ISSN: 2573-9506

Research article

International Journal of Women's Health Care

Determinants of Preterm Delivery Among Mothers Who Gave Birth in Hospitals of Wolaita Zone, Southern Ethiopia, 2023: Unmatched Case-Control Study

Cherinet Tilahun[1*], Asmare Getie[2], Hiwot Tadesse[2], Temesgen Geta[3] and Adisu Ashiko[4]

[1]*School of Midwifery, College of Medicine and Health Science, Wolaita Sodo University, Wolaita, Ethiopia*

[2]*School of Nursing, College of Medicine and Health Science, Arba Minch University, Arba Minch, Ethiopia*

[3]*School of Nursing, College of Medicine and Health Science, Wolaita Sodo University, Wolaita, Ethiopia*

[4]*School of Public Health, College of Medicine and Health Science, Wolaita Sodo University, Wolaita, Ethiopia*

[*]Corresponding Author
Cherinet Tilahun, School of Midwifery, College of Medicine and Health Science, Wolaita Sodo University, Wolaita, Ethiopia

Submitted: 2023, Nov 01; **Accepted:** 2023, Dec 15; **Published:** 2024, Jan 08

Citation: Tilahun, C., Getie, A., Tadesse, H., Geta, T., Ashiko, A. (2024). Determinants of Preterm Delivery Among Mothers Who Gave Birth in Hospitals of Wolaita Zone, Southern Ethiopia, 2023: Unmatched Case-Control Study. *Int J Women's Health Care, 9*(1), 01-13.

Abstract

Background: *Preterm delivery refers to childbirth that occurs before 37 full weeks' gestation. Globally, around 13.4 million babies are born preterm annually, and a million die due to its complications. Identifying its determinants is mandatory to decrease preterm birth and thereby neonatal deaths. Therefore, this study aimed to identify the determinants of preterm delivery among mothers who gave birth in hospitals in the Wolaita zone, southern Ethiopia.*

Methods: *An Institutional-based unmatched case-control study design was conducted from March 29 to May 20, 2023, in the Wolaita zone, southern Ethiopia. Cases were women who gave birth after 28 weeks and before 37 completed weeks, and controls were women who gave birth at and after 37 and before 42 weeks of gestation from the first day of the last normal menstrual period. A consecutive sampling method was used. Data were collected by a structured interviewer-administered questionnaire. Data were coded and entered into Epi data 3.1 and analyzed by using SPSS version 25. Variables that had a P-value < 0.25 in the bivariate logistic regression analysis were entered into a multivariable logistic regression model. Finally, p-value < 0.05 was used to claim statistical significance.*

Result: *From a total of 405 eligible participants, 399 respondents (133 cases and 266 controls) participated in this study with a response rate of 98.52%. The result of the multivariable analysis shows that mothers who resided in rural areas [AOR=2.777:95% CI (1.507-5.118)], not receiving support from their partner [AOR=2.368:95% CI (1.243-4.514)], less than four antenatal care visits [AOR=4.520:95%CI (2.384-8.569)], developed pregnancy-induced hypertension [AOR=5.248:95%CI (2.270-12.135)] and exposed for intimate partner violence [AOR=2.945:95%CI (1.105-7.848)], had statistically significant association with experiencing preterm delivery.*

Conclusion and Recommendation: *Most of the determinants for preterm delivery have been proven modifiable. Thus, designing new strategies, providing policies for partner support during pregnancy, and Health care providers should give due attention to mothers with pregnancy-induced hypertension and exposure to intimate partner violence and increase the awareness of antenatal care follow-up and support during pregnancy to reduce preterm delivery.*

Keywords: Preterm Delivery, Determinant, Gestational Age, Ethiopia

Abbreviations and Acronyms

ANC - Ante Natal care
APH - Antepartum Hemorrhage
BMI – Body mass index
EDHS - Ethiopian Demographic and Health Survey
ETB - Ethiopian Birr
GDM - Gestational diabetes mellitus
IPV - Intimate Partner Violence
LMP - Last Menstrual Period
MUAC - Mid-Upper Arm Circumference
PIH - Pregnancy Induced Hypertension
PROM - Premature Rapture of Membrane
PTB - Preterm Birth
PH - Primary Hospital
SDG - Sustainable Development Goal
UTI - Urinary Tract Infection
WSUCSH - Wolaita Sodo University Comprehensive Specialized Hospital

1. Introduction

Preterm delivery is defined by the World Health Organization (WHO) as any birth that occurs before 37 full weeks of pregnancy or less than 259 days after the start of the mother's last menstrual cycle (LMP) [1]. Around 13.4 million live births were preterm in 2020, meaning that 1 in 10 babies worldwide were born preterm. Although the highest rates are predominantly in low- and middle-income contexts, rates of 10% or higher persist in some high-income countries. Almost half (45%) of all preterm births occurred in just five countries: India, Pakistan, Nigeria, China, and Ethiopia [2,3].

The proportion of preterm births varies from different regions of the country. In a developed country, the prevalence of preterm birth is from 5-7%, and in developing countries, it is estimated to be 11.9% on average [4]. The world's preterm birth rate has been consistently rising in most countries with reliable trend data. Evidence suggests that the proportion of preterm delivery among 12 cohorts studied in Europe to assess the educational disparity, singleton preterm live delivery proportion varied between 3.7% and 7.5 % [5].

In 2021, almost a million children (0.9 million) died due to direct complications of preterm birth, and over a third of the estimated 2.3 million neonatal deaths worldwide were due to direct complications of preterm birth [2]. According to the systematic review and meta-analysis report, the overall pooled prevalence of preterm delivery in Ethiopia was 10.48% in 2020 [6]. In Ethiopia, about 320,000 babies are born too soon and 24,000 Children under five years die of direct complications of preterm each year [8]. The 2019 Mini Ethiopia Demographic and Health Survey shows that the neonatal mortality rate was 33 deaths per 1,000 live births and prematurity was the major cause of death [8]. In Ethiopia, preterm Birth (PTB) is the main cause of neonatal death accounting for 34% and contributing to 12.5% of deaths of under five children [9].

Preterm delivery also causes short and long-term disabilities in surviving infants like effects on brain functions, cerebral palsy, mental retardation, breathing difficulties, feeding problems, jaundice, visual and hearing impairments, and poor health and growth [4,10]. Prematurity also has various effects on individuals, family's parents, communities, and the country as a whole. Effects include an increased possibility of not having more children, the danger of preterm delivery in future generations, financial pressure, a loss of social connection, failure to maintain employment, stress, and disturbance in families [4,11]. Additionally, there are significant social implications because many families must deal with stressful hospital stays or the unexpected loss of a preterm baby [12].

Preterm delivery rates are rising over time due to a variety of circumstances, and it is a symptom of numerous underlying conditions [13]. However, most preterm births are unplanned. Common determinants include a multiparty, previous history of preterm birth (PTB), infections, and chronic conditions, such as hypertension and diabetes mellitus but the exact etiology is not well identified. Therefore, it needs knowing the causes, determinants, and reasons for the occurrence of preterm birth will help the development of prevention strategies [4,13,14].

Different programs work on the prevention and care of preterm delivery. World Health Organization (WHO) established guidelines to overcome preterm birth problems in 2016 [15]. For instance, The Sustainable Development Goals (SDGs) and the global strategy for women's, children's, and adolescents' health have been developed and are currently being implemented to reduce neonatal and under-five mortality to 12 and 25 per 1,000 live births annually, respectively, by 2030 [16,17]. Urgent action is required to both prevent preterm birth by identifying the determinants and improve the quality of care for individuals born preterm to meet SDG 3.2's goals of ending unnecessary neonatal deaths [2,18].

To achieve national strategies and goals, preterm delivery determinants need to be understood, given top emphasis, and successfully managed. However, no study was conducted on the determinants of preterm delivery in the Wolaita zone. The determinants of preterm delivery may vary from region to region and time trends even within the same country, due to variations in socioeconomic status and health care service coverage. On the other hand, most of the studies conducted in Ethiopia were based on card review, and used cross-sectional study design and others are missing some variables therefore, the determinants of preterm delivery were not fully addressed. Therefore, this study aimed to identify determinants of preterm delivery among mothers who gave birth in hospitals of the Wolaita zone, southern Ethiopia. The finding of this study is important for policymakers, program designers, and healthcare workers by providing important information related to determinants of preterm delivery in designing an effective strategy and policy to prevent and control Preterm delivery.

2. Methods and Materials

2.1 Study Design, Period, and Area

An institutional-based unmatched case-control study was conducted in the Wolaita zone, southern Ethiopia from March 29 to May 20, 2023. The capital city of the zone is about 328 km away from Addis Ababa. The administrative Centre of the Wolaita zone is Wolaita Sodo town. About an area of 451,170.7 hectares 2,161,842 population, 1,071,625 males and 1,090,217 females resided in Wolaita Zone. The total number of households counted in the zone is 414,192 and approximately 5 persons to households. Currently, there are 362 functional health posts, 69 health centers, and 13 hospitals (3 non-governmental (NGO) primary Hospitals, 1 NGO general hospital 8 governmental primary Hospitals, and 1 comprehensive specialized Hospital) in Wolaita Zone [19]. Among 13 hospitals there are 10 hospitals in the Wolaita zone give exempted or fee-free maternal delivery services for the community these are Wolaita Sodo University Comprehensive Specialized Hospital (WSUCSH), Bombe Primary Hospital, Bodit Primary Hospital, Bale Primary Hospital, Tebela primary hospital, Gasuba primary hospital, Halale primary hospital, Bitena primary hospital and Badessa primary hospital and Dubbo primary hospital.

2.2 Population

2.2.1 Source Population

All mothers who gave birth at hospitals in the wolaita zone were the source population for both case and control.

2.2.2 Study Population

Cases: - All mothers who delivered live preterm newborns (after 28 and before 37 weeks of gestation) in hospitals of the wolaita zone during the study period.

Controls: - All mothers who delivered live term newborns at and after 37 completed weeks and before 42 weeks of gestation in hospitals of the Wolaita zone during the study period.

2.3 Eligibility Criteria

2.3.1 Inclusion Criteria

All mothers who delivered live preterm babies and all mothers who delivered live babies at and after 37 completed weeks of gestation during the data collection period were included in the study.

2.3.2 Exclusion Criteria

Mothers with unknown last normal menstrual period (LNMP) and not reliable ultrasonography (not early taken at ≤ 20 completed weeks of gestation), unable to communicate due to serious medical illness during the study period, and mothers who gave births during the data collection period but referred to other health institution for better service.

2.4 Sample Size Determination

The sample size was calculated by using the EPI INFO 7.2.5.0 Software menu StatCalc programs by considering the double population proportion formula from the findings of previous studies. Different variables that were associated with preterm delivery were used and history of abortion was chosen as an independent variable since it brought a higher sample size among other computed explanatory variables Proportion of case and control was 38% and 23.3% respectively taken from a study done in Dilla University Referral Hospital [20]. The following assumptions used for the sample size calculation were: 80% power, a 95% confidence level, and r = 2 (the ratio of cases to controls 1:2). Finally, 123 cases and 246 controls are generated, giving a sample size of 369. Allowing a 10% non-response rate, the sample size was calculated to be 405 mothers (135 cases and 270 controls).

2.5 Sampling Procedures and Sampling Technique

To get the required number of cases and control all ten hospitals in the Wolaita zone which give exempted or fee-free maternal delivery service for the community such as Wolaita Sodo University Comprehensive Specialized Hospital (WSUCSH) and nine primary hospitals such as Bombe, Bodit, Dubbo, Bale, Tebela, Gasuba, Halale, Bitena and Badessa were included. A consecutive sampling technique was employed for both cases and controls. From all mothers admitted in obstetric, labor, and kangaroo mother care (KMC) wards, the first case was selected based on inclusion criteria then two consecutive controls were selected to reach the maximum sample size of the study.

2.6 Data Collection Tool and Procedures

Data was collected by using developed questionnaires prepared in English and Amharic language by reviewing different previous studies [21-26]. The questionnaire was structured, pretested, and interviewer-administered. The questionnaire was grouped into seven categories: Socio-demographic variables, maternal obstetric variables, nutritional variables, Pre-existing medical illness and Obstetric complication factors, fetal factors, lifestyles and behavioral factors, and intimate partner violence variables. The questionnaire contains around 98 questions and on average, the interview took 30-35 minutes. Ten BSC-holder health professionals

who have prior experience in data collection were assigned as data collectors and three MPH-holder professionals were recruited as supervisors and assigned to each hospital.

The data were collected using face-to-face interviews, chart review, and measurement. The outcome variable (preterm delivery) was obtained from medical records indicated by physicians or midwifery which was measured by using either the last menstrual period (LMP), early ultrasound result, or Ballard maturity examination. Interview and anthropometric measurements were taken after delivery when the mothers became stable. In addition to the interview, the mothers' and the babies' medical records were reviewed by using a checklist to retrieve medical information and laboratory tests that might not be captured by the interview. A close follow-up was made whether the trained data collectors appropriately filled the questionnaires data was collected, and all tools were placed in the appropriate place.

2.7 Study Variables

The dependent variable was preterm delivery and the independent variables were Socio-demographic variables (age, education, occupation, income level, marital status, ethnicity, partner support, religion, residence, sex of the baby), maternal obstetric variables (history of preterm birth, history of abortion, birth interval, number of ANC visits, stillbirth, parity, labor status, anemia), nutritional variables (MUAC, Wt, Ht, Body mass index, dietary supplement, restriction of food), Pre-existing medical illness and Obstetric complication factors (UTI, HIV, chronic hypertension, pre-pregnancy DM, PROM, PIH, APH, GDM, polyhydramnios, oligohydramnios, and hyperemesis), fetal factors (Birth weight, multiple gestations, congenital malformations, Apgar score), lifestyles and behavioral factors (Heavy work activity, stressful life events, smoking cigarettes, drinking alcohol, drug use, chewing khat), intimate partner violence variables (physical, sexual, psychological violence).

2.8 Operational Definition and Measurements

Preterm Birth: Birth of a live baby after 28 and before 37 completed weeks of gestation (4).

Term Birth: Birth of a live baby after 37 and before 42 completed weeks of gestation [27].

Standing for A Long Period: Standing for more than 3 hours per day during pregnancy [28].

Alcohol consumption during the current pregnancy: A woman reported consuming at least one unit of alcohol from any sources (Tella, Teje, Areqe, Beer, Wine, etc.) during the current pregnancy, she was labeled as an alcohol consumer and she consumed five or more alcohol drinks in one session (one sit) during the current pregnancy, she was labeled as a binge alcohol consumer [29].

Partner/Family Support: Support in the form of money, household chores, and accompanying women to ANC [21].

Stressful Life Events: imply any event that could impose a negative impact on pregnant women, such as sickness, separation, and death of a family member [30].

Intimate Partner Violence: any physical, sexual, or psychosocial violence encountered by pregnant women from their intimate partner [31].

Cigarette Smoking During the Current Pregnancy: The woman responded "yes", to the question concerning cigarette smoking during the current pregnancy labeled as a smoker and the pregnant woman was exposed to tobacco at home during the current pregnancy or at the workplace in the last one month of the interview or public places in the last 7 days, she was labeled as a passive tobacco smoker [29].

Medication Use During Pregnancy: Any Medication(s) intake during pregnancy including prescribed, over-the-counter, and traditional medication (s) (excluding vitamins, iron, folic acid supplementation, and vaccinations) [30].

The Vigorous Intensity of Activities: Refers to activities that cause a huge impact on the maternal effort, such as carrying or lifting heavy loads, being involved in construction works, or prolonged standing during pregnancy [28].

2.9 Data Quality Control

All data collectors and supervisors were trained about the objectives of the study, the sensitivity of the issue, confidentiality of responses, contents of questionnaires, and how to approach the study subjects (cases and controls) for one day and engage in hands-on activities to become comfortable with the questionnaire. Pre-testing of the questionnaire was done on 5% of the sample to ensure clarity, wordings, logical sequence, and skip patterns of the questions, the pretested sample was not included in the study, and modification was done on wordings, logical sequence, and skip patterns accordingly before starting the actual data collection. In addition, the supervisors supervise the data collection process and check the filled questionnaires every day for completeness, and correctness necessary corrections were made timely and discrepancies were resolved by referring to the original data collection tools.

2.10 Data Processing and Analysis

The Data were coded and entered into Epi data version 3.1, then verified and cleaned to ensure quality. Then exported and analyzed by using SPSS version 25. Based on the nature of variables frequency distribution and summary statistics were computed for case and control groups. Correlation between the independent variables was assessed to test multi-collinearity by Spearman correlation coefficient which is less than ± 0.70 and by using collinearity diagnostics, Variance inflation factor (VIF) was between (1.079 and 1.885) which is less than 10 and tolerance between (0.531&0.927) which is greater than 0.1. Model fitness was tested with the Hosmer-Lemeshow goodness of fit test (0.384). Logistic regression models were used to compute Bivariable and multivariable analysis. The Bivariable analysis was used to measure the association between preterm delivery and each independent variable. Those variables that have a P-value

< 0.25 on bivariate analysis were entered into a multivariable logistic regression model to control confounders and identify the independent predictors of preterm delivery. Finally, the strength of association was measured using adjusted odds ratios with a 95% confidence interval (CI). Statistical significance was declared at P-value < 0.05 and the data was presented by tables, figures, charts, and texts.

3. Results

3.1 Socio-Demographic Characteristics of the Study Participants

From a total of 405 eligible participants (135 cases and 270 controls), 399 respondents (133 cases and 266 controls) participated in the study making a response rate of 98.52%. Out of 399 mothers who participated in the study age of mothers ranged from 18 to 39 years with the mean and standard deviation (±SD) of 29.40 and ±5.585 for controls and 30.37 and ±5.267 for cases respectively. More than half of participants, 215(54.4%) mothers were in 25-34 age groups and 75(56.4%) and 142(53.4%) for cases and controls respectively. Regarding maternal residence, more than half of mothers 239(59.9%) lived in an urban setting from which 49(36.8%) and 190(71.4%) for cases and controls respectively.

Regarding religion, 83(63.2%) of the cases and 150(56.4%) of the controls were protestant religious followers. The majority of the study participants, 120 (90.2%) and 232(87.2%) were Wolaita in ethnicity, 129(97.0%) and 253(95.1%) were married, 49 (36.8%) and 83 (31.2 %) were educated up to primary, 59(44.4%) and 109(41.0%) were housewife, 68 (51.1%) and 144 (54.1%) had ≥4001ETB monthly income and 92 (69.2%) and 180 (67.7%) had ≥5 family size for both cases and controls respectively. Regarding partner/family support, 43 (32.3%) of cases and 32 (12.0%) of controls had no partner/family support during the current pregnancy (Table 1).

Variables	Category	Cases, n (%)	Controls, n (%)	Total, n (%)
Age of mother	15-24 years	28(21.1%)	70(26.3%)	98(24.6%)
	25–34 years	75(56.4%)	142(53.4%)	217(54.4%)
	≥35 years	30(22.6%)	54(20.3%)	84(21.1%)
Residence of mother	Rural	84 (63.2%)	76 (28.6%)	160 (40.1%)
	Urban	49 (36.8%)	190 (71.4%)	239 (59.9%)
Religion	Protestant	83 (62.4%)	150 (56.4%)	233 (58.4%)
	Orthodox	36 (27.1%)	90 (33.8%)	126 (31.6%)
	Muslim	8 (6.0%)	13 (4.9%)	21 (5.3%)
	Catholic	6 (4.5%)	13 (4.9%)	19 (4.8%)
Ethnicity	Wolaita	120 (90.2%)	232 (87.2%)	352 (88.2%)
	Gamo	3(2.3%)	8(3.0%)	11(2.8%)
	Sidama	3(2.3%)	8(3.0%)	11(2.8%)
	Amhara	2(1.5%)	5(1.9%)	7(1.8%)
	Oromo	1(0.8%)	4(1.5%)	5(1.3%)
	Others*	4(3.0%)	9(3.4%)	13(3.3%)
Marital status	Married	129 (97.0%)	253 (95.1%)	382 (95.7%)
	Others**	4 (3.0%)	13 (4.9%)	17 (4.3%)
Educational status	No formal education	14 (10.5%)	36 (13.5%)	50 (12.5%)
	Primary	49 (36.8%)	83 (31.2%)	132 (33.1%)
	Secondary	43 (32.3%)	76 (28.6%)	119 (29.8%)
	Collage and above	27 (20.3%)	71 (26.7%)	98 (24.6%)
Occupation of mother	Housewife	59 (44.4%)	110 (41.4%)	169 (42.4%)
	Farmer	13 (9.8%)	26 (9.8%)	39 (9.8%)
	Merchant	33 (24.8%)	70 (26.3%)	103 (25.8%)
	Government employee	14 (10.5%)	25 (9.4%)	39 (9.8%)
	NGOs employee	3 (2.3%)	5 (1.9%)	8 (2.0%)
	Students	5(3.8%)	13(4.9%)	18(4.5%)
	Daily labors	6(4.5%)	17(6.4%)	23(5.8%)

Monthly income	≤1000	7 (5.3%)	14 (5.3%)	21 (5.3%)
	1001-2000	23 (17.3%)	35 (13.2%)	58 (14.5%)
	2001-3000	18 (13.5%)	39 (14.7%)	57 (14.3%)
	3001-4000	17 (12.8%)	34 (12.8%)	51 (12.8%)
	≥4001	68 (51.1%)	144 (54.1%)	212 (53.1%)
Family size	< 5	41 (30.8%)	86 (32.3%)	127 (31.8%)
	≥5	92 (69.2%)	180 (67.7%)	272 (68.2%)
Partner/family support	No	43 (32.3%)	32 (12.0%)	75 (18.8%)
	Yes	90 (67.7%)	234 (88.0%)	324 (81.2%)
* kembata and gurage, ** Single, divorced and widowed				

Table 1: Socio-demographic characteristics of mothers who gave birth in hospitals of Wolaita zone, southern Ethiopia, 2023 (n = 399; cases: 133 and controls: 266).

3.2 Obstetric, Gynecologic, and Nutritional Factors of the Study Participants

From the total number of cases and controls, 114 (85.7%) and 232 (87.2%) of the women were multiparous. The majority of the study participants, 103 (90.4%) and 200 (86.2%) had ≥ 2 years interval of pregnancy, 126 (94.7%) and 256 (96.2%) had antenatal care follow-up, 58 (46.0%) and 133 (52.0%) had ANC follow up at Hospital, 110 (82.7%) and 226 (85.0%) were labor started spontaneously, 124(93.2%) and 210 (78.9%) were spontaneous vaginal delivery, 129(97.0%) and 252 (94.7%) had hemoglobin ≥11g/d for both cases and controls respectively.

Regarding number of ANC visits, 113 (85.0%) of cases and 95 (37.1%) of controls had < 4 ANC visits. About 15 (11.3%) of mothers had a history of abortion in the cases while only six (2.3%) of mothers had a history of abortion in the controls and nine (6.8%) of mothers had a history of preterm birth in the cases while 11 (4.1%) of mothers had a history of preterm birth in the controls. Regarding contraceptive use and fertility drug use, 48 (36.1%) and 111 (41.7%) used the contraceptive method, 4 (3.0%) and six (2.3%) used fertility drugs for both cases and controls respectively. Related to nutritional factors the majority of mothers, 117 (88.0%) and 254 (95.5%) ate≥ 3 meals per day, 126 (94.7%) and 251 (94.4%) have taken dietary supplements, 126 (94.7%) and 256 (96.2%) had body mass index of 18.5 – 25 Kg/m^2, 120 (90.2%) and 259(97.4%) had MUAC ≥23cm for both cases and controls respectively (Table 2).

Variables	Category	Cases, n (%)	Controls, n (%)	Total, n (%)
Parity	Primipara	19 (14.3%)	34 (12.8%)	53 (13.3%)
	Multipara	114 (85.7%)	232 (87.2%)	346 (86.7%)
Interval of pregnancy	<2 Years	11 (9.6%)	32 (13.8%)	43 (12.4%)
	≥2 Years	103 (90.4%)	200 (86.2%)	303 (87.6%)
Antenatal Care	Yes	126 (94.7%)	256 (96.2%)	382 (95.7%)
	No	7 (5.3%)	10 (3.8%)	17 (4.3%)
Place of ANC visit	Health Centre	61 (48.4%)	108 (42.2%)	169 (44.2%)
	Hospital	58 (46.0%)	133 (52.0%)	191 (50.0%)
	Private clinic	7 (5.6%)	15 (5.9%)	22 (5.8%)
ANC Visit	<4 Visits	113 (85.0%)	108 (40.6%)	221 (55.4%)
	≥4 Visits	20 (15.0%)	158 (59.4%)	178 (44.6%)
History of Abortion	Yes	15 (11.3%)	6 (2.3%)	21(5.3%)
	No	118 (88.7%)	260 (97.7%)	378 (94.7%)
History of StillBirth	Yes	1 (0.8%)	3 (1.1%)	4 (1.0%)
	No	132 (99.2%)	263 (98.9%)	395 (99.0%)
History of Preterm Birth	Yes	9 (6.8%)	11 (4.1%)	20 (5.0%)
	No	124 (93.2%)	255 (95.9%)	379 (95.0%)
Labor Started	Spontaneously	110 (82.7%)	226 (85.0%)	336 (84.2%)
	Induced	23 (17.3%)	40 (15.0%)	63 (15.8%)

Mode of Delivery	SVD	124(93.2%)	210 (78.9%)	334 (83.7%)
	Instrumental delivery	9 (6.8%)	56 (21.1%)	65 (16.3%)
Contraceptive use	Yes	48 (36.1%)	111 (41.7%)	159 (39.8%)
	No	85 (63.9%)	155 (58.3%)	240 (60.2%)
Fertility drug use	Yes	4 (3.0%)	6 (2.3%)	10 (2.5%)
	No	129 (97.0%)	260 (97.7%)	389 (97.5%)
Hemoglobin of mother	Hgb<11 g/dl	4 (3.0%)	14 (5.3%)	18 (4.5%)
	Hgb≥11g/d	129 (97.0%)	252 (94.7%)	381 (95.5%)
Frequency of eating meals	< 3 meals per day	16 (12.0%)	12 (4.5%)	28 (7.0%)
	≥ 3 meals per day	117 (88.0%)	254 (95.5%)	371 (93.0%)
Take Iron folic Acid	Yes	126 (94.7%)	251 (94.4%)	377 (94.5%)
	No	7 (5.3%)	15 (5.6%)	22 (5.5%)
Take additional food	Yes	55 (41.4%)	100 (37.6%)	155 (38.8%)
	No	78 (58.6%)	166 (62.4%)	244 (61.2%)
Forbidden food during pregnancy	Yes	2 (1.5%)	4 (1.5%)	6 (1.5%)
	No	131 (98.5%)	262 (98.5%)	393 (98.5%)
The body mass index of the mother	BMI <18.5 Kg/m2	5 (3.8%)	6 (2.3%)	11 (2.8%)
	BMI 18.5 - 25 Kg/m2	126 (94.7%)	256 (96.2%)	382 (95.7%)
	BMI≥25 Kg/m2	2 (1.5%)	4 (1.5%)	6 (1.5%)
MUAC of mother	MUAC< 23	13 (9.8%)	7 (2.6%)	20 (5.0%)
	MUAC≥23	120 (90.2%)	259 (97.4%)	379 (95.0%)
HGB: Hemoglobin, BMI: Body Mass Index, MUAC: Mid-Upper Arm Circumference, SVD: Spontaneous Vaginal Delivery				

Table 2: Obstetric, gynecologic, and nutritional factors of mothers who gave birth in hospitals of Wolaita zone, southern Ethiopia, 2023 (n = 399; cases: 133 and controls: 266).

3.3 Pre-Existing Medical Illnesses and Obstetric Complications of the Study Participants

Concerning pre-existing maternal illness and obstetric complications among cases, the proportion of pregnancy-induced hypertension, antepartum hemorrhage, urinary tract infection, premature rupture of the membrane, hyperemesis gravidarum and HIV AIDS was 23 (17.3%), one (0.8%), 20 (15.0%), 20 (15.0%), seven (5.3%) and two (1.5%) respectively, while the proportion was 19 (7.1%), four (1.5%), 11 (4.1%), 10 (3.8%), 13 (4.9%) and 3 (1.1%) respectively, among the controls (Table 3).

Variables	Category	Cases, n (%)	Controls, n (%)	Total, n (%)
Chronic Hypertension	Yes	2 (1.5%)	4 (1.5%)	6 (1.5%)
	No	23 (17.3%)	19 (7.1%)	42 (10.5%)
Pregnancy-induced Hypertension	Yes	23 (17.3%)	19 (7.1%)	42 (10.5%)
	No	110 (82.7%)	247 (92.9%)	357 (89.5%)
Diabetes mellitus before pregnancy	Yes	1 (0.8%)	3 (1.1%)	4 (1.0%)
	No	132 (99.2%)	263 (98.9%)	395 (99.0%)
Gestational diabetes mellitus	Yes	4 (3.0%)	6 (2.3%)	10 (2.5%)
	No	129 (97.0%)	260 (97.7%)	389 (97.5%)
Bleeding during pregnancy	Yes	1 (0.8%)	4 (1.5%)	5 (1.3%)
	No	132 (99.2%)	262 (98.5%)	394 (98.7%)
Previous uterine surgery	Yes	1 (0.8%)	2 (0.8%)	3 (0.8%)
	No	132 (99.2%)	264 (99.2%)	396 (99.2%)
Sexually transmitted infection	Yes	3 (2.3%)	6 (2.3%)	9 (2.3%)
	No	130 (97.7%)	260 (97.7%)	390 (97.7%)

Urinary tract infection	Yes	20 (15.0%)	11 (4.1%)	31 (7.8%)
	No	113 (85.0%)	255 (95.9%)	368 (92.2%)
PROM	Yes	20 (15.0%)	10 (3.8%)	30 (7.5%)
	No	113 (85.0%)	256 (96.2%)	369 (92.5%)
Hyperemesis gravidarum	Yes	7 (5.3%)	13 (4.9%)	20 (5.0%)
	No	126 (94.7%)	253 (95.1%)	379 (95.0%)
Polyhydraminous during the current pregnancy	Yes	7 (5.3%)	6 (2.3%)	13 (3.3%)
	No	126 (94.7%)	260 (97.7%)	386 (96.7%)
Oligohydramnios during the current pregnancy	Yes	2 (1.5%)	5 (1.9%)	7 (1.8%)
	No	131 (98.5%)	261 (98.1%)	392 (98.2%)
Chorioamnionitis during the current pregnancy	Yes	2 (1.5%)	1 (0.4%)	3 (0.8%)
	No	131 (98.5%)	265 (99.6%)	396 (99.2%)
HIV status of the mother	Yes	2 (1.5%)	3 (1.1%)	5 (1.3%)
	No	131 (98.5%)	263 (98.9%)	394 (98.7%)
HIV: Human Immune Virus, PROM: Premature Rupture of Membrane				

Table 3: Pre-existing maternal illness and obstetric complications of mothers who gave birth in hospitals of Wolaita zone, southern Ethiopia, 2023 (n = 399; cases: 133 and controls: 266).

3.4 Characteristics of the Newborn

Among cases, 10 (7.5%) mothers had multiple pregnancies, whereas seven (2.6%) mothers had multiple pregnancies in the control group. Regarding the sex of the baby, 72 (53.3%) of cases and 158 (58.0%) of controls were female. About 66 (49.6%) had a baby with a birth weight<2500 gm. in the cases while 65 (24.4%) had one in the controls (Figure 1).

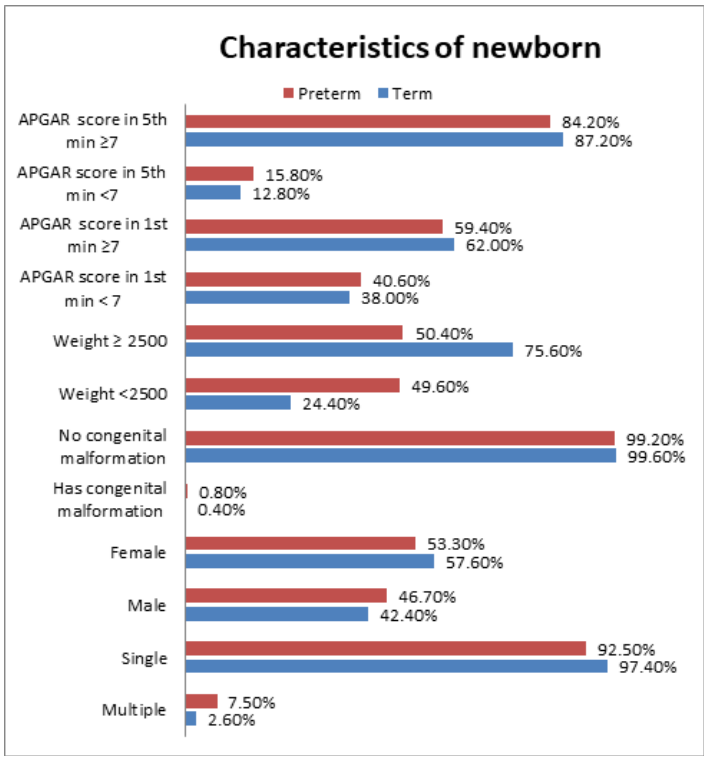

Figure 1: Characteristics of the newborn delivered in hospitals of Wolaita zone southern Ethiopia, 2023 (n = 399; cases: 133 and controls: 266).

3.5 Lifestyle, Behavioral, and Intimate Partner Violence Factors

The proportion of lifestyle and behavioral factors among cases and controls for the vigorous intensity of activity were five (3.8%) and six (2.3%) respectively. The proportion of Stressful life events was two (1.5%) and three (1.1%) among cases and controls. Regarding intimate partner violence were 18 (13.5%) and ten (3.8%) among cases and controls respectively. Out of 18 cases seven (38.9%) were physical violence, 7(38.9%), were psychological violence and four (22.2%) were Sexual violence (Table 4).

Variables	Category	Cases, n (%)	Controls, n (%)	Total, n (%)
Vigorous intensity activity	Yes	5 (3.8%)	6 (2.3%)	11 (2.8%)
	No	128 (96.2%)	260 (97.7%)	388 (97.2%)
Stressful life event	Yes	2 (1.5%)	3 (1.1%)	5 (1.3%)
	No	131 (98.5%)	263 (98.9%)	394 (98.7%)
Drink alcohol during current pregnancy	Yes	1 (0.8%)	4 (1.5%)	4 (1.0%)
	No	132 (99.2%)	262 (98.5%)	395 (99.0%)
Smoke cigarettes during the current pregnancy	Yes	1 (0.8%)	3 (1.1%)	4 (1.0%)
	No	132 (99.2%)	263 (98.9%)	395 (99.0%)
Exposed to Tobacco	Yes	1 (0.8%)	2 (0.8%)	3 (0.8%)
	No	132 (99.2%)	264 (99.2%)	396 (99.2%)
Chewed chat during pregnancy	Yes	1 (0.8%)	1 (0.4%)	2 (0.5%)
	No	132 (99.2%)	265 (99.6%)	397 (99.5%)
Using medication during pregnancy	Yes	1 (0.8%)	3 (1.1%)	4 (1.0%)
	No	132 (99.2%)	263 (98.9%)	395 (99.0%)
Intimate partner violence (IPV)	Yes	18 (13.5%)	10 (3.8%)	28 (7.0%)
	No	115 (86.5%)	256 (97.4%)	371(93.0%)
Type of IPV	Physical violence	7(38.9%)	2 (20.0%)	9 (32.1%)
	Psychological violence	7 (38.9%)	6 (71.0%)	13 (46.4%)
	Sexual violence	4 (22.2%)	2 (20.0%)	6 (21.4%)

Table 4: Lifestyle, Behavioral, and Intimate partner violence factors of mothers who gave birth in hospitals of Wolaita zone, southern Ethiopia, 2023 (n=399; cases: 133 and controls: 266).

3.6 Determinants of Preterm Delivery

Bivariable logistic regression analysis showed that place of residence, partner/family support, number of ANC visits, history of abortion, frequency of eating meals per day, pregnancy-induced hypertension, urinary tract infection, PROM, polyhydramnios during the current pregnancy, multiple pregnancies, intimate partner violence, weight of baby, MUAC of the mother were significantly associated with the preterm delivery at a p-value < 0.25. Variables significantly associated with preterm delivery at a P value less than 0.25 in the Bivariable analysis were entered into the multivariable model. The multivariable analysis showed that place of residence, partner/family support, number of ANC visits, pregnancy-induced hypertension, and intimate partner violence were statistically significant associations with preterm delivery.

In this finding, women who resided in rural areas had 2.7 times higher odds of preterm delivery compared to women who resided in urban settings [AOR=2.777:95% CI (1.507-5.118)]. The odds of a mother not receiving support from her partner was increased by 2.4 times in delivering a preterm compared to mothers who received support from their partners during pregnancy [AOR=2.368:95% CI (1.243-4.514)]. Women who had less than four antenatal care visits for this index pregnancy had five-fold higher odds of preterm delivery compared to those who had ≥ 4 antenatal care visits [AOR=4.520:95% CI (2.384-8.569)]. Women who had pregnancy-induced hypertension during pregnancy were five times more likely to have preterm delivery as compared to those who had no pregnancy-induced hypertension during pregnancy [AOR=5.248:95% CI (2.270-12.135)]. The odds of having preterm delivery among mothers who were exposed to intimate partner violence were three times higher than those mothers who didn't experience intimate partner violence [AOR=2.945:95% CI (1.105-7.848)] (Table 5).

Variables	Category	Cases (%)	Controls (%)	COR (95%CI)	AOR (95%CI)	P-value
Place of Residence	Rural	84 (63.2%)	76 (28.6%)	4.286(2.756-6.664)	2.777(1.507-5.118)	0.001*
	Urban	49 (36.8%)	190 (71.4%)	1.00	1.00	
Partner/family support	Not receiving	43 (32.3%)	32 (12.0%)	3.494(2.081-5.866)	2.368 (1.243-4.514)	0.009*
	Receiving	90 (67.7%)	234 (88.0%)	1.00	1.00	
ANC Visit	<4 Visits	113 (85.0%)	108 (40.6%)	8.266(4.842-14.11)	4.520 (2.384-8.569)	0.000**
	≥4 Visits	20 (15.0%)	158 (59.4%)	1.00	1.00	
History of Abortion	Yes	15 (11.3%)	6 (2.3%)	5.508(2,085-14.552)	3.527(0.910-13.673)	0.068
	No	118 (88.7%)	260 (97.7%)	1.00	1.00	
Frequency of eating meal/day	< 3meals	16 (12.0%)	12 (4.5%)	2.895(1.327-6.314)	1.166 (0.407-3.342)	0.775
	≥ 3meals	117 (88.0%)	254 (95.5%)	1.00	1.00	
PIH	Yes	23 (17.3%)	19 (7.1%)	2.718(1.422-5.195)	5.248(2.270-12.135)	0.000**
	No	110 (82.7%)	247 (92.9%)	1.00	1.00	
UTI	Yes	20 (15.0%)	11 (4.1%)	4.103(1.903-8.847)	2.466(0.843-7.218)	0.099
	No	113 (85.0%)	255 (95.9%)	1.00	1.00	
PROM	Yes	20 (15.0%)	10 (3.8%)	4.531(2.055-9.991)	1.851(0.524-6.537)	0.339
	No	113 (85.0%)	256 (96.2%)	1.00	1.00	
Polyhydramnios	Yes	7 (5.3%)	6 (2.3%)	2.407(0.793-7.312)	1.714(0.253-11.630)	0.581
	No	126 (94.7%)	260 (97.7%)	1.00	1.00	
Multiple pregnancies	Yes	10 (7.5%)	7 (2.6%)	3.008(1.118- 8.091)	3.182(0.903-11.213)	0.072
	No	123 (92.5%)	259 (97.4%)	1.00	1.00	
IPV	Yes	18 (13.5%)	10 (3.8%)	4.007(1.794-8.951)	2.945(1.105-7.848)	0.031*
	No	115 (86.5%)	256 (97.4%)	1.00	1.00	
Weight of baby	<2500	66 (49.6%)	65 (24.4%)	3.046(1.961-4.731)	1.622(0.468-5.626)	0.446
	≥ 2500	67 (50.4%)	201 (75.6%)	1.00	1.00	
MUAC of mother	< 23	13 (9.8%)	7 (2.6%)	4.008(1.560-10.30)	1.538(0.421-5.613)	0.514
	≥23	120 (90.2%)	259 (97.4%)	1.00	1.00	

**shows significant at P-value < 0.001 *shows significant at P-value < 0.05, Abbreviation: PIH: Pregnancy-induced Hypertension, UTI: Urinary tract infection, IPV: Intimate partner violence, COR: Crude Odd Ratio, AOR: Adjusted Odd Ratio, CI: Confidence Interval.

Table 5: Multivariable logistic regression analysis of preterm delivery among mothers who gave birth in hospitals of Wolaita zone, southern Ethiopia, 2023 (n = 399; cases: 133 and controls: 266).

4. Discussion

According to this study, the odds of giving preterm delivery were higher among mothers who had a rural residence, not receiving partner or family support, number of ANC Visit < 4, had pregnancy-induced hypertension, and were exposed to intimate partner violence. The study indicates that the odds of preterm delivery among mothers in rural areas are 2.7 times higher than mothers in urban areas. This finding is consistent with the study conducted in Amhara and Jimma [23&32].

The reason for this may be that women in rural areas may have less access, availability, and utilization of healthcare services than women in urban areas. Women in Ethiopia's rural areas are also less likely to be exposed to the media, which is frequently utilized to promote health and address issues related to pregnancy at the national and regional levels. Additionally, healthcare facilities are more readily available, and people are more aware of their health needs in urban areas than in rural ones, which may be important factors in the prevention of preterm birth. Further, rural resident women might be subjected to hard physical work and far distance from health facilities putting pregnant women under social and economic stress that might contribute to preterm birth [33,34].

Contrasting this finding, a study carried out in the northern region of Ethiopia reveals that urban women were more likely to have premature babies [35]. There may be a difference in lifestyle, awareness, accessibility to maternal health care services, and socioeconomic level that accounts for this variation.

This study also showed that mothers who were not receiving partner or family support had 2.4 times higher in delivering a preterm compared to mothers who received support from their partners during pregnancy. This finding is in line with studies done in Ghana [21].

This might be linked to the reason that the women who did not receive support during pregnancy make unfavorable surroundings for the mother due to lack of money, time, workload, and decreased motivation for ANC visits, which makes the mother not or less than recommended ANC follow up and stressful environment which leads the mother for different pregnancy-related complications including preterm delivery. Support may moderate the stress on pregnant women, which in turn may decrease a woman's chance of having a poor birth outcome [36].

The present study showed that women who had less than four antenatal care visits for this index pregnancy had five-fold higher odds of preterm delivery compared to those who attended a minimum of four antenatal care visits. The finding is supported by a study conducted in Ghana, Jimma, kambata, and western Ethiopia [21, 37-39].

The reasons could be due to the less frequently a mother receives ANC visits, the obstetric problems cannot be identified early which results in preterm delivery. Additionally, it is generally accepted that prenatal care visits (ANC) support fetal health monitoring. Furthermore, more ANC visits increase the chance of identifying and treating obstetric problems early. Insufficient ANC visits throughout pregnancy reduce the likelihood of identifying preterm delivery risks and offering suitable measures for their prevention [40-42].

The studies conducted in Kenya and Shire didn't show an association between the number of ANC visits and preterm delivery. This might be due to the variation of knowledge on ANC visits, quality of health care services, and socio-demography from place to place [43,44].

The study indicated that women who had pregnancy-induced hypertension during pregnancy were five times more likely to have preterm delivery as compared to those who had no pregnancy-induced hypertension. This result is in line with studies conducted in Ddilla, Ghana, Jimma, kembata, Kenya, and Amhara [20,21,37,38,45,46].

The possible reasons for this could be the fact that pregnancy-induced hypertension can cause vascular damage to the placenta causing abruption of the placenta, which results in preterm delivery. In addition, reduced placental blood flow in hypertensive pregnant women decreases fetal growth, with an increased risk of intrauterine growth restriction leading to either low birth weight or premature birth. When the blood pressure becomes uncontrollable, the quickest means of emptying the uterus becomes the choice accounting for the preterm delivery [47].

The study also showed that intimate partner violence, including physical, psychological and sexual violence had a statistically significant association with preterm birth. The odds of having preterm delivery among mothers who were exposed to intimate partner violence were three times higher than those mothers who did not experience intimate partner violence. This finding is in line with the findings of the study conducted in Tanzania, Hawassa, and Tigray region [25,30,48].

The reasons could be due to that physical, psychological, and sexual violence can influence neonatal outcomes through physiological reactions to violence-related stress by releasing prostaglandin, which can cause premature contractions and delivery. The other reason could be that physical violence may lead to traumas causing premature rupture of membranes or abruption of the placenta and thus untimed uterine contraction resulting in preterm labor and leading to preterm delivery [26,31]. This study has clinical implications for policymakers and practitioners in developing effective strategies to reduce preterm delivery and also made significant scientific contributions by identifying determinants of preterm delivery.

4.1 Limitations of the Study

There may be recall bias from mothers due to the nature of some questions, which focused on past information and there is a chance that mothers give false information (social desirability bias) because of the sensitive nature of some questions like sexual violence-related questions and the face-to-face methods of data collecting.

5. Conclusions and Recommendations

This study identified rural residence, not receiving partner or family support, less than four ANC visits, pregnancy-induced hypertension, and exposure to intimate partner violence as the determinants of preterm delivery. So we recommend establishing comprehensive mobile clinic services to address hard-to-reach areas, providing policy for partner or family support during pregnancy and Health care providers should give due attention to mothers with pregnancy-induced hypertension and exposure to intimate partner violence and increase the awareness of antenatal care follow-up and support during pregnancy and also Health extension workers should provide primary prevention in the form of intensified continuous public education on the importance of antenatal care follow-up and partner support in reducing preterm delivery and inform couples about the risk of adverse birth outcomes about IPV exposure. In addition, the regional government should work on the accessibility of available health services for the rural community.

Declarations

Ethical Approval and Consent to Participate

The study was approved by Arba Minch University, institutional research ethics review board (Ref: IRB/1429/2023). Based on the approval, an official letter was written from Arbaminch University, School of Nursing to the zonal health department. Support letters submitted to the hospitals were obtained from the zonal health department. Similarly, the administrators of each hospital have written a letter to the concerned unit. Then the respondents or their parents were informed about the purpose and procedure of the study, the importance of their participation, the benefits, and risks associated with the study, and the right to withdraw at any time if they feel discomfort. After explaining the purpose of the study, informed consent was obtained from participants. If the participants are minoring the informed consent is obtained from their parents. To maintain the confidentiality of information gathered from the study participants, code numbers were used throughout the study.

Availability of Data and Materials

The datasets are available from the corresponding author upon reasonable request.

Funding

This study was funded by the Arba Minch University. The funders had no role in study design, data collection and analysis, decision to publish, or preparation of the manuscript.

Author Contributions

Cherinet Tilahun wrote the proposal, designed the study, supervision, performed the analysis, and data interpretation, and drafted the paper and the manuscript. Asmare Getie and Hiwot Tadesse approved the proposal and participated in data analysis and drafting of the paper. Temesgen Geta and Adisu Ashiko assisted in designing the study, supervision, data interpretation, and analysis. All authors read and approved the final manuscript.

Acknowledgments

We would like to express our heartfelt thanks to Arba Minch University College of Medicine and Health Science for giving us a chance to work on this research topic and for the financial support to undertake this study. We would like to express our appreciation to the administrators of the Wolaita Zone Health Department and each hospital for their invaluable cooperation. We would also like to extend our thanks to the study participants, data collectors, and supervisors.

References

1. WHO: recommended definitions, terminology and format for statistical tables related to the perinatal period and use of a new certificate for cause of perinatal deaths. (1977). Modifications recommended by FIGO as amended October 14, 1976. *Acta Obstet Gynecol Scand, 56*(3), 247-253.
2. World Health Organization. (2023). *Born too soon: decade of action on preterm birth*. World Health Organization.
3. Ohuma, E. O., Moller, A. B., Bradley, E., Chakwera, S., Hussain-Alkhateeb, L., Lewin, A., ... & Moran, A. C. (2023). National, regional, and global estimates of preterm birth in 2020, with trends from 2010: a systematic analysis. *The Lancet, 402*(10409), 1261-1271.
4. Blencowe, H., Cousens, S., Chou, D., Oestergaard, M., Say, L., Moller, A. B., ... & Born Too Soon Preterm Birth Action Group (see acknowledgement for full list). (2013). Born too soon: the global epidemiology of 15 million preterm births. *Reproductive Health, 10,* 1-14.
5. Poulsen, G., Strandberg-Larsen, K., Mortensen, L., Barros, H., Cordier, S., Correia, S., ... & Andersen, A. M. N. (2015). Exploring Educational Disparities in Risk of Preterm Delivery: A Comparative Study of 12 E uropean Birth Cohorts. *Paediatric and Perinatal Epidemiology, 29*(3), 172-183.
6. Muchie, K. F., Lakew, A. M., Teshome, D. F., Yenit, M. K., Sisay, M. M., Mekonnen, F. A., & Habitu, Y. A. (2020). Epidemiology of preterm birth in Ethiopia: systematic review and meta-analysis. *BMC Pregnancy and Childbirth, 20,* 1-12.
7. International UAIDPC. (2015). Ethiopia profile of preterm and low birth weight prevention and care. *Relief Web,* Ethiopia.
8. Ethiopian Public Health Institute (EPHI) [Ethiopia] and ICF. 2021. Ethiopia Mini Demographic and Health Survey 2019: Final Report.
9. Blencowe, H., Cousens, S., Oestergaard, M. Z., Chou, D., Moller, A. B., Narwal, R., ... & Lawn, J. E. (2012). National, regional, and worldwide estimates of preterm birth rates in the year 2010 with time trends since 1990 for selected countries: a systematic analysis and implications. *The Lancet, 379*(9832), 2162-2172.
10. Mattison, D. R., Wilson, S., & Coussens, C. (2003). Institute of Medicine (US) Roundtable on Environmental Health Sciences, Research, and Medicine. The role of environmental hazards in premature birth: workshop summary.
11. Lakshmanan, A., Agni, M., Lieu, T., Fleegler, E., Kipke, M., Friedlich, P. S., ... & Belfort, M. B. (2017). The impact of preterm birth< 37 weeks on parents and families: a cross-sectional study in the 2 years after discharge from the neonatal intensive care unit. *Health and Quality of Life Outcomes, 15,* 1-13.
12. Pichler-Stachl, E., Pichler, G., Baik, N., Urlesberger, B., Alexander, A., Urlesberger, P., ... & Schmölzer, G. M. (2016). Maternal stress after preterm birth: impact of length of antepartum hospital stay. *Women and Birth, 29*(6), e105-e109.
13. Althabe, F. (2012). *Born too soon: the global action report on preterm birth.* World Health Organization.
14. Behrman, R. E., & Butler, A. S. (2007). Preterm birth: causes, consequences, and prevention.
15. World Health Organization. (2016). WHO recommendations on antenatal care for a positive pregnancy experience, 2016 Geneva. *World Health Organization.*
16. PROGESS, M. Global Strategy for Women's, Children's and Adolescents' Health (2016–2030): adolescents' health.
17. Colglazier, W. (2015). Sustainable development agenda: 2030. Science, 349(6252), 1048-1050.
18. MOH F. (2015). National Strategy for New-born and Child Survival in Ethiopia Maternal and Child Health Directorate Federal Ministry of Health.
19. Wolayita Zone (2023).
20. Wakeyo, D., Addisu, Y., & Mareg, M. (2020). Determinants of Preterm Birth among Mothers Who Gave Birth in Dilla University Referral Hospital, Southern Ethiopia: A Case-Control Study. *BioMed Research International, 2020,* 1-7.
21. Asiedu, E. K. (2016). Determinants of Preterm Delivery in Ridge Regional Hospital, Greater Accra: University of Ghana.
22. Rockville M, USA: CSA and ICF. Central Statistical Agency (CSA) [Ethiopia] and ICF. Ethiopia Demographic and Health Survey. Addis Ababa, Ethiopia, and Rockville, Maryland, USA: CSA and ICF. 2016.
23. Woday, A., Muluneh, M. D., & Sherif, S. (2019). Determinants of preterm birth among mothers who gave birth at public hospitals in the Amhara region, Ethiopia: A case-control study. *PloS one, 14*(11), e0225060.
24. Sifer, S., Kedir, B., Demisse, G., & Sisay, Y. (2019).

Determinants of preterm birth in neonatal intensive care units at public hospitals in Sidama zone, South East Ethiopia; case control study. *J Pediatr Neonatal Care, 9*(6), 180-186.
25. Sigalla, G. N., Mushi, D., Meyrowitsch, D. W., Manongi, R., Rogathi, J. J., Gammeltoft, T., & Rasch, V. (2017). Intimate partner violence during pregnancy and its association with preterm birth and low birth weight in Tanzania: A prospective cohort study. *PloS one, 12*(2), e0172540.
26. García-Moreno, C., Jansen, H. A., Ellsberg, M., Heise, L., & Watts, C. (2005). WHO multi-country study on women's health and domestic violence against women. *World Health Organization.*
27. Quinn, J. A., Munoz, F. M., Gonik, B., Frau, L., Cutland, C., Mallett-Moore, T., ... & Brighton Collaboration Preterm Birth Working Group. (2016). Preterm birth: Case definition & guidelines for data collection, analysis, and presentation of immunisation safety data. *Vaccine, 34*(49), 6047-6056.
28. CDC RHN. "Physical Demands (Lifting, Standing, Bending) - Reproductive Health | NIOSH | CDC." Physical Demands (Lifting, Standing, Bending) - Reproductive Health | NIOSH | CDC, 2 June 2022.
29. Alamneh, A. A., Endris, B. S., & Gebreyesus, S. H. (2020). Caffeine, alcohol, khat, and tobacco use during pregnancy in Butajira, South Central Ethiopia. *PloS one, 15*(5), e0232712.
30. Zewde, A., Gebremichael, B., Tesfaye, T., Sibhat, M. M., & Bimer, K. (2022). Risk factors of preterm birth among newborns delivered in public hospitals of Southern Ethiopia: A case-control study.
31. World Health Organization. (2011). *Intimate partner violence during pregnancy: Information sheet* (No. WHO/RHR/11.35). World Health Organization.
32. Bekele, I., Demeke, T., & Dugna, K. (2017). Prevalence of preterm birth and its associated factors among mothers delivered in Jimma university specialized teaching and referral hospital, Jimma Zone, Oromia Regional State, South West Ethiopia. *J Women's Health Care, 6*(1), 1-10.
33. Woldemichael, A., Takian, A., Akbari Sari, A., & Olyaeemanesh, A. (2019). Availability and inequality in accessibility of health centre-based primary healthcare in Ethiopia. *PloS one, 14*(3), e0213896.
34. Lisonkova, S., Haslam, M. D., Dahlgren, L., Chen, I., Synnes, A. R., & Lim, K. I. (2016). Maternal morbidity and perinatal outcomes among women in rural versus urban areas. *Cmaj, 188*(17-18), E456-E465.
35. Wudie, F. T., Tesfamicheal, F. A., Fisseha, H. Z., Weldehawaria, N. B., Misgena, K. H., Alema, H. B., ... & Woldu, M. G. (2019). Determinants of preterm delivery in the central zone of Tigray, northern Ethiopia: A case-control study. *South African Journal of Child Health, 1*3(3), 108-114.
36. Shah, M. K., Gee, R. E., & Theall, K. P. (2014). Partner support and impact on birth outcomes among teen pregnancies in the United States. *Journal of Pediatric and Adolescent Gynecology, 27*(1), 14-19.
37. Abaraya, M., Seid, S. S., & Ibro, S. A. (2018). Determinants of preterm birth at Jimma university medical center, Southwest Ethiopia. *Pediatric Health, Medicine and Therapeutics,* 101-107.
38. Debay, S., Hailemariam, H., Hailu, D., & Tamiru, D. (2021). Determinants of Preterm Birth in Kembata Tembaro Zone Public Hospitals, Southern Ethiopia, 2019.
39. Abadiga, M., Wakuma, B., Oluma, A., Fekadu, G., Hiko, N., & Mosisa, G. (2021). Determinants of preterm birth among women delivered in public hospitals of Western Ethiopia, 2020: Unmatched case-control study. *PloS one, 16*(1), e0245825.
40. Baldewsingh, G. K., Jubitana, B. C., Van Eer, E. D., Shankar, A., Hindori-Mohangoo, A. D., Covert, H. H., ... & Zijlmans, C. W. R. (2020). Adequate antenatal care and ethnicity affect preterm birth in pregnant women living in the tropical rainforest of Suriname. *BMC Pregnancy and Childbirth, 20*, 1-9.
41. Pervin, J., Rahman, S. M., Rahman, M., Aktar, S., & Rahman, A. (2020). Association between antenatal care visit and preterm birth: a cohort study in rural Bangladesh. *BMJ open, 10*(7), e036699.
42. World Health Organization. (2020). WHO recommendations on antenatal care for a positive pregnancy experience: World Health Organization; 2016. *View Article.*
43. Wagura, P., Wasunna, A., Laving, A., Wamalwa, D., & Ng'ang'a, P. (2018). Prevalence and factors associated with preterm birth at kenyatta national hospital. *BMC pregnancy and childbirth, 18,* 1-8.
44. Kelkay, B., Omer, A., Teferi, Y., & Moges, Y. (2019). Factors associated with singleton preterm birth in Shire Suhul general hospital, northern Ethiopia, 2018. *Journal of Pregnancy,* 2019.
45. Okube, O. T., & Sambu, L. M. (2017). Determinants of preterm birth at the postnatal ward of Kenyatta National Hospital, Nairobi, Kenya. *Open Journal of Obstetrics and Gynecology, 7*(9), 973-988.
46. Mekuriyaw, A. M., Mihret, M. S., & Yismaw, A. E. (2020). Determinants of preterm birth among women who gave birth in Amhara region referral hospitals, Northern Ethiopia, 2018: institutional based case control study. *International Journal of Pediatrics,* 2020.
47. Sivakumar, S., Vishnu Bhat, B., & Badhe, B. A. (2007). Effect of pregnancy induced hypertension on mothers and their babies. *The Indian Journal of Pediatrics, 74*, 623-625.
48. Berhanie, E., Gebregziabher, D., Berihu, H., Gerezgiher, A., & Kidane, G. (2019). Intimate partner violence during pregnancy and adverse birth outcomes: a case-control study. *Reproductive Health, 16*, 1-9.