceived risk and the willingness to use PrEP. Youth with strong social networks were better able to translate their sense of risk into a readiness for prevention.

The finding that 40.4% of pastoralist youth are willing to use PrEP is significant, especially given the known difficulties in connecting marginalized groups like pastoralists with formal health services.[7] This level of willingness surpasses reports from youth studies in Kisumu, Kenya (30%)[40] and among Black and Latino youth in the US (22%).[22] However, it falls short of willingness levels seen in other African contexts, such as Uganda (86.4%)[24], South Africa (49%)[41], and Nigeria (50.2%).[21] These variations likely stem from differences in study populations and settings; many comparison studies occurred in urban areas. The unique challenges faced by Southern Ethiopian pastoralists, including limited healthcare access and information flow, must be considered. Despite these hurdles and the fact that very few (3.1%) participants perceived themselves as high risk, the expressed willingness suggests a latent demand for PrEP. With tailored information, culturally attuned messaging, and improved service access, PrEP uptake could potentially increase significantly among this population.

Our study revealed that being in the high HIV risk group directly boosted PrEP willingness, but this direct link wasn't seen for the precarious-risk group. This distinction underscores how different levels of objective risk translate into prevention interest. High-risk individuals seem more directly receptive, possibly because existing (though limited) interventions might already target them, raising awareness about risk and prevention options like PrEP, thus directly influencing willingness.[23] Those in the precarious-risk category, however, might not feel the same urgency or awareness. Reaching

them likely requires different strategies, focusing on enhancing their understanding of personal risk and PrEP's benefits. Personalized or community-anchored approaches could prove particularly effective for this group.[42]

We identified perceived HIV risk as a key mediator connecting objective risk status to PrEP willingness. This means that being at higher objective risk influences PrEP willingness partly because it increases an individual's feeling of being at risk. This aligns well with findings from other studies highlighting the critical role of risk perception in driving HIV prevention behaviors.[24,25,43–45] Research by Hill et al. (2019) similarly found perceived risk partially mediated the link between objective risk and PrEP interest. The fact that this mediation occurred for both high-risk and precarious-risk youth suggests it's a fundamental psychological pathway. Interventions aimed at improving accurate risk perception could therefore be valuable in motivating PrEP consideration across different risk levels.[23,45]

A crucial finding was the moderating role of social support. The positive relationship between perceived risk and PrEP willingness was significantly stronger for youth reporting higher social support. Essentially, having supportive family, friends, or community members helped youth convert their awareness of risk into a concrete willingness to adopt PrEP. This resonates with the Stress-Buffering Hypothesis,[46] which suggests social connections can cushion the negative effects of stressors (like perceived health threats) on well-being and behavior. Social support might alleviate the anxiety linked to acknowledging HIV risk, empowering individuals to take proactive preventive steps.[47] Given the strong community bonds in pastoralist societies, leveraging these existing social networks seems a promising strategy. Interventions that engage community leaders, peers, and families to endorse and support PrEP use could effectively enhance willingness by bolstering accurate risk perception and providing encouragement.

While offering valuable insights, this study has limitations that require cautious interpretation. First, PrEP was not available in the study area during data collection, and awareness was low. Responses about willingness were therefore hypothetical and might underestimate actual uptake if PrEP were readily accessible. We believe this lack of real-world experience likely made participants more conservative in their responses. Although we provided standardized PrEP explanations to mitigate misinterpretation, the lack of direct experience limits the generalizability of our findings to settings where PrEP is accessible. Second, self-reported PrEP willingness and risk perception could be subject to social desirability bias, where participants give answers they deem more acceptable. We stressed confidentiality and the absence of "right" or "wrong" answers to minimize this, but it cannot be entirely eliminated. Third, we measured perceived HIV risk with a single-item question, which, while straightforward, may insufficiently capture the multidimensional nature of risk perception. This may have influenced our mediation results, potentially underestimating or oversimplifying the psychological processes linking HIV risk status and PrEP willingness. Future research should employ multi-item, validated scales to more fully characterize perceived risk. Finally, the cross-sectional design allows us to identify associations but not establish causality. We can see relationships between risk, perception, support, and willingness, but we cannot definitively say which causes which.

Conclusions and Recommendations

Our findings demonstrate that HIV risk status significantly predicts PrEP willingness, and that this effect is partially mediated by perceived HIV risk—youth who recognize their HIV risk show greater willingness to use PrEP. Moreover, strong social support further amplifies this pathway, enabling risk-aware youth to act on their willingness to use PrEP.

Based on these findings, we recommend a two-pronged HIV prevention approach for pastoralist youth that addresses both individual risk perception

and social context. First, targeted education should provide clear, culturally relevant information on HIV transmission and PrEP, linking specific behaviors to risk to support accurate self-assessment. Second, programs should strengthen existing social support systems by engaging community figures—such as elders, peer educators, and family members—to foster environments that promote PrEP uptake. Future research should use longitudinal designs to track PrEP initiation and adherence.

Acknowledgements
We sincerely thank the young pastoralist participants (ages 15–24) for their valuable insights, and the Hammer District Health Office for their support and ensuring our team's safety. Special thanks to Mr. Aklilu Defaru.

Author Contributions
All authors contributed equally to the conception and design of the study, data acquisition, analysis, and interpretation.

Funding
This research was supported by Arba Minch University under Grant number GOV/AMU/PhDMast/TH3/CMHS/PH/RCO/04/15.

Ethical approval
Ethical approval for this study was granted by the Institutional Ethical Review Board (IRB) of Arba Minch University (Protocol Number: SH23137, Ref No: IRB/23137/2024). The consent process involved multiple stakeholders. Verbal informed consent was first obtained from district and village administrators. For participants aged 18 and older, written informed consent was collected directly. For participants under 18, both parental or guardian consent and the adolescent's assent were obtained to ethical protocols for minors.

Conflict of Interest
The authors declare no conflicts of interest. The funders of the study had no role in the study's design, data collection, analysis, manuscript preparation, or the decision to publish.

Data Availability Statement
The data that support the findings of this study are available from the corresponding author upon reasonable request by qualified researchers.

Correspondent Author: Sultan Hussen Hebo,
E-mail: Sultanhussn@gmail.com,
m.spigt@maastrichtuniversity.nl (Mark Spigt),
francine.schneider@maastrichtuniversity.nl
(Francine Schneider)
Phone: +251-933-53-95-05

REFERENCES

1. World Health Organization. HIV [Internet]. Geneva: WHO; 2025 [cited 2025 Jun 15]. Available from: https://www.who.int/news-room/fact-sheets/detail/hiv-aids
2. UNICEF. Adolescent HIV prevention [Internet]. New York: UNICEF; 2025 [cited 2023 Jun 11]. Available from: https://data.unicef.org/topic/hivaids/adolescents-young-people/
3. The Partnership for Maternal, Newborn & Child Health. As world marks arrival of 8 Billionth citizen, the largest ever generation of youth call for change [press release] [Internet]. Geneva: PMNCH; 2022 Nov 18 [cited 2025 Jun 10]. Available from: https://pmnch.who.int/news-and-events/news/item/18-11-2022-as-world-marks-arrival-of-8-billionth-citizen-the-largest-ever-generation-of-youth-call-for-change
4. UNAIDS. The path that ends AIDS: UNAIDS global AIDS update 2023 [Internet]. Geneva: UNAIDS; 2023 [cited 2025 Jan 19]. Available from: https://www.unaids.org/en/resources/documents/2023/global-aids-update-2023
5. Cowden RG, Tucker LA, Govender K. Conceptual pathways to HIV risk in Eastern and Southern Africa. In: Govender K, Poku NK, editors. Preventing HIV among young people in southern and eastern Africa. London: Routledge; 2020. p. 31-47.
6. Federal HIV/AIDS Prevention and Control Office. Gender-transformative HIV response for Ethiopia: addressing strategic interests and specific needs [Internet]. Addis Ababa: FHAPCO; 2021 [cited 2025 Jun 20]. Available from: https://africa.unwomen.org/sites/default/files/2022-02/gender%20transformative%20hiv%20response%20for%20ethiopia.pdf
7. Zepro NB, Ali NT, Tarr N, Medhanyie AA, Paris DH, Probst-Hensch N, et al. Sexual and reproductive health services use among adolescents in pastoralist settings, northeastern Ethiopia. BMC Health Serv Res. 2023;23(1):677.
8. Gammino VM, Diaz MR, Pallas SW, Greenleaf AR, Kurnit MR. Health services uptake among nomadic pastoralist populations in Africa: a systematic review of the literature. PLoS Negl Trop Dis. 2020;14(7):e0008474.
9. Zinsstag J, Ould Taleb M, Craig PS. Health of nomadic pastoralists: new approaches towards equity effectiveness. Trop Med Int Health. 2006;11(5):565-8.
10. Jumare J, Habib AG, Gebi U, Zoakah A, Dakum P, Farley J, et al. Migration, pastoralists, HIV infection and access to care: the nomadic Fulani of Northern Nigeria. J Acquir Immune Defic Syndr. 2009;51(2):251.
11. Owens DK, Davidson KW, Krist AH, Barry MJ, Cabana M, Caughey AB, et al. Preexposure prophylaxis for the prevention of HIV infection: US Preventive Services Task Force recommendation statement. JAMA. 2019;321(22):2203-13.
12. World Health Organization. Pre-exposure prophylaxis (PrEP) [Internet]. Geneva: WHO; 2023 [cited 2025 Feb 1]. Available from: https://www.who.int/teams/global-hiv-hepatitis-and-stis-programmes/hiv/prevention/pre-exposure-prophylaxis
13. Baeten JM, Donnell D, Ndase P, Mugo NR, Campbell JD, Wangisi J, et al. Antiretroviral prophylaxis for HIV prevention in heterosexual men and women. N Engl J Med. 2012;367(5):399-410.
14. Thigpen MC, Kebaabetswe PM, Paxton LA, Smith DK, Rose CE, Segolodi TM, et al. Antiretroviral preexposure prophylaxis for heterosexual HIV transmission in Botswana. N Engl J Med. 2012;367(5):423-34.
15. Centers for Disease Control and Prevention. Pre-exposure prophylaxis (PrEP) [Internet]. Atlanta: CDC; 2022 [cited 2025 Jan 9]. Available from: https://www.cdc.gov/hiv/risk/prep/index.html
16. Ferrer L, Folch C, Fernandez-Davila P, Garcia A, Morales A, Belda J, et al. Awareness of pre-exposure prophylaxis for HIV, willingness to use it and potential barriers or facilitators to uptake among men who have sex with men in Spain. AIDS Behav. 2016;20:1423-33.
17. Gordián-Arroyo A, Garofalo R, Kuhns LM, Pearson C, Bruce J, Batey DS, et al. Awareness, willingness, and perceived efficacy of Pre-exposure Prophylaxis among adolescent sexual minority males. J Urban Health. 2020;97:749-57.
18. Holloway IW, Tan D, Gildner JL, Beougher SC, Pulsipher C, Montoya JA, et al. Facilitators and barriers to pre-exposure prophylaxis willingness among young men who have sex with men who use geosocial networking applications in California. AIDS Patient Care STDS. 2017;31(12):517-27.
19. Lee YC, Chang SY, Lin KY, Chang LH, Liu WC, Wu CH, et al. Awareness and willingness towards pre-exposure prophylaxis against HIV infection among individuals seeking voluntary counselling and testing for HIV in Taiwan: a cross-sectional questionnaire survey. BMJ Open. 2017;7(10):e015142.
20. Peng L, Cao W, Gu J, Hao C, Li J, Wei D, et al. Willingness to use and adhere to HIV pre-exposure prophylaxis (PrEP) among men who have sex with men (MSM) in China. Int J Environ Res Public Health. 2019;16(14):2620.
21. Gbaja-Biamila T, Obiezu-Umeh C, Nwaozuru U, Rosenberg NE, Igbokwe M, Oladele D, et al. Awareness of, willingness to use, and experiences with Pre-exposure prophylaxis among youth in Nigeria. BMC Health Serv Res. 2024;24(1):1-10.

22. Taggart T, Liang Y, Pina P, Albritton T. Awareness of and willingness to use PrEP among Black and Latinx adolescents residing in higher prevalence areas in the United States. PLoS One. 2020;15(7):e0234821.
23. Hill LM, Maseko B, Chagomerana M, Hosseinipour MC, Bekker LG, Pettifor A, et al. HIV risk, risk perception, and PrEP interest among adolescent girls and young women in Lilongwe, Malawi: operationalizing the PrEP cascade. J Int AIDS Soc. 2020;23:e25502.
24. Agwang W, Nangendo J, Nabikande S, Okello T, Tusabe J, Semitala FC, et al. Factors associated with willingness to take Pre-Exposure Prophylaxis (PrEP) among high-risk adolescent boys and young men in Masese fishing community, Uganda. PLOS Glob Public Health. 2023;3(6):e0001191.
25. Serbessa MK. Vulnerability to HIV infection among the Borana pastoral community of Southern Ethiopia: a persisting challenge. HIV AIDS (Auckl). 2019; 11:69–76.
26. Qiao S, Li X, Stanton B. Social support and HIV-related risk behaviors: a systematic review of the global literature. AIDS Behav. 2014;18:419-41.
27. Warzywoda S, Fowler JA, Dyda A, Fitzgerald L, Mullens AB, Dean JA. Pre-exposure prophylaxis access, uptake and usage by young people: a systematic review of barriers and facilitators. Ther Adv Infect Dis. 2024;11:20499361241303415.
28. Chen-Charles J, Davey DJ, Toska E, Seeley J, Bekker LG. PrEP Uptake and Utilisation Among Adolescent Girls and Young Women in Sub-Saharan Africa: A Scoping Review. AIDS Behav. 2025 Feb 28:1-21.
29. Parcesepe AM, Filiatreau LM, Gomez A, Ebasone PV, Dzudie A, Pence BW, et al. HIV-related stigma, social support, and symptoms of mental health disorders among people with HIV initiating HIV care in Cameroon. AIDS Patient Care STDS. 2023;37(3):146-54.
30. Ngadaya E, Kimaro G, Kahwa A, Mnyambwa NP, Shemaghembe E, Mwenyeheri T, et al. Knowledge, awareness and use of HIV services among the youth from nomadic and agricultural communities in Tanzania. 2021;11(2):69-74.
31. Yazew BT, Kassa G. Social structure and clan group networks of Afar pastorals along the Lower Awash Valley. Humanit Soc Sci Commun. 2024;11:1-20.
32. Alemneh A, Alemu A. Pastoralism and conflict transformation in Nyangatom, hammer, and dassanech community of Ethiopia. J Soc Transform Reg Dev. 2023;5(2).
33. Dhand NK, Khatkar MS. Statulator: an online statistical calculator [Internet]. 2014 [cited 2024 Jan 2]. Available from: https://statulator.com/SampleSize/ss1P.html
34. Little MA. Pastoralism. In: Muehlenbein MP, editor. Basics in human evolution. London: Academic Press; 2015. p. 337-47.
35. Raykov T, Harrison M, Marcoulides GA. Examining class separation contribution by observed indicators in latent class models: A multiple testing procedure. Struct Equ Modeling. 2019;27(1):88-96.
36. Zimet GD, Dahlem NW, Zimet SG, Farley GK. The multidimensional scale of perceived social support. J Pers Assess. 1988;52(1):30-41.
37. Zakiei A, Norouzi E, Ghasemi SR, Komasi S, Rostampour M, Khazaie H. Controlling risky behavior associated with AIDS: the role of social support, family functioning, self-efficacy and AIDS risk perception. BMC Psychol. 2022;10(1):132.
38. Banstola RS, Ogino T, Inoue S. Self-esteem, perceived social support, social capital, and risk-behavior among urban high school adolescents in Nepal. SSM Popul Health. 2020;11:100570.
39. Hayes AF. Introduction to mediation, moderation, and conditional process analysis: A regression-based approach. New York: Guilford Publications; 2017.
40. Ngere SH, Aduda DO, Nyambuga CO, Oduor PA, Awuoche HA, Nyanjom MA, et al. Exposure and predictors of intention to use HIV pre-exposure prophylaxis (PrEP) among adolescent girls and young women: assessment of Jipende JiPrEP campaign in Kisumu, Kenya. PAMJ One Health. 2021;4(3).
41. Shamu S, Shamu P, Khupakonke S, Farirai T, Chidarikire T, Guloba G, et al. Pre-exposure prophylaxis (PrEP) awareness, attitudes and uptake willingness among young people: gender differences and associated factors in two South African districts. Glob Health Action. 2021;14(1):1886455.
42. Eisingerich AB, Wheelock A, Gomez GB, Garnett GP, Dybul MR, Piot PK. Attitudes and acceptance of oral and parenteral HIV preexposure prophylaxis among potential user groups: a multinational study. PLoS One. 2012;7(1):e28238.
43. Peng P, Su S, Fairley CK, Chu M, Jiang S, Zhuang X, et al. A global estimate of the acceptability of pre-exposure prophylaxis for HIV among men who have sex with men: a systematic review and meta-analysis. AIDS Behav. 2018;22:1063-74.
44. Rankin KA. Is Risk Compensation Real? The Effect of Perceived Level of HIV Acquisition on Risk Behavior in a Pilot Pre-exposure Prophylaxis Demonstration Project in Men Who Have Sex with Men in Malaysia [dissertation]. New Haven (CT): Yale University; 2023.
45. Krajewski T, LeMasters KH, Oser CB, Brinkley-Rubinstein L. Perceived versus actual HIV risk among PrEP indicated persons with criminal legal involvement. AIDS Care. 2024:1-10.

46. Cohen S, Wills TA. Stress, social support, and the buffering hypothesis. Psychol Bull. 1985;98(2):310-57.
47. Uchino BN. Social support and health: A review of physiological processes potentially underlying links to disease outcomes. J Behav Med. 2006;29(4):377-87.

ATTITUDE AND ITS PREDICTORS TOWARDS SEXUAL AND REPRODUCTIVE HEALTH SERVICE AMONG PODOCONIOSIS PATIENTS IN WOLAITA ZONE, SOUTH ETHIOPIA

Temesgen Lera Abiso[1], Amene Abebe Kerbo[1], Eskinder Wolka Woticha[1], Temesgen Anjulo Ager[2,3]

ABSTRACT

BACKGROUND: Sexual and reproductive health (SRH) refers to the comprehensive well-being of individuals in matters concerning sexuality and reproduction. Despite the integration of SRH into primary healthcare frameworks, billions globally still lack access to fundamental reproductive health services. Perception and attitudes significantly shape individuals' willingness to utilize these services. This study aimed to assess attitudes and influencing factors related to SRH service among individuals living with podoconiosis in Wolaita Zone, South Ethiopia.

METHODS: This study employed a community-based cross-sectional design involving 836 podoconiosis patients of reproductive age, selected using a multistage random sampling approach. Attitude data were collected via a five-term Likert scale questionnaire, yielding a Cronbach's alpha of 0.884 for internal reliability. Bivariable and multivariable logistic regression analyses were used to identify associations, with significance declared at $p < 0.05$ with a 95% confidence interval (CI).

RESULTS: Among the participants, 59.7% (95% CI: 56.4%–63.0%) demonstrated a positive attitude toward SRH services. Factors significantly associated with favorable attitudes included being female (AOR = 1.64; 95% CI: 1.08–2.49), urban residency (AOR = 8.85; 95% CI: 5.54–14.1), lack of stigma (AOR = 1.60; 95% CI: 1.10–2.34), family awareness of the disease etiology (AOR = 2.16; 95% CI: 1.08–4.32), routine health service use (AOR = 3.32; 95% CI: 2.04–5.44), prior use of SRH services (AOR = 10.0; 95% CI: 5.93–16.98), ability to move from place to place (AOR = 2.75; 95% CI: 1.37–5.56), and living with the disease for 1–5 years (AOR = 0.41; 95% CI: 0.20–0.82).

CONCLUSION: The majority of participants exhibited a supportive attitude toward SRH services. Key drivers of positive attitude included sociodemographic factors, health-seeking behavior, lack of stigma, and awareness of the cause of disease etiology. Targeted interventions should prioritize rural outreach, gender-sensitive strategies, and early engagement of newly diagnosed patients to improve SRH outcomes among podoconiosis-affected populations.

KEYWORDS: Attitude; reproductive age; sexual and reproductive health; health services; South Ethiopia (The

Ethiopian Journal of Reproductive Health; 2025; 17; 66-77)

1 School of Public Health, College of Medicine and Health sciences, Wolaita Sodo University, Wolaita, Ethiopia

2 Public Health Research Program, School of Public Health, Walailak University, Nakhon Si Thamarata, Thailand

3 Wolaita Sodo University Colleges of Medicine and Health Sciences, Wolaita Sodo, Ethiopia

INTRODUCTION

The concept of SRH encompasses a comprehensive view of individuals' health across the life span, incorporating access to family planning, maternal care, sexually transmitted infection (STI) prevention, and reproductive counseling[1].

SRH extends beyond specific reproductive issues, encompassing the complete well-being of individuals in all matters related to sexuality and the reproductive system[2].

Ensuring equitable access to SRH services is integral to realizing the Sustainable Development Goals (SDG Target 3.7), where reproductive rights are acknowledged as core to human dignity and global development[3].

A holistic approach to SRH ensures that individuals' needs are met throughout their reproductive lives[4]. Even though SRH services are part of global health priorities and often included in national health systems, around 4.3 billion people remain without access to fundamental services such as antenatal care, contraception, and safe abortions, particularly in low-resource settings[5].

Achieving universal access to SRH services is critical to meeting the Sustainable Development Goals (SDGs) by 2030, as SRH is recognized as a fundamental human right[6,7]. However, despite international commitments and agreements, significant gaps remain, and many men and women continue to face unmet SRH needs[7–9]. Among those most affected are people living with podoconiosis, who encounter multiple barriers in accessing SRH services[10].

Podoconiosis is a non-infectious form of lower limb lymphoedema triggered by prolonged barefoot contact with mineral-rich volcanic soil[11]. Although preventable, it results in chronic swelling, pain, and deformity, often accompanied by social stigma and psychological distress[12,13]. Misconceptions about its origins, such as beliefs in heredity or contagion, compound the isolation of affected individuals, who may avoid seeking health services, including those related to SRH[14]. Physical disability and misconceptions about podoconiosis—such as beliefs about contagion or heredity—often contribute to delays or avoidance in seeking healthcare, including SRH services. This avoidance increases vulnerability to poor reproductive health outcomes[15].

Podoconiosis remains a significant public health issue, affecting over four million individuals across 32 endemic countries, primarily in Sub-Saharan Africa, but also in parts of Asia and Latin America[16]. Ethiopia bears the greatest burden, with more than 1.5 million confirmed cases and approximately 35 million people at risk, particularly in highland regions where barefoot exposure to irritant soil is common[17]. In these areas, where poverty is widespread, subsistence farming is the norm, and protective footwear is often unaffordable, prevalence rates can reach as high as 10%[18,19].

Comprehensive SRH services include education, counseling, family planning, antenatal and postnatal care, safe delivery and abortion services, and testing and treatment of STIs including HIV[20.] However, the use of these services is closely tied to individuals' attitudes, how they perceive their need for care, their trust in the healthcare system, and the cultural beliefs they hold[21]. Attitudes, shaped by both personal experience and community norms, strongly influence whether individuals choose to engage with available health sources[22,23].

A favorable outlook tends to correlate with greater utilization of SRH services, while negative perceptions can lead to avoidance or delay in seeking care, increasing the risk of negative outcomes[24]. For podoconiosis patients, these challenges are compounded by physical disability and stigma, creating significant hurdles to SRH service access.

Despite the critical role of individual attitudes in SRH service utilization, little is known about attitudes and their determinants among podoconiosis patients in Ethiopia. Understanding these factors is essential to inform interventions that promote equitable access to SRH services and improve reproductive health outcomes in this vulnerable population. Therefore, this study aimed to assess attitudes and their predictors regarding SRH service utilization among podoconiosis patients in Wolaita Zone, South Ethiopia.

Methods and Materials

Study setting

The study was conducted in Wolaita Zone, one of twelve administrative zones in South Ethiopia, located about 324 km from Addis Ababa.The zone comprises 22 districts and 7 town administrations, with Wolaita Sodo as its administrative center. It is highly endemic for podoconiosis. Geographically, Wolaita is bordered by Gamo and Gofa zones (south), the Omo River and Dawuro (west), Kembata (northwest), Hadiya (north), Oromia (northeast), Lake Abaya (southeast), and the Bilate River separating it from Sidama (east). Covering approximately 451,171 hectares, it has a population of 2.86 million (1.4 million males and 1.45 million females) across 414,192 households in 369 kebeles (290 rural, 79 urban). The health infrastructure includes 362 health posts, 69 health centers, and 11 hospitals (8 government primary, 2 NGO primary, 1 NGO general, and 1 comprehensive specialized hospital). Currently, 14,888 podoconiosis cases are registered in the zone[25].

Study design

A community-based cross-sectional study was employed from November 12 to December 20, 2024.

Source population and eligibility

The source population consisted of reproductive-age podoconiosis patients, women aged 15–49 and men aged 15–64, who had resided in the selected districts for at least six months. Those who were severely ill, unable to communicate, or suffering from mental illness that hindered participation were excluded.

Sample size and sampling procedure

A sample size of 845 was determined using a single population proportion formula, assuming a 50% prevalence of SRH service utilization (due to lack of prior data), a 5% margin of error, 95% confidence level, and a design effect of 2, with an added 10% non-response rate. Five districts with the highest podoconiosis prevalence—Damot Gale, Sodo Zuria, Humbo, Hobicha, and Offa—were randomly selected. Eligible participants were then chosen via simple random sampling from registration lists at health posts, with household-level interviews conducted accordingly.

Data collection procedure

Data were collected using an interviewer-administered, semi-structured questionnaire through the Kobo Collect application on smartphones. Trained public health professionals conducted face-to-face interviews under close supervision. Data collectors were guided to participants' homes by community health workers. In households with multiple eligible individuals, one was selected via lottery.

Data quality management

A pre-test was conducted on 5% of the sample in a non-study district to refine the tool. Data collectors and supervisors received training on ethical procedures, question interpretation, and use of Kobo Collect. Supervisors and the principal investigator reviewed data daily for accuracy, completeness, and response time. Regular debriefing addressed field-level issues promptly.

Data analysis procedures

The collected data were exported to STATA version 14 for cleaning, recoding, and analysis. Descriptive statistics such as median, standard deviation, and percentages summarized the demographic and clinical characteristics. Bivariable logistic regression identified candidate variables at p-value < 0.25, which were then included in the multivariable model to control for confounding. Adjusted odds ratios (AORs) with 95% confidence intervals were calculated. A p-value < 0.05 was considered statistically significant. Model fitness was checked using the Hosmer-Lemeshow test.

Measurement and operational definitions

Attitude towards SRH: Measured by a seven-item Likert scale (1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, and 5 = strongly agree). A score

above the mean indicated a favorable attitude; below indicated unfavorable (26). Internal consistency was strong with Cronbach's alpha at 0.884.

Sexual and reproductive health service utilization: The use of one or more comprehensive SRH services such as family planning, antenatal care, delivery service, postnatal care, post-abortion service, HIV testing and counseling service, STI and HIV treatment service, etc.[27].

Accessibility: Refers to non-discrimination in access, physical accessibility of health facilities, economic accessibility (affordability), and information accessibility[28].

Wealth index: Principal Component Analysis (PCA) was employed to generate a composite variable representing household wealth status. Household asset ownership was assessed using tools adapted from the Ethiopian Demographic and Health Survey (EDHS), with adjustments made to reflect both rural and urban contexts. To account for contextual differences in asset ownership, wealth scores were calculated separately for rural and urban households. These scores were then combined, and households were classified into three wealth categories: poor, middle, and rich.

Result

Socio-demographic and economic characteristics of Podoconiosis patients

Out of 845 podoconiosis patients identified for the study, 836 participated, resulting in a response rate of 98.93%. Among the included patients 306(36.6%) were male and 530(63.4%) were female. Regarding the age of participants, 401(48%) were under the age category of 35-44 and 185(22.1%) were between the age 25-34. Majority of the study participants 454(54.3%) had no formal education and 639(76.4%) were married (Table 1).

Table1: Socio-demographic Characteristics of podoconiosis patients in Woliata Zone, South Ethiopia, 2024 (n=836).

Socio-demographic characteristics	Description	Frequency (%)
Sex of the participant	Male	306(36.6)
	Female	530(63.4)
Age of the participants	18-29	117(14)
	30-34	115(13.7)
	35-39	226(27.03)
	40-44	196(23.44)
	≥45	182(21.77)
Educational status of respondent	No formal education	454(54.3)
	Primary education	297(35.5)
	Secondary and above	85(10.2)
Occupational status of the respondent	Farmer	755(90.3)
	Merchant	51(6.1)
	Government & private worker	30(3.59)
Marital status of the respondent	Married	639(76.4)
	Single	58(6.9)
	Divorce	22(2.6)
	Widowed	117(14)
Educational status of the partner	No formal education	392(46.9)
	Primary	181(21.7)
	Secondary and above	66(7.9)
Occupational status of the partner	Farmer	597(93.43)
	Merchant	21(3.29)
	Government and private worker	21(3.29)
Wealth index	Poor	335(40)
	Middle	336(40.2)
	Rich	165(19.7)
Residence	Rural	503(60.2)
	Urban	333(39.8)

Disease related characteristics among podoconiosis patients

From the total 836 respondents included in this study, 194(23.2%) lived for 1-5 years with the disease, 266(31.82%) lived with the disease 6-10 years. Majority of the respondents 488(57.5%) had more than one acute attack in the last 12 months and 169(20.2%) of the participants had at least one family member with the disease. Majority of the participants families 482(57.7%) had awareness about the cause the disease (Refer Table 2).

Table 2: Disease related characteristics of podoconiosis patients in Wolaita Zone, South Ethiopia, 2024 (n=836)

Characteristics	Description	Frequency	Percent (%)
Years lived with the disease	1-5 years	194	23.2
	6-10 years	266	31.82
	11-15	160	19.14
	16-20	117	14
	≥20	99	11.84
Acute attack more than 1 in a year	Yes	481	57.5
	No	355	42.5
Family members with the disease	Yes	169	20.2
	No	667	79.8
Fear of stigma	Yes	306	36.6
	No	530	63.4
Support from the family	Yes	408	48.8
	No	428	51.2
Support from the Government	Yes	252	30.1
	No	584	69.9
Presence of any other supporting organization	Yes	206	24.6
	No	630	75.4
Involvement in community affairs	Yes	709	84.8
	No	127	15.2
Wash feet regularly with soap and water	Yes	739	88.4
	No	97	11.6
Use of foot shoes	Yes	756	90.4
	No	80	9.6
Able to move from place to place	Yes	690	82.5
	No	146	17.5
Able to go to health facility whenever sick	Yes	758	90.7
	No	78	9.3
Awareness of the family that the disease is not transmitted	Yes	482	57.7
	No	354	42.3
Awareness of the community that the disease is not transmitted	Yes	467	55.9
	No	369	44.1
Presence of other disease	Yes	236	28.2
	No	600	71.8
Use health services when needed	Yes	655	78.4
	No	181	21.6
SRH service use experience	Yes	288	34.4
	No	548	65.6

Sexual and reproductive health services utilization status

Out 836 podoconiosis patients participated in this study, 154(18.4%) patients utilized SRH services in the last 12 months. The SRH services utilized by the patients were family planning and counseling services 82(53.3%), HIV and STI testing and counseling services 42(27.3%), ANC services 14(9.2%) and delivery service 15(7.8%)

Attitude towards SRH services

This study revealed that, 59.7 %(95 % CI: 56.4%-63%) had favorable attitude towards SRH services whereas 337(40.31%) of the respondents had unfavorable attitude towards SRH services. (Figure 1).

a favorable attitude compared to male respondents and respondents residing in urban are 8.85(5.54-14.1) times more likely to have favorable attitude compared to respondents in rural areas.

The current study also showed that individuals who had lived with the disease for 1–5 years were 41% less likely (95% CI: 0.20–0.82) to have a favorable attitude toward SRH services compared to those who had lived with the disease for more than 5 years.

The finding of this study revealed that respondents who don't fear stigma related to the disease are 1.61(1.12-2.34) times more likely to have favorable attitude towards SRH services than those who fear stigma.

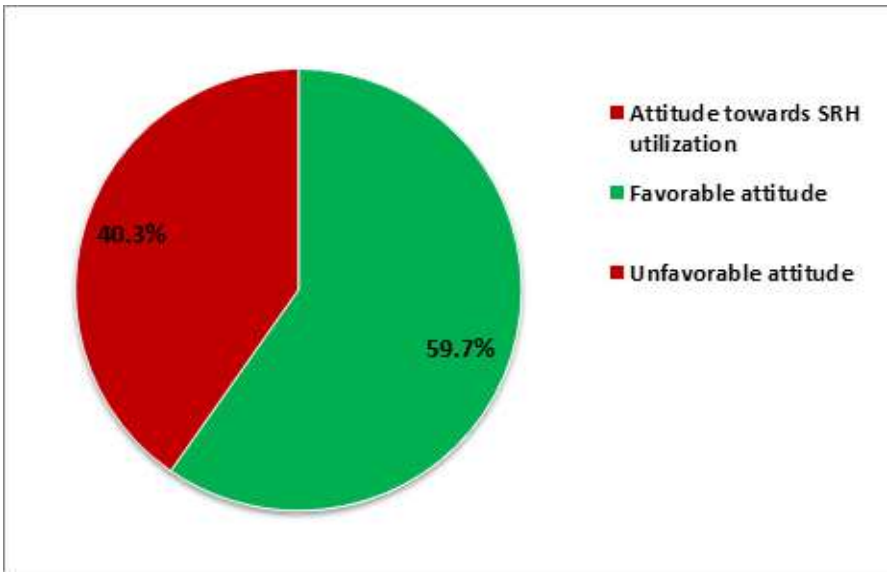


Figure1: Attitude towards SRH services among podoconiosis patients

Predictors of attitude towards SRH services among podoconiosis patients

The multivariable logistic regression analysis showed that variables: sex of the respondent, residence, years lived with the disease , fear of stigma, family awareness about the disease cause, use of health services when needed, SRH services use experience and community awareness about the cause of the disease were statistically significantly associated with attitude towards SRH services.

This study showed that female respondents are 1.64(95% CI: 1.08-2.49) times to more likely to have

This study also showed that respondents whose families are aware of the disease cause are 2.16(1.08-4.32) times more likely to have favorable attitude towards SRH services than respondents whose families are not aware of the disease cause. Moreover, respondents whose use health services regularly are 3.32(2.04-5.44) times more likely to have favorable attitude towards SRH services compared to those who don't use health services regularly. Furthermore, respondents who have ever used SRH services are 10(5.93-16.98) times more likely to have favorable attitude towards SRH services than those

who haven't used SRH services and individuals who can move from place to place are 2.75(1.37-5.56) time more likely to have favorable attitude towards SRH services than those who are unable to move easily from place to place (Table 3)

Table 3: Factors associated with Attitude towards SRH services among podoconiosis patients in Wolaita Zone, South Ethiopia, 2024(n=836)

Characteristics		Attitude Favorable	Not favorable	COR (95%CI)	AOR (95%CI)	Corresponding p-value
Age of respondents	18-29	85	32	2.76(1.68-4.57)	1.33(0.64-2.74)	0.446
	30-34	82	33	2.59(1.58-4.27)	1.05(0.53-2.11)	0.88
	35-39	145	81	1.87(1.26-2.78)	1.09(0.62-1.93)	0.75
	40-44	98	98	1.04(0.69-1.56)	1.19(0.69-2.05)	0.52
	> 45	89	93	Ref.	Ref.	
Sex of the respondent	Female	347	183	1.92(1.44-2.56)	1.64(1.08-2.49)	0.02***
	Male	125	154	Ref.	Ref.	
Educational status of the respondent	No formal education	242	212	Ref.	Ref.	
	Primary education	201	96	1.8(1.35-2.49)	1.55(0.99-2.4)	0.056
	Secondary and above	56	29	1.69(1.04-2.71)	1.04(0.53-2.11)	0.913
Residence	Urban	276	57	6.08(4.35-8.49)	8.85(5.54-14.1)	<0.001***
	Rural	223	280	Ref.	Ref.	
Years lived with the disease in years	1-5	127	67	0.99(0.59-1.65)	0.41(0.21-0.82)	0.011***
	6-10	166	100	0.87(0.54-1.41)	0.6(0.32-1.13)	0.116
	11-15	89	71	0.66(0.39-1.1)	0.67(0.32-1.16)	0.129
	16-20	52	65	0.42(0.24-0.72)	0.53(0.27-1.04)	0.063
	> 20	65	34	Ref.	Ref.	
Own monthly income	Yes	22	8	1.89(0.83-4.3)	1.09 (0.37-3.25)	0.871
	No	477	329	Ref.	Ref.	
Fear of Stigma	Yes	148	158	Ref.	Ref.	
	No	351	179	2.09(1.57-2.79)	1.61(1.12-2.34)	0.012***
Able to move from place to place	Yes	425	265	1.56(1.1-2.2)	0.83(0.52-1.31)	0.416
	No	74	72	Ref.	Ref.	
Family awareness of the disease cause	Yes	320	162	1.93(1.46-2.56)	2.16(1.08-4.32)	0.03***
	No	179	175	Ref.	Ref.	
Presence health facility near to home	Yes	420	230	2.47(1.77-3.45)	1.32(0.86-2.03)	0.201
	No	79	107	Ref.	Ref.	
Use health services when needed	Yes	417	238	2.11(1.52-2.95)	3.32(2.04-5.44)	<0.001***
	No	82	99	Ref.	Ref.	
SRH services use experience	Yes	258	30	10.96(7.24-16.57)	10(5.93-16.98)	<0.001***
	No	241	307	Ref.	Ref.	
Community awareness about the disease.	Yes	304	163	1.67(1.26-2.2)	2.75(1.37-5.56)	0.005***
	No	195	174	Ref.	Ref.	
Involvement in community affairs	Yes	173	78	1.76(1.29-2.4)	0.73(0.46-1.13)	0.157
	No	326	259	Ref.	Ref.	
Presence of other disease	Yes	167	69	1.95(1.41-2.7)	1.13(0.73-1.75)	0.595
	No	332	268	Ref.	Ref.	
Self-stigma	Yes	16	19	Ref.	Ref.	
	No	483	318	0.55(0.28-1.09)	0.61(2.57-1.47)	0.273

Discussion

This study showed that sex of the respondents, residence, years lived with the disease, fear of stigma, family awareness about the disease cause, use of health services when needed, SRH services use experience, and community awareness about the cause of the disease were factors associated with attitude towards SRH services.

This study revealed that, from the total respondents included in the study, 499 (59.7%) had a favorable attitude towards SRH services. This finding is in line with studies conducted in Ethiopia, Guji Zone[29], which reported 60%. This finding is higher than studies conducted in Ethiopia, Kombolcha town[30], which showed 52.4%, and North West Ethiopia[31], which reported 53.4%, Guji Zone[29], 46.1%, and Jimma Zone[32], 49.3% of respondents had a good attitude towards SRH services. This difference might be due to differences in population, since the majority of participants in our study were married, and in the cited study, the majority of the respondents were single—that is, married people have more exposure to the services than single individuals.

Moreover, this finding is lower than other studies conducted in Ethiopia, which reported 69.3%[33]. This variation might be due to differences in study population and study area.

This study showed that female respondents are 1.64 (AOR = 1.64; 95% CI: 1.08–2.49) times more likely to have a favorable attitude compared to male respondents. This finding is similar to a study conducted in Iran[34], which revealed that sociodemographic characteristics significantly affected the attitude towards SRH services among adults. This may be due to women's higher utilization of reproductive health services and their involvement in maternal health programs, which often serve as entry points for SRH education. Conversely, men may be less exposed to SRH information and more influenced by cultural norms that discourage their active participation in SRH matters.

The respondents residing in urban areas are 8.85 (5.54–14.1) times more likely to have a favorable attitude compared to respondents in rural areas. This finding is similar to the study conducted elsewhere in Bangladesh, which showed that urban residence significantly predicted the attitude towards SRH health services[35]. The possible explanation is that education and information on SRH services are generally easier to obtain in urban areas. The media, educational initiatives, and health promotion activities that spread knowledge about SRH are more likely to reach urban dwellers. Rural communities, on the other hand, frequently lack access to this kind of information, which results in decreased knowledge and comprehension of SRH services[36]. Furthermore, there are typically more healthcare institutions, especially those providing SRH services, in urban areas. Urban dwellers can more easily access and make use of these services because of their greater availability. In contrast, rural areas might have a shortage of medical facilities, which would make it more difficult to get SRH treatments[37].

The current study also showed that individuals who lived with the disease for 1–5 years are 41% (95% CI: 0.2–0.82) less likely to have a favorable attitude towards SRH services than those who lived with the disease for more years. The possible justification is that podoconiosis is a highly stigmatized condition, particularly in the early years after diagnosis. Internalized stigma, discrimination, and social isolation are common experiences for affected people, and they can have a negative impact on their self-esteem and motivation to seek out SRH and other health services. The effects of stigma are more severe in the early years; people may eventually learn coping skills to deal with it in later years[38].

The findings of this study revealed that respondents who don't fear stigma related to the disease are 1.6 (1.1–2.34) times more likely to have a favorable attitude towards SRH services than those who fear stigma. This finding is in line with a study conducted among Sub-Saharan countries, which showed that cultural hurdles include the stigma and restrictive

standards around SRH, unfair or damaging gender norms, and prejudice and condemnation from families, partners, communities, and providers [39].

This study also showed that respondents whose families are aware of the disease cause are 2.16 (1.08–4.32) times more likely to have a favorable attitude towards SRH services than respondents whose families are not aware of the disease cause. The possible justification is that podoconiosis stigma and misconceptions are lessened when people are aware of the disease. The stigma associated with podoconiosis has a negative impact on reproductive health, including decreased chances of marriage and discrimination in medical care, according to a systematic review[10]. Moreover, families with better knowledge are more aggressive in pursuing medical care. According to a study assessing a podoconiosis intervention in Ethiopia, health education enhanced attitudes and behaviors related to health. Given that families are more likely to use SRH services because they are aware of its advantages, this proactive approach probably applies to SRH services as well[40].

This study also showed that respondents whose communities are aware of the cause of podoconiosis are 2.75 (1.37–5.56) times more likely to have a favorable attitude towards SRH services than respondents whose communities are not aware of the disease cause. The possible reason is that when communities are aware of podoconiosis, they are more likely to use SRH programs and other preventative health practices. Raising awareness can result in more people taking part in health education programs, which encourage the usage of different health services[40].

Moreover, respondents who use health services regularly are 3.32 (2.04–5.44) times more likely to have a favorable attitude towards SRH services compared to those who don't use health services regularly. The possible justification is that frequent healthcare consumers are more comfortable talking about SRH and other health issues. This normalization fosters a more positive attitude toward using SRH services and lessens stigma[41].

Furthermore, respondents who have ever used SRH services are 10 (5.93–16.98) times more likely to have a favorable attitude towards SRH services than those who haven't used SRH services. The possible explanation is that interactions with healthcare professionals who provide instruction on many facets of SRH are usually required when using SRH services. People's knowledge and awareness are increased by this education, which results in better-informed and favorable views regarding SRH services[39]. In addition, a firsthand encounter with SRH services might help debunk widespread misconceptions and lessen the stigma that society attaches to obtaining such care. As people get more accustomed to these services, they feel more at ease and have fewer negative opinions, which leads to a more positive attitude[42].

Furthermore, this study showed that individuals who can move from place to place are 2.75 (1.37–5.56) times more likely to have a favorable attitude towards SRH services than those who are unable to move easily from place to place. The possible explanation is that mobility makes social relationships easier, enabling people to access support systems and take part in community events. Positive attitudes toward SRH services can be strengthened by these exchanges, which can offer knowledge and encouraging feedback.

Strengths and Limitations of the Study

It is among the first to assess attitudes and their predictors toward SRH services among podoconiosis patients—a marginalized and neglected population in Ethiopia. The community-based design allowed inclusion of both rural and semi-urban residents, enhancing the representativeness and generalizability of the findings. Despite the strengths of the study, there are also some limitations that need to be considered while interpreting these findings. First: self-report bias—relying on self-reported data for attitude towards service may result in recall bias or social desirability bias. Second: because this is a cross-sectional study, data is collected at a single point in time, which limits the capacity to prove causality between variables.

Conclusion

The favorable attitude towards SRH services among podoconiosis patients in this study was 59.7%. Targeted strategies should address gender disparities by engaging men in SRH programs, reduce urban–rural gaps through community-based outreach in rural areas, and provide early counseling for newly diagnosed patients to counter stigma and misconceptions. Enhancing community and family awareness about podoconiosis can foster supportive environments that encourage SRH service uptake. Moreover, integrating SRH services into podoconiosis care programs and strengthening the accessibility and quality of these services could promote positive attitudes and sustained utilization among this vulnerable population.

