Original article

Predictors of preterm birth in Jimma town public hospitals, Jimma, Ethiopia

Ebissa Bayana Kebede[1], Yonas Biratu Terfa[1], Bonsa Amsalu Geleta[2], Adugna Olani Akuma[1]

[1]School of Nursing and Midwifery, Faculty of Health Sciences, Institute of Health, Jimma University, Jimma, Ethiopia

[2]Department of Nursing, Faculty of Public Health and Medical Science, Metu University, Metu, Ethiopia

Abstract

Background: Preterm birth is the most fundamental reason of adverse infant outcomes. Analyzing the preterm birth and its predictor helps health caregivers and policymakers to design better strategies. This study aims to assess predictors of preterm birth in Jimma town public hospitals.

Method: Facility-based cross-sectional study was undertaken. Systematic sampling was used to select 319 study participants. Data was entered into EpiData version 3.1 and exported to SPSS® version 23 for analysis. Logistic regression was used to analyze the association between dependent and independent variables and variables with p-value < 0.05 at 95% confidence interval (95%CI) in multivariable were considered statistically significant.

Result: This study showed that 13.8% from the total 319 mothers gave a preterm birth. Place of residence (p = 0.003, AOR = 0.37, 95%CI [0.11, 0.65]), interpregnancy interval (p = 0.023, AOR = 3.91, 95%CI [1.25, 7.30]), history of preterm births (p = 0.000, AOR = 1.83, 95%CI [0.93, 4.85]), pregnancy-induced hypertension (p = 0.000, AOR = 7.52, 95%CI [3.33, 14.23]), chronic disease (p = 0.000, AOR = 5.70, 95%CI [2.81, 8.01]), history of abortion (p = 0.038, AOR = 3.23, 95%CI [1.12, 10.42]) and age 40-44 (p = 0.04, AOR = 1.62, 95%CI [0.21, 14.59]) were found to be significant predictors of preterm birth.

Conclusion: Place of residence, short pregnancy interval, pregnancