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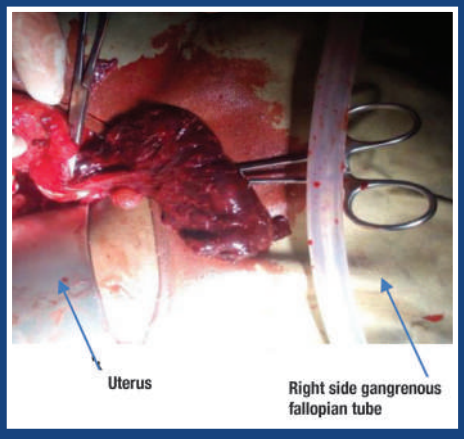

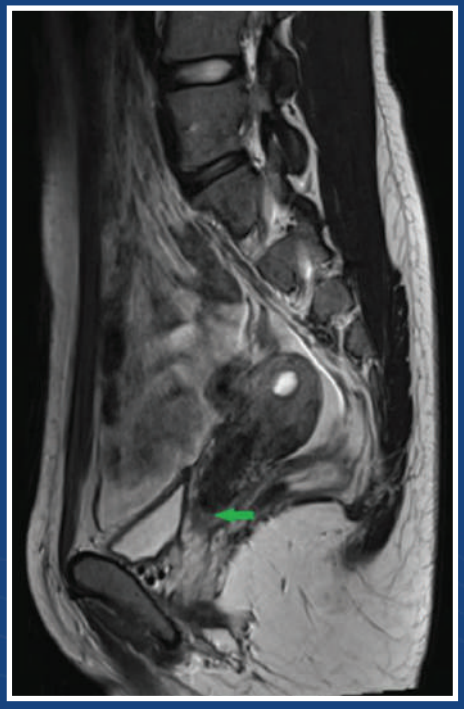

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PERINATAL OUTCOME OF FETAL GROWTH RESTRICTION AND FACTORS ASSOCIATED WITH IT AT ASELLA TEACHING AND REFERRAL HOSPITAL, SOUTH-EAST ETHIOPA

Melese Gezahegn[1], Andualem Fikadu[2], Mesfin Tafa[3]

ABSTRACT

BACKGROUND: Fetal growth restriction (FGR) is a disorder of fetal growth and development caused by decreased nutrient and oxygen supply to the fetus, often due to placental insufficiency during intrauterine life. FGR is associated with a variety of adverse perinatal outcomes. There is a scarcity of data on the perinatal outcomes of FGR and the factors associated with it in the study area. This study aims to assess perinatal outcomes of FGR and factors associated with unfavorable perinatal outcomes at Asella Teaching and Referral Hospital.

METHODS: A hospital-based cross-sectional study was conducted at Asella Teaching and Referral Hospital from February 1, 2022, to September 30, 2022. Pregnant mothers with singleton gestation diagnosed with IUGR participated in the study. Data were entered into EpiData version 4.6 and exported to SPSS version 26 for cleaning and analysis. Logistic regression analysis was performed to identify factors associated with unfavorable perinatal outcomes. The results are reported with 95% confidence intervals for both crude and adjusted odds ratios. Statistical significance was determined using a p-value threshold of <0.05.

RESULTS: A total of 172 pregnant mothers who gave birth to FGR fetuses were enrolled. Of these deliveries, 107 (62.2%) cases had unfavorable perinatal outcomes. Mothers aged between 20–34 years (AOR: 0.098, 95% CI: 0.016–0.58) and those without any maternal risk factors for FGR (AOR: 0.21, 95% CI: 0.049–0.918) were associated with decreased odds of developing unfavorable perinatal outcomes by 90.2% and 79%, respectively, compared to mothers aged >35 years and those with at least one risk factor for FGR. Additionally, mothers with a pre-pregnancy BMI between 18.5–24.9 kg/m² (AOR: 0.20, 95% CI: 0.07–0.55) and BMI >25 kg/m² (AOR: 0.116, 95% CI: 0.02–0.68) were associated with decreased odds of developing unfavorable perinatal outcomes by 80% and 88.4%, respectively, compared to mothers with a BMI <18.5 kg/m². Conversely, stage 1 FGR (AOR: 9.07, 95% CI: 2.83–29.10) and stage 2 FGR (AOR: 22.66, 95% CI: 1.84–278.55) were associated with 9 times and 22 times increased odds of developing unfavorable perinatal outcomes, respectively, compared to stage 0 FGR. The presence of maternal hypertension (AOR: 5.83, 95% CI: 1.14–29.76) was associated with a six-fold increased risk of unfavorable perinatal outcomes compared to mothers without hypertension.

CONCLUSIONS AND RECOMMENDATIONS: Maternal age between 20–35 years, a pre-pregnancy BMI of 18.5–24.9 kg/m² or >25 kg/m², and the absence of maternal risk factors for FGR were associated with a decreased risk of unfavorable perinatal outcomes. However, stage 1 FGR, stage 2 FGR, and maternal hypertension significantly increased the risk of unfavorable perinatal outcomes. It is recommended to counsel women on nutrition to increase their pre-pregnancy BMI before conception and to intervene in minimizing the risk of FGR development in the community.

KEYWORDS: Early neonatal death, fetal growth restriction, intrauterine growth restriction, low birth weight, small for gestational age, stillbirth, unfavorable perinatal outcome

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INTRODUCTION

Fetal growth restriction (FGR), also known as intrauterine growth restriction (IUGR), is a disorder of fetal growth and development characterized by deceleration of fetal growth. This is determined by a change in fetal growth velocity due to diminished or impaired nutrient and oxygen supply to the fetus as a result of placental insufficiency during intrauterine life[1,2]. An abnormal umbilical artery Doppler pulsatility index, reflecting increased impedance to flow in the umbilical circulation, is considered an indicator of placental disease. FGR and small-for-gestational-age (SGA) are not synonymous[2]. FGR describes fetuses with an estimated fetal weight (EFW) or abdominal circumference (AC) below the 10th percentile for gestational age (GA), whereas SGA exclusively describes newborns with a birth weight below the 10th percentile for GA[1]. Using fetal weight <10th percentile as a criterion may overclassify FGR, as many fetuses might be constitutionally small and healthy, not at increased risk of adverse perinatal outcomes (APOs)[3,4]. The combined finding of an EFW <10th percentile and abnormal umbilical artery Doppler velocimetry is widely accepted as indicative of FGR[2,5].

FGR can be classified in various ways. Based on GA at diagnosis, it is sub-classified into early and late FGR, depending on whether the onset is before or after 32 weeks of gestation, respectively[4]. The Delphi consensus standardized the definition of early and late-onset FGR using size (biometry) and functional parameters (Doppler blood flow)[2,4,6]. Early FGR is associated with umbilical artery Doppler abnormalities, while late FGR is often associated with a low pulsatility index in the middle cerebral artery[2]. FGR can also be classified as asymmetric or symmetric. In asymmetric growth, somatic growth (e.g., AC and lower body) shows significant delay, with relative or absolute sparing of head growth. In symmetric growth, both body and head growth are similarly affected[7,8].

The etiology of FGR can be broadly categorized into maternal, fetal, environmental, and placental factors. Although the primary pathophysiologic mechanisms underlying these conditions differ, they often share a common final pathway: suboptimal uterine–placental perfusion and fetal nutrition[1,7,8]. Identifying the factors responsible for FGR is crucial for early intervention and improved perinatal outcomes[7].

FGR is the second leading cause of perinatal mortality after prematurity, affecting 10–15% of pregnancies[9]. Identifying pregnancies at risk for preventable perinatal handicap is a primary goal for obstetric care providers. Birth weight plays a critical role in infant mortality, morbidity, development, and future health[10]. Growth-restricted fetuses are predisposed to cognitive delay in childhood and diseases like obesity, type 2 diabetes mellitus, coronary artery disease, and stroke in adulthood[1]. Compared to appropriately grown counterparts, perinatal mortality rates in neonates with FGR are 6–10 times higher, with rates as high as 120/1000 for all cases of IUGR and 80/1000 after excluding anomalous infants. Up to 53% of preterm stillbirths and 26% of term stillbirths are growth-restricted[8].

Studies have identified several predictive factors for adverse outcomes, including pregnancy-induced hypertension, chronic hypertension, maternal weight gain <8 kg, early-onset FGR, EFW <5th percentile, amniotic fluid index <5 cm, and abnormal umbilical artery Doppler [11]. Another study reported that GA <30 weeks, absent/reversed end-diastolic flow, chronic hypertension, superimposed preeclampsia, and umbilical artery pulsatility index >95th percentile were predictors of perinatal death and severe adverse outcomes in FGR cases[12].

The prevalence of low birth weight in Ethiopia is estimated to be 14%[10]. However, the prevalence and outcomes of FGR in Ethiopia remain understudied, making it challenging to develop strategies to reduce IUGR prevalence and its associated risks. This study aims to assess perinatal outcomes of FGR and factors associated with unfavorable perinatal outcomes at Asella Teaching and Referral Hospital (ATRH).

METHOD

Study Area, Study Design, and Study Period

A hospital-based cross-sectional study design was employed to conduct this study at ATRH from February 1, 2022, to September 30, 2022. ATRH is located about 175 km from Ethiopia's capital city, Addis Ababa, in the southeast direction. ATRH is staffed by midwives, interns, gynecology and obstetrics residents, and obstetrics and gynecology consultants. It has an average monthly delivery rate of 650. The hospital also has a neonatal intensive care unit (NICU).

Source Population and Study Population

The source population comprised pregnant mothers who gave birth to FGR newborns at ATRH, while the study population included all singleton gestations with FGR who gave birth at ATRH during the study period. All pregnant mothers with singleton gestation admitted to ATRH labor ward with the diagnosis of FGR for delivery service were included, except for deliveries complicated by congenital anomalies, RH isoimmunization, and pregnancies with unknown gestational age (GA).

Sample Size and Sampling Procedures

The required sample size was determined using the single population proportion formula, considering the proportion of low APGAR scores (12.9%) among all FGR deliveries in a study conducted at St. Paul Hospital[5], with a 95% confidence interval, 5% margin of error, and a 5% non-response rate. Thus, the sample size was calculated to be 182. All singlet on gestations with FGR who gave birth at ATRH during the study period were enrolled consecutively until the sample size was reached.

Study Variables

Dependent Variable: Perinatal outcome

Independent Variables:

- **Socio-demographic characteristics of mothers:** Age, educational status, family income
- **Obstetric factors:** Parity, history of FGR delivery, antenatal care (ANC) follow-up, GA, maternal weight gain, antepartum hemorrhage, hypertensive disorders of pregnancy
- **Environmental/medical characteristics:** History of chronic illness, history of smoking, history of alcohol intake, malnutrition
- **Fetal characteristics:** Sex of the fetus

Operational Definitions

- **Perinatal outcome:** An unfavorable perinatal outcome is defined by the presence of any of the following conditions: low APGAR score, low birth weight, NICU admission, meconium aspiration syndrome (MAS), neonatal sepsis, respiratory distress syndrome (RDS), stillbirth, or early neonatal death (END). A favorable perinatal outcome is characterized by the absence of these conditions[13,14].
- **Early neonatal death:** Death of a newborn within the first 7 days of life.
- **Fetal growth restriction (FGR):** Fetuses with an estimated fetal weight (EFW) or abdominal circumference (AC) less than the 10th percentile for GA.
- **Stillbirth:** Delivery of a dead fetus after the age of viability (>28 weeks) or at a weight of >1 kg.
- **Perinatal deaths:** A combination of fetal deaths (stillbirth) and END.
- **Low APGAR score:** An APGAR score less than or equal to 6.
- **Family income:** The average monthly income generated by family members per month.
- **Maternal weight gain:** Maternal weight gained during pregnancy, calculated by subtracting the pre-pregnancy weight of the mother from her weight immediately before the onset of labor.
- **Chronic illness:** Presence of any chronic medical illness requiring long-term follow-up and treatment, such as hypertension, diabetes, cardiac diseases, bronchial asthma, etc.

Data Collection Tools and Procedure

The questionnaire was adapted from other relevant literature[4,5,7,11] and translated into the local language (Afan Oromo). Three third-year obstetrics and gynecology residents were recruited and trained to collect data. The purpose of the study was explained to mothers, and their willingness to participate in the study was sought. For those who gave consent, labor progress and fetal heart rate were monitored

using a Pinard stethoscope and cardiotocography. Interviews with mothers were conducted to gather information related to the socio-demographic and obstetric characteristics of study participants. Data on neonatal outcomes were extracted from client records, delivery registers, and operation room registers. The APGAR score was used to assess the condition of newborns at the first and fifth minutes after birth. Study participants were followed from the time of admission until their discharge from the hospital. Neonatal conditions were followed for 7 days postpartum through phone interviews if the mother and neonates were discharged from the hospital.

Data Quality Assurance

To maintain data quality, data collectors were trained for one day and selected based on their educational level, work experience, and knowledge of FGR. Moreover, the questionnaire was pre-tested on 5% of the total sample at Adama Hospital Medical College to assess the appropriateness of the data collection tool, language clarity, and responses. The collected data were reviewed and checked for completeness and consistency by the principal investigator daily during the data collection period.

Data Processing and Analysis

Data were entered and cleaned using Epi-data version 4.6 and analyzed using SPSS version 26 statistical software. Errors related to data inconsistency were checked and corrected during data cleaning. Measures of central tendency appropriate to study variables were calculated. Descriptive analyses were conducted. A multivariate approach was applied to determine the best predictors of perinatal outcomes of FGR and factors associated with unfavorable perinatal outcomes. Adjusted odds ratios (AOR) and corresponding 95% confidence intervals (CI) were used to quantify the degrees of association between dependent and independent variables. Variables with a p-value ≤ 0.25 in the univariate analysis were entered into the multivariate logistic regression model to control for possible confounding factors. A p-value of <0.05 was considered statistically significant.

Ethical Considerations

Ethical clearance was obtained from the Institutional Review Board of Arsi University. Informed verbal consent was obtained from each selected study participant. The purpose of the study and their right to decline participation were explained to the participants. Furthermore, the information collected was kept confidential by omitting personal identifiers.

RESULTS:

Socio-demographic, obstetric and reproductive characteristics of respondents

A total of 172 study participants were enrolled to this study making response rate of 94.5%. Only 10 (5.8%) participants complete their college or university education while 78(45.3%) of the mother attended their high school education. Almost the entire mother 169 (98.3%) live in union with their husband. Majority of the mothers were housewife 158(91.9%) and primiparous 80(46.5%) while all of them (100%) have ANC follow up. About 47 (27.3%) of mother have low pre pregnancy BMI, <18.5.and 146(86.6%) have inadequate weight gain during pregnancy. Majority of the FGR 104 (60.5%) were stage 0 (normal Doppler of umbilical artery) and nearly half mothers 84(48.8%) gave birth through cesarean section. Fifty two (30.2%) of the neonates were delivered preterm [**Table 1**].

Table 1: Socio-Demographic, Obstetric and Reproductive Characteristics of the Mother at Asella Teaching & Referral Hospital, South-East Ethiopia, 2022.

Variable	Variable Category	Frequency N= 172	Percent
AGE in years	< 20	10	5.8
	20-34	146	84.9
	≥35	16	9.3
Marital status	Single	2	1.2
	Married	169	98.3
	Divorced	1	0.6
Level of education	College or university	10	5.8
	High school	78	45.3
	Primary education	56	32.6
	Able to read & write	16	9.3
	Unable to read & write	12	7
Occupation	Housewife	158	91.9
	Merchant	5	2.9
	Government employee	6	3.5
	Private employee	3	1.7
Religion	Orthodox	79	45.9
	Muslim	77	44.8
	Protestant	9	5.2
	Catholic	7	4.1
Ethnicity	Oromo	136	79.1
	Amhara	36	20.9
Family income per month *	Lower middle income	24	14
	Upper middle income	148	86
Parity	Primiparous	80	46.5
	Para 2-4	76	44.2
	Para≥5	16	9.3
Stage of IUGR	Stage 0	104	60.5
	Stage 1	47	27.3
	Stage 2	21	12.2
Mode of delivery	Ceserean Delivery	84	48.8
	Spontaneous vaginal delivery	27	15.7
	Successful Induction	61	35.5
GA at delivery	<37wks	52	30.2
	≥37wks	120	69.8
Previous_IUGR delivery	Yes	7	4.1
	No	165	95.9

*2015 World Bank classification

Perinatal Outcome

Of the total cases, 107 (62%) had unfavorable perinatal outcome. Majority of newborn had low birth weight, 122(70.9%) between 1.5kg-2.49kg and 21(12.2%) has very low birth weight between 1kg-1.49kg. About 92(53.5%) of newborns were female. Majority of neonate have normal 5th minute Apgar score, 158(91.9%). About 107 (62.2%) needed NICU admission for different reasons. About 14(8.1%) of the newborns has ended up with early neonatal death (END) and 11(6.4%) were still birth. The summaries of perinatal outcomes are provided by the table below [**Table 2**].

TABLE 2: Neonatal Outcome of FGR neonates born at Asella Teaching & Referral Hospital, South-East Ethiopia, 2022.

Variable	Category	Frequency	Percent
Birth weight	1.1kg-1.49kg	21	12.2
	1.5kg-2.49kg	122	70.9
	2.5kg-4kg	29	16.9
Sex	Male	80	46.5
	Female	92	53.5
Apgar score	Normal	158	91.9
	Low	14	8.1
NICU admission	Yes	103	59.9
	No	69	40.1
Stillbirth	Yes	11	6.4
	No	161	93.6
END	Yes	14	8.1
	No	158	91.9
Perinatal outcome(PO)	Unfavorable PO	107	62.2
	Favorable PO	65	37.8
Oligohydramnios	Yes	71	41.3
	No	101	58.7

Maternal condition associated with FGR

Of all participants, only 74(43%) have known risk factor for FGR. From the known maternal risk factors 58 (33.7%) have hypertension followed by low pre-pregnancy BMI (<18.5 kg/m2) 47(27.3%) and antepartum hemorrhage 15(8.7%).

Factors associated with unfavorable perinatal outcomes

On binary logistic regression participants who attended College or University, preterm delivery, pre pregnancy BMI of 18.5-24.9 kg/m2 and > 25kg/m^2, stage 1 FGR, stage 2 FGR, absence of known maternal risk factor for FGR, and presence of maternal hypertension have shown association with unfavorable perinatal outcome compared to illiterate, term delivery, BMI <18.5 kg/m^2, stage 0 FGR and presence of maternal risk factors counterparts at P-value of <0.05.

However, variables that have shown positive significant association with development of unfavorable perinatal outcome at P-value of < 0.05 on multivariate logistic regression were; stage 1 FGR [AOR= 9.07, 95%CI: (2.83-29.10)], stage 2 FGR [AOR= 22.66, 95%CI:(1.84-278.55)], and presence of maternal hypertension [AOR=5.83, 95%CI: (1.14-29.76)] while maternal age of 20-35 years [AOR=0.096, 95%CI:(O.016-0.58)], Normal pre-pregnancy BMI [AOR= 0.20, 95%CI:((0.07-0.55)], pre-pregnancy BMI of >25 kg/m^2 [AOR=0.116, 95%CI: (0.02-0.68)], and absence of any of maternal risk factor for FGR [AOR=0.21, 95%CI: (0.049-0.918)] were significantly associated with decreased risk of unfavorable perinatal outcome [**Table 3**]

Table 3. Multivariate logistic regression analysis of adverse perinatal outcome among FGR neonates born at Asella Teaching & Referral Hospital, South-East Ethiopia, 2022.

Variables	Category	Perinatal Outcome (PO): N (%) Unfavorable PO	Favorable PO	COR(95%CI)	AOR(95%CI)	P-Value
Age in years	< 20	8(80%)	2(20%)	0.92(0.12-1.9)	0.236(0.018-3.13)	0.27
	20-35	86(59)	60(41)	0.33(0.9-1.21)	0.096(O.016-0.58)	0.01*
	≥35	13(81)	3(19)	REF	REF	
Educational status	College/University	3(30)	7(70)	0.14(0.02-0.93)	0.28(0.25-3.17)	0.3
	High School	51(65)	27(35)	0.63(0.15-2.52)	2.55(0.38-17.16)	0.33
	Primary school	31(55%)	25(45)	0.41(0.10-1.69)	1.2(0.19-8.18)	0.8
	Able to read and write	13(81)	3(19)	1.44(0.23-8.84)	8.39(0.83-84.06)	0.07
	Unable to read and write	9(75)	3(25)	Ref	Ref	
Pre-pregnancy BMI	<18.5	37(78.7)	10(21.3)	REF	REF	
	18.5-24.9	64(55.6)	51(44.4)	2.9(1.33-6.40)	0.20(0.07-0.55)	0.002*
	>25	6(60)	4(40)	2.4(0.5-10.46)	0.116(0.02-0.68)	0.018*
Weight gain during pregnancy	Adequate	11(47.8)	12(52.2)	REF	REF	
	Inadequate	96(64.4)	53(35.6)	0.50(0.20-1.2)	1.83(0.56-5.82)	0.31
Gestational age at delivery	≥37wk	63(52.5)	57(47.5)	REF	REF	
	<37wk	44(84.6)	8(15.4)	4.97(2.16-11.46)	1.81(0.56-5.82)	0.32
Stage of FGR	Stage 0	47(45.2)	57(54.8)	REF	REF	
	Stage 1	40(85)	7(15)	0.14(0.059-0.35)	9.07(2.83-29.10)	0.01*
	Stage 2	20(95.2)	1(4.8)	0.04(0.005-0.319)	22.66(1.84-278.55)	0.015*
Presence of any known maternal risk factor for FGR	Yes	53(71.6)	21(29.4)	REF	REF	
	No	54(55.1)	44(44.9)	2.05(1.08-3.91)	0.21(0.049-0.918)	0.038*
Presence of maternal hypertension	Yes	48(82.7)	10(17.3)	4.47(2.06-9.70)	5.83(1.14-29.76)	0.034*
	No	59(51.7)	55(49.3)	REF	REF	

DISCUSSION

In this study, the magnitude of unfavorable perinatal outcomes was found to be 107 (62.2%). Adverse perinatal outcomes occurred in 44.6% of cases[11], in 39.7% of cases[12], and in one-third of cases[15] in different studies. The finding of our study is relatively similar to those studies, whereas the proportion of fetuses with adverse perinatal outcomes was 5% in another study conducted in Ireland[16]. The significant difference between the Ireland study and ours might be due to methodological variation in the operational definition of APO we used. In the Ireland study, APO was defined as a composite of intraventricular hemorrhage, periventricular leukomalacia, bronchopulmonary dysplasia, necrotizing enterocolitis, sepsis, hypoxic-ischemic encephalopathy, and death, which are rare occurrences with FGR. In our case, we defined APO as a composite of low APGAR score, low birth weight, NICU admission, meconium aspiration syndrome (MAS), neonatal sepsis, respiratory distress syndrome (RDS), stillbirth, and early neonatal death (END).

In this study, normal pre-pregnancy BMI [AOR = 0.20, 95% CI: (0.07–0.55)] and pre-pregnancy BMI > 25 kg/m² [AOR = 0.116, 95% CI: (0.02–0.68)] were significantly associated with decreased odds of developing unfavorable PO by 80% and 88.4%, respectively, compared with those with pre-pregnancy BMI < 18.5 kg/m². Maternal BMI is a modifiable risk factor associated with unfavorable PO, such as low birth weight, preterm labor, and SGA. The finding of our study is similar to that of a study conducted in Gondar, which showed an association between low BMI and FGR[9]. Based on maternal BMI, the FGR risk profile was U-shaped and bidirectional. Both underweight and obesity were associated with a higher risk of FGR and APO[17,18]. In another study, maternal obesity was associated with an increased risk of perinatal mortality, genetic disorders, and intrauterine growth restriction[7].

Similarly, maternal age of 20–35 years [AOR = 0.096, 95% CI: (0.016–0.58)] and absence of maternal risk factors for FGR [AOR = 0.21, 95% CI: (0.049–0.918)] were significantly associated with decreased odds of developing unfavorable PO by 90.4% and 79%, respectively, compared with those aged > 35 years and those having maternal risk factors for FGR. Our study aligns with another study that showed a significant association between advanced maternal age and FGR or APO[17]. Advanced maternal age is an independent and substantial risk factor for different APOs, such as low birth weight, preterm birth, and low APGAR scores. Another study revealed that the odds of composite APO were higher among advanced maternal age women compared with adult-aged women (AOR = 2.01, 95% CI: 1.06–3.79)[19].

In this study, Stage 1 FGR [AOR = 9.07, 95% CI: (2.83–29.10)] and Stage 2 FGR [AOR = 22.66, 95% CI: (1.84–278.55)] were significantly associated with increased odds of developing unfavorable PO by 9 and 23 times, respectively, compared to Stage 0 FGR. Fetuses with Stage 0 FGR have normal Doppler studies, while Stage 1 FGR has abnormal Doppler flow, and Stage 2 FGR has absent or reversed Doppler flow on ultrasound assessment. The findings of our study are consistent with other studies. Newborns with affected umbilical artery Doppler studies develop APOs such as NICU admission, RDS, neonatal sepsis, neonatal hyperbilirubinemia, and END more frequently than those with normal Doppler studies. In a study conducted at Saint Paul Hospital, newborns with abnormal umbilical Doppler studies were 2.3 times more likely to develop RDS and require resuscitation compared to those with normal Doppler studies[5]. Infants with abnormal antenatal Doppler flow were at increased risk of perinatal complications in another study as well[20].

The risk of developing unfavorable perinatal outcomes increased sixfold with the presence of maternal hypertension compared to its absence [AOR = 5.83, 95% CI: (1.14–29.76)]. A history of pregnancy-induced hypertension and chronic hypertension were found to be predictors of adverse perinatal outcomes in other studies as well[11, 12].

LIMITATION

The limitation of this study was that the assessment of neonatal outcomes was restricted to short-term intrapartum events and the first seven days of neonatal life.

CONCLUSION & RECOMMENDATION

The magnitude of unfavorable perinatal outcomes among FGR fetuses was high (62%) in this study. Maternal age of 20–35 years, pre-pregnancy BMI of 18.5–24.9, and > 25 kg/m², as well as the absence of known maternal risk factors for FGR, were associated with a decreased risk of unfavorable perinatal outcomes, while Stage 1 FGR, Stage 2 FGR, and maternal hypertension were significantly associated with an increased risk of unfavorable perinatal outcomes. We recommend counseling women on nutrition to increase their pre-pregnancy BMI before conception and intervening to minimize the risk of FGR development in the community.

ABBREVIATIONS

AC: Abdominal circumference;
ANC: Antenatal care;
AOR: Adjusted odds ratio;
APO: Adverse perinatal outcome;
ATRH: Asella Teaching and Referral Hospital;
BMI: Body mass index;
CI: Confidence interval;
COR: Crude odds ratio;
CS: Cesarean section;
EFW: Estimated fetal weight;
END: Early neonatal death;
FGR: Fetal growth restriction;
GA: Gestational age;
IUGR: Intrauterine growth restriction;
MAS: Meconium aspiration syndrome;
NICU: Neonatal intensive care unit;
SGA: Small for gestational age;
RDS: Respiratory distress syndrome;
SVD: Spontaneous vaginal delivery.

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Availability of Data & Materials

The data used to generate and analyze the current study are available from the corresponding author upon request.

Author's Contributions

All authors participated in the design and analysis of the study. A.F. and M.G. searched the databases and wrote the first and second drafts of the article. M.G. and M.T. reviewed proposal development activities and each draft of the final article. All authors revised the manuscript and approved the final version.

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Ethics Approval and Consent to Participate

The study was approved by the Institutional Review Board of Arsi University. Verbal informed consent was obtained from each study participant.

Consent for Publication

Not applicable for this publication.

Competing Interests

We declare that we have no competing interests regarding the publication of this article.

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PREDICTORS OF EMERGENCY SECOND CAESAREAN SECTION AMONG WOMEN WITH ONE PREVIOUS SCAR DELIVERING AT IRINGA REGIONAL REFERRAL HOSPITAL: HOSPITAL BASED CROSS-SECTIONAL STUDY

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ABSTRACT

BACKGROUND: A significant increase in second emergency caesarean sections (CS) is associated with numerous adverse obstetric outcomes. Women have the opportunity to undergo planned childbirth, potentially preventing the need for a second emergency caesarean section.

Objective: To determine the predictors of emergency second caesarean section among pregnant women delivering at Iringa Referral Hospital.

METHODOLOGY: The study was conducted at Iringa Hospital over six months using a cross-sectional design. Participants were recruited serially, involving women with one previous scar arriving for delivery. Data were collected using a structured questionnaire, and analysis was conducted using SPSS. Chi-square tests were used to test the association of variables, and binary logistic regression assessed significance at a 95% confidence interval (CI) with a p-value <0.05.

RESULTS: The study recruited a total of 355 participants who had second caesarean deliveries, with 204 (57.46%) having an emergency caesarean and 151 (42.54%) having an elective caesarean. The significant predictors of emergency second CS were lack of employment [AOR=3.02, 95% CI (1.59, 15.46)], late booking (11–20 weeks) [AOR=4.70, 95% CI (1.18, 18.64)] and >21 weeks [AOR=6.53, 95% CI (1.02, 41.67)], category of healthcare provider [AOR=3.87, 95% CI (1.30, 11.53)], lack of information on the mode of delivery during ANC [AOR=3.02, 95% CI (2.59, 15.46)], third-trimester ultrasound scanning [AOR=10.05, 95% CI (3.95, 25.61)], and pregnancy interval [AOR=10.05, 95% CI (3.95, 25.61)].

CONCLUSION: Emergency second caesarean sections (CS) are prevalent. Most women originate from primary healthcare centers, where nurses primarily manage them during ANC without establishing a birth plan. The number of antenatal visits and delays in booking exacerbate the situation. Therefore, all women with previous scars who arrive late for booking must receive attention from a physician. They should undergo critical evaluation and counseling on their birth plan.

KEYWORDS: Predictors, emergency, second caesarean section, previous scar, Iringa.

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INTRODUCTION

An emergency second caesarean section (CS) is a surgical procedure performed on pregnant women, involving an abdominal incision (laparotomy) and a uterine incision (hysterotomy) to deliver the baby when there are life-threatening risks to either the mother, the baby, or both. It is commonly performed after the onset of labor[1]. There are four categories of caesarean sections: in Category I, there is an immediate threat to the fetus and mother; in Category II, the health of either the mother or the fetus is compromised, but there is no immediate risk to life; in Category III, early delivery is necessary, but neither the mother nor the fetus is in danger; and in Category IV, an elective caesarean section is planned[2].

The rate of second caesarean sections is increasing. Globally, the average rate of caesarean sections is rising by 21.1%. Estimates based on global and regional data from 2010 to 2018 reveal significant variations: from 5% in sub-Saharan Africa to 42.8% in Latin America and the Caribbean. Projections indicate further increases by 2030, with an expected 28.5% of women worldwide delivering via caesarean section, ranging from 7.1% in sub-Saharan Africa to 63.4% in Eastern Asia[3].

In Tanzania, there is also a noticeable increase in the caesarean delivery rate. Specifically, the occurrence of emergency second caesarean sections was observed to be 64.4% at Muhimbili National Hospital (MNH) and 62.4% at Kilimanjaro Christian Medical College (KCMC) Hospital among women with one previous caesarean scar[1,4]. Emergency second CS is associated with higher adverse obstetric outcomes compared to vaginal birth after caesarean section (VBAC) and elective caesarean section[5,6]. Women with one previous scar are required to have a birth plan before reaching term pregnancy during antenatal care. This birth plan may include trial labor after caesarean section (TOLAC) or elective second caesarean[7,8]. TOLAC has a 60–80% success rate for vaginal birth after caesarean section (VBAC)[9].

Despite this, many women with one previous scar attending antenatal care present in labor without a birth plan, resulting in emergency second CS. This is associated with higher maternal and fetal adverse outcomes compared to VBAC and elective caesarean section[1,10,11].

This study aims to identify the predictors of emergency second CS and address these predictors in antenatal care settings to ensure early intervention for at-risk women, thereby reducing complications related to emergency second CS. Understanding predictors of emergency second CS helps healthcare providers identify patients prone to emergencies early, enabling the establishment of a birth plan before labor-related emergencies arise.

METHODOLOGY

Study Setting and Design

The study was conducted at Iringa Regional Referral Hospital, a teaching and tertiary hospital situated in the Iringa region of the southern highlands of Tanzania. The hospital serves not only Iringa District hospitals but also mission hospitals within the region. The study took place in the Obstetrics department, which comprises a 78-bed facility divided into five sections: the antenatal ward, postnatal ward, labour ward, gynaecology ward, and outpatient clinic. The department is staffed with 4 specialists, 8 residents from The University of Dodoma (UDOM), 4 medical doctors, 1 assistant medical officer, and 51 nurses and medical students from UDOM. Despite this staffing, there remains a high demand for healthcare providers, necessitating task shifting. Consequently, during nighttime, staffing levels are reduced, impacting the delivery of care. The department handles approximately 400 deliveries per month, with around 250 (60%) being caesarean sections. A study done in 2018 showed that emergency second caesarean section was observed to be 38.6% among all patients admitted for Trial of Labour After Caesarean (TOLAC). TOLAC is performed at this facility; however, TOLAC was not convenient during the night due to limited staffing and the hospital's role as a referral centre that accepts emergencies at all times. This had an effect on delays in intervention when necessary,

although it occurred on rare occasions. This was a quantitative cross-sectional hospital-based study.

Study Period

The study was conducted over a period of six months, from August 2023 to February 2024.

Study Population

All women who came for delivery at Iringa Regional Referral Hospital and had one previous scar.

Inclusion Criteria

- Women with one previous scar at term admitted to the labour ward with labour pain and who eventually had an emergency second caesarean section.
- Women with one previous scar who came for an elective caesarean section, not in labour.

Exclusion Criteria

- Women who had a failed trial of labour leading to an emergency caesarean section.
- All women with one previous scar in labour who had been diagnosed with other medical conditions, including pre-eclampsia, diabetes mellitus, and sickle cell disease.

Sampling Technique

All women admitted for delivery with one previous caesarean scar were interviewed. Upon admission, we assessed those in labour through a history, physical examination, and bedside ultrasound investigation. We directly enrolled those who came for an elective caesarean section in the study. We used the checklist (attached as Appendices 1) to determine the mode of delivery for each patient presenting with labour pain. We immediately prepared patients who did not qualify for TOLAC for an emergency caesarean section and included them in the study. Those who met the TOLAC criteria were closely monitored for their labour progress and excluded if necessary.

Study Variables

Social Demographic Characteristics: Age (years), referral status, marital status (married/single), educational level, parity, place of residence (rural/urban).

Obstetric Characteristics: Gestational age at booking (weeks in first visit), number of antenatal visits, duration from last ANC visit to admission in weeks, ultrasound scan in the last trimester, inter-pregnancy interval (months), previous vaginal birth after CS, previous vaginal birth before CS, category of previous CS (emergency or elective), duration of labour (hours).

Health Facility Characteristics: Level of health facility during the last ANC (dispensary, health center, district hospital, referral hospital), category of healthcare provider (nurse [midwife] /doctor).

Dependent Variable (Primary Outcome)

- Emergency second caesarean section/elective caesarean section.

Operational Definition

Caesarean Delivery: A mode of delivery through the incision made on the abdomen (laparotomy) and uterus (hysterotomy).

Emergency Caesarean: A mode of delivery through laparotomy and hysterotomy when there is an immediate threat to the mother and foetus.

Categorisation of Emergency Caesarean Section:

- **Category 1:** Pregnancy has an immediate threat to the foetus and mother.
- **Category II:** Pregnancy compromises the maternal or foetal health but has no immediate life-threatening risk.
- **Category III:** Early delivery is needed, but there is no maternal or foetal compromise.
- **Category IV:** Planned for elective caesarean section.

Elective Caesarean Section: A mode of delivery through laparotomy and hysterotomy when vaginal delivery is not possible and usually performed before the onset of labour at term pregnancy.

Obstetric Outcomes: The pregnancy outcomes after delivery, describing both maternal and foetal outcomes of a particular pregnancy.

Primary Caesarean Section: The delivery through caesarean section for the first time, even if the mother had a previous vaginal delivery.

Second Caesarean Section: The mode of delivery by caesarean section for the second time after having a previous caesarean section.

Repeat Caesarean Section: The mode of delivery by making an incision on the abdomen and uterus for

a patient who had a previous caesarean section. In this study, it will refer to all patients who underwent caesarean section for the second time.

Data Collection Procedure

Data collection began with demographic information, including socio-demographic characteristics (age, residence, education level), and obstetric details such as parity, previous mode of delivery, antenatal visit history (including evidence from antenatal cards), the level of the health facility visited last, number of antenatal visits, gestational age at first booking, and planned mode of delivery as recorded during antenatal care. We collected all this information using a structured questionnaire designed based on previous studies. We collected information from patients during their admission, and after surgery for those with emergency conditions who were unable to provide information. We also collected additional data on maternal and foetal outcomes during surgery and obtained post-delivery information from patient files.

Data Analysis

After collecting the data, we checked the questionnaires for completeness. We coded and entered the completed questionnaires into the Statistical Package for Social Sciences (SPSS). We cleaned the data by examining the error codes and making the necessary corrections. We then conducted an analysis, initially analyzing demographic data, obstetric information, and outcomes using frequency tables, figures, and chi-square tests. We checked the variables with a p-value of 0.2 for statistical association using chi-square tests. Both unadjusted and adjusted logistic regression were performed at a 95% confidence interval, with a p-value of less than 0.05 considered statistically significant.

Ethical Clearance

The UDOM Research Ethical Committee granted ethical clearance under reference number MA.84/261/64/99, and the Iringa Regional Referral Hospital administration issued a research permit for data collection under reference number IRRH/E10/16/Vol.xxxiii/137. Participants were given a comprehensive explanation of the study's aims and benefits before giving consent, along with the assurance that they could freely opt out if they did not wish to participate. For those who were unable to read or write, the researcher or research assistant read the information to them. If they agreed to participate, they were asked to use fingerprint ink on the written consent form. No payment or allowance was provided to participants during this study. The study participants received a unique identification number, which was coded with the patient file number and recorded on various papers for easy reference. We informed patients that withdrawing from the study would not impact their treatment plan during the entire period of admission and would require further follow-up, if necessary. All participant information was kept confidential.

Results:

This study recruited 355 participants who had second CS. The majority of them 214 (60.28%) were referrals, ages of participants ranged from 21 to 45 years with a mean age of 32.09±6.15. About 313(88.17%) were married, and a large number of the participants, 208 (58.59%), resides in rural areas. The employment rate was low, with 215 (60.56%) not being employed and 207 (58.31%), has completed primary and secondary education (**Table 1**).

Table 1: Socio-demographic characteristics of women with emergency second caesarean section after one previous scar

Variable characteristics	Frequency	Percentage
Referral status		
Yes	214	60.28
No	141	39.72
Age (32.09±6.15)		
20-34	203	57.18
≥35	152	42.82
Marital status		
Married/Cohabiting	313	88.17
Separated	26	7.32
Widow	16	4.51
Level of education		
Primary and secondary level	207	58.31
College	148	41.69
Occupation		
Unemployed	215	60.56
Employed	140	39.44
Residence		
Urban	147	41.41
Rural	208	58.59

Proportional of emergence CS among women with one previous CS

The study recruited a total of 355 participant who had second caesarean delivery with 204 (57.46%) having an emergency cesarean and 151 (42.54%) having an elective cesarean (**Figure 1**).

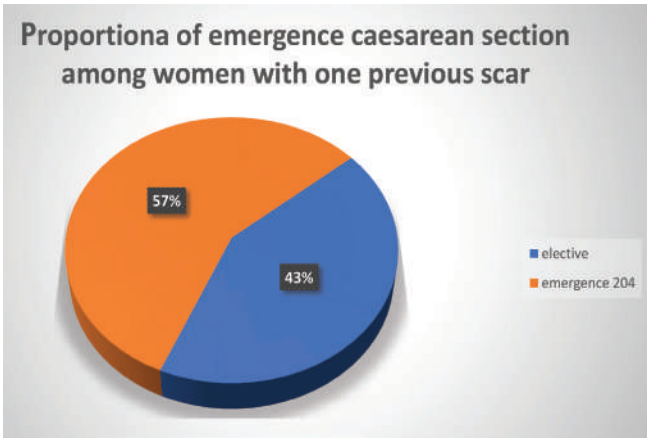

Fig1 proportional of emergency second caesarean section among patient with one previous scar

The large number of participants had emergency caesarean section.

Predictors of emergency second caesarean section among women with one previous scar delivered by second CS

The predictors of emergency second cesarean sections (CS) were analyzed using chi-square tests to identify associations. Variables with significant associations were then tested in a logistic regression model, as shown in **Table 2**. In unadjusted logistic model, we found that socio- demographics such as young age, education level, occupation, residence, referral status, and obstetrics characteristics such as the location of the antenatal visit, the interpregnancy interval, the absence of ultrasound in the third trimester, the time since the last visit, the category of previous Caesarean section, and the absence of a birth plan all influence the emergency second caesarean section. However, in multivariate analysis, we observed significant associations with certain predictors: individuals referred from another facility showed a significant association of emergency second CS than elective [AOR = 3.26, 95% CI (1.30, 8.17), P = 0.01]. Furthermore, the study revealed a significant association between employment status and the likelihood of undergoing an emergency caesarean section in unemployed individuals [AOR = 3.02, 95% CI (1.59, 15.46), P = 0.02]. Gestational age at booking also showed significance; the likelihood of an emergency caesarean section increased with late booking, particularly for those booked at 11–20 weeks [AOR=4.70, 95% CI (1.18, 18.64), P=0.03] and >21 weeks [AOR=6.53, 95% CI (1.02, 41.67), P=0.04]. Furthermore, the category of health care provider significantly influenced the emergency of a second emergency caesarean section, with those under the care of a nurse/midwife having a higher chance [AOR=3.88, 95% CI (1.30, 11.54), P=0.01]. and all women lacking birth plan had higher chances of emergency second CS [AOR= 3.02,95%CI (2.59,15.46), P=0.02]

Table 2: Chi- square test for predictors of emergency caesarean section among women with one previous scar delivered at Iringa referral hospital.

Variable	Emergency Second C/S			
	YES n=204	NO(elective) n=151	Chi-Value 250.58	P-Value <0.05
Mode of delivery at ANC				
Informed	28(15.80)	149(84.20)		
Not informed at all	176(98.88)	2(1.12)		
Referral status			151.08	<0.05
Yes	179(83.64)	35(16.36)		
No	25(17.73)	116(82.27)		
Age			46.25	<0.05
21-34	148(72.91)	55(27.09)		
≥35	56(36.84)	96(63.16)		
Marital status			0.08	0.77
Married/Cohabiting	179(57.19)	134(42.81)		
Separated/Widow	25(59.52)	17(40.48)		
Level of education			104.94	<0.05
Primary and Secondary level	166(80.19)	41(19.81)		
College	38(25.68)	110(74.32)		
Occupation			99.68	<0.05
Unemployed	169(78.60)	46(21.40)		
Employed	35(25.00)	105(75.00)		
Residence			35.85	<0.05
Urban	57(38.78)	90(61.22)		
Rural	147(70.67)	61(29.33)		
Place of antenatal visit			75.55	<0.05
Dispensary	77(62.60)	46(37.40)		
Health center	111(76.03)	35(23.97)		
District hospital	13(20.97)	49(79.03)		
Referral hospital	3(12.50)	21(87.50)		
Gestation age at booking weeks			65.89	<0.05
≤10	5(11.90)	37(88.10)		
11-20	142(56.57)	109(43.43)		
≥21	57(91.94)	5(8.06)		
Number of antenatal visits			91.70	<0.05
≤4	138(81.66)	31(18.34)		
5-7	57(44.88)	70(55.12)		
≥8	9(15.25)	50(84.74)		
Interval from last antenatal visit to delivery. (Weeks)			35.85	<0.05
<3	25(18.3)	128(81.7)		
>3	179(88.6)	23(11.4)		
Health care provider			159.12	<0.05
Nurse	192(80.67)	46(19.33)		
Doctor	12(10.26)	105(89.74)		
Ultrasound scan in 3rd trimester			170.74	<0.05
Yes	18(13.43)	116(86.57)		
No	186(84.16)	35(15.84)		
Inter pregnancy interval			55.11	<0.05
Less than 18 months	14(19.18)	59(80.82)		
More than 18 moths	190(67.38)	92(32.62)		
Category of previous caesarean section			8.22	0.04
Emergency	178(60.96)	114(39.04)		
Not emergency	26(41.27)	37(58.73)		

We found a significant association between ultrasound scanning and the emergency of a second caesarean section. Those who did not undergo scanning in last trimester had a higher chance of experiencing an emergency second CS [AOR=10.05, 95% CI (3.95, 25.60), P<0.05]. Additionally, we found that an inter-pregnancy interval of more than 18 weeks significantly increases the likelihood of having an emergency second CS [AOR=7.85, 95% CI (2.77, 22.22), P=0.05] **Table 3**.

Table 3: Binary Logistic Regression for predictors of emergency second caesarean section among women with one previous scar delivered at Iringa Regional Referral hospital

Variable	Unadjusted logistic model		Adjusted logistic model	
	OR [95%CI]	p-variable	AOR [95%CI]	p-variable
Age				
21-34	4.61[2.94,7.25]	<0.05	1.95[0.33,2.75]	0.93
≥35	Ref		Ref	
Level of education				
Primary and Secondary level	11.72[7.09,19.38]	<0.05	1.49[0.37,6.01]	0.57
College	Ref		Ref	
Occupation				
Unemployed	11.02[6.67,18.22]	<0.05	3.02[1.59,15.46]	0.02
Employed	Ref		Ref	
Residence				
Urban	0.26[0.17,0.41]	<0.05	0.60[0.27,1.31]	0.20
Rural	Ref		Ref	
Place of ANC on last visit				
Dispensary	11.72[3.31,41.46]	<0.05	1.74[0.13,4.07]	0.73
Health center	22.20[6.23,78.90]	<0.05	1.98[0.17,5.97]	0.98
District hospital	1.86[0.48,7.20]	0.37	1.65[0.12,3.54]	0.62
Referral hospital	Ref		Ref	
Gestation age at booking weeks				
≤10	Ref		Ref	
11-20	9.64[3.67,25.35]	<0.05	4.70[1.18,18.64]	0.03
≥21	84.36[22.84,311.64]	<0.05	6.53[1.02,41.67]	0.05
Number of antenatal visits				
≤4	Ref		Ref	
5-7	0.18[0.11,0.19]	<0.05	0.66[0.23,1.88]	0.45
≥8	0.04[0.02,0.09]	<0.05	0.33[0.28,6.44]	0.72
Interval from last antenatal visit to delivery.				
≤3weeks	0.06[0.03,0.11]	<0.05	0.47[0.15,1.45]	0.19
>3weeks	Ref		Ref	
Who provided the service to you on last visit				
Nurse	36.52[18.53,71.97]	<0.05	3.88[1.30,11.54]	0.01
Doctor	Ref		Ref	
Birth plan				
YES (SVD+CS	Ref		Ref	
NO(not informed)	12.33[5.66,32.73]	0.05	3.02[2.59,15.46]	0.02
Ultrasound scan in 3rd trimester				
Yes	Ref		Ref	
No	34.25[18.54,63.28]	<0.05	10.05[3.95,25.60]	0.05
Inter pregnancy interval				
Less than 18 months	Ref		Ref	
More than 18 months	8.70[4.62,16.40]	<0.05	7.85[2.77,22.22]	0.05

Here's the revised version of your text with the requested language editing:

DISCUSSION

The proportion of women who underwent emergency second CS was 204 (57.46%). The results of this study bear a striking resemblance to the Muhimbili study (64.2%)[1] and a study from Rwanda (54.9%)[21]. This similarity may be due to the fact that all studies involved patients who came in labor during admission.

A large number of participants came from rural areas and were unemployed. Among them, the majority underwent emergency second CS. Studies conducted in Ethiopia, Nigeria, and Bangladesh reveal a lower overall rate of Caesarean sections among this group[22–24]. This is likely due to the difficulty in accessing early health services, leading to delayed hospital presentations, which results in a higher incidence of emergency caesarean sections.

From this study, the lack of a birth plan established during antenatal care (ANC) was associated with a higher chance of having an emergency second caesarean section (CS). These findings are similar to those from studies conducted in Rwanda and Muhimbili, Tanzania, which indicate that the majority of women who underwent emergency second CS did not have a birth plan established during ANC[1,21].

The study also found that the category of healthcare provider during the ANC visit influences the occurrence of emergency second caesarean sections (CS). These findings are similar to a study conducted in California, which indicates that maternal outcomes were better for those attended by doctors compared to those attended by nurses[25].

Additionally, the study identified that the absence of a third-trimester ultrasound and an interpregnancy interval exceeding 18 weeks increases the chances of emergency second caesarean section. Other studies that evaluated these predictors also found similar findings[26–28].

The study found that social demographic data, such as age, level of education, and obstetric characteristics, including place of antenatal visit, number of antenatal visits, and duration from the last antenatal visit, were not significantly associated with emergency second caesarean section. However, some studies show different results. A study conducted in Brazil shows that education level, increased maternal age, and more antenatal visits are protective factors for emergency caesarean section but increase the likelihood of elective caesarean delivery[29,30].

Limitations of the Methods

This study was conducted at the point of care, where all information was obtained directly from the patients. This approach posed a challenge in verifying whether verbal counseling was actually provided by healthcare providers during antenatal care (ANC).

Limitations of the Study

This study was conducted at a referral hospital where more severe or complex cases are typically transferred. As a result, the sample may be skewed towards more complicated cases, potentially limiting the generalizability of the identified predictors. To enhance the applicability of the findings, further research is needed in lower-level healthcare facilities where less complex cases are managed. The study could also be conducted at the antenatal point of care with follow-up, which would help determine whether the predictors identified in this study are relevant across different healthcare settings.

CONCLUSIONS AND RECOMMENDATIONS

Patients who have previously undergone a caesarean section still have a high rate of emergency second caesarean sections. Most of these patients come from primary healthcare facilities and receive care from nurses. This group often lacks a birth plan, has fewer antenatal visits, books late, and lacks ultrasound. The factors that predict emergency second caesarean sections include not having a birth plan, not having an ultrasound in the third trimester, having a nurse attend the last visit, and being unemployed.

All unemployed women with one previous scar who arrive late for their antenatal visit should undergo a thorough evaluation and investigation. A birth plan should be arranged for their index pregnancy, and all women with one previous scar pregnancy should be referred before the onset of labor.

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Appendices

Check list used to evaluate patient for Emergence Second caesarean section (adopted and modified from Canadian Medical Association journal.(31).

S/N	MATERNAL FACTORS	FETAL FACTORS
1	maternal age during primary CS >35years	Estimated fetal weight≥3.5kg
2	Body mass index >35kg/m2	Any early perinatal death or low score outcome in primary caesarean section
3	Short Inter-pregnancy interval from primary caesarean section <18 months	Prolonged rupture of membrane.
4	Prolonged labour during primary CS that end up with prolonged catheterization	Fetal station above 0 with strong contraction
5	Previous pregnancy losses	Mal-presentation
6	Gestation age >41 weeks	
7	Had secondary suture or prolonged wound dressing more than 2 weeks during primary caesarean section	
8	Primary caesarean section at gestation age less than 28 weeks (hysterotomy)	
9	Any known complication from primary caesarean section like fistula, uterus rupture	
10	Contracted pelvis or history of pelvic fracture	
11	Disagree Consent to have TOLAC.	

Any of the above factor was considered to be candidate for repeat CS

MEASURING THE EFFECT OF DIFFERENT MODES OF MOBILE PHONE-BASED ANTENATAL FAMILY PLANNING COUNSELING ON THE INTENTION FOR EARLY POSTPARTUM FAMILY PLANNING UPTAKE IN WESTERN KENYA: A PRAGMATIC FACTORIAL RANDOMIZED CONTROL TRIAL

Morris Senghor Shisanya[1], Mary Kipmerewo[2], Everlyne Morema[2], Collins Ouma[3]

ABSTRACT

INTRODUCTION: The Maternal and Child Health care continuum offers a key opportunity to integrate postpartum family planning (PPFP) interventions, particularly through antenatal counseling. This study assessed the impact of mobile phone-based antenatal family planning counseling on the intention for early PPFP among postpartum mothers in Western Kenya.

METHODOLOGY: This pragmatic factorial randomized controlled trial assessed the effectiveness of family planning counseling delivered by nurses and community health workers using a mobile phone-based tool, compared to routine counseling, on the intention for early postpartum family planning among postpartum mothers in Kisumu County, Western Kenya. Ordinal regression identified predictors of intention, while ANOVA evaluated the effectiveness of counseling modalities, with significance set at $P < 0.05$. Tukey's post hoc test and partial eta^2 were used to determine differences between study arms and effect size, respectively.

RESULTS: The mean intention for early PPFP on a 7-point Likert scale was 6.59±0.87 for the nurses' arm, 6.05±0.86 for the community arm, and 6.03±0.69 for the control arm. ANOVA revealed a significant difference in mean intention scores between the arms ($F(2,243)=12.43$, $P<0.0001$). Tukey's post hoc test showed significantly higher mean intention in the nurses' arm compared to both the community ($P<0.0001$) and control arms ($P<0.0001$) with a medium effect size (partial eta^2 = 0.06 to <0.14). The combined mean intention for the two intervention arms (6.22±0.85) was significantly higher than the control arm ($P=0.012$) with a small effect size (partial eta^2 = 0.026). There was no significant difference between the community and control arms ($P=0.986$).

CONCLUSION: Mobile phone-based antenatal family planning counseling by nurses was more effective in increasing intention for early postpartum family planning for participants in Kisumu County compared to community-based and routine delivery of counseling. Therefore, more efforts should be directed toward empowering nurses with mobile phone-based antenatal family planning counseling tools to enhance intention for early postpartum family planning.

TRIAL REGISTRATION: The study was registered with the Pan African Clinical Trial Registry on 03 July 2021 under Trial Registration Number PACTR202107891858045. The trial was prospectively registered.

KEYWORDS: Intention for Early Postpartum Family Planning (PPFP), Nurses Intervention, Community Health Worker Intervention, Early Postpartum Family Planning, Mobile Phone-Based Family Planning Counseling Guide.

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INTRODUCTION

International trends indicate varying intentions toward birth spacing and limiting, emphasizing the importance of understanding women's intentions regarding early PPFP. While regions such as Eastern and Southern Asia exhibit higher desires for birth spacing and limiting, Sub-Saharan Africa lags behind[1–3]. A study across five low-income countries revealed disparities between the desire to delay pregnancies and actual contraceptive usage, particularly among young mothers[4].

Determinants of intention for early PPFP vary. Studies have shown perceived norms, male partner support, and antenatal counseling as key predictors of family planning intention. For example, male partner approval in Ethiopia and antenatal counseling in Tanzania have significantly influenced intentions for early PPFP[5,6]. In countries like Ethiopia, Ghana, and Uganda, antenatal care visits, the gender composition of living children, and early decision-making through interventions such as appointment vouchers are pivotal for PPFP intentions[3, 7, 8]. In Kenya, societal and community influences, education, and marital status play major roles in shaping postpartum contraceptive intentions[9].

Mobile phone-based interventions have shown potential in improving family planning outcomes in low- and middle-income countries, including increased postpartum contraceptive uptake and care attendance[10]. These interventions typically use text messages, calls, or apps to deliver content, with interactive methods proving more effective[11]. However, gaps exist in tools designed to assist counselors in ensuring comprehensive coverage of the PPFP package and providing real-time feedback on process fidelity[12]. Existing interventions often lack mechanisms for guiding counseling sessions or ensuring adherence to the intended process[11]. Furthermore, there is a scarcity of research exploring the impact of mobile phone-based tools on intention for early PPFP compared to routine antenatal care, which typically lacks a structured guide for family planning counseling.

Despite these insights, there is a paucity of interventional research actively addressing and influencing women's antenatal intentions for early PPFP. According to the Theory of Planned Behavior, intention is a good predictor of behavior, making interventions that influence intention for early PPFP likely to improve its uptake. The current study addresses these gaps by employing a mobile phone-based tool that not only guides counselors through antenatal PPFP counseling but also enhances process fidelity through feedback to an independent observer[13]. This study aimed to determine the effect of antenatal counseling of mothers by nurses and community health workers using a mobile phone-based tool compared to routine counseling on the intention for early PPFP in Western Kenya.

METHODOLOGY

Study Population and Sample

This was a pragmatic factorial randomized control trial with three arms: the nurses' intervention arm, the community intervention arm, and a control (routine care) arm. The study was conducted between February 26 and August 30, 2022, among pregnant women in their second or third trimester attending ANC clinics in Kisumu County, Western Kenya. The study was carried out in community and primary health centers. The mothers were allocated to the study using simple random sampling.

The sample size was estimated using a sample size determination formula for differences in proportions, considering Type I and II errors and power[14–18]:

N1={z(1−α/2)p¯q¯(1+1k)+z(1−β)p1q1+p2q2k}2/Δ2N_1 = \left\{z_{(1-\alpha/2)} \cdot \sqrt{\bar{p} \cdot \bar{q} \cdot \left(1+\frac{1}{k}\right)} + z_{(1-\beta)} \cdot \sqrt{p_1 \cdot q_1 + \frac{p_2 \cdot q_2}{k}}\right\}^2 / \Delta^2

Where q1=1−p1q_1 = 1-p_1, q2=1−p2q_2 = 1-p_2, p¯=p1+kp21+K\bar{p} = \frac{p_1 + kp_2}{1+K}, p1,p2p_1, p_2 = proportions (incidence) of group 1 (27%, the KDHS-estimated current PPFP use) and group 2 (53%, the KDHS-estimated contraceptive

prevalence rate in the general population), Δ=p2−p1\Delta = |p_2 - p_1| (absolute difference, or desired clinical difference between intervention and control arms), n1=n_1 = sample size for group 1, n2=n_2 = sample size for group 2, α=\alpha = probability of Type I error (set at 0.05), β=\beta = probability of Type II error (set at 0.1, i.e., 90% power), zz = critical Z value for a given α\alpha or β\beta (1.96), and KK = ratio of sample sizes for group 2 to group 1[1].

Thus, for practical equal sample distribution with an assumed 10% loss to follow-up, the actual sample size was 246, with each study arm having 82 participants. Each facility per arm, based on the rural-urban dichotomy, had 41 participants[19]. The final sample size was 246, with 82 eligible pregnant women per study arm, as shown in **Figure 1**.

Cluster random sampling was used to select two facilities allocated to each arm, with one facility assigned to rural and peri-urban sites per arm. The facilities were matched based on their operational level. Each client meeting the criteria was randomly assigned to the study using simple random sampling by picking folded paper labeled "yes" or "no." The study was approved by Masinde Muliro University of Science and Technology (MMUST) School of Graduate Studies (SGS), with ethical clearance from the MMUST Institutional Ethics Review Committee (IERC), and preregistered with the Pan African Clinical Trials Registry.

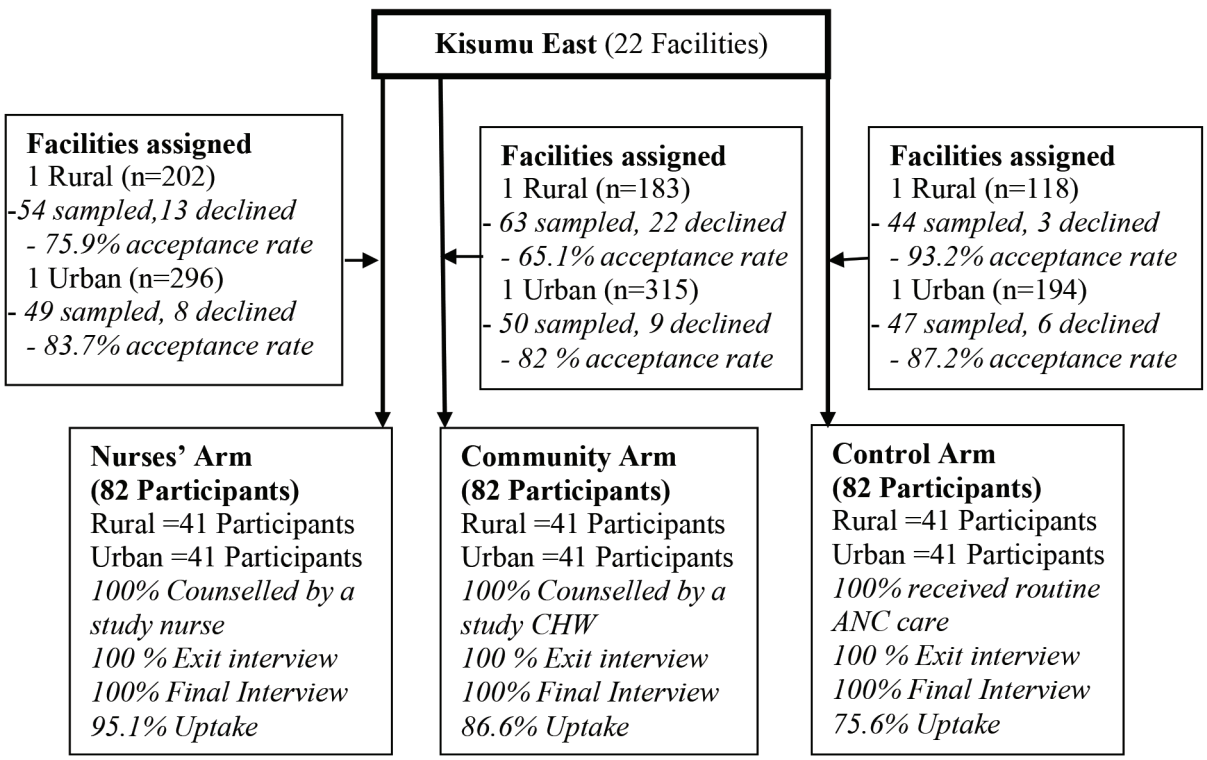

Figure 1: CONSORT diagram showing participant flow

Intervention and Measures

The intervention consisted of a single session of antenatal counseling by nurses (nurses' arm) or community health workers (CHWs) (community arm) on early PPFP using a phone-based WHO Medical Eligibility Criteria (MEC) for contraceptives on the Kobo Collect platform. This structured counseling guide ensured the counselor covered all aspects of the MEC for early PPFP[13]. The tool provided nurses or CHWs counseling antenatal clients with standardized and comprehensive information. This was ensured by refresher training of the implementers and orientation to the tool.

The tool, based on the Kobo Collect platform, required a "yes" or "no" submission for each key aspect covered, including eligibility criteria for each method during the early postpartum period. It was validated by master trainers for FP, animators for community health service training modules, and guidelines for CHWs, as well as by nurses and CHWs during FP refresher training, making it standard and practical for both groups.

The researchers aimed to evaluate the overall effect of the family planning counseling tool on intentions for early PPFP by comparing the intervention (combined nurse and community/CHW arms) to the control arm. They also assessed differences in intention between nurse-administered and CHW-administered counseling, as well as between each intervention arm (nurses and community/CHW) and the control arm.

Data Collection and Measures

Intimate partner relationships, including physical and sexual violence, were assessed using a 7-point Likert scale ranging from "strongly disagree" 1 to "strongly agree" 7. The questions evaluated physical violence, psychological violence, sexual violence, and partner engagement on FP issues. A summary rating of good intimate partner relationships was presented as an ordinal scale based on agreement levels. This rating was determined by averaging scores across all parameters, where "strongly agree" was 7, "agree" was ≥6 and <7, and so on, down to "strongly disagree" at <2.

Health education after birth was assessed through a yes/no question. Health status before, during, and after pregnancy was measured using a Likert scale ranging from "very poor" to "very good."

Process characteristics included staff post-test scores, client waiting time, counseling process turnaround time (from the beginning to the end of the counseling session), counseling process quality, self-assessed fidelity to the process, and clients setting a postnatal appointment date for PPFP. Staff post-test scores, client waiting times, counseling turnaround times, and client satisfaction were continuous variables. Fidelity was assessed through five Likert scale questions (strongly disagree to strongly agree), averaged to provide an ordinal score. Fidelity ratings ranged from "very high fidelity" 7 to "very low fidelity" (<2). Quality adherence to the counseling process was evaluated with a "yes" or "no."

Outcome Measurement

Intention to use early PPFP, one of the outcome variables, was assessed during an exit interview after the counseling session using three 7-point Likert scale questions (Cronbach's alpha = 0.850). These were summarized into a continuous variable by calculating the mean score, which was then scaled into ordinal categories: "very high intention"7, "high intention" (≥6, <7), and so on, down to "very low intention" (<2). The questionnaire followed recommendations by Francis et al. (2004) and Ajzen and Klobas (2013)[20, 21].

Data Analysis

Intention to use early PPFP was summarized with descriptive statistics to show distribution across participant characteristics. Ordinal logistic regression was used to examine the influence of client-related characteristics and intervention process factors on intention to use early PPFP. Model diagnostic statistics evaluated overall model fit and explanatory power. The goodness-of-fit was assessed using Pearson's chi-square test ($P>0.05$ indicating a good fit), while the likelihood ratio chi-square test assessed predictor significance ($P<0.05$ indicating meaningful predictors). Nagelkerke's Pseudo R^2 quantified variance explained.

One-way ANOVA with post hoc testing evaluated the intervention's impact on intention for early PPFP use. Shapiro-Wilk and Levene's tests assessed normality and homogeneity of variance, with P>0.05 indicating acceptable thresholds. Partial eta-squared (η2\eta^2) determined effect size: ≥0.01–<0.06 (small), ≥0.06–<0.14 (medium), and ≥0.14 (large). Statistical significance was set at P<0.05.

RESULTS

Participant characteristics

A total of 246 participants were enrolled in the study. The mean age of the participants in years was 25.2±4.9 with a minimum age of 16 years and a maximum of 42 years. The modal age group was 15-24 years. Most, 207 (84.1%) of the participants were married. More than half of the participants 155 (63%) had attained high school or tertiary education. A large proportion, 211 (85.77%) of the participants earned less than 5000 KES. In a cross-tabulation of sociodemographic aspects and intention **(Table 1)**,

Table 1: Distribution of intention across the sociodemographic characteristics of women in a Western Kenya

Sociodemographic characteristics	Neither high nor low Intention	Moderately high Intention	High Intention	Very high Intention	Total
Age group					
15-24	4 (3.08)	17 (13.08)	66 (50.77)	43 (33.08)	130 (52.85)
25-34	4 (4.00)	16 (16.00)	39 (39.00)	41 (41.00)	100 (40.65)
35-44	0 (0.00)	0 (0.00)	8 (50.00)	8 (50.00)	16 (6.5)
ANC Visits					
<4	1 (1.14)	13 (14.77)	40 (45.45)	34 (38.64)	88 (35.77)
>=4	7 (4.43)	20 (12.66)	73 (46.20)	58 (36.71)	158 (64.23)
Marital Status					
Never Married	0 (0.00)	4 (11.43)	21 (60.00)	10 (28.57)	35 (14.23)
Separated	0 (0.00)	0 (0.00)	1 (25.00)	3 (75.00)	4 (1.63)
Married	8 (3.86)	29 (14.01)	91 (43.96)	79 (38.16)	207 (84.15)
Level of education					
No formal education	0 (0.00)	0 (0.00)	0 (0.00)	1 (100.00)	1 (0.41)
Primary	2 (2.22)	10 (11.11)	38 (42.22)	40 (44.44)	90 (36.59)
Secondary	2 (1.69)	16 (13.56)	61 (51.69)	39 (33.05)	118 (47.97)
Tertiary	4 (10.81)	7 (18.92)	14 (37.84)	12 (32.43)	37 (15.04)
Employment status					
Not employed	1 (1.30)	5 (6.49)	41 (53.25)	30 (38.96)	77 (31.3)
House wife	4 (4.30)	15 (16.13)	48 (51.61)	26 (27.96)	93 (37.8)
Self employed	1 (1.64)	7 (11.48)	21 (34.43)	32 (52.46)	61 (24.8)
Formal	2 (13.33)	6 (40.00)	3 (20.00)	4 (26.67)	15 (6.1)
Monthly income					
<5000	5 (2.35)	26 (12.21)	103 (48.36)	79 (37.09)	213 (86.59)
≥5000-≤10000	2 (10.53)	2 (10.53)	7 (36.84)	8 (42.11)	19 (7.72)
>10000	1 (7.14)	5 (35.71)	3 (21.43)	5 (35.71)	14 (5.69)
Overall Intention	8 (3.25)	33 (13.42)	113 (45.93)	92 (37.40	246 (100)

Intention to use early PPFP was assessed using three Likert scale questions, the means were summed into scale; very high intention (=7), high intention (≥6, <7), moderately high intention (≥5, <6), neither high nor low intention (≥4, <5), moderately low intention (≥3, <4), low intention (≥2, <3), and very low intention (≥1, <2). Bivariate analysis was done by cross-tabulation of sociodemographic aspects and level of intention for early PPFP. The figures N are counts and (%) percentages. The denominators for intention proportions per variable were row totals for each variable group.

out of the 130 participants aged 15-24 years, 109 (83.85%) exhibited high to very high intentions for early postpartum family planning (PPFP) uptake, while[16] 100% of those aged between 35-44 reported high to very high intentions. Additionally, out of the 88 individuals with less than four ANC visits 74 (84.09%) had high to very high intentions, compared to 131 (82.91%) among those with four or more visits (N=158). Distribution of intention across marital status also showed that never married women (N=35) had predominantly high intentions category 21 (60.00%), while all separated respondents fell exclusively within the high 1 (25%) or very high 3 (75%) intention categories. Education level had distribution of intention, with primary (n=90) and secondary (N=118) educated participants exhibiting predominantly high and very high intentions 78 (86.66%) and 100 (84.74%), respectively, while tertiary educated participants showed a more balanced distribution. Unemployed individuals (N=77) reported predominantly high and very high intentions 71 (92.21%), while formally employed individuals (N=15) were more skewed towards moderately high intentions 6 (40%). Distribution of intention across income levels also had an impact, with those earning below KES 5000 (N=213) displaying 182 (85.45%) within high and very high intentions, and a more balanced distribution observed in participants earning between KES 5000-10000 and those earning above KES 10000. Overall, 96.74% of participants rated their intention between moderately high and very high intention.

Intention to use early PPFP was assessed using three Likert scale questions, the means were summed into scale; very high intention (=7), high intention (≥6, <7), moderately high intention (≥5, <6), neither high nor low intention (≥4, <5), moderately low intention (≥3, <4), low intention (≥2, <3), and very low intention (≥1, <2). Bivariate analysis was done by cross-tabulation of sociodemographic aspects and level of intention for early PPFP. The figures N are counts and (%) percentages. The denominators for intention proportions per variable were row totals for each variable group.

3.2 Predictors of intention for early PPFP among pregnant women attending ANC in Western Kenya

In an ordinal logistic regression analysis, we examined how various client-related characteristics and intervention process factors influence the intention to use early postpartum family planning (PPFP) (**Table 2**).

Table 2: Predictors of intention for early PPFP among pregnant women attending ANC in Western Kenya

Parameter	OR	95% CI	P-value
Sociodemographic aspects			
Client's age	1.06	1.01 - 1.12	0.022
Marital status	0.94	0.64 - 1.38	0.750
Level of education	0.72	0.49 - 1.04	0.084
Employment status	0.85	0.61 - 1.19	0.342
Monthly income	0.86	0.50 - 1.48	0.580
Pregnancy related aspects			
ANC visits number	0.96	0.81 - 1.14	0.647
Gestation when PPFP counseling was done	1.03	0.98 - 1.09	0.255
Existing illness	1.28	0.44 - 3.79	0.650
Number of children	1.33	1.10 - 1.62	0.004
Complication in pregnancy	0.97	0.54 - 1.74	0.914
Labour, delivery and postpartum aspects			
Labour complications	0.72	0.34 - 1.51	0.384
Postpartum complication	1.17	0.47 - 2.87	0.736
Health education afterbirth	0.89	0.44 - 1.78	0.742
Health status after pregnancy	0.91	0.32 - 2.60	0.861
Health status in 3 months postpartum	0.50	0.20 - 1.28	0.151
Rating previous experience with FP	1.36	-0.19 - 1.36	0.504
Intimate partner relationship	1.47	1.18 - 1.84	<0.0001
Process related aspects			
FP counseling waiting time	0.98	0.96 - 1.00	0.097
FP counselling turnaround time	0.93	0.90 - 0.97	<0.0001
Mode of counseling	1.25	0.71 - 2.20	0.449
Counseling quality	1.03	0.99 - 1.06	0.105
Fidelity to process	2.62	1.91 - 3.59	<0.0001
Accepting to set postnatal appointment	2.44	1.28 - 4.64	0.007

Ordinal regression analysis of predictors of intentions for early PPFP use. OR- Odds Ratio, 95% CI – 95% confidence interval, Significance set at P≤0.05

The model diagnostics statistics were as follows: Goodness of fit Pearson X2 (403)=327.921, P=0.997, Model fit to data X2(5)=11.516, P=0.042, Nagelkerke's Pseudo R2=0.610, which demonstrates a good fit to the data with significant predictors explaining 61% of the variance. Among client-related factors, age (OR: 1.06; 95% CI: 1.01-1.12; P=0.022), number of children (OR: 1.33; 95% CI: 1.10-1.62; P=0.004), and the quality of intimate partner relationship (OR: 1.47; 95% CI: 1.18-1.84; P<0.0001) showed significant associations with increased odds of higher intention to use early PPFP. This indicates that as age, number of children, and the quality of the intimate partner relationship increase, the likelihood of being in a higher category of intention for early PPFP increases. Additionally, certain intervention process factors, such as fidelity to process (OR: 2.62; 95% CI: 1.91-3.59; P<0.0001) and acceptance of postnatal appointments for early PPFP (OR: 2.44; 95% CI: 1.28-4.64; P=0.007), significantly increased the cumulative odds of reporting higher intention to use early PPFP. Suggesting that higher adherence to the intervention process and acceptance of setting postnatal appointments increase the likelihood of a stronger intention to use early PPFP. Conversely, FP counselling turnaround time exhibited an inverse relationship with intention (OR: 0.93; 95% CI: 0.90-0.97; P<0.0001), indicating that longer counseling turnaround times decrease the cumulative odds of being in a higher category of intention to use early PPFP. The remaining client-related and process-related factors assessed did not

show significant effects on the intention for early PPFP.

Effect of antenatal family planning counseling on the intention for early postpartum family planning among postpartum mothers in Western Kenya

The normality of the intention scale was assessed using the Shapiro-Wilk test. The results indicated that the data was approximately normally distributed, W(246) = 0.990, P = 0.080. Therefore, the assumption of normality was met. A one way ANOVA for intentions for early PPFP was done with Levene's test showing that homogeneity of variance was met F(2,243)=0.715, P=.490 thus Tukey's post hoc test used to estimate which arms had significant difference in intention, and effect size between arms. The mean intention out of a 7-point Likert score was 6.59±0.87 for the nurses' arm, 6.05±0.86 for the community arm and 6.03±0.69 for the control arm. The ANOVA showed that there was a significant difference in the mean client intention for early PPFP scores between arms F(2,243)=12.43, P<0.0001. Tukey's post hoc test showed a significantly higher mean intention for early PPFP between nurses' and community arm (P<0.0001) and nurses' arm and control arms (P<0.0001) with a medium effect size (partial eta2 0.06 to <0.14) (**Table 3**).

The combined mean intention for early PPFP for the two intervention arms (6.22±0.85) portrayed a significant difference compared with that of control arm (P=0.012) albeit with a small effect size (partial eta2 =0.026). There was no difference in intention between the community and control arm (P=0.986).

Table 3: ANOVA for difference in intentions for early PPFP between study arms in a study in Western Kenya

Study Arms being compared	Mean difference	95% CI	P-value	Effect Size
Nurses vs Community	0.54	0.24-0.84	<0.0001	0.089
Nurses vs Control	0.56	0.26-0.86	<0.0001	0.113
Community vs Control	0.02	-0.28-0.32	0.986	0.000
Intervention arms vs Control	0.29	0.07-0.51	0.012	0.026

Mean difference is for the study arms being compared; 95% CI is the Confidence Interval for the Mean Difference (MD); Effect size was estimated by Partial eta2 (0.01 to <0.06 - Small, 0.06 to <0.14 medium, ≥0.14 Large); Levene's test F(2,243)=0.715, P=0.490, thus, Tukey's post hoc test was applied because homogeneity of variance was met; Significance set at P<0.05

DISCUSSION

In this study, we found a high intention to use early PPFP, which was predicted by the client's age, number of children, and positive intimate partner relationship rating. The study also showed that counseling turnaround time, fidelity to the process, and accepting to set a postnatal appointment for early PPFP had a significant effect on the intention to use early PPFP. The intervention had an overall significant effect on client intention for early PPFP, with higher intention scores in the nurses' arm compared to the community and control arms.

A study on patterns and correlates of intention to use contraceptives shows that intention to use FP increases with age, averagely peaking between 29–34 years, and then dropping thereafter[22]. Another study showed that older women have stronger intentions to use early PPFP due to their increased pregnancy and childbirth experience, leading to a heightened desire to space or limit future pregnancies for their well-being and their children's welfare. Furthermore, older women may be more in control of the decision to limit the number of children[23]. The current study demonstrated that older participants had significantly higher intentions to use early PPFP. While Navodani et al. (2017) highlighted similar trends in postpartum FP utilization among older women with more children in Sri Lanka, conflicting findings were reported by Daba et al. (2021) and Ooko et al. (2022), indicating that younger clients expressed higher intentions for PPFP compared to older individuals[9, 24, 25].

The current study found that having more children was associated with higher odds of intention to use PPFP, aligning with previous research suggesting that women with more children are often more motivated to limit future pregnancies to prioritize their well-being and that of their existing children[26]. Equally, having a partner can be a key determinant of intention for early PPFP. Supportive partners facilitate open communication and collaborative decision-making regarding FP, fostering shared responsibility and motivation to prevent unintended pregnancies[27, 28]. The current findings demonstrate the importance of a good intimate partner relationship in positively influencing intention to use early PPFP.

Process-related factors, such as the FP counseling process, postnatal appointment setting, and counseling turnaround time, significantly influenced intentions for early PPFP in this study. Similar findings by Kabue et al. (2018) and Grenier et al. (2017) highlight the importance of efficient counseling and timely appointments in fostering positive intentions[29, 30]. Jones et al. (2020) also noted that high-fidelity PPFP services increase intention by ensuring women receive accurate information and personalized guidance[31]. In line with this, our study found that setting postnatal appointments for early PPFP increased intention, consistent with a Gambian study that showed FP counseling boosted both appointment setting and intention for postpartum FP services[32]. Counseling turnaround time had an inverse relationship with the intention to use early PPFP, meaning longer sessions reduced the odds of intention. This suggests that optimizing the time spent in counseling can strengthen FP intentions, as shown in a quasi-experimental study by Befkene et al. (2020). Similarly, Befkene et al. (2020) emphasized the importance of process fidelity in PPFP interventions, which increases the likelihood of women receiving accurate, comprehensive FP information. This aligns with our findings, where fidelity to the counseling process increased the intention to use early PPFP[33].

Antenatal family planning (FP) counseling has shown mixed effects on intention for PPFP uptake, with some studies reporting increased intention to use postpartum FP[32, 34] and others showing no significant impact[35]. In this study, antenatal counseling on early PPFP positively influenced intention. The quality of counseling in prior studies varied, with many women reporting dissatisfaction due to limited provider interaction[36]. Our findings revealed that participants in the nurse-administered arm had significantly higher intentions to use early PPFP compared to both the community and

control arms, with no significant difference between the community and control arms. While prior studies comparing nurse versus CHW effectiveness in similar populations are limited, a previous study found that antenatal counseling by highly skilled health workers leads to higher postpartum contraceptive uptake[37]. Although this study showed no significant difference in intention between the CHW and control arms, a systematic review has suggested that CHW-provided information can be more effective than standard care in influencing PPFP intentions[38].

This study fills a key gap by comparing nurse- and community health worker-led mobile phone-aided ANC interventions to boost early PPFP intention. The findings highlight the need for policies that integrate mobile phone-based tools and enhance counseling quality, particularly empowering nurses with such technologies. It also lays the groundwork for future research on the scalability of these interventions.

Strengths and Limitations of the Study

This study, grounded in the Theory of Planned Behavior, provides a solid foundation for future comparable research. A key strength is its comparison of outcomes between nurse- and community health worker-led interventions, offering evidence to refocus resources on empowering nurses to enhance intention for early PPFP. Additionally, as a pragmatic RCT, the study's scalability is supported by its near-real-world setting, aside from randomization and control.

However, the study's limitations include selection bias, as it focused solely on ANC attendees, limiting generalizability to the broader pregnant population. The recruitment of participants primarily in the third trimester further restricts insights into family planning decisions made earlier in pregnancy. Expanding the sample and recruiting earlier in pregnancy could improve external validity.

CONCLUSION AND RECOMMENDATION

In conclusion, the significant differences in intention for early PPFP between the intervention and control arms, particularly between the nurses' arm and others, indicate that antenatal FP counseling via a mobile phone-based tool, especially when delivered by nurses, is more effective in increasing intention for early PPFP. Therefore, more efforts should be directed toward empowering nurses with mobile phone-based antenatal family planning counseling tools to enhance intention for early postpartum family planning.

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ADOLESCENT MOTHERS' CONCEPTUALISATION OF SOCIAL SUPPORT IN THE IBADAN URBAN SLUM: AN INTERPRETIVE PHENOMENOLOGICAL ANALYSIS

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ABSTRACT

INTRODUCTION: Adolescent motherhood represents a global challenge, with significant implications for the holistic health and well-being of adolescent mothers and their offspring. Access to social support plays a critical role in mitigating the challenges faced by adolescent mothers as they navigate the postpartum phase and develop resilience for holistic well-being.

OBJECTIVE: Consequently, understanding the conceptualization of social support among adolescent mothers residing in urban slums of Ibadan, Oyo State, Nigeria, is essential for designing effective and needs-sensitive interventions and policies.

METHODS: This study employed a qualitative, interpretive phenomenological approach to explore the lived experiences of adolescent mothers in Ibadan municipality. Utilizing purposive sampling, 20 in-depth interviews were conducted with adolescent mothers across all five urban local government areas, with a pilot study conducted in Oluyole Local Government Area. Data collection involved audio recording and verbatim transcription of interviews into English. A systematic analysis of field notes, reflective insights, and coded transcripts was employed to identify emerging themes. Interpretive Phenomenological Analysis was then applied to interpret these themes, providing a rich contextual understanding of social support from the adolescent mothers' perspectives.

RESULTS: Adolescent mothers conceptualized social support as iranlowo/aduroti—a construct encompassing the provision of resources, assistance, and interventions designed to address their specific needs and challenges. Participants noted that social support within their communities often transcended kinship ties but was insufficient to meet all their needs.

CONCLUSION: Findings underscore the necessity of interventions aimed at enhancing the quality and efficacy of social support within informal networks.

KEYWORDS: Support, Informal Network, Adolescent Mothers, Urban Slums, Ibadan, Oyo State, Nigeria.

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INTRODUCTION

Adolescent motherhood is a significant public health challenge that impacts adolescent girls, their children, and the communities in which they live[1, 2]. It has been described as a consequence of a lack of access to resources (information, health care, quality education)[3]. Transitioning to motherhood is challenging for most women and even more so for adolescent mothers, who bear the additional burden of adolescence. These challenges are further exacerbated by a lack of access to social and economic resources for adolescent mothers in urban slums[4, 5]. Social support plays a crucial role in mitigating these challenges[6, 7] and in ensuring young mothers become resilient; yet the effectiveness and accessibility of support systems vary widely[8]. This background explores the conceptualizations of social support among adolescent mothers in Ibadan's urban slums, drawing on relevant literature and research.

Ibadan, the capital of Oyo State, is home to a range of socio-economic conditions, with many residents living in informal settlements or urban slums[9]. These areas are characterized by inadequate infrastructure, limited access to basic services, and high levels of poverty[10]. Urban slums in Ibadan face challenges such as poor sanitation, overcrowded living conditions, and limited access to healthcare and education[11]. These conditions exacerbate the difficulties faced by adolescent mothers, who often struggle with both the demands of early motherhood and the harsh realities of slum life.

Adolescent mothers in Ibadan's urban slums are at a heightened risk of adverse outcomes. Early pregnancy often leads to interrupted education and limited employment prospects, perpetuating a cycle of poverty[12]. The stigma associated with teenage pregnancy can further isolate these young mothers, impacting their mental health and social integration[13,14]. Social support is critical in mitigating the negative impacts of early motherhood. It encompasses various forms of assistance, including emotional, informational, and instrumental support from family, peers, and community networks.

Understanding how adolescent mothers conceptualize social support in Ibadan's urban slums is crucial for developing effective interventions and policies that are sensitive to their needs[15]. By enhancing social support systems, it is possible to improve the well-being of adolescent mothers and their children, contributing to better health and socio-economic outcomes in these underserved communities. Hence, this study sought to explore the conceptualizations of social support by adolescent mothers in Ibadan's urban slums.

METHODOLOGY

A qualitative approach and interpretive phenomenological design were utilized for this study[16,17]. The aim was to document the experiences of adolescent mothers from their own perspectives and within their own contexts and to interpret these experiences, making it an exploratory process. In-depth interview and focus group discussion guides were used to collect data on the context of social support for adolescent mothers in Ibadan's urban slums. Participants were selected through a purposive sampling approach.

The study was conducted in Ibadan municipality, which comprises five local government areas: Ibadan Southwest, Ibadan North, Ibadan Northwest, Ibadan Southeast, and Ibadan Northeast. As part of a broader PhD study, O.I. interviewed 20 adolescent mothers in November 2022. Saturation was reached by the end of these interviews. O.I. conducted two community mapping focus group discussions in May 2023 for additional insights into the context of social support in Ibadan's urban slums. Each in-depth interview lasted 40 minutes and covered a range of issues beyond the scope of this paper. The community mapping focus group discussions lasted 1 hour 10 minutes and 53 minutes, respectively. Interviews were recorded in Yoruba, the author's native language, translated, and transcribed verbatim into English. This approach ensured that the insights from research participants and their contexts were retained. Transcripts were coded and uploaded to Atlas.ti version 17. Themes

were generated, and analysis was conducted by combining field notes, reflections, and coded interviews. Interpretive Phenomenological Analysis was applied to understand themes and the context of social support from the perspective of adolescent mothers.

Ethical approval was obtained from the University of Ibadan/University College Hospital Ethical Review Committee with approval number UI/EC/21/0719. All ethical issues were considered. Data were anonymized, and the privacy and confidentiality of participants were maintained. Participants were well informed of the study's purpose and the possible benefits and risks associated with participation. They were also informed that their participation was completely voluntary and would not affect their access to resources within their communities. Participants gave verbal consent.

RESULTS

Socio-demographic characteristics of participants interviewed

Pseudonyms are as presented, 7 Adolescent mothers were 17years old, 9 of them were 18 years old and 4 adolescent mothers were 19 years olds. Majority of the adolescent mothers had only one child while 2 of these adolescent mothers have 2 children.

Table 1: Code, age and parity of Adolescent mothers interviewed

Category	Code (Name- Age)	Age	Frequency (n)
1	TM-17, KD-17, K-17, MA-17, IH-17, MR-17, WM-17	17 years	7
2	MY-18, MM-18, ML-18, MP-18, MR-18,MU-18, MT-18, TM-18, AY-18	18 years	9
3	MA-19, TA-19, MR-19, DS-19	19 years	4

Adolescent mothers' perceptions of social support in Ibadan urban slum

This was a qualitative description of how adolescent mothers conceptualise social support. Social support was conceptualised and described in diverse ways by adolescent mothers. Although, there are similarities in the description of what support meant, for context and better understanding, social support was translated as "atileyin"-translated loosely as backbone but in more contextual terms means support in Yoruba and mothers were asked to describe what social support meant to them. Three recurring descriptions of support were resources, help and support which enabled them to navigate the period of pregnancy till date.

Theme 1_ Social support as "Resources"

Adolescent mothers recognised social support as a combination of human presence, emotional encouragement, spiritual guidance and material assistance. These resources were not just limited to material items, but also includes emotional and spiritual resources from individuals around them. These various resources gave them relief during pregnancy which for them was critical time; having someone who offered to listen, encourage and stand by them was very appreciated, someone who helped allayed their fear, calmed their anxious mind, and helped them stay resolute in the face of judgement, stigma and exclusion faced within their communities.

Part of the resource's adolescent mothers received was prayers for safe delivery offered by immediate family members which gave them a sense of hope and reassurance. Adolescent mothers described how they were taken to prayer homes for antenatal services which added a layer of comfort and peace to their journey

An adolescent mother reflecting on her experience shared below

They are like resources (awon eeyan to duro ti mi, awon nkan ti mo ri- the people that stood by me, the things i received), that were helpful to me during pregnancy up till now .TM-17

This illustrates the dimensions of social support received by adolescent mothers which helped them navigate the delicate period of pregnancy,

emphasising human resources, individuals who supported her as well as the material items she received. Both of which shaped her pregnancy experience helping her manage the practical and emotional demands of pregnancy

Theme 2_Social support as "Help"

Adolescent mothers in Ibadan's urban slums described social support, known as "Iranlowo," as a form of help that often feels undeserved because they haven't had the opportunity to give back. They expressed feeling a deep sense of gratitude but also a strong sense of indebtedness, as they hoped to one day repay the kindness they had received. Many of them felt that the support came at a time when they had little to offer in return, which left them feeling indebted to those who helped them.

One adolescent mother shared her experience after moving from Iwo to Ibadan to join her husband. She talked about how a neighbour, someone she didn't know beforehand, became like a mother to her, taking care of her during a difficult time:

"Like help, people just helping you even when they do not know you like that, like when I came from Iwo to join my husband in Ibadan, our neighbor stood like my mother. She took care of me; I did not know her from anywhere..... May God bless her and help me to pay her back too." (MY-18) For these young mothers, the support they received from neighbors and the community was essential, especially in the absence of formal systems of care. These acts of kindness, often from strangers or acquaintances, became a lifeline. However, alongside the relief of receiving help came a desire to repay it, adding emotional weight to the already challenging circumstances they faced

Adolescent mothers shared that the support received helped them navigate the stigma and shame experienced within their communities, community members passed snide remarks like, "oh she is pregnant", "who got her pregnant", "she will soon understand", they shared that these words were really terrifying but having someone to just be there is relieving and they can focus on how to deliver the pregnancy.

If not for my husband(partner) who said I should not worry about what people are saying about me, (obe ti ge omo lowo, omo ti so obe nu, sugbon obe ti sise owo- Throwing the knife away after a cut is of no use because the deed is done) because worrying about it will not make me unpregnant, that he is there for me and I should focus on how to deliver safely, if I were to consider what people said, I might have committed suicide, MA_19

Adolescent mothers shared that receipt of social support takes time, the news of pregnancy was not a positive news and parents and other support sources required some time to process, the timing is not right, hence the initial reluctance to provide support as needed. however, parents do and may have a change of heart based on some factors, first, is their perceived response to how the partner of their daughter responds to the pregnancy, if he takes up the responsibility of providing the finance, moral and other support that is needed and standing by their daughter, they begin to warm up to the adolescent mother and treat her right and even accord her the respects of a married member of the family. This is corroborated by a participant below.

My family were angry at first but when they saw my partner and the way he treated me, they changed their mind and began to give me the respect of a married woman, everyone changed towards me TA_19

On the other hand, if the adolescent mother got pregnant by someone who is unable to provide for her needs and does not think much of her, then the road to receipt of social support is longer, she is likely to feel abandoned, and left out, even when she needs it the most.

As shared by one of the participants who moved from her parents to her partner's mother, she did not receive as much as social support as needed because her partner was not living in the same household, she was handed to her partner's mother who lives on her own,

Before you got pregnant and started living with your mother-in-law, have you lived with someone else apart from your parents?

R: No

I: Where is your husband living? How old is he, what

work does he do?

R: Lanlose, 18years, those selling copper at Gate -MA-17

She shared further that how she took her own delivery and only reached out when it was done even when she was surrounded by people, she could not reach out to ask for help.

Where did you deliver your child?

R: At home, someone came to help me cut the cord, my mother-in-law was not at home -MA-17

The dynamics of support during pregnancy can significantly influence the experiences of adolescent mothers. Adolescent mother's conceptualisation of social support as iranlowo ties to their lived realities and the cultural expectation of shaming of adolescent mothers, hence, receiving any form of help is underserving and met with gratitude and in some instances indebtedness, the gratitude shown stems from their recognition of the impact of such support on their lives, particularly during their moments of vulnerability. This gratitude shapes the way they engage and interact with the social network, doing all they can to remain in the good books of the people who matter to them.

Social support is important (without support life is difficult)

Adolescent mothers in Ibadan's urban slums conceptualize social support as an indispensable element of life, equating its presence with the ability to thrive and navigate challenges, particularly in their roles as young mothers. During focus group discussions, participants highlighted this sentiment, expressing that "ti a ba ri eni ba la, bi ole laari" (when you do not have support, you appear lazy). This proverb encapsulates the idea that the absence of support not only limits one's capacity to act but may also stigmatize the individual, reinforcing societal judgments. For these adolescent mothers, social support is vital to their functioning as caregivers and for maintaining a sense of dignity and productivity.

Social support is not based on kinship ties:

Going further, adolescent mothers understood that social support is determined by kinship or blood, that an individual is related to you or is a parent or guardian does not imply that they will be able and willing to provide support as needed, It is often offered out of compassion, not necessarily provided by people with whom they shared kinship ties, anyone could be of help without any previous ties (Kinship ties does not confer compassion, only the lord determines who will do you good)

You cannot say this is the person who will do you good, like for me, since I got pregnant till now, my father has not said anything to me, it is like I don't exist to him, I know I have disappointed him, but then, my church has done more for me, they even gave me the house I am living in now, ajumobi o kan tanu o. ML_18

It is not out of place for relatives of adolescents to feel this way because individuals process disappointments differently, the news of pregnancy is devastating to family members who have plans for them and are working hard to meet their needs, yet the duration of pregnancy calls for immediate action to ensure safe delivery for the mother and good health of the baby, it requires the ability to be able to set anger aside and provide the needed support which is easier said than done. Hence it may seem that relatives are hesitant to support while processing the information that their loved one is pregnant before the anticipated time.

DISCUSSION

This study explored the conceptualization of social support among adolescent mothers in Ibadan urban slums. The diverse ways in which adolescent mothers conceptualize social support, described as atileyin or iranlowo in Yoruba, provide critical cultural and contextual insights that deepen our understanding of their lived experiences in the urban slums of Ibadan. The richness of these conceptualizations highlights the multidimensional nature of support and its impact on their well-being. Atileyin and iranlowo are not mere translations but embody broader societal attitudes and expectations around caregiving and reciprocity in Yoruba culture[18]. The use of these terms reveals that social support is not just material or financial but deeply rooted in relationships, communal responsibilities, and spiritual reassurance. This description resonates with[18], which also included a spiritual dimension in their conceptualization of social support.

Adolescent mothers' descriptions emphasize the multidimensional nature of support, incorporating emotional, material, spiritual, and psychological elements. For instance, spiritual guidance and prayers were described as vital during pregnancy, illustrating a reliance on both tangible and intangible forms of help. Emotional support, such as having someone listen and encourage them, highlights the need for validation and acceptance in a context of stigma and exclusion. These descriptions of support also expose limitations. While atileyin embodies ideals of standing by someone, the reality often falls short, with adolescent mothers feeling that their needs remain partially unmet. Conditional support, such as assistance contingent on a partner's behavior or societal judgment, highlights systemic barriers to receiving consistent help. Nevertheless, the study brings to the fore the role of the informal social network in social support provision to adolescent mothers, which is yet to receive adequate attention.

Spirituality emerged as a critical dimension of support for adolescent mothers. This finding is similar to the findings of[6] conducted in Iran among adolescent mothers. Practices such as prayers, visits to prayer homes, and spiritual reassurances provided a sense of hope, peace, and comfort during what many described as a challenging and uncertain time. Spiritual resources were often intertwined with cultural beliefs about protection and safe delivery, contributing to the mothers' resilience. Family members' involvement in spiritual practices, such as praying for the mother and baby, reinforced a sense of collective care and trust in divine intervention.

Practical assistance has ripple effects that extend beyond immediate needs, influencing the long-term well-being and development of adolescent mothers and their children. By addressing immediate concerns like healthcare and childcare, practical support reduces the emotional and psychological burden on adolescent mothers. Supportive teaching and resources build a sense of competence in adolescent mothers, positively influencing their parenting style and relationship with their child. Practical support ensures that children receive better nutrition, healthcare, and developmental opportunities, setting the stage for healthier futures. Families are a form of support to individuals and form an essential part of the social network system[19]. Informal networks comprising family, friends, neighbors, and community members are often the primary source of social support for adolescent mothers.

While social support from the informal network provided so much comfort and help, it was delayed, conditional, and inconsistent. Relatives of adolescent mothers were at first angered but eventually warmed up and supported their pregnant daughters in all domains of support. Parents, particularly in resource-limited settings, may initially react negatively to news of pregnancy due to concerns about the financial and social implications of pregnancy[20, 21]. However, when a partner steps up to share the burden, he alleviates these fears, paving the way for parental support. The dynamics of familial support for adolescent mothers are deeply influenced by the level of involvement demonstrated by their partners. This relationship underscores the interplay between

perceived responsibility, family expectations, and cultural norms, which collectively shape how and when parental support is offered.

When partners actively provide financial, emotional, and practical support, they signal their commitment to the well-being of the adolescent mother. This demonstration of responsibility often reassures parents and other family members, prompting them to view the pregnancy in a more positive light. The influence of partner involvement extends beyond immediate support, shaping long-term family relationships and dynamics. It leads to shifts in power balances. A supportive partner who assumes a central role may help the adolescent mother assert her needs more effectively within the family structure. Conversely, a lack of partner involvement may lead to the adolescent mother becoming overly dependent on her family, potentially straining those relationships. When partners and families collaborate to support the adolescent mother, it fosters trust and cohesion, which are critical for the well-being of both mother and child.

Family members, particularly older women like mothers or grandmothers, often play a key role in teaching adolescent mothers basic parenting skills, similar to[6]. Practical items such as baby clothes, diapers, and feeding supplies are often provided by supportive networks, reducing financial strain and enabling the mother to focus on bonding with her child. Practical support alleviates the stress of managing child-rearing responsibilities alone, which is particularly important for adolescent mothers navigating the challenges of young parenthood.

STUDY IMPLICATIONS

Adolescent mothers possess a nuanced understanding of what social support entails and are capable of articulating its significance during the vulnerable phase of early motherhood. They not only recognize the impact of support on their well-being but also demonstrate an ability to negotiate and maintain interpersonal relationships, enabling them to access social support. This finding challenges the common assumption that adolescent mothers are inherently unable to navigate or sustain such relationships.

However, this understanding of social support often comes with a sense of indebtedness. Adolescent mothers may perceive their access to social support as unmerited or undeserved, creating a dynamic where they feel obligated to their social network. This sense of indebtedness could influence how they interact with their support systems, potentially affecting their willingness to seek further help or their long-term relationships within the network.

Interventions for adolescent mothers should acknowledge their capacity to engage with and sustain supportive relationships. Programs should aim to build their confidence in accessing support without fostering feelings of inadequacy or indebtedness. Efforts should be made to sensitize social networks to provide unconditional and empowering support, reducing the pressure of perceived reciprocity on adolescent mothers. While these findings are specific to Ibadan's urban slums, they are applicable to Africa and contexts where social welfare systems for adolescent mothers and other vulnerable groups are non-existent. Further studies can explore the perception of reciprocity among adolescent mothers.

STRENGTH AND LIMITATION

This study shared an in-depth insight into the experiences of young mothers as they navigated through adolescent motherhood using both in-depth interviews and community mapping focus group discussions. This aided a comprehensive understanding of the experiences of adolescent mothers. However, the study is limited to adolescent mothers in urban slums in Ibadan, Nigeria. While this provides valuable insights, the findings may not be generalizable to adolescent mothers in rural settings, other urban areas, or different cultural and socio-economic contexts. Furthermore, factors such as age, education level, marital status, and family structure could influence how social support is conceptualized among adolescent mothers. A potential bias with self-reported data is that participants could have provided socially desirable responses, especially during the community mapping focus group discussions.

CONCLUSION

Adolescent mothers in Ibadan's urban slums conceptualize social support as an essential lifeline that profoundly influences their ability to navigate the challenges of early motherhood and life in general. They view social support as a determinant of success and survival, embodying both practical help and emotional reassurance. This understanding is deeply rooted in cultural beliefs and their lived experiences, emphasizing the necessity of support for personal growth and the fulfillment of their caregiving roles.

While the gratitude they express for any form of assistance underscores its perceived value, their acknowledgment of inadequacies in the support received highlights the complexity of their needs. Social support is not merely a transactional concept for them but a relational and emotional construct, intertwined with feelings of indebtedness, dignity, and hope. This nuanced understanding of social support calls for interventions that go beyond provision, fostering holistic and sustainable systems that empower adolescent mothers, recognize their agency, and address their multifaceted needs.

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POSTPARTUM DEPRESSION AND ASSOCIATED FACTORS AMONG WOMEN ATTENDING POSTNATAL CLINIC AT TIRUNESH BEIJING HOSPITAL, ADDIS ABABA ETHIOPIA

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ABSTRACT

BACKGROUND: Postpartum depression (PPD) is a significant clinical and public health problem in Sub-Saharan Africa (SSA). Despite the magnitude of PPD, early detection, treatment, and prevention of PPD remain a challenge in Ethiopia. This study aims to assess the magnitude and associated factors of PPD among women visiting the postnatal clinic at Tirunesh Beijing Hospital, Addis Ababa, Ethiopia.

METHOD: A hospital-based, cross-sectional study was conducted among 396 women attending the postnatal clinic at the hospital. Depressive symptoms were assessed using a locally pre-validated Edinburgh Postnatal Depression Scale (EPDS). Data were analyzed using SPSS version 26. Descriptive analysis was employed for socio-demographic characteristics and to determine the magnitude of PPD. Bivariable and multivariable logistic regression analyses were used to identify factors associated with PPD. Odds ratios (OR) with 95% confidence intervals (CI) were computed, and a p-value cut-off <0.05 was used to consider the significance of associations.

RESULT: In this study, 24% of women experienced postpartum depression. Mothers aged 25–30 years were less likely to develop PPD (AOR=0.07, 95% CI: 0.02, 0.24). Women who were illiterate (AOR=4.8, 95% CI: 1.92, 14.52), those who experienced intimate partner violence (AOR=7.1, 95% CI: 2.76, 16.12), had unwanted or unplanned pregnancies (AOR=6.1, 95% CI: 2.01, 13.25), had low-birth-weight babies (AOR=3.2, 95% CI: 1.29, 12.84), and those with poor family support (AOR=3.4, 95% CI: 1.40, 10.92) were significantly associated with postpartum depression.

CONCLUSION: The magnitude of postpartum depression was higher among mothers visiting the postnatal clinic. This highlights the need for targeted interventions addressing the needs of postpartum women who experience various risk factors. Further well-designed and representative studies are recommended to inform policy and devise targeted strategies to address PPD.

KEYWORDS: Postpartum depression, postpartum mothers, Tirunesh Beijing General Hospital, Ethiopia

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INTRODUCTION

Postpartum depression (PPD) is the onset of depressive episodes after childbirth, within 6–12 weeks, and can continue for more than a year[1]. It is the most frequent psychiatric disorder following childbirth and can have adverse consequences for the mother's well-being, child development, and family functioning[2]. Worldwide, about 10% of pregnant women and 13% of women who have just given birth experience a mental disorder, primarily depression[3]. In developing countries, this is even higher, at 15.6% during pregnancy and 19.8% after childbirth[4]. In Sub-Saharan Africa, varying prevalence rates of PPD have been reported, with the highest prevalence in Western Africa (20.2%), followed by Eastern Africa (18.6%) and Southern Africa (18.3%)[5]. Within a country, prevalence estimates vary significantly. For example, the prevalence rate in Ethiopia ranges from 12.2% to 37% [6–7]. The wide variation in reported estimates of PPD in Sub-Saharan Africa may hinder strategies aimed at lowering PPD in the region[5].

In the global progress toward universal health coverage (Sustainable Development Goals (SDGs) target 3.8) by 2030 and the African Union Agenda 2063, there is a need for valid and dependable estimates of the PPD burden in Sub-Saharan Africa, including Ethiopia[5].

PPD has been proven to have an unfavorable impact on maternal health and child development[8]. Maternal consequences of PPD may include physical health issues, psychological challenges, relationship difficulties, and risky behaviors, while infant-related impacts encompass anthropometry, physical health, sleep, and motor, cognitive, language, emotional, social, and behavioral development. PPD can also affect mother–child interactions, including bonding, breastfeeding, and the maternal role[5].

Recently, maternal mental health has caught the attention of local and international researchers as maternal health issues have been recognized as integral components of the bundle needed to achieve the SDGs of reducing maternal mortality and under-five mortality rates[9].

The occurrence of PPD is influenced by various factors, including age, education, income, marital dissatisfaction, and intimate partner violence[7,10–16]. Obstetric-related factors such as unplanned pregnancy, history of miscarriage/stillbirth, and being a first-time mother are also associated with PPD[17–19]. Social and behavioral factors such as a history of substance use, poor social support, previous depression, and the death of infants are additional contributors[12, 18, 20–21].

In resource-constrained countries like Ethiopia, PPD is often neglected in the healthcare system. Postnatal care primarily focuses on obstetric problems and the baby's health, while the social and psychological well-being of the mother is given little attention. This includes the absence of screening during postnatal follow-ups and inadequate referral of PPD cases for appropriate mental health services[22].

Recognizing universal health coverage and the SDGs, there is a need for valid and reliable estimates of the PPD burden in Sub-Saharan Africa, including Ethiopia. This information is crucial for advising policymakers, who must consider the socio-economic implications of PPD. Addressing these issues could catalyze adequate provisions for early detection and treatment. Therefore, this study aims to assess the magnitude and associated factors of postpartum depression among mothers visiting the postnatal clinic at Tirunesh Beijing Hospital in Addis Ababa, Ethiopia.

METHOD AND MATERIALS

Study Area and Period

Tirunesh Beijing General Hospital (TBGH) is located in the capital of Ethiopia, Addis Ababa. It was established in 2011. There are five gynecologists and one psychiatrist currently employed at the hospital. An estimated 900 deliveries take place monthly. The postnatal services provided include basic and comprehensive essential postpartum care needed for the management of the mother and child. The quarterly report showed that, on average, about 450 women visit the postnatal clinic monthly. This study was conducted from December 2023 to February 2024.

Study Design

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

Population

Source Population

All women who gave birth and were attending the postnatal clinic at Tirunesh Beijing Hospital, Addis Ababa, Ethiopia.

Study Population

All women who gave birth and were attending postnatal clinics at Tirunesh Beijing Hospital during the study period and met the inclusion criteria.

Eligibility Criteria

Inclusion Criteria

- Women who delivered in the study hospital or attended postnatal care at the clinic.
- Women who were within the postpartum period (within six weeks of delivery).
- Women who were willing to participate in the study and provided informed consent.

Exclusion Criteria

- Women who were in an acute psychiatric or other clinical problem in the postpartum period and had serious communication disorders due to medical conditions.
- Women who experienced complications during childbirth that required immediate medical attention or interfered with participation.

Sample Size Determination

The sample size was determined using a single population proportion formula with the assumptions of a 37.4% PPD prevalence from a previous study in Ethiopia (23), a 95% confidence level, and a 5% margin of error. The minimum sample size was 360. A final sample of 396 mothers was considered after allowing for a 10% non-response rate.

Sampling Procedure

During the study period, approximately 1,350 mothers attended the postnatal clinic at the study hospital. To select the required sample of 396 participants, a systematic random sampling technique was employed. The first participant was randomly chosen using a lottery method. Subsequently, every third patient was selected based on a calculated sampling interval (k = 3.5, approximately 1,350/396).

Data Collection Tools and Techniques

Data were collected via face-to-face interviews using a structured, pre-tested data collection questionnaire. The questionnaire was prepared in English and then translated into local languages (Amharic and Afan Oromo) and back to English to maintain consistency. The tool contained both closed and open-ended questions specifically designed for the study and was adopted from previous similar studies[24–29].

Importantly, it contained the Edinburgh Postnatal Depression Scale (EPDS), the most commonly used depression screening tool in perinatal care (30–31). The EPDS is a ten-item self-report questionnaire in which each question is scored 0 through 3, with raw scores ranging from 0 to 30. Items 1, 2, and 4 are scored 0, 1, 2, or 3, with the top answer proposal scored as 0 and the bottom answer proposal scored as 3. On the other hand, items 3 and 5–10 are reverse scored, with the top answer proposal scored as 3 and the bottom answer proposal scored as 0 (30–31). A cut-off score of 8 is suggested in the literature for "possible depression" in the Ethiopian context and was thus chosen for this study[6, 32–33]. Three professional healthcare workers (two nurses and one health officer) were recruited, and two-day training was provided by the investigator to familiarize them with the data collection tool, interview techniques, eligible study subjects, sampling techniques, and ethical concerns. Data were collected after obtaining written informed consent from the study participants.

Study Variables

Dependent Variable

Postpartum depression (PPD) was measured by EPDS. PPD was categorized as depressed (women who scored 8 or above) or non-depressed (women who scored below 8)[32].

Independent Variables

- Socio-demographic characteristics: age, marital status, education level, employment status, and monthly income.
- Behavioral factors: work-family conflict within the last year, satisfaction with the current marital relationship, death of a family member or close relative in the past three months, and desired sex of the baby.
- Health-related characteristics: presence of medical illnesses and pregnancy-related illnesses.
- Obstetric-related factors: breastfeeding, intention of the pregnancy (whether the pregnancy was wanted or not at conception), history of miscarriage, parity, mode of delivery, sex of the infant, birth weight, and gestational age at birth.
- Psychosocial factors: intimate partner violence (IPV) and social support (emotional and practical support).

Operational Definition

- Postpartum period: The first six weeks following the delivery of the baby.
- Social support: A psychosocial resource accessible in the context of interpersonal contacts and one's social network, measured by the 14-point Oslo Social Support Scale. Patients were categorized as having poor social support if they scored 3–8, moderate social support if they scored 9–11, and strong social support if their score ranged from 12 to 14[34].

Data Quality Management

Close supervision was maintained during data collection, and all questionnaires were double-checked daily for consistency and completeness. The questionnaire was pretested on 5% of the calculated sample size at Abebech Gobena Maternal and Child Health Hospital. Feedback from the pretest was used to modify and finalize the tool.

Methods of Data Analysis

Data entry, coding, and cleaning were performed using Microsoft Excel (version 2016), and statistical analysis was done using the Statistical Package for the Social Sciences (SPSS) version 26. Descriptive statistics (frequency and cross-tabulation) were used to check for missing values and variables. The baseline characteristics and the level of PPD among participants were computed using descriptive statistics such as mean, percentage, frequencies, and standard deviation. Binary and multiple logistic regressions were used to identify factors contributing to the outcome variable. Variables yielding a p-value ≤0.25 in binary regression analysis were then exported into multiple logistic regression models for further analysis to compute odds ratios with corresponding 95% confidence intervals. Multi-collinearity tests were conducted to rule out correlations among independent variables. The Hosmer-Lemeshow goodness-of-fit test was used to assess model fitness.

Ethical Considerations

Ethical approval was obtained from St. Paul's Hospital Millennium Medical College Institutional Review Board. A support letter was submitted to the study health facility. Before interviewing clients, the purpose of the study was explained in plain language, and written consent was obtained. Participants were informed that the information collected would be kept anonymous and confidential and that the data would be used only for the purpose of the study.

RESULT

Socio-demographic characteristics of the study participants

In this study 381 mothers participated making a response rate of 96.2%. About 43% of the study participants were in the age group of 25-30 years with mean 26.6 years (±SD 4.28). Of whom, 47.5% of the study participants were Orthodox in religion, 45.4% were able to read and write, 29.7% were farmer in occupation and majority of the study participants were living in a household monthly income of 5000-10000 Ethiopian birr (**Table 1**).

Table 1. Socio-demographic characteristics of the study participants who visited postnatal clinic at TBH, Ethiopia, 2023/4 (N=381).

Variable	Sub-group	N (%)
Age in years	18-24	130 (34.1)
	25-30	163 (42.8)
	31-34	69 (18.1)
	≥35	19 (5.0)
Marital status	Single	23 (6.0)
	Married	331 (86.9)
	Divorced	10 (2.6)
	Widowed	17 (4.5)
Religion	Muslim	104 (27.3)
	Orthodox	181 (47.5)
	Protestant	96 (25.2)
Education level[a]	Unable to read and write	77 (20.2)
	Can read and write	173 (45.4)
	Primary	9 (2.4)
	Secondary school	38 (10.0)
	Collage and above	84 (22.0)
Occupation	Farmer	113 (29.7)
	Merchant	39 (10.2)
	Civil servant	52 (13.6)
	Private employee	24 (6.3)
	Unemployed	2 (0.5.)
	Housewife	71 (18.6)
	Student	38 (10.0)
	Daily laborer	42 (11.0)
Household monthly income (ETB)[b]		
	<5000	81 (21.3)
	5000-10000	269 (70.6)
	>10000	31 (8.1)

N.B: a=Primary education indicates 1–8th grades; secondary education indicates 9–12th grades; b=ETB, Ethiopian currency.

Behavioral characteristic of the study participants

About 18.9% of the study participants had work-family conflict in the last 1 year and 21.8% were not satisfied with their marital relationship. Almost 9% of the study mothers had a history of IPV and 10.5% had a history of family member or close family death in the last 3 months. More than three quarters (80%) of the candidate had the desired sex of their baby and 87.9% breast fed their baby for the last 7 days of post-partum **(Table 2)**.

Table 2. The behavioral characteristic of the study participants at TBH, Ethiopia 2023/4 (N=381).

Variable	Sub-group	N (%)
Work-family conflict within the last 1 year		
	Yes	72 (18.9)
	No	309 (81.1)
Do you think you are satisfied with your current marital relationship		
	Yes	298 (78.2)
	No	83 (21.8)
History of intimate partner violence		
	Yes	33 (8.7)
	No	348 (91.3)
Death of family member or close relative in the past 3 months		
	Yes	40 (10.5)
	No	341 (89.5)
Desired sex of the baby[c]		
	Yes	305 (80.1)
	No	76 (19.9)
Breast feeding[d]		
	Yes	335 (87.9)
	No	46 (12.1)

Note: c=desired sex of the baby is which gender that she wishes to have;
d= breastfeeding is for those for the last 7 postpartum day.

Medical illness related characteristics of the study participants

Almost 11% of the study participants had medical illness and from those having medical illness, Diabetes Mellitus (DM) accounts 10 (24.4%) followed by Hypertension 8 (HTN) (19.5%), and Asthma 7 (17.1%). About 21% of the study participants had developed pregnancy related illness and from which, preeclampsia (PE) accounts 40 (50%) followed by post-term and Pre-rupture of membrane (PROM) with (13.8%) each. Using a social support assessing score, 47% of the study participants had strong social support **(Table 3)**.

Table 3. Health related characteristics of the study participants at TBH, Ethiopia 2023/4 (N=381).

Variable	Sub-group	N (%)
Presence of medical illness		
	Yes	41 (10.8)
	No	340 (89.2)
Types of chronic medical illness (n=41)		
	DM	10 (24.4)
	HTN	8 (19.5)
	MDD	6 (14.6)
	Asthma	7 (17.1)
	Cardiac	6 (14.6)
	Renal	2 (4.9)
	Epilepsy	2 (4.9)
Presence of pregnancy related illness		
	Yes	80 (21)
	No	301 (79)
Current pregnancy related illness(n=80)		
	APH	6 (7.5)
	GHTN	4 (5)
	GDM	5 (6.25)
	IUGR	3 (3.8)
	PE	40 (50)
	Post-term	11 (13.8)
	PROM	11 (13.8)
Social support assessing score		
	Poor	32 (8.4)
	Moderate	170 (44.6)
	Strong	179 (47)

NB. APH=Anti-partum Hemorrhage;
GHTN=Gestational Hypertension;
GDM=Gestational Diabetes Mellitus;
IUGR= Inter-uterine Growth Retardation;
MDD=Major depressive Disorder.

Table 4. Obstetric related characteristics of the study participants at TBH, Ethiopia 2023/4 (N=381

Variable	Sub-group	N (%)
Intention of the pregnancy		
	Wanted and planned	240 (63.0)
	Unwanted and unplanned	51 (13.4)
	Wanted but unplanned	90 (23.6)
History of abortion or miscarriage		
	Yes	135 (35.4)
	No	246 (64.6)
Parity		
	1	140 (36.7)
	2	140 (36.7)
	>2	101 (26.5)
Mode of delivery		
	Spontaneous	256 (67.2)
	Instrumental	25 (6.6)
	Cesarean-section (CS)	100 (26.2)
Sex of the infant		
	Male	175 (45.9)
	Female	206 (54.1)
Baby birth weight at birth		
	<2500	27 (7.1)
	2500-3999	327 (85.8)
	≥4000	27 (7.1)
Gestational age at delivery		
	<37	21 (5.5)
	37-41+6	329 (86.4)
	≥42	31 (8.1)

Obstetric characteristics of the study participants

The majority 63% (240) of the pregnancy were wanted and planned at the time of conception, 135 (35.4%) of the participants had a history of abortion and 140 (36.7%) were on first pregnancy. 67.2% of the study participants gave birth in spontaneous labour, 327 (85.8%) of the participants delivered normal birth weight baby and 329 (86.4%) were delivered at a gestational age of 37-41+6 weeks **(Table 4)**.

3.5 Postpartum depression characteristics of the study participants

The finding of the study showed that the magnitude of postnatal depression found to be 24% (91/381) as shown in **Figure 1**.

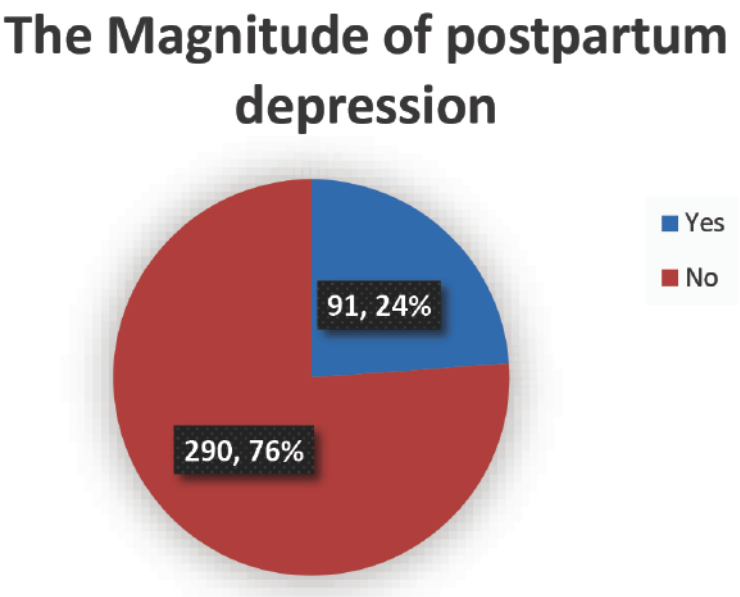

Figure 1. The Magnitude of postpartum depression among postnatal women in Tirunesh Beijing hospital, Addis Ababa, Ethiopia, 2023/24 (n=381).

The specific depression measurement tools indicted that majority 253 (66.4%) of the study participants not laugh and see the funny side of the things (results not shown).

Factors associated with postpartum depression

Our study showed that, study participant whose age of 25-30 years were 93% less likely (AOR=0.07, (95%CI: 0.02, 0.24)), to have PPD compared to age of 18-24 years and postpartum women who were unable to read and write had 4.8 folds increase (AOR=4.8, (95%CI: 1.92, 14.52)), of PPD compared to those of highly educated women (college level and above). Postpartum mothers who experienced intimate partner violence had higher odds of developing PPD compared to those who did not experience IPV (AOR=7.1, (95%CI: 2.76, 16.12)). Postpartum women whose pregnancy was unwanted and unplanned had 6 folds increase (AOR=6.1, (95%CI: 2.01, 13.25)), and when wanted but unplanned, 4 folds increase (AOR=4.1, (95%CI: 1.79, 11.86)), in PPD compared to those of wanted and planned pregnancy. Postpartum women with low-birth-weight baby had 3.2 folds increase (AOR=3.2, (95%CI:1.29, 12.84)), in PPD compared to those of delivered normal birth weight and study participant with poor support had 3.4 (AOR=3.4, (95%CI:1.40, 10.92)), and moderate social support with 2.5 folds (AOR=2.5, (95%CI:1.96, 11.61)), increase its PPD compared to those of having strong social support **(Table 5)**.

Table 5. Bivariate and multivariate logistic regression of association between independent variable and postpartum depression among postnatal women in TBH, Ethiopia 2023/24

Variable	Postpartum depression		COR with 95%CI	P-value	AOR with 95%CI
	Yes	No			
Age in years					
18-24 (ref)	39	91		1	
25-30	26	137	0.44(0.25, 0.78)	0.000	0.07(0.02, 0.24)
31-34	18	51	0.82(0.43, 1.59)	0.748	0.79(0.20, 3.14)
≥35	8	11	1.7(0.63, 4.54)	0.473	2.1(0.29, 14.25)
Education status					
Illiterate	29	48	1.8(0.92, 3.56)	0.001	4.8(1.92, 11.52)
can read and write	31	142	0.66(0.35, 1.23)	0.135	0.29(0.06, 1.47)
primary	2	7	0.86(0.17, 4.45)	0.405	0.21(0.01, 40.73)
high school	8	30	0.80(0.32, 2.01)	0.062	0.45(0.14, 4.26)
college and above (ref)	21	63		1	
Intimate partner violence					
Yes	27	6	19.9(7.92, 50.37)	0.000	7.1(2.76, 16.12)
No (ref)	64	284		1	
Breast feeding					
Yes (ref)	74	261		1	
No	17	29	2.1(1.08, 3.97)	0.458	1.6(0.44, 6.13)
Intention of the pregnancy					
wanted and planned	17	223		1	
unwanted and unplanned	41	10	13.8(2.30, 35.72)	0.000	6.1(2.01, 13.25)
wanted but unplanned	33	57	7.6(3.95, 14.59)	0.000	4.1(1.79, 11.86)
Baby birth weight					
<2500	18	9	7.0(2.09, 23.47)	0.038	3.2(1.29, 12.84)
2500-3999 (ref)	67	260		1	
≥4000	6	21	0.9(0.35, 2.32)	0.985	0.96(0.03, 8.58)
Gestational status					
<37	9	12	3.1(0.90, 10.81)	0.132	5.4(1.00, 18.46)
37-41+6	76	253	1.3(0.49, 3.16)	0.418	4.1(0.13, 14.85)
≥42	6	25		1	
Social support					
Poor	11	21	3.4(1.45, 7.89)	0.000	3.4(1.40, 10.92)
Moderate	56	114	3.2(1.86, 5.42)	0.003	2.5(1.96, 11.61)
Strong	24	155		1	

NB: Ref= reference; COR= Crude Odd Rations; AOR=Adjusted Odd Ratios.

DISCUSSION

The study found that 24% of the mothers experienced postpartum depression. This was similar to the studies conducted in India (26.3%), Lao People's Democratic Republic (28.1%), South Africa (22%), Uganda (27.1%), and North-West Ethiopia (23.7% to 25%)[35–40]. The result was lower than the studies conducted in Nigeria (34.6%)[25], Cameroon (45.8%) (41), and in public health facilities in North-East Ethiopia (37.4%)[42]. Our result is higher than the studies conducted in Malawi (9.6%)[24], Khartoum (9.2%)[43], and central Eritrea (7.4%)[44]. The discrepancy could be due to differences in methodologies, such as varying diagnostic criteria, assessment tools, sampling methods, and time frames for assessing PPD, leading to variations in reported prevalence rates. Demographic factors like age, socio-economic status, cultural background, and access to healthcare can influence the prevalence of PPD[3]. The timing of PPD assessment can also impact prevalence rates. Some studies assess PPD shortly after childbirth, while others assess it at later time points. PPD prevalence tends to decrease over time, so studies conducted at different time points may report different rates[24]. Cultural attitudes toward mental health, societal support structures, and healthcare accessibility can vary by region, influencing PPD prevalence rates[35, 45].

In this study, women aged 25–30 years were 93% less likely to report postpartum depression compared to those aged 18–24 years. This finding was supported by a study conducted in Nigeria[25]. This may be due to maternal age often correlating with various psychosocial factors that can influence the risk of PPD. Cultural and societal values regarding young mothers in various countries could be a reason for this difference[46–47]. Study participants who were unable to read and write had a 4.8-fold increase in PPD compared to those with education levels of college and above. The finding aligns with studies conducted in Malawi[24] and previously published research in Ethiopia[42]. This may be due to higher levels of education often being associated with greater access to resources, including healthcare services, social support networks, and information about maternal mental health. Women with higher levels of education may have fulfilling careers and greater financial independence, providing a sense of purpose beyond motherhood. In contrast, individuals with lower education levels may face limited job prospects and financial dependence, contributing to feelings of inadequacy, stress, and PPD[37].

This study demonstrated that women exposed to intimate partner violence (IPV) had a 7-fold increase in PPD compared to their counterparts. This finding aligns with studies conducted in South Africa[37] and Ethiopia[42]. This may be due to women experiencing IPV during pregnancy or the postpartum period often enduring significant psychological trauma. Participants whose pregnancies were unwanted and unplanned had a 6-fold increase in postpartum depression compared to those with wanted and supported pregnancies. This was supported by studies conducted in the Lao population[36], Eritrea[44], and Ethiopia[40, 45]. This may be due to unwanted or unplanned pregnancies evoking a range of emotions, including shock, disbelief, fear, anxiety, and uncertainty about the future. Coping with the emotional burden of an unwanted pregnancy, particularly if it conflicts with a woman's reproductive intentions or life plans, can increase the risk of developing PPD. Women who experience unwanted or unplanned pregnancies may feel a loss of control over their bodies, reproductive choices, and life trajectories. This loss of autonomy and agency can exacerbate feelings of powerlessness, helplessness, and distress, which are strongly associated with depression, including PPD. Unplanned pregnancies can place significant financial strain on individuals and families, particularly if they lack adequate resources or support systems. Concerns about providing for the needs of a newborn, including healthcare, childcare, and basic necessities, can heighten stress levels and contribute to the development of PPD.

Study participants having low-birth-weight babies

had a 3-fold increase in PPD compared to those who delivered normal-birth-weight babies. This finding aligns with studies conducted in the Lao population[36] and Northern Ethiopia[39]. This may be due to low birth weight often resulting from pregnancy complications such as maternal health issues, inadequate prenatal care, gestational diabetes, hypertension, or placental abnormalities[48]. Delivering a low-birth-weight baby may involve medical interventions, prolonged hospital stays, and uncertainty about the baby's health and prognosis. Witnessing their infant's medical challenges and vulnerability can be emotionally distressing for mothers, heightening feelings of anxiety, guilt, and helplessness, which are risk factors for PPD.

Study participants having poor social support had a 3.4-fold increase in PPD compared to those with strong social support. This finding was congruent with studies conducted in India[35], South Africa[37], and Ethiopia[20, 40]. Social relationships provide individuals with a general sense of self-worth and psychological well-being, as well as access to resources during stressful periods and transitions in life. Pregnancy is a time of significant life change for every woman. This may be due to the lack of social support leading to feelings of loneliness, isolation, and an inability to solve problems without external help, which are risk factors for depression. Without friends, family, or community support, new mothers may feel overwhelmed by the demands of caring for a newborn, leading to increased stress and depressive symptoms. Social support serves as a buffer against stress. Without a support system in place, women may experience heightened levels of stress during the postpartum period. Social support provides an avenue for new mothers to express their emotions and receive validation for their experiences. Without empathetic listeners or understanding individuals to turn to, women may feel invalidated or misunderstood, which can exacerbate feelings of depression[49].

Lastly, our study has some limitations. It was a single-institution study, and its conclusions may not be generalizable to hospitals across the country. The cross-sectional nature of the study design makes it difficult to infer the direction of causality, and some responses may not be accurate due to subjective responses, recall biases, and the use of interviewer-administered questions, which can lead to social desirability bias. One of the strengths of this study is the use of a standard measuring instrument for PPD (i.e., the EPDS tool), which has been previously validated in the Ethiopian context[32].

CONCLUSION

The magnitude of postpartum depression in this study was high. This highlights the need for targeted interventions addressing the needs of postpartum women with various risk factors for PPD, including low education, intimate partner violence, unwanted pregnancy, and poor social support. Further well-designed and representative studies are recommended to inform policy and devise targeted strategies to address PPD.

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Data Availability Statements:
All relevant underlying data that support the findings of this study can be accessed through the corresponding author.

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PREDICTORS OF AGE AT FIRST MARRIAGE AMONG RURAL WOMEN IN THE WEST GUJI ZONE, SOUTHERN ETHIOPIA

Shiferaw Gelchu[1], Dessalegn Wirtu[2], Merga Dheresa[3]

ABSTRACT

BACKGROUND: Age at first marriage is crucial for a woman's life prospects. Rural women are more likely to marry at an early age. This study focused on identifying the factors that influence the age at first marriage.

METHODS: A cross-sectional study was conducted in the West Guji Zone, southern Ethiopia, from April 1 to May 5, 2024. A multistage sampling procedure was used to select 711 participants. The data were entered into Epi-Data version 4.4.3.1 and exported to SPSS version 25 for analysis. A multivariable linear regression model was fitted to determine the predictors of the age at first marriage, and statistical significance was determined using $p < 0.05$.

RESULTS: The participants' age at marriage was 17.5 ± 2.456 years, ranging from 13 to 25 years. Factors associated with the age at first marriage were family wealth ($\beta = 0.922$, $p < 0.001$), mother's education ($\beta = 0.677$, $p < 0.001$), awareness of legal age ($\beta = 0.357$, $p < 0.001$), lack of punishment for perpetrators ($\beta = -0.600$, $p = 0.001$), lack of job opportunities ($\beta = -0.608$, $p = 0.016$), marriage decision ($\beta = 0.254$, $p = 0.013$), and parents' family size ($\beta = -0.086$, $p = 0.026$).

CONCLUSION: In this study, the average age of first marriage in the West Guji Zone was lower than the legal marital age. Girls from poorer families, with low levels of education and larger family sizes, should be the target of intervention programs to end early marriage. Furthermore, the general public should be made aware of the legal marital age.

KEYWORDS: first marriage, rural women, age, predictors, West Guji, Ethiopia

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INTRODUCTION

Marriage before the age of eighteen is regarded as a discriminatory practice that violates human rights and exposes women to numerous challenges[1]. Early marriage is associated with lower education levels, marital dissatisfaction, poor physical and mental health outcomes, lack of autonomy, increased gender inequality, divorce, lower social status of women, curtailed economic empowerment, limited job opportunities, and higher fertility rates[2-4]. In contrast, marriage at an older age is correlated with higher rates of female involvement in the labor force, improved mother and child health, more bargaining power, higher levels of education, and lower fertility rates[5].

Globally, the mean age at first marriage has increased. In Western countries, between 1965 and 2000, the mean age of marriage rose from 24.7 to 28.3 years[6]. Similarly, the proportion of women married before the age of 18 has declined over the past three decades, from 1 in 3 girls to 1 in 4 girls[7]. In Sub-Saharan Africa (SSA), from 1950 to 2005, the average marital age increased by 3.3 years in urban areas and 1.1 years in rural areas[8]. Despite this, the region still has a 55.11% prevalence of early marriage[9]. Similarly, in Ethiopia, the mean age at first marriage among women increased from 14.34 years in 2000 to 15.5 years in 2016[10].

Risk factors contributing to early marriage include women's education, employment opportunities, family wealth, family size, religion, rural residence, marriage decisions, media exposure, social norms, fear of pregnancy, awareness of the legal marriage age, family conflict, and virginity-associated stigma[9,11-21]. According to Sustainable Development Goal (SDG) 5.3, early marriages should cease by 2030, and Ethiopia pledged to end marriages before the age of 18 by 2025[22,23]. However, more than half (56.34%) of Ethiopian girls marry before reaching 18 years[24]. Furthermore, research has shown that rural women are more likely to marry early than their urban counterparts[18,24]. In the study area, arranged marriages are more common than love marriages, further increasing the likelihood of early marriage[25]. In Ethiopia, limited information exists about the age at first marriage among rural women. Therefore, this research aims to investigate the age at first marriage and its predictors among rural women of reproductive age.

METHODS AND MATERIALS

Study setting: This study was conducted in the West Guji Zone of southern Oromia, located 470 kilometers south of Ethiopia's capital, Addis Ababa. The zone consists of 10 administrative districts (9 rural and 1 urban) and 196 kebeles. The Guji society, an Oromo ethnic group, practices arranged marriages rather than love marriages[26].

Study Period: This study was carried out from April 1 to May 5, 2024.

Study design: A community-based cross-sectional study design.

Population: The source population included all women of reproductive age (15–49 years) living in rural districts of the West Guji Zone. The study population consisted of randomly selected women of reproductive age living in selected kebeles who were available at home during the study period. Women who were married and had resided in the selected kebeles for over six months were included, while women who were ill or in cohabiting relationships were excluded.

Sample size determination: The sample size was determined using a single population proportion formula, with the assumptions of $Z\alpha/2 = 1.96$, a 95% confidence level, a 5% margin of error, a 69.9% proportion of early marriage from a previous Ethiopian study[27], and a design effect of 2. After adding a 10% nonresponse rate, the final sample size was 711.

Sampling technique and procedure: A multistage sampling technique was adapted from previous studies[18,28]. Four of the 9 rural districts were selected randomly. Of the 96 kebeles in the selected districts, 37 kebeles were chosen based on proportional representation. After identifying households with eligible women, a sampling frame was prepared for each selected kebele. Finally, a random sampling method (random number

table) was used to select households with eligible participants. If more than one eligible woman was present in a household, a lottery method was applied (**Fig. 1**).

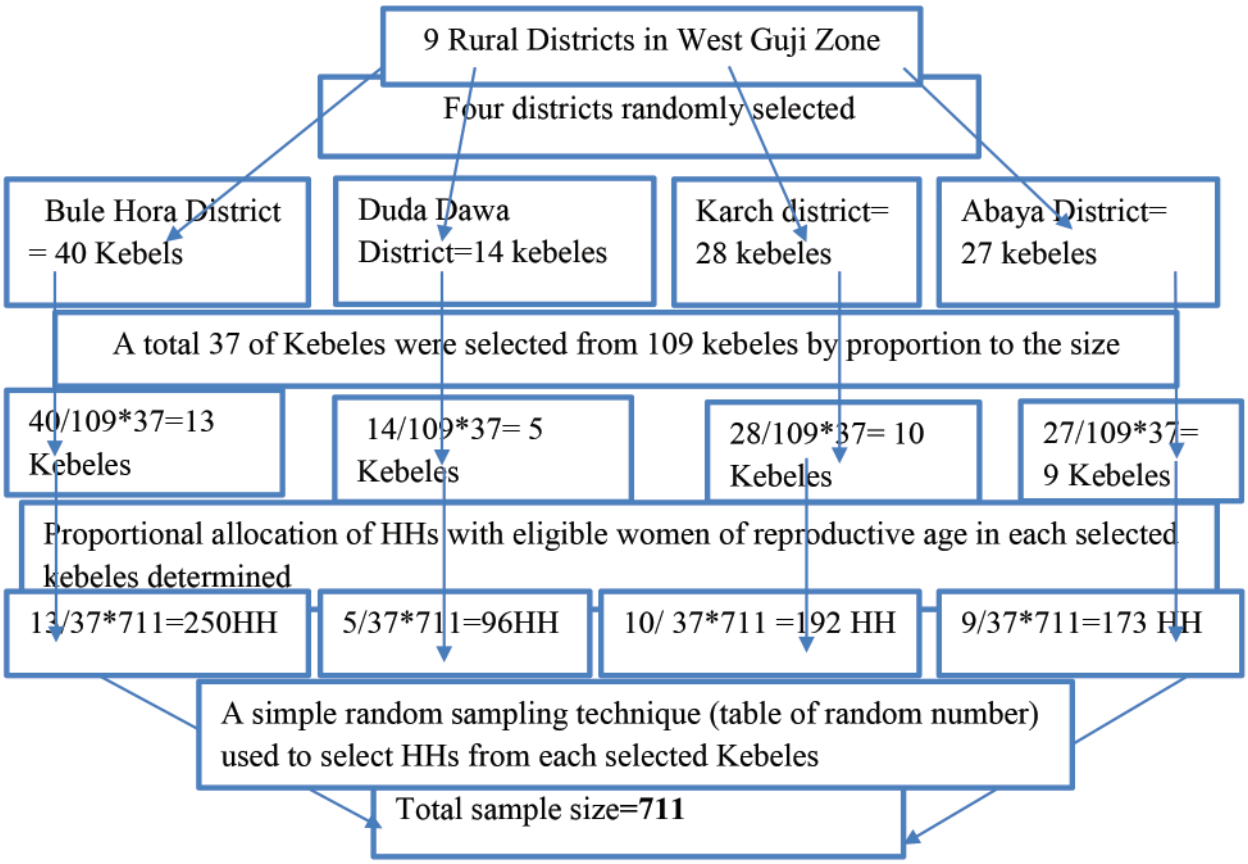

Figure 1: Pictorial presentation of the sampling procedure for the study conducted among rural reproductive-age women in the West Guji zone, Southern Ethiopia, 2024

Study variables

Dependent Variable: Female age at first marriage.

Independent Variables: Sociodemographic factors such as age, marital status, education level, and family size. Social structure and service-related factors, including media accessibility, legal punishments for early marriage offenders, and the availability of job opportunities for girls. Individual-related factors such as perceived marital age and awareness of the legal age, as well as context-related factors, such as criteria for girls reaching marriageable age, stigma related to girls' age, honor concerning virginity, family conflict, and marriage decisions.

Operational Definition: Age at first marriage is measured in years, with distribution examined using the mean[29].

Data collection tools, techniques, and quality control: The data collection instrument was adapted from relevant literature[12,18,30]. The tools were pretested in 5% (36 married women) of the study participants living in a similar setting outside the study area (Uraga district of the East Guji Zone) and administered via face-to-face interviews. Two language experts prepared the tools in English, translated them into Afan Oromo, and then

retranslated them into English for consistency. Twenty health extension workers participated in data collection, supervised by ten supervisors. The study assistants received two days of training on the instruments, data collection procedures, study objectives, confidentiality, and informed consent.

Data analysis: The data were cleaned, coded, and verified for completeness before being entered into Epi-Data version 4.4.3.1 and exported to SPSS version 25 for analysis. Descriptive statistics, including frequencies, percentages, and means, were calculated. Simple and multivariable linear regression models were used to identify predictors of age at first marriage. Variables with a significant association at $p < 0.2$ in bivariate analysis were selected for multivariable regression, with statistical significance set at $p < 0.05$.

RESULTS

Sociodemographic characteristics of the women

A total of 711 married women were interviewed in this study, making up 100% of the response rate. The mean marital age of the surveyed women was 17.5 ± (2.456 SD). The minimum and maximum ages at first marriage were 13 and 25 years, respectively. Among the interviewed women, nearly half (353, 49.6%) had an age at first marriage less than 18 years (**Table 1**).

Table 1: Sociodemographic characteristics of rural women in West Guji zone, Southern Ethiopia, 2024

Characteristics	Frequency(n)	Percent (%)
Participants age at first marriage		
<18	353	49.6
≥18	358	50.4
Participants current age		
<20	30	4.2
20-29	354	49.8
30-39	303	42.6
≥40	24	3.4
Participants marital status		
Married	682	95.9
Divorced	20	2.8
Widowed	9	1.3
Religion		
Orthodox	107	15
Muslim	147	20.7
Protestant	384	54
Waqefata	73	10.3
Father education		
Had no formal education	461	64.8
Primary(1-8)	186	26.2
Secondary (9-12)	42	5.9
College or University	22	3.1
Mother Education		
Had no formal education	616	86.6
Primary(1-8)	75	10.6
Secondary (9-12)	8	1.1
College or University	12	1.7
Participant education		
Had no formal education	251	35.3
Primary(1-8)	333	46.8
Secondary (9-12)	92	12.9
College or University	37	5
Parents family size		
1-3	17	2.4
4-6	230	32.3
≥7	464	65.3
Wealth Index		
Poor	238	33.5
Middle	237	33.4
Rich	235	33.1

Social structure and service pertaining to early marriage

The majority of the respondents (548, 77.1%) had followed media, and of those who had access to media, two-thirds listened to the radio. A remarkable number of study participants (567, 79.7%) reported the absence of girls supporting agencies in their vicinity. More than half of them (423, 59.5%) reported a lack of legal punishment against perpetrators of early marriage. The majority of surveyed women (87.9%) stated a lack of job opportunities in their locality for females.

Perceptions of the participants on early marriage

A significant number of the respondents (638, 89.7%) believed that sexual intercourse before marriage was incorrect. Similarly, more than half of the participants (365, 51.3%) mentioned that sexual intercourse before marriage led to a girl's marriage at an early age **(Table 2)**.

Table 2: Perceptions of rural women regarding early marriage in West Guji zone, Southern Ethiopia, 2024

Variables	Frequency(n)	Percent (%)
Your opinion on having sex before getting married		
Not correct	638	89.7
Correct	73	10.3
Do you believe that having sex before marriage leads to early marriage?		
No	365	51.3
Yes	346	48.7
Perceived age of marriage		
<18	126	17.7
≥18	585	82.3
Know the legal age of marriage		
No	125	17.6
Yes	586	82.4

Context-related factors of early marriage

Among the surveyed women, 638 (83.1%) reported the appearance of signs of puberty considered as a criterion for a girl reaching marriage. The majority of women (93.4%) reported that there was fear related to girls' age in the community. A total of 632 (88.9%) and 591 (83.1%) women reported that there is honor related to girls' virginity for girls as well as for girls' parents **(Table 3)**.

Table 3: Context-related factors of early marriage among rural women in the West Guji zone, Southern Ethiopia, 2024

Characteristics	Frequency (n)	Percent (%)
The criterion for girl's reached for marriage		
Signs of puberty (breast enlargement, menses)	591	83.1
Age greater than 18 years old	82	11.5
Finished school or graduate	38	5.3
The custom of girls marriage age <18 years old		
No	242	34
Yes	469	66
Reason for marriage age <18 years old		
To protect girls` virginity	158	33.7
To avoid premarital affairs	192	40.9
To strengthen inter-family relationship	45	9.6
Lack of other options for girls	74	15.8
Is there fear in your area if girls grow older?		
No	47	6.6
Yes	664	93.4
Reason for fear		
Face difficulty to marry	334	50.3
For family reputation	275	41.4
Stigma related to older age	55	8.3
Who decided your marriage?		
Not self (father, mother, relative)	241	33.9
Self	470	66.1
Honor for girls related to girls' virginity		
No	79	11.1
Yes	632	88.9
Honor for parents related to girls' virginity		
No	120	16.9
Yes	591	83.1
Conflict within family		
No	606	85.2
Yes	105	14.8

Multiple linear regression of factors associated with early marriage

A multiple linear regression model was used to determine the predictors of age at first marriage. In the multivariable forward linear regression, seven key variables were significant at $p < 0.05$: wealth status, education level of mothers, perceived age of marriage, lack of punishment against perpetrators

of early marriage, availability of job opportunities for girls, marriage decision makers, and parents' family size.

The family wealth index was a predictor of a girl's age at first marriage (β=0.922, p < 0.001). For every one-level increase in the mother's education, girls' age at first marriage increases by 0.677 years (β=0.677, p < 0.001). An increase in the perceived age of marriage increases girls' marital age by 0.357 years (β=0.357, p < 0.001). The lack of legal punishment of the perpetrators of early marriage (β= -0.600, p = 0.001). A lack of job opportunities for females (β= -0.608, p = 0.016). The age at first marriage increased by 0.254 years when girls decided to get married (β= 0.254, p = 0.013). An increase in family size by one member decreases a girl's marital age by 0.086 years (β= -0.086, p = 0.026) (**Table 4**).

Table 4: A multiple linear regression analysis for the predictors of age at first marriage among rural women in the West Guji zone, Southern Ethiopia, 2024

Predictors of age at first marriage	Unstandardized Coefficients		Standardized Coefficients	t	p-value
	B	Std. Error	Beta		
(Constant)	9.639	1.689		5.708	.000
Wealth index	.922	.102	.307	9.063	.000
Mother education	.677	.098	.233	6.916	.000
Perceived age of marriage	.357	.093	.133	3.859	.000
Lack of punishment against perpetrators	-.600	.173	-.120	-3.460	.001
No job opportunities for females	-.608	.251	-.081	-2.422	.016
Marriage decision	.254	.102	.083	2.490	.013
Parents family size	-.086	.039	-.077	-2.233	.026

DISCUSSION

In this study, the mean age at first union was 17.5 years. This means almost half of the surveyed women were married before 18 years. In the study area, the onset of secondary sexual characteristics (occurrence of menses and breast enlargement) was considered as the criteria that the girls met for marriage. These results are in line with those of previous studies carried out in Ethiopia, where the mean age of the first union was 17.2 years[11]. However, there was a slight improvement in the mean age of the first union compared with another study conducted in Ethiopia, which reported that the mean age of first marriage was 14.8 years[27]. The observed discrepancy is perhaps due to study time, the differences in the study population, sample size, and the commitment of the government interventions to eliminate violence against women, including early marriage.

The study results revealed that there was fear associated with girls' age, and the reasons for this fear were that they may face difficulty marrying and age-related stigma. This finding is supported by a study conducted in the Harari region, in eastern Ethiopia[18]. This could be because early marriage is a widely accepted and practiced custom in Ethiopia.

Family wealth status was a significant predictor of age at first marriage. An increase in the wealth index from a lower to a higher level increases a girl's marital age by 0.922 years (β=0.922). This finding is in line with previous studies[9,28,30], showing parents' economic status is a potential determinant of marital age in developing countries.

Despite the legal age of marriage being 18 years old in Ethiopia[23], insufficient legal protection is one of the predictors of a girl's marriage below 18 years. In this study, the lack of legal punishment for offenders of early marriage decreases girls' age at first marriage by 0.600 years (β= -0.600). Another study reported that inadequate legal protection of girls' age at first marriage is a risk factor for early marriage[19]. Furthermore, one level increase in the mother's education increases the girls' age at first marriage by 0.677 years (β=0.677). This result contradicts a study conducted in the Amhara region, where the father's education status was significantly associated with the girls' age at first marriage[28]. However, parents' level of education has an influence on girls' age at marriage[20]. The marriage decision of an individual girl increases the age at first marriage by 0.254 years (β= 0.254). This finding is supported by earlier studies conducted in Ethiopia[18,30], showing that marriage decisions by parents are significantly associated with early marriage.

Family size was a negative predictor of a girl's age at first union. An increase in family size by one member decreases the girl's age at first marriage by 0.086 years (β= -0.086). The findings agree with a study done in northern Ethiopia, where girls from larger families were four times more likely to marry at an early age than their counterpart[28]. Families prefer to marry their girls at an early age to be free from financial constraints to care for and educate[19].

Even though the large sample size in this study enables generalization to the target population, the cross-sectional study design made it impossible to determine a cause-and-effect relationship between the predictor variables and the outcome.

CONCLUSION

This study revealed the average age of first marriage was lower than the national legal marital age. Girls from poorer families, low levels of education, and larger family sizes should be the target of intervention programs to end early marriage. Additionally, girls, parents, and the general public should be made aware of the impact of early marriage.

Ethical approval

The Bule Hora University Ethical Review Committee granted ethical approval before the start of the study (Ref.no.BHU-IOH 02-012). A permission letter was provided to the West Guji Zone administration office, selected districts, and Kebeles. The participants were informed of their freedom to withdraw from the study at any time, and their anonymity was protected by providing pseudonyms.

Data availability

Upon a reasonable request, the corresponding author will provide the data used to support the conclusions of this study.

Conflict of Interests

The authors declare that they have no conflict of interest.

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ISOLATED FALLOPIAN TUBE TORSION IN 20 YEARS OLD LADY: CASE REPORT

Eyob Asefa, MD[1], Bazza Kedida, MD[2]

ABSTRACT

BACKGROUND: Isolated fallopian tube torsion is the rotation of the fallopian tube along its long axis, resulting in obliteration of blood supply while the ovary's blood supply and lymphatic drainage remain unaffected. The prevalence of isolated fallopian tube torsion is estimated to be only 1 in 1,500,000 but is believed to be rarer. Although the pathophysiology of isolated fallopian tube torsion is not well known, there are well-defined risk factors for the disease. It most commonly affects the right side of the fallopian tube rather than the left side.

CLINICAL PRESENTATION: A 20-year-old woman presented with acute severe lower abdominal pain, vomiting, and lower back pain. She had a urinary complaint of 3 days' duration.

PERTINENT FINDINGS:

PHYSICAL EXAMINATION: Vital signs: PR = 110 bpm, temp = 38°C. On abdominal examination, there was significant tenderness in the lower abdomen on deep palpation.

GENITOURINARY SYSTEM: There was no abnormal vaginal discharge. On vaginal digital examination, there was tenderness on the right side of the pelvis.

With the above-mentioned clinical presentation, pelvic inflammatory disease was considered the working diagnosis, and broad-spectrum antibiotics were started. Despite administering broad-spectrum antibiotics for 48 hours, the clinical symptoms and signs worsened. For this reason, operative laparotomy was decided. Intraoperatively, there was right-sided fallopian tube torsion. It was gangrenous, and a right-sided salpingectomy was performed. The postoperative period was smooth.

DISCUSSION: Isolated fallopian tube torsion is an extremely rare disease entity. Predisposing factors are classified as intrinsic and extrinsic. It occurs in reproductive-age groups and is a rare cause of acute abdomen in this population. This case presented with severe acute abdominal pain, vomiting, and urinary symptoms. On physical examination, the patient was febrile and had abdominal tenderness. Ultrasound showed a dilated fallopian tube and pelvic collection. These findings were nonspecific, leading to an initial diagnosis of acute pelvic inflammatory disease. Isolated fallopian tube torsion was diagnosed intraoperatively after 48 hours of antibiotic treatment for pelvic inflammatory disease, which did not respond. Diagnosis of isolated fallopian tube torsion remains challenging as it presents with vague and nonspecific clinical features. Advanced medical imaging, such as MRI, is recommended for early diagnosis and intervention.

CONCLUSION: Isolated fallopian tube torsion remains difficult to diagnose early due to nonspecific clinical presentation. Acute pelvic inflammatory disease is one of the top differential diagnoses in sexually active patients. To improve the early diagnosis of isolated fallopian tube torsion, advanced medical imaging, such as MRI, is advised. A less invasive surgical approach is the gold standard treatment. Salvaging the fallopian tube is a priority if the tube is not gangrenous.

KEYWORDS: Isolated fallopian tube torsion, pelvic inflammatory disease, acute abdomen

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INTRODUCTION

Isolated fallopian tube torsion (IFTT) is the rotation of the fallopian tube along its long axis, resulting in obliteration of blood supply while the ovary's blood supply and lymphatic drainage remain unaffected.[1] It was first described by Bland-Shunton in 1890. The prevalence was estimated to be only 1 in 1,500,000 but is believed to be rarer.[1,2,3,4] It occurs less frequently in the pediatric age group. Although the pathophysiology of IFTT is not well known, there are well-defined risk factors for the disease.[5] Risk factors are classified as intrinsic and extrinsic.[5]

IFTT is a rare cause of acute abdomen in females.[3,6] It is often mistakenly identified as appendicitis, ovarian torsion, acute PID, or ectopic pregnancy.[3,6,7,8] It most commonly affects the right side of the fallopian tube rather than the left side. This is because the left-side fallopian tube is fixed by the sigmoid colon and mesentery, while the cecum and ileum are hypermobile. Additionally, a slightly longer right mesosalpinx and utero-ovarian ligament allow for greater adnexal mobility.[5]

Risk factors for isolated fallopian tube torsion are commonly identified intraoperatively. These factors are classified as intrinsic (e.g., excessive tubal length, tortuous tube, tubal cyst, hydrosalpinx, hematosalpinx) and extrinsic (e.g., tubo-ovarian abscess, ovarian cyst, pelvic adhesions, enlarged uterus).[9] Diagnosis of IFTT remains challenging due to vague and nonspecific clinical presentation.[10] The most common clinical presentation is acute severe lower abdominal pain.[3,7] Other clinical presentations include tachycardia and possibly leukocytosis. Chronic pelvic pain is a less common presentation.[11]

If diagnosis and treatment are delayed, irreversible tubal necrosis will result, and the necrotized tube cannot be salvaged.[12] Advanced medical imaging aids in the early identification and treatment of IFTT.[10] This case is noteworthy because IFTT developed in a woman with no known risk factors, and the diagnosis was delayed due to nonspecific clinical presentation.

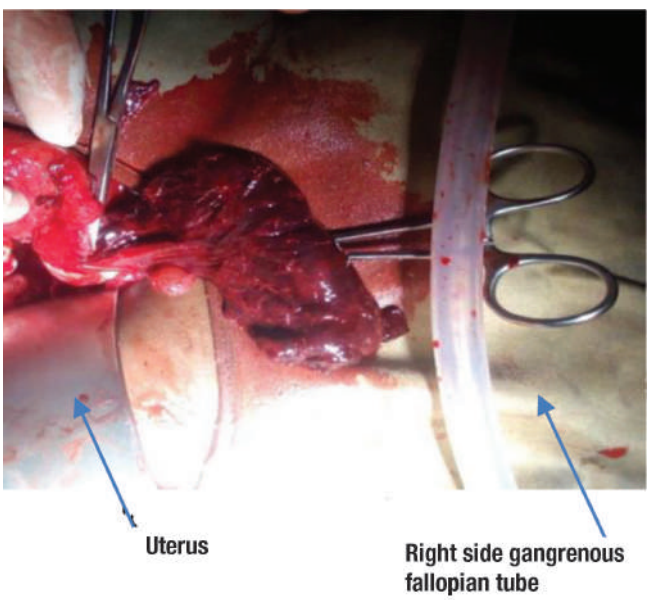

Figure 1: right side gangrenous fallopian tube and normal looking uterus

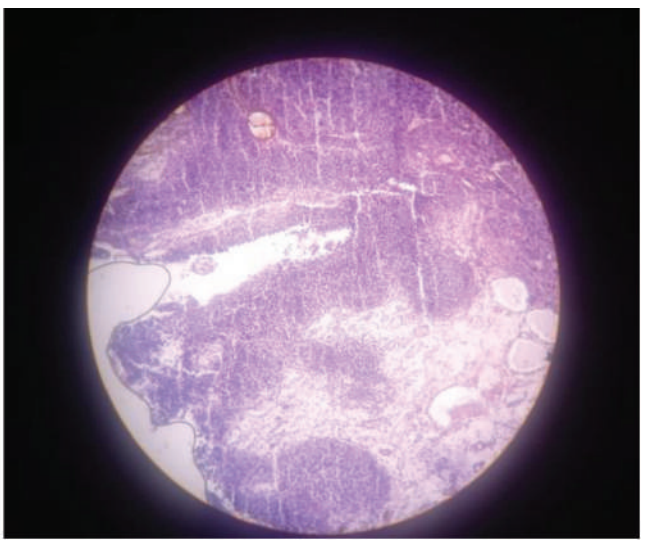

Figure 2: histopathology study showing inflammatory cells infiltration with focal necrosis

DISCUSSION:

Isolated fallopian tube torsion (IFTT) is an extremely uncommon disease entity[5,6]. The prevalence of IFTT is unknown, but literature suggests that it occurs once in every 1,500,000 people[5,6]. The etiology and pathophysiology of fallopian tube torsion are unclear. Predisposing factors are divided into two categories: intrinsic and extrinsic factors[3]. It is more common among young adults than among children and the elderly[10]. The diagnosis of IFTT remains difficult due to its non-specific clinical presentation[9].

Extrinsic risk factors include ovarian mass, tubal and para-tubal mass, pelvic inflammatory disease, and pelvic adhesions. Intrinsic risk factors include hydrosalpinx, hematosalpinx, long fallopian tube, hypermobile fallopian tube, endometriosis, tubal neoplasm, and tubal ligation[5,9]. In this case, intraoperative findings revealed that the patient had no signs of PID, normal fallopian tube length, no pelvic adhesions, no tubal or ovarian mass, and a normal-appearing uterus. As a result, no risk factors were identified for this patient.

It is difficult to diagnose fallopian tube torsion using ultrasound. Predisposing factors are frequently observed on ultrasound imaging, resulting in either misdiagnosis or delayed diagnosis[13]. Ovarian masses, tubal or para-tubal masses, appendicitis, or pelvic collections suggestive of PID are often found, leading to delayed or incorrect diagnosis[3,5,12]. A significant number of IFTT cases are diagnosed intraoperatively, either by laparotomy or laparoscopic approach[5,6,14]. In this case, ultrasound imaging revealed a dilated and edematous right fallopian tube surrounded by an echo-complex mass around the tube and fluid collection in the pelvic region. With these findings, acute PID was regarded as the working diagnosis. The diagnosis of pelvic inflammatory disease was further supported by the recent initiation of sexual intercourse, fever, and leukocytosis in CBC test results. Other symptoms included severe acute lower abdominal pain, vomiting, and lower back pain, which were all non-specific symptoms. Antibiotics were started as the first-line treatment for PID. After 48 hours of follow-up, there was no clinical improvement, and laparotomy was decided. Torsion of the right fallopian tube was discovered intraoperatively. It was gangrenous, and right salpingectomy was performed. No grossly identifiable risk factors were found following the patient's clinical and intraoperative evaluation.

In this case, it was difficult to diagnose IFTT using ultrasound imaging and clinical features. If a definitive diagnosis is not possible, advanced imaging, such as MRI, and diagnostic procedures, like diagnostic laparoscopy, are recommended. For early diagnosis and tube salvage, early intervention and advanced imaging are essentia[13].

CONCLUSION:

The non-specific clinical presentation of IFTT makes early diagnosis challenging. Acute PID is a leading differential diagnosis in sexually active patients. The diagnosis of IFTT should be considered early in patients who are unresponsive to antibiotic treatment. Advanced medical imaging, such as MRI, is recommended for the early diagnosis of IFTT. A less invasive surgical approach is the gold standard treatment. If the fallopian tube is not gangrenous, it should be preserved.

Ethical Consideration:

Informed consent was obtained for the images and potential publication of the case.

Competing Interest:

We declare that there is no conflict of interest.

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SILENT TUBERCULOUS ENDOMETRITIS AS A CAUSE OF PRIMARY AMENORRHEA IN A YOUNG WOMAN FROM A TUBERCULOSIS ENDEMIC COUNTRY: A CASE REPORT

Kuky Cahya Hamurajib[1], Nurulita Ainun Alma[2], Giovanna Renee Tan[3], Ifatul Hanifah[3], Muhammad Lutfi[1]

ABSTRACT

INTRODUCTION: Tuberculosis (TB) is an infectious disease that primarily affects the lungs but can also involve genital organs and the endometrium. Endometrial TB generally has nonspecific clinical manifestations, such as menstrual irregularity causing amenorrhea and infertility.

CASE PRESENTATION: A 20-year-old nulliparous patient presented with primary amenorrhea of 20 years. She had no other complaints. She had no response to a 3-month treatment with combined oral contraceptives. Her medical history included a previous TB treatment at age 12. Clinical examination showed appropriate secondary sexual development. Laboratory tests, including thyroid, FSH, LH, estrogen, prolactin, and karyotyping, were normal. MRI revealed a hypoplastic uterus with intraluminal lesions, suggesting uterine synechiae and minimal hematometra. Hysteroscopy and laparoscopy confirmed extensive uterine synechiae and abdominal adhesions. A positive Interferon Gamma Release Assay (IGRA) indicated genital tuberculosis.

CONCLUSION: This case highlights the rare occurrence of tuberculosis-related uterine synechiae leading to primary amenorrhea, emphasizing the importance of considering tuberculosis in the differential diagnosis of unexplained primary amenorrhea in TB-endemic regions.

KEYWORDS: Tuberculous endometritis, amenorrhea, uterine synechiae.

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INTRODUCTION

Tuberculosis (TB) remains a persistent global health issue, with Indonesia ranking as the country with the second-highest TB burden worldwide[1]. Tuberculosis is primarily caused by Mycobacterium tuberculosis infection, which primarily affects the lungs but can also involve other systems, including the genital and reproductive organs[2]. Genital TB typically originates from pulmonary TB that spreads to the genital tract through hematogenous or lymphatic dissemination[1]. The most commonly affected sites are the fallopian tubes (95-100%), uterine endometrium (50-60%), ovaries (20-30%), cervix (5-15%), uterine myometrium (2.5%), and vagina/vulva (1%)[3].

Endometrial TB, a form of genital TB in women, has nonspecific clinical manifestations and is often overshadowed by pelvic TB. It typically affects reproductive-age women (15-40 years old) and is rarely diagnosed in children, partly due to low clinical awareness of the disease and its nonspecific symptoms[1]. While many patients are asymptomatic, others present with menstrual irregularities or infertility[4]. In advanced stages, adhesions between the ovaries can occur, and intrauterine adhesions may cause partial or complete obliteration of the uterine cavity, potentially leading to amenorrhea[3]. However, there are currently no reported cases of endometritis tuberculosis resulting in primary amenorrhea. Herein, we report a rare case of primary amenorrhea in a young woman with tuberculous endometritis.

CASE PRESENTATION

A 20-year-old nulliparous patient presented to the endocrine clinic in Sardjito Hospital with a failure to menstruate since birth. The patient had undergone three cycles of combined oral contraceptives without achieving menstruation. She reported no lower abdominal pain, vaginal discharge, or abnormal hair growth on the chest and face. There were no complaints of headaches, projectile vomiting, persistent cough, weight loss, or weight gain. The patient reported no history of learning or social adjustment disorders, dietary restrictions, medication use, sexual activity, or psychological stress. History-taking revealed that the patient had been diagnosed with pulmonary tuberculosis at age 12 and had completed a 6-month regimen. At age 13, she developed a mass on her left middle finger, which was biopsied. A pathology examination supported the diagnosis of cutaneous TB. She had undergone another course of TB medication and reported no signs or symptoms of pulmonary or extrapulmonary TB afterward.

On general examination, the patient had a body mass index of 18.73 kg/m^2 and normal vital signs. Head, neck, and lung physical examinations were unremarkable. Abdominal examination found no pain or palpable mass. Other systemic examinations were normal. Secondary sexual characteristic development was appropriate for age. Genital examination revealed an intact hymen and vagina. Subsequent uterine sounding measured the endometrial cavity at 4 cm in length.

Laboratory investigations showed a follicle-stimulating hormone (FSH) level of 6.89 mIU/mL, luteinizing hormone (LH) level of 9.66 mIU/mL, and estradiol level of 87.9 pg/mL, consistent with normogonadotropic normogonadism. Thyroid function tests were normal, with a thyroid-stimulating hormone (TSH) level of 2.53 µIU/mL and free T4 level of 1.32 ng/dL. The prolactin level was 12.9 ng/mL, within the normal range. A chest X-ray revealed no lung abnormalities.

Radiological evaluation with transanal ultrasonography (USG) showed a normal uterus measuring 6.17 x 2.52 cm, with a possible impression of hematometra. Transperineal USG indicated normal anatomy of the urethra, vagina, rectum, and anal sphincter muscles. Magnetic resonance imaging (MRI) revealed a normal uterus measuring 3.2 x 6.4 cm with intraluminal lesions along the uterine cavity measuring 1.16 cm longitudinally. Uterine synechiae with minimal hematometra was suspected **(Fig 1)**.

Fig 1. Pelvis MRI with contrast showed a normal uterus with minimal hematometra. In the distal uterus, a narrowing with intrauterine synechiae was seen (green arrow).

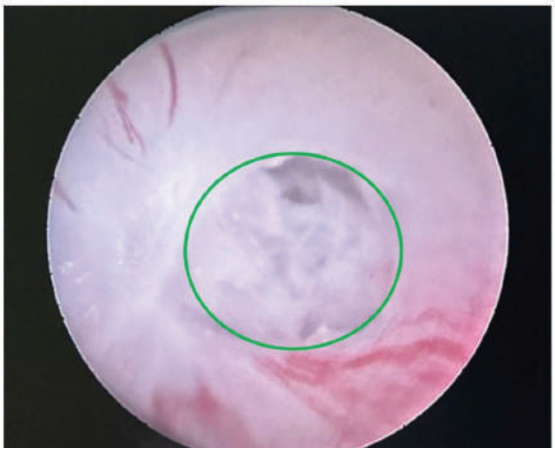

Fig 2. Hysteroscopic images revealed complete fibrosis of the uterine cavity. During the procedure, after passing through the external cervical canals, the hysteroscope could not pass through the internal cervical ostium. The uterine corpus and fundus could not be visualized due to total fibrosis (highlighted in the green circle).

No abnormalities were detected in the parametrium or the kidneys. Karyotyping confirmed a normal 46, XX karyotype.

Based on history, physical examination, and supporting examinations, we established a working diagnosis of primary amenorrhea due to uterine hypoplasia with suspected synechiae uteri. The patient was then scheduled for hysteroscopy and diagnostic laparoscopy. Intraoperative hysteroscopy revealed fibrotic tissue covering the uterine cavity, obscuring visualization of the uterine corpus and fundus (**Fig 2**).

Visualization of the fallopian tubes was also challenging. Laparoscopic examination showed extensive adhesions in the abdominal cavity between the intestines, omentum, and anterior abdominal wall, as well as between the uterus, pelvic cavity, and lateral pelvic wall.

Synechiolysis and adhesiolysis were performed, and a pathological examination of uterine and abdominal tissue samples confirmed chronic inflammation. The patient was then consulted with the pulmonology department, and the Interferon Gamma Release Assay (IGRA) test revealed positive results, while the Human Immunodeficiency Virus (HIV) test showed negative results. The patient then began a six-month course of treatment for extrapulmonary TB.

After completing TB treatment, the patient underwent a second-look hysteroscopy. The hysteroscope successfully accessed the uterine cavity, but fibrotic tissue was still present. Synechiolysis and adhesiolysis were performed to address the intrauterine adhesions (Fig. 3).

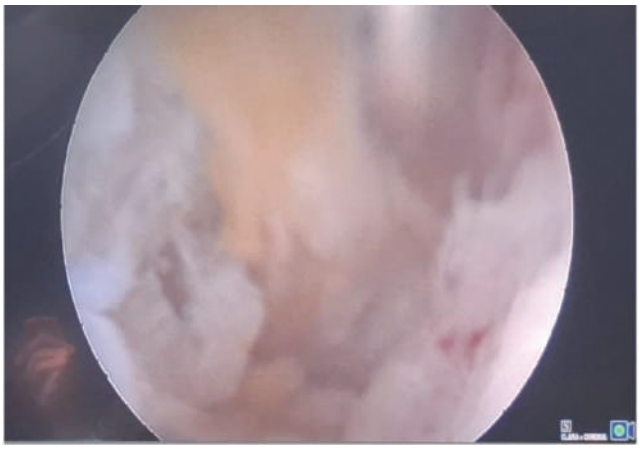

Fig 3. Hysteroscopic view during the second procedure following prior treatment. The cervical canal was accessed, revealing complete adhesions within the uterine cavity. Synechiolysis was performed up to the uterine fundus, but the bilateral tubal ostia could not be identified due to extensive scarring.

Despite these efforts, the bilateral tubal ostia remained obscured by the extensive fibrosis. To prevent re-adhesion of the uterine walls, a poloxamer-chitosan gel was applied as a barrier. One month post-procedure, cyclical estrogen-progesterone therapy was prescribed, resulting in a 3-day menstrual period.

DISCUSSION

Genital TB mainly affects individuals of reproductive age, between 20 and 45 years old[5]. Genital TB can extend to the endometrium in about 50% of cases, where it persists in the basal layer. This layer is not shed during menstruation and may contribute to re-infection. The tuberculous uterus triggers a chronic inflammatory response and forms epithelioid granulomas, which are the hallmark of TB infections. Further inflammation can lead to endometrial ulcers, fibrosis, and scarring, ultimately resulting in partial or complete intrauterine adhesions, obliteration, and deformity of the uterus[6].

In this case, the patient was diagnosed with unexplained primary amenorrhea after ruling out common underlying causes of amenorrhea, such as outflow tract abnormalities, ovarian insufficiency, hypothalamic or pituitary disorders, endocrine gland disorders, and physiological or medication-induced factors[7]. Pulmonary TB has been found to cause hypothalamic-pituitary dysfunction, premature ovarian failure, or organic lesions in the uterine endometrium, leading to hypomenorrhea or secondary amenorrhea[8]. Although menstrual cessation or reduced menstrual bleeding flow and duration have been reported in pulmonary TB patients, primary amenorrhea in TB patients is rare. The failure to induce menstruation despite hormonal combination treatment to stimulate the endometrium, along with confirmed normal hypothalamic-pituitary-ovarian function, suggests uterine synechiae as the cause of amenorrhea[9].

Patients with clinical manifestations and a history of TB infection or exposure should be suspected of having genital TB, where the disease has been reported to cause approximately 4% of uterine synechiae cases[10]. Uterine synechiae can be underdiagnosed, as they are often undetectable by routine examinations or diagnostic procedures, such as ultrasound. Radiologic evaluation may provide clues to M. tuberculosis in the endometrium. Evaluation of the endometrium with transvaginal ultrasonography can show endometrial thickening

or pyometra, while a hysterosalpingogram can show uterine distortion. The diagnosis of endometrial TB can be confirmed through granulomatous histopathology from biopsy or tissue curettage[11]. In addition, an endometrial biopsy can be used for acid-fast bacilli staining and mycobacterial culture. Menstrual fluid can also be utilized to diagnose TB endometritis[12]. To diagnose the extent of uterine synechiae, hysteroscopy is usually the diagnostic gold standard.

In this case, the endometrial tissue evaluation showed chronic inflammation, but no caseating granulomas were found. Caseating endometrial granulomas are more commonly observed in postmenopausal women compared to those of reproductive age, as the endometrium is typically expelled before caseation develops in reproductive-age women[13]. As such, endometrial biopsies are recommended to be performed during the premenstrual or late secretory phase, when granulomas are more likely to be present and well-developed throughout the menstrual cycle[13,14].

In our case, the diagnosis of genital TB was confirmed by a positive IGRA result from the patient's peripheral blood sample. In recent years, the IGRA has been used for diagnosing active and latent TB infection[15–17]. In women with confirmed female genital tuberculosis, the sensitivity and specificity of the IGRA test were found to be 86–94% and 70–75%, respectively, compared to the control group[18,19].

The treatment of genital TB is similar to that of pulmonary TB. According to the Indonesian Ministry of Health (2021), patients with genital TB are treated with a 6–9-month regimen. The treatment regimen includes 2 months of intensive phase therapy with a combination of four drugs: isoniazid, rifampicin, pyrazinamide, and ethambutol, followed by a 4–7-month continuation phase therapy with isoniazid and rifampicin[11]. After treatment with antituberculosis drugs, the endometrium can revert back to normal, and patients may experience improvement in their menstruation cycles. However, in cases with extensive endometrial gland damage, the endometrium may not respond to hormonal stimulation, thus preventing or delaying endometrial regeneration. In such cases, endometrial regeneration and the return of menstrual cycles can take years, even with proper treatment[20]. Laparoscopy and hysteroscopy can be repeated after completion of antituberculosis treatment to monitor disease resolution and assess the prognosis for infertility treatment. If major adhesions, frozen pelvis, or blocked fallopian tubes persist with or without signs of diminishing minor lesions after the treatment regimen, the fertility prognosis is poor[21]. Accordingly, in this case, the patient underwent a second-look hysteroscopy procedure after TB treatment completion, followed by administration of cyclical estrogen-progesterone, resulting in a 3-day menstrual period.

CONCLUSIONS

Tuberculous endometritis is a type of extrapulmonary tuberculosis that affects women. Diagnosing tuberculous endometritis is challenging due to its nonspecific signs and symptoms. In this case, we present the rare occurrence of tuberculosis-related uterine synechiae leading to primary amenorrhea, highlighting the importance of considering tuberculosis in the differential diagnosis of unexplained primary amenorrhea, especially in TB-endemic regions.

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