Abbreviations (acronyms and abbreviations)

CI – Confidence Interval;
FP – Family Planning;
HIV – Human Immune Virus;
ICC – Intra-Class Correlation;
MOR – Median Odds Ratio;
NGO – Non-Governmental Organization;
NTDs – Neglected Tropical Diseases;
PCV – Proportional Change in Variance;
PNC – Postnatal Care;
SRH – Sexual and Reproductive Health;
STIs – Sexually Transmitted Infections;
SDGs – Sustainable Development Goals;
VIF – Variance of Inflation Factors;
UHC – Universal Health Coverage;
WHO – World Health Organization

Acknowledgments

We would like to forward our gratitude to Wolaita Sodo University, College of Health Sciences and Medicine. We also thank Wolaita Zone administrators, district health office administrators, health extension workers, the supervisors, respondents, and data collectors.

Funding

This study is not funded.

Availability of Data & Materials

The original contributions presented in the study are included in the article/supplementary material. Any enquiries can be directed to the corresponding author.

Ethical Clearance

Ethical clearance and approval letter to conduct the study was obtained from the Wolaita Sodo University Institutional Review Board with the Ref. No: WSU-IRRC/011/2024. A letter of cooperation was taken from the Wolaita Sodo University College of Health Sciences and Medicine to selected districts. Informed consent was obtained from each study participant after explaining the study objectives and procedures, and their right to refuse to participate in the study at any time was assured. Confidentiality of the information was ensured by coding.

Consent for Publication

Not applicable.

Competing Interests

The authors have declared that no competing interests exist

Corresponding author:
Temesgen Lera Abiso
School of Public Health, College of Medicine and Health sciences, Wolaita Sodo University, Wolaita, Ethiopia
temelera@gmail.com(TL)

REFERENCES

1. Abdurahman, C., Oljira, L., Hailu, S. et al. Sexual and reproductive health services utilization and associated factors among adolescents attending secondary schools. Reprod Health 19, 161 (2022). https://doi.org/10.1186/s12978-022-01468-w
2. Organization WWH. Reproductive health. . https:// www. who. int/ weste rnpac ific/ health- topics/ repro ducti ve- health. 2018.
3. United Nations(UN). Transforming our world: the 2030 agenda for sustainable development. Accessed from: www.un.org/en/development/ desa/population/ migration/generalassembly/. 2015.
4. Appleford G, RamaRao S, Bellows B. The inclusion of sexual and reproductive health services within universal health care through intentional design. Sexual and reproductive health matters. 2020;28(2):1799589.
5. WHO. Universal access to sexual and reproductive health: New tools offer strategies on integrating sexual and reproductive health into primary health care, as a fundamental component of universal health coverage. . 2022.
6. Nations: U. The Sustainable Development Goals Report. New York, US. 2016.
7. Adewole I, Gavira A. Sexual and reproductive health and rights for all: an urgent need to change the narrative. Lancet (London, England). 2018;391(10140):2585-7.
8. Paudel YR, Dariang M, Keeling SJ, Mehata S. Addressing the needs of people with disability in Nepal: The urgent need. Disability and health journal. 2016;9(2):186-8.
9. Ganle JK, Baatiema L, Quansah R, Danso-Appiah A. Barriers facing persons with disability in accessing sexual and reproductive health services in sub-Saharan Africa: A systematic review. PloS one. 2020;15(10):e0238585.
10. Abiso TL, Kerbo AA, Woticha EW, Koyira MM. Stigma related to podoconiosis in Ethiopia: a systematic review. Frontiers in Tropical Diseases. 2024;5.
11. WHO WhO. Fcat sheet on podoconiosis (non-filarial lymphoedema). WHO fact sheet. 2023.
12. Negussie H, Molla M, Ngari M, Berkley JA, Kivaya E, Njuguna P, et al. Lymphoedema management to prevent acute dermatolymphangioadenitis in podoconiosis in northern Ethiopia (GoLBeT): a pragmatic randomised controlled trial. The Lancet Global health. 2018;6(7):e795-e803.
13. Tora A, Davey G, Tadele G. A qualitative study on stigma and coping strategies of patients with podoconiosis in Wolaita zone, Southern Ethiopia. International health. 2011;3(3):176-81.
14. Bartlett J, Deribe K, Tamiru A, Amberbir T, Medhin G, Malik M, et al. Depression and disability in people with podoconiosis: a comparative cross-sectional study in rural Northern Ethiopia. International health. 2016;8(2):124-31.
15. Hounsome N, Kassahun MM, Ngari M, Berkley JA, Kivaya E, Njuguna P, et al. Cost-effectiveness and social outcomes of a community-based treatment for podoconiosis lymphoedema in the East Gojjam zone, Ethiopia. PLoS neglected tropical diseases. 2019;13(10):e0007780.
16. Deribe K, Cano J, Trueba ML, Newport MJ, Davey G. Global epidemiology of podoconiosis: A systematic review. PLoS neglected tropical diseases. 2018;12(3):e0006324.
17. Deribe K, Negussu N, Newport MJ, Davey G, Turner HC. The health and economic burden of podoconiosis in Ethiopia. Transactions of the Royal Society of Tropical Medicine and Hygiene. 2020;114(4):284-92.
18. Geshere Oli G, Tekola Ayele F, Petros B. Parasitological, serological and clinical evidence for high prevalence of podoconiosis (non-filarial elephantiasis) in Midakegn district, central Ethiopia. Tropical medicine & international health : TM & IH. 2012;17(6):722-6.
19. Desta K, Ashine M, Davey G. Predictive value of clinical assessment of patients with podoconiosis in an endemic community setting. Transactions of the Royal Society of Tropical Medicine and Hygiene. 2007;101(6):621-3.
20. UNFPA Ia. Global Sexual and Reproductive Health Service Package for Men and Adolescent Boys. London and New York City. 2017.
21. Rocklage MD, Fazio RH. Attitude Accessibility as a Function of Emotionality. Personality & social psychology bulletin. 2018;44(4):508-20.
22. Harmon-Jones E, Harmon-Jones C, Amodio DM, Gable PA. Attitudes toward emotions. Journal of personality and social psychology. 2011;101(6):1332-50.
23. Kashefi F, Bakhtiari A, Pasha H, Amiri FN, Bakouei F. Student Attitudes About Reproductive Health in Public Universities: A Cross-Sectional Study. International quarterly of community health education. 2021;41(2):133-42.
24. Bearinger LH, Sieving RE, Ferguson J, Sharma V. Global perspectives on the sexual and reproductive health of adolescents: patterns, prevention, and potential. Lancet (London, England). 2007;369(9568):1220-31.
25. Depratment WZH. WZH. Wolaita zone health department Annual report. 2022.

26. Darebo TD, Birhanu Z, Alemayehu M, Balcha B, Worku A, Assele DD, Spigt M. Utilization of sexual and reproductive health services among construction worker women in southern Ethiopia. BMC Womens Health. 2024 Mar 26;24(1):201. doi: 10.1186/s12905-024-03042-x. PMID: 38532387; PMCID: PMC10967034.
27. UNFPA UNP. Sexual and reproductive health andrights: an essential element of universal healthcoverage. 2019. Accessed from:www.unfpa.org. 2020.
28. Organization WH. Gender, equity and humanrights: Availability, accessibility, acceptability, quality. 2016.
29. Godana G, Garoma S, Ayers N, Abera M. Knowledge, attitude towards, and utilization of friendly health services among school adolescents in the pastoral community of Guji zone, Ethiopia: an institution-based comparative cross-sectional study. Frontiers in reproductive health. 2024;6:1291742.
30. Endalew A, Kefale B, Atnafu Gebeyehu N, Birhan B. Sexual and reproductive health service utilization and associated factors among youth workers at Kombolcha Industry Park, Kombolcha town, Northeast Ethiopia, 2023. Frontiers in public health. 2024;12:1367421.
31. Ayalew M, Nigatu D, Sitotaw G, Debie A. Knowledge and attitude towards sexual and reproductive health rights and associated factors among Adet Tana Haik College students, Northwest Ethiopia: a cross-sectional study. BMC research notes. 2019;12(1):80.
32. Diribsa T, Wakjira D, Atomsa G, Mekoya T, Mamo F, Fekecha B, et al. Determinant Factors of Sexual and Reproductive Health Service Utilization among In-School Adolescents with Disability in Jimma Zone, Southwest Ethiopia. International journal of reproductive medicine. 2022;2022:5945921.
33. Tilahun M, Mengistie B, Egata G, Reda AA. Health workers' attitudes toward sexual and reproductive health services for unmarried adolescents in Ethiopia. Reproductive health. 2012;9:19.
34. M. Khajehei, Ziyadlou2 S, Ghanizadeh3 aA. Knowledge of and attitudes towards sexual and reproductive health in adults in Shiraz: a need for further education. Eastern MediterraneanHealth Journa. 2013.
35. Zakaria M, Karim F, Mazumder S, Cheng F, Xu J. Knowledge on, Attitude towards, and Practice of Sexual and Reproductive Health among Older Adolescent Girls in Bangladesh: An Institution-Based Cross-Sectional Study. International Journal of Environmental Research and Public Health. 2020;17(21):7720.
36. Habte A, Dessu S, Bogale B, Lemma L. Disparities in sexual and reproductive health services utilization among urban and rural adolescents in southern Ethiopia, 2020: a comparative cross-sectional study. BMC public health. 2022;22(1):203.
37. Pliskin E, Welti K, & Manlove J. Rural and urban women have differing sexual and reproductive health experiences. Bethesda, MD: Child Trends. https://doi.org/10.56417/6910b2254v. 2022.
38. Kebede Deribe, Sara Tomczyk, Elizabeth Mousley, & AT, Davey G. Stigma towards a Neglected Tropical Disease: Felt and enacted Stigma Scores among Podoconiosis Patients in Northern Ethiopia. BMC public health. 2013.
39. Ninsiima LR, Chiumia IK, Ndejjo R. Factors influencing access to and utilisation of youth-friendly sexual and reproductive health services in sub-Saharan Africa: a systematic review. Reproductive health. 2021;18(1):135.
40. Engdawork K, Tadele G, Anagnostopoulou V, Nahar P, Davey G, Zaman S. Improving health behaviours and attitudes around podoconiosis in Northern Western Ethiopia: Implementation and intervention effectiveness. PLoS neglected tropical diseases. 2024;18(9):e0012507.
41. Chilinda I, Hourahane G, Pindani M, Chitsulo C, Maluwa A. Attitude of Health Care Providers towards Adolescent Sexual and Reproductive Health Services in Developing Countries: A Systematic Review. Health. 2014;06(14):1706-13.
42. Tilahun BD, Yilak G, Amena S, Abebe GK, Ayele M. Exploring the perceptions of health service providers and adolescents on the utilization of adolescent sexual and reproductive health services in Tikur, 2023: A qualitative study. SAGE open medicine. 2024;12:20503121231223660.

UTERINE PERFORATION FOLLOWING MANUAL VACUUM ASPIRATION FOR A FIRST TRIMESTER INCOMPLETE ABORTION: A CASE REPORT

Muleta Befkene Wayessa[1], Fekadu Regassa Feyissa[1,2], Anteneh Sisay Chala[1,2]

ABSTRACT

BACKGROUND: Uterine perforation, though rare, is a serious complication of intrauterine procedures such as Manual Vacuum Aspiration (MVA) used for managing first-trimester incomplete abortion. It is associated with significant morbidity and potential mortality, necessitating prompt diagnosis and intervention. Accurate preoperative assessment and careful procedure execution are critical in minimizing risks. We report here a case of uterine perforation following 1st MVA for incomplete abortion.

CASE PRESENTATION: A 24-year-old gravida III, para I woman presented with vaginal bleeding of 8 hrs following 3 months of amenorrhea. The patient experienced acute abdominal pain and vomiting post-procedure, with ultrasound revealing a 1 cm uterine defect. Emergency laparotomy was done under spinal anesthesia and a 2 cm perforation was detected at the vesico-uterine junction. The defect was repaired in 2 layers. The patient had a smooth postop course and was discharged improved.

CONCLUSION: This case highlights the necessity for meticulous pre-procedure assessment to determine uterine position and the importance of skilled healthcare providers performing MVA to minimize the risk of uterine perforation. Early diagnosis and timely management are crucial to avoid maternal catastrophes.

KEYWORDS: Uterine perforation, Manual vacuum aspiration, Incarcerated omentum

(The Ethiopian Journal of Reproductive Health; 2025; 17; 78-82)

1. Department of Obstetrics and Gynecology, Adama Hospital Medical College, Adama, Oromia, Ethiopia
2. Resident in Gynecology and Obstetrics

INTRODUCTION

Uterine perforation is a rare but significant complication that can occur during intrauterine procedures, including Manual Vacuum Aspiration (MVA) used for the management of first-trimester incomplete abortion. This condition is associated with substantial morbidity and potential mortality, requiring prompt recognition and intervention to prevent severe outcomes[1].

The incidence of uterine perforation varies widely in the literature, ranging from 0.1% to 1.3% for diagnostic and therapeutic procedures, respectively[1]. Several factors contribute to the risk of uterine perforation, including multiparity, previous uterine surgery, abnormal uterine shape and position, advanced gestational age, and the experience level of the healthcare provider performing the procedure[2,3]. Additionally, a proper physical examination, including a bimanual examination to assess the position and size of the uterus, is crucial in minimizing the risk of perforation[4].

The pathophysiology of uterine perforation involves the accidental breaching of the uterine wall by surgical instruments, which may cause injury to adjacent organs such as the bowel and bladder, leading to complications like peritonitis and hemorrhage[3]. The clinical presentation of uterine perforation can vary but typically includes acute abdominal pain, vaginal bleeding, and signs of peritonitis[2].

Early diagnosis of uterine perforation is crucial for effective management. Ultrasound is often the first-line imaging modality used to confirm the diagnosis, although a CT scan may be required for a more detailed assessment of intra-abdominal injuries[4].

Management of uterine perforation typically involves immediate stabilization of the patient, surgical repair of the perforation, and antibiotic therapy to prevent infection[5]. Preventive measures include adequate training and experience of healthcare providers and careful preoperative assessment to identify high-risk patients[2,4].

Case Presentation

A 24-year-old G-III P-I abortion one woman presented to Adama Teaching Hospital with vaginal bleeding of eight hours after amenorrhea of 3 months. She had passage of tissue with the bleeding. The pregnancy was wanted and planned. There was no history of interference. She had no previous history of curettage or uterine surgery.

On physical examination, the patient was in pain with a blood pressure of 100/70 mmHg, pulse rate of 78 beats per minute, respiratory rate of 22 breaths per minute, and temperature of 36.6°C. She had pink conjunctiva and non-icteric sclera.

She had a flat, non-tender abdomen and the uterus was non-palpable abdominally. The cervix was open and admitted one finger. There was tissue at the cervical os with bleeding. However, a bimanual examination was not performed by the healthcare professional who evaluated her first. Examination in the other systems was unremarkable.

The laboratory results were white blood cell count (WBC) of 15,060, hemoglobin (HGB) of 13.1 g/dL, and platelets (PLT) of 324,000/microlitre. Blood group/Rh was A positive.

With a diagnosis of incomplete abortion, Doxycycline 200 mg orally stat and Diclofenac 75 mg intramuscular injection were given and the patient was prepared for evacuation. The vagina was cleaned with povidone, and then a bivalve speculum was used. The bleeding was mopped with gauze, and the anterior lip of the cervix was grasped with a tenaculum. The tissue at the cervical os was removed with sponge forceps. Subsequently, a Manual Vacuum Aspirator with cannula size of number twelve was used to evacuate the uterus. During the procedure, resistance developed against taking out the cannula. Following the resistance, the nurse discontinued the procedure and consulted the Gynecology and Obstetrics resident.

Upon evaluation by the resident, the patient complained of severe crampy abdominal pain and had three episodes of vomiting. On physical examination, the patient was in pain with stable

vital signs. She had mild abdominal tenderness and bright red vaginal bleeding with visible fatty tissue coming out of the cervix.

Immediately, a bilateral intravenous line was opened, and an abdominal ultrasound and erect abdominal X-ray were performed. There was a visible 1 cm uterine defect in the lower segment with an echogenic mass protruding through it, extending down to the cervical canal with a clear fundal outline of the endometrium. There was no cul-de-sac collection, and the adnexa were free. The abdominal X-ray showed no sign of viscus perforation. With an impression of a perforated uterus with incarcerated omentum, the patient was prepared for laparotomy.

Under spinal anesthesia, a midline sub-umbilical incision was made to enter the abdomen. There was a retroverted uterus with a 2 cm by 2 cm anterior uterine segment perforation at the vesico-uterine junction and no hematoma or visible transurethral catheter. There was no active bleeding, no peritoneal collection, and the edges of the perforated site were clean. Upon peritoneal entry, no incarcerated omentum was identified, despite its prior suggestion on ultrasound. It is possible that the omental segment was dislodged during uterine manipulation. Intraoperative exploration revealed no evidence of omental ischemia. Otherwise, the bilateral tubes and ovaries appeared healthy. The perforated segment was repaired in two layers, and the patient was transferred to the regular ward with stable vital signs. She had a smooth postoperative course and was discharged on the third day.

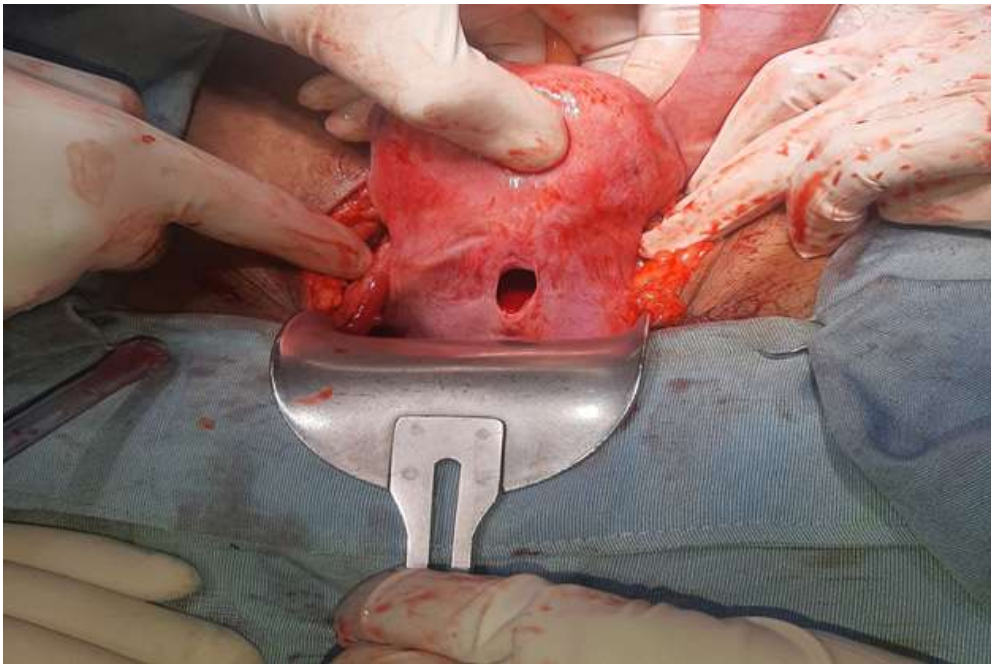


Figure 1 Anterior lower segment uterine perforation as a complication of manual vacuum aspiration for first-trimester incomplete abortion.

Here is the language-only copy-edited version of your text:

The patient was discharged with instructions on post-abortion care, follow-up visits, family planning, and future pregnancy planning, with the recommendation of a caesarean section as the subsequent mode of delivery. After one week, the patient visited a gynecology referral clinic, and the post-operative course of the patient was smooth.

Discussion

Our case of uterine perforation following MVA for first-trimester incomplete abortion shares similarities and differences with findings reported in the literature.

In our case, the patient was a gravida[3], para[1], which aligns with the identified risk factors such as multiparity mentioned in the literature. Zorilă et al.[1] noted that uterine perforation rates vary widely and highlighted risk factors including multiparity, previous uterine surgeries, and operator inexperience. Ngatia[6] also emphasized that the risk is higher in cases where less experienced providers perform procedures.

The clinical presentation of our case is consistent with the typical symptoms described in the literature, such as acute abdominal pain, vaginal bleeding, and signs of peritonitis[2]. The patient's sudden onset of severe pain and the presence of bright red vaginal bleeding with fatty tissue are classic indicators of uterine perforation, which are similar to the findings reported by Zorilă et al.[1] and Costumbrado et al.[7].

Our use of ultrasound to identify a uterine defect and the subsequent use of abdominal X-ray is in line with the diagnostic approaches discussed in the literature. According to the Royal College of Obstetricians and Gynaecologists[4], ultrasound is the first-line imaging modality, and CT scans can provide further detail if necessary. In our case, the ultrasound findings of a 1 cm defect in the lower uterine segment with an echogenic mass protruding through it, extending to the cervical canal, were crucial for diagnosis.

The management of our patient included immediate stabilization with IV fluids, surgical repair of the perforation, and antibiotic therapy to prevent infection. These steps are consistent with the management protocols outlined by the American College of Obstetricians and Gynecologists (3) 2016 and the World Health Organization[5] 2018. The prompt laparotomy and repair of the perforated segment ensured the patient's recovery and stability, matching the recommended practices for handling such complications.

Preventive measures highlighted in the literature, such as the adequate training of healthcare providers, the use of ultrasound guidance, and careful preoperative assessment of high-risk patients, were underscored by the case findings[4,5]. The importance of these preventive strategies is evident, as they could potentially reduce the incidence of such complications in future cases.

Preventive measures, including comprehensive patient assessment, provider training, and the potential integration of ultrasound guidance, can collectively reduce the incidence of uterine perforation. The broader application of these strategies within clinical practice holds promise for enhancing patient safety and improving outcomes in women's health. Through continuous learning and adherence to best practices, the medical community can ensure that such complications are addressed promptly and effectively while striving to prevent their occurrence in future cases.

Conclusion

This case highlights the importance of having skilled healthcare providers perform MVA, as well as the need for a thorough pre-procedure assessment to determine the uterine position and size in order to minimize the risk of uterine perforation. Early diagnosis and timely management are essential to prevent maternal catastrophes.

Corresponding author
MULETA BEFKENE WAYESSA [MD, ASSISTANT PROFESSOR OF GYNECOLOGY AND OBSTETRICS]
muletawayessa@gmail.com

REFERENCES

1. Zorilă GL, Căpitănescu RG, Drăgușin RC, Istrate-Ofițeru AM, Bernad E, Dobie M, Bernad S, Craina M, Ceaușu I, Marinaș MC, Comănescu MC, Zorilă MV, Drocaș I, Berbecaru EIA, Iliescu DG. Uterine Perforation as a Complication of the Intrauterine Procedures Causing Omentum Incarceration: A Review. Diagnostics (Basel). 2023 Jan 16;13(2):331. doi: 10.3390/diagnostics13020331. PMID: 36673141; PMCID: PMC9858542.
2. Cunningham, F. G., et al. (2018). Williams Obstetrics, 25th Edition. McGraw-Hill Education. In.
3. American College of Obstetricians and Gynecologists (2016). Practice Bulletin: Medical Management of Abortion. Obstetrics & Gynecology, 127(6), 1233-1236. doi:10.1097/AOG.0000000000001481.
4. Royal College of Obstetricians and Gynecologists (2015). Best Practice in Comprehensive Abortion Care. Best Practice Paper No. 2 June 2015
5. World Health Organization (2018). Safe Abortion: Technical and Policy Guidance for Health Systems. Department of Reproductive Health and Research World Health Organization Avenue Appia 20, CH-1211 Geneva 27, Switzerland E-mail: reproductivehealth@who.int
6. Ngatia, Justus W. "Perforated Uterus: Case Report and Review of Literature". The East and Central Africa Medical Journal , vol. 3, no. 1, Aug. 2018, pp. 46-47, https://journal.ku.ac.ke/index.php/ecamj/article/view/68.
7. Costumbrado J, Snyder L, Ghassemzadeh S, Ng D. Vaginal Bleeding Due to Iatrogenic Uterine Perforation - A Case Report. J Educ Teach Emerg Med. 2024 Apr 30;9(2): V6-V9. doi: 10.21980/J83643. PMID: 38707940; PMCID: PMC11068317.

RAPID PROGRESSION AND POOR PROGNOSIS IN ENDOMETRIOID OVARIAN CANCER ARISING FROM ENDOMETRIOMA: A CASE REPORT

Ratri Wulandari[1], Adelina Bofe[2], Shofwal Widad[2], Ardhanu Kusumanto[1]

ABSTRACT

Endometriosis is linked to an increased risk of endometrioid ovarian cancer, though malignant transformation is rare. We report a 35-year-old nulliparous woman with a 12-year history of endometriosis who developed endometrioid ovarian cancer two months after her last surgery. Histological examination initially showed no malignancy, but subsequent immunohistochemical analysis confirmed cancer. The patient underwent surgery followed by six cycles of platinum-taxane chemotherapy. This case underscores the need for thorough assessment of patients in rapidly progressing endometriosis.

KEY WORDS: Endometriosis, Endometriosis-associated ovarian cancer

(The Ethiopian Journal of Reproductive Health; 2025; 17; 83-89)

1 Division of Gynaecology Oncology, Department of Obstetrics and Gynaecology Universitas Gadjah Mada, Yogyakarta, Indonesia

2 Division of Fertility and Reproductive Endocrinology, Department of Obstetrics and Gynaecology Universitas Gadjah Mada, Yogyakarta, Indonesia

INTRODUCTION

Endometriosis is a benign inflammatory disease that is characterized by the implantation of endometrium-like tissue outside the uterus in 5 to 15% of women of reproductive age[1]. It shares common features with the neoplastic process, including cancer-like cell invasion, rapid growth, angiogenesis, and a reduction in apoptosis[2]. In women with a long history of endometriosis, the relative risk of ovarian cancer is 40% higher compared with the control population[1]. Malignant changes in endometriosis affect approximately 0.1–1.6% of ovarian endometriomas. Endometrioid cancer represents the most well-known example of an epithelial malignancy arising from endometriosis. Patients with endometriosis-associated ovarian cancer (EAOC) are generally younger and have earlier-stage and low-grade disease compared to patients with de novo ovarian malignancies. In this case report, we present the malignant transformation of endometriosis to endometrioid ovarian cancer in a young patient with a poor prognosis. This paper aims to highlight the importance of comprehensive assessment in rapidly progressing and recurrent endometrioma to enable early detection of malignant transformation and improve patient outcomes.

Case Presentation

The patient is a 35-year-old nulliparous woman who has been treated for endometriosis at our hospital for 12 years. Initially, she had a cystectomy and left oophorectomy for a 15 cm endometrioma, followed by GnRH agonist injections. Eleven years later, she reported worsening abdominal pain. A multislice computed tomography (MSCT) revealed a septated pelvic mass from the right ovary, approximately 11.4 × 8.2 cm axially and 8.7 × 11 cm coronally, diagnosed as a recurrent endometrioma. She was prescribed dienogest 2 mg.

Six months later, she experienced acute abdominal pain and visited the emergency unit. An MRI suggested a ruptured ovarian endometrioma, leading to an emergency laparotomy. During surgery, a 10 cm right endometrioma was identified, with brownish fluid confirming the rupture. A cystectomy was performed, preserving the right ovarian tissue to maintain fertility. Histopathology of the ruptured cyst showed fibrous tissue, simple cuboidal-columnar epithelium, hemorrhages, and hemosiderophages, without signs of malignancy, confirming external endometriosis.

Two months later, she returned to the emergency unit, complaining of severe abdominal pain not alleviated by painkillers. A mass as high as the umbilicus was palpable, and an MSCT showed an inhomogeneous lesion in the right ovary, with irregular edges, measuring 10.4 × 9.3 × 11.7 cm, with papillary projection and septations, infiltrating the superior wall of the bladder with para-aortic lymph node metastases and ascites. Laparoscopic surgery was then planned. During the surgery, a right ovarian cyst measuring 12 cm in diameter was discovered. It was adherent to the omentum, intestine, and anterior abdominal wall. Adhesiolysis was performed, and the cyst was subsequently ruptured. Cystic fluid was aspirated, a papilla seen inside the cystic mass, and cyst capsule were sampled.

Pathological examination showed ovarian tissue with back-to-back tubular and papillary formations, along with solid tumors. Some areas exhibited squamous metaplasia ("squamous morules"). Tumor cells were polymorphic, partially columnar and ciliated, with eosinophilic, clear, and vacuolated cytoplasm. The nuclei were round-oval, poorly polarized, with irregular membranes, rough chromatin, and visible nucleoli. The stroma was oedematous with dilated vessels, hemorrhage, and extensive necrosis. Peritumoral lymphocytic infiltration was about 1%. The diagnosis was endometrioid carcinoma, FIGO grade 1. The cyst capsule showed ovarian tissue without tumor involvement and areas of dilated endometrial glands surrounded by endometrial stroma, infiltrated by lymphocytes, histiocytes, and hemosiderophages. The capsule and cortex exhibited external endometriosis.

Following the pathology result, surgical staging was performed, revealing another mass originating from the right ovary, measuring 15 cm in diameter. Total abdominal hysterectomy, right salpingo-oophorectomy, and omentectomy were conducted. Pathological study confirmed endometrioid carcinoma in the right ovary, and no malignancies were found in other organs. The patient was then diagnosed with endometrioid ovarian carcinoma stage IC3, FIGO grade 1. Based on this finding, immunohistochemistry (IHC) staining using p53, Ki57, and estrogen receptor (ER) markers was performed on the previous endometriosis pathology slides from the last endometrioma samples and pathology slide of endometrioid ovarian cancer samples, to investigate the malignancy transformation of endometriosis (Figure 1).

The IHC study on endometriosis samples revealed that ER staining was strongly positive in most of the nuclei of lining epithelial cells. P53 staining was also strongly positive in most nuclei of lining epithelial cells, while Ki-67 was positively stained in approximately 70% of these nuclei. In another IHC study of endometrioid ovarian cancer samples, ER staining was strongly positive in most tumor cell nuclei. P53 showed moderate intensity staining in a small portion of tumor cells, and Ki-67 was positive with strong intensity in approximately 85% of tumor cells. These findings for the right ovarian tumor were consistent with a diagnosis of endometrioid carcinoma, FIGO grade 1, with a proliferation index of approximately 85%, which suggested a malignant transformation of endometriosis to endometrioid ovarian cancer.

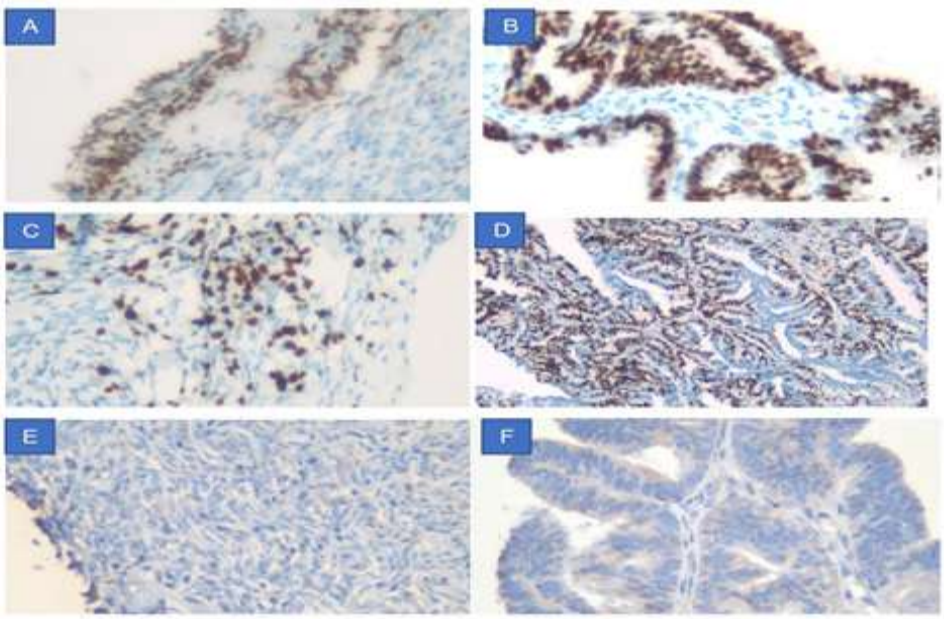


Figure 1. Immunohistochemical staining of ER, Ki67, and P53 in endometrioma and ovarian endometrioid carcinoma. (A) ER shows strong positive staining in the nuclei of lining epithelial cells in endometrioma. (B) ER is similarly stained in ovarian endometrioid carcinoma. (C) Ki67 is positive in approximately 70% of the nuclei of lining epithelial cells in endometrioma, while (D) 85% of the nuclei are positive in ovarian endometrioid carcinoma. (E) P53 displays strong positive staining in the nuclei of lining epithelial cells in endometrioma. (F) In ovarian endometrioid carcinoma, P53 is stained with moderate intensity in a small portion of tumor cell nuclei.

The patient received platinum- and taxane-based chemotherapy for six cycles following surgical staging. However, she relapsed 14 months later, with pleural cytology suggesting metastatic carcinoma of the ovary. A subsequent abdominal MSCT showed an inhomogeneous mass in the left parametrium, measuring approximately 7.2 × 8.2 × 8.9 cm, with papillary projection and septation, infiltrating the superior wall of the urinary bladder. She then underwent second-line chemotherapy with cyclophosphamide, doxorubicin, and cisplatin. Before the sixth cycle, her condition deteriorated. She experienced severe headaches and lost her vision, with an acute infarct in the bilateral occipital and bilateral cerebellum lobes found on brain MRI. Coagulation factors were abnormal, with a platelet count of 96,000/μL, an INR of 1.13, a D-dimer of 20,227 ng/mL FEU, and a fibrinogen level of 115 mg/dL. Three weeks later, she had respiratory distress and was transferred to the ICU due to pneumonic-type metastases and pulmonary edema. She died a month later due to septic shock.

Discussion

EAOC is rare, estimated to occur in about 0.1–1.6% of women with endometriosis[3]. The main histological types of EAOC are endometrioid adenocarcinoma and clear cell carcinoma[4]. EAOC usually presents in women 10 to 20 years younger and has a better prognosis than de novo ovarian cancer. The risk of developing EAOC is increased, particularly in women with a long history of endometriosis, especially those whose disease duration exceeds ten years from initial diagnosis[5]. In a 10-year retrospective analysis in Taiwan, all the patients who developed EAOC were above 40 years old (3). Interestingly, in our case, the patient was 35 years old, which is approximately 5 years younger than the respective study.

EAOC is characterized as the development of ovarian cancer in the ipsilateral or contralateral ovarian endometriosis or pelvic endometriosis, with histological findings compatible with an endometrial origin. It requires the absence of primary tumor sites and histopathological evidence of transition from benign endometriosis to malignant tumor[4,6]. This latter aspect poses a challenge in the clinical setting, as benign epithelial tissues in endometriosis are often replaced by malignant lesions. However, in our case, the endometriosis tissue was present alongside the endometrioid ovarian cancer, which confirms the EAOC diagnosis.

EAOC is typically associated with early-stage and low-grade disease[1], which aligns with our case, as our patient was diagnosed with endometrioid ovarian carcinoma stage IC3, FIGO grade 1. Early diagnosis of EAOC may be attributed to symptoms related to endometriosis, including dysmenorrhea, chronic pelvic pain, dyspareunia, or new onset of lower abdominal bloating. A study found that more than 70% of 33 patients experienced malignant transformation within a decade of monitoring their endometriomas[7]. In our case, the patient was diagnosed with endometrioid ovarian cancer twelve years after her initial diagnosis of endometriosis.

Factors contributing to the development of EAOC include molecular genomic alterations, oxidative stress, inflammation, and hormonal influences such as hyperestrogenism[6]. However, currently, no single biomarker can predict the malignant transformation of endometriosis. A recent systematic review revealed altered expression in the phosphoinositide 3-kinase (PI3K)/AKT/mTOR pathway, p53, ARID1a, estrogen and progesterone receptors, transcriptional, nuclear, and growth factors in atypical endometrioma compared to endometriosis[8]. In this report, we used Ki-67, ER, and p53 to investigate the malignant transformation of endometriosis into EAOC. Ki-67 can be used to predict the premalignant potential of atypical endometriosis, as its expression increases from endometriosis to atypical endometriosis and eventually to cancer, which is consistent with our case. A study showed no difference between p53 staining of invasive EAOC and its precursor lesion[9]. Our IHC study showed different results, where p53 staining is stronger in endometriosis compared to EAOC. Marked p53 expression in benign

endometriosis with weaker staining in malignant tissues represents an unusual pattern, potentially indicating non-pathogenic protein accumulation or wild-type overexpression unrelated to mutation. According to a study, low p53 staining is associated with a more favorable prognosis of endometrioid ovarian cancer. However, in our case, the disease was rapidly progressing and the prognosis remains poor. This could be explained by other mutations such as mismatch repair proteins (MMR) and polymerase ε (POLE) exonuclease domain mutations, which contribute to carcinogenesis and tumor progression[10]. A previous study demonstrated higher ER expression in EAOC compared to endometriosis[11]. In contrast, in our case, ER expression was similarly strong in both the endometriosis foci and the cancerous tissue samples. Our IHC study indicates the possibility of malignant changes of endometriosis since there was a high proliferation index in the endometriosis tissue, strong positive ER staining, and strong p53 staining, although no cell atypia was found in the pathology examination.

The management strategies for EAOC and de novo ovarian cancer are similar, involving complete surgical intervention, either by primary cytoreductive surgery or by interval cytoreductive surgery, followed by platinum-taxane-based chemotherapy. The 10-year survival rate of EAOC is 90%[3]. Our patient died two years after the cancer diagnosis, despite an early-stage diagnosis, partly due to chemotherapy-related coagulopathy[12]. This case is unique due to the rapid growth and poor prognosis of EAOC, which differ from those described in the existing literature. EAOC typically evolves gradually from pre-existing benign endometriotic lesions to atypical endometriosis to invasive carcinoma over several years[5]. In this case, the diagnosis shifted from endometrioma to endometrioid ovarian cancer within just two months based on the pathologic findings, although the possibility of cellular atypia in the endometriosis sample cannot be excluded. Fertility-sparing surgery was initially planned despite the sign of malignancy found during ultrasound examination, which then delayed the complete surgical staging by about a month. This could have contributed to the delay in more aggressive treatment. The significant size and persistent endometriosis, along with the rapid enlargement of the ovarian mass, raise concerns and necessitate both surgical intervention and thorough pathological assessment.

Conclusions

This case reveals a rare, rapidly progressing EAOC in a younger patient. Despite an early-stage diagnosis, aggressive histopathology makes the prognosis remain poor. The abrupt shift from benign endometrioma to carcinoma underscores the need for vigilant long-term monitoring and careful histopathology assessment in persistent endometriosis beyond ten years. Tailored diagnostic protocols may improve outcomes in atypical EAOC presentations.

Acknowledgements

We sincerely thank the patient and her family for their valuable contribution to this case report. We also appreciate the support of the pathology teams at Dr. Sardjito Hospital.

Ethics approval

Our institution does not require ethics approval for reporting individual case reports. However, the patient gave informed consent for the procedure, publication of this case report, and accompanying images. Patient identity is not disclosed. Written informed consent was obtained from the patient's guardian.

Contributions

RW, AB, SW, and AK drafted, designed, planned, organized, and interpreted the case study and manuscript writing. SW and AK contributed to the care of the patient and reviewed the report critically. All the authors approved the version to be published and agreed to be accountable for all aspects of the work in ensuring that questions

related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

Funding
No funding was received for assisting with the preparation of this manuscript.

Competing interests
None declared.

Corresponding author: Ratri Wulandari
Postal address: Department of Obstetrics and Gynecology, Universitas Gadjah Mada, 55281, Indonesia
E-mail address: ratri.wulandari@ugm.ac.id
ORCID: 0000-0002-4189-8043

REFERENCES

1. Matalliotakis M, Matalliotaki C, Goulielmos GN, Patelarou E, Tzardi M, Spandidos DA, et al. Association between ovarian cancer and advanced endometriosis. Oncol Lett. 2018 May 1; 15(5):7689–92.
2. Dahiya A, Sebastian A, Thomas A, George R, Thomas V, Peedicayil A. Endometriosis and malignancy: The intriguing relationship. International Journal of Gynecology & Obstetrics. 2021 Oct 1 ;155(1):72–8.
3. Kuo HH, Huang CY, Ueng SH, Huang KG, Lee CL, Yen CF. Unexpected epithelial ovarian cancers arising from presumed endometrioma: A 10-year retrospective analysis. Taiwan J Obstet Gynecol. 2017 Feb 1;56(1):55–61.
4. Negrão E, Flor-de-Lima B, Duarte AL, Braga AC, Portugal R, Madureira AJ. Ovarian clear cell carcinoma arising in a large endometrioma – A case report with pathological correlation and literature review. Radiol Case Rep. 2022 Aug 1;17(8):2806–11.
5. Capozzi VA, Scarpelli E, dell'Omo S, Rolla M, Pezzani A, Morganelli G, et al. Atypical Endometriosis: A Comprehensive Systematic Review of Pathological Patterns and Diagnostic Challenges. Biomedicines. 2024 Jun 1;12(6):1209.
6. Robinson KA, Menias CO, Chen L, Schiappacasse G, Shaaban AM, Caserta MP, et al. Understanding malignant transformation of endometriosis: imaging features with pathologic correlation. Abdominal Radiology. 2020 Jun 1;45(6):1762–75.
7. Taniguchi F, Harada T, Kobayashi H, Hayashi K, Momoeda M, Terakawa N. Clinical Characteristics of Patients in Japan with Ovarian Cancer Presumably Arising from Ovarian Endometrioma. Gynecol Obstet Invest. 2014;77(2):104–10.
8. Bartiromo L, Schimberni M, Villanacci R, Mangili G, Ferrari S, Ottolina J, et al. A Systematic Review of Atypical Endometriosis-Associated Biomarkers. Int J Mol Sci. 2022 Apr 1;23(8):4425.
9. Lai CR, Hsu CY, Chen YJ, Yen MS, Chao KC, Li AFY. Ovarian cancers arising from endometriosis: A microenvironmental biomarker study including ER, HNF1ß, p53, PTEN, BAF250a, and COX-2. Journal of the Chinese Medical Association. 2013 Nov;76(11):629–34.
10. Parra-Herran C, Lerner-Ellis J, Xu B, Khalouei S, Bassiouny D, Cesari M, et al. Molecular-based classification algorithm for endometrial carcinoma categorizes ovarian endometrioid carcinoma into prognostically significant groups. Modern Pathology. 2017 Dec 1;30(12):1748–59.
11. Penciu RC, Postolache I, Steriu L, Izvoranu S, Tica AA, Mocanu ID, et al. Is there a relationship in-between ovarian endometriosis and ovarian cancer? Immunohistochemical profile of four cases with coexisting ovarian endometriosis and cancer. Romanian Journal of Morphology and Embryology. 2020 61(1):157.
12. Pramanik R, Gupta R, Suvvari P, Mishra S. Management of Complications and Toxicities Related to Chemotherapy in ICU. InOnco-critical Care: An Evidence-based Approach. 2022 Jun 7 (pp. 279-291). Singapore: Springer Nature Singapore.

INSTRUCTION TO AUTHORS

1. Type of Articles

The Ethiopian Journal of Reproductive Health (EJRH) publishes original articles, review articles, short reports, program briefs, and commentaries on reproductive health issues in Ethiopia, and the African region. EJRH aims at creating a forum for the reproductive health community to disseminate best practices, and relevant information on reproductive health.

Original Articles: Articles reporting on original research using quantitative and/or qualitative studies could be submitted to EJRH.

Review Articles: Review articles on all aspects of reproductive health issues could be considered for publication in the EJRH.

Commentaries: Commentaries on any aspects of reproductive health in Ethiopia or the African region will be considered for publication in the EJRH.

Program Briefs: A one or two pages of description of a program run by governmental or non-governmental organizations could be submitted for publication. These briefs should give short summaries about the objectives, strategies for implementation, and expected outputs of programs that are executed by different organizations.

Short Reports: Preliminary research findings or interesting case studies could be presented in a summarized form to the journal.

2. Uniform Requirements

In order to fulfill uniform requirements for the journal, the following instructions have to be followed by authors: The manuscript should be a total of 3000 to 4000 words. Manuscript layout: Manuscripts should be written in English and typed double-spaced leaving generous margins. Pages should be consecutively numbered. The body of the manuscript should be organized under appropriate headings and sub-headings such as introduction, methods, results, discussion, acknowledgements, and references.

Title page: The title page should have title of the article; name of each author and institutional affiliation, and address of the corresponding author.

Abstracts: It should not be more than 250 words. It should summarize the background, objective, methods, major findings and conclusions.

Tables and Figures: All tables and figures should be submitted on separate sheets of paper and be clearly labeled in the order of their citation in the text. A reader should be able to read only the tables and easily understand all information without reading the text.

References: References have to be numbered consecutively in the order in which they are first mentioned in the text. References must also follow the Vancouver system.

EJRH

Visit us at www.ejrh.org

ISSN: 2520-0275 (Print)
ISSN: 2520-0283 (Online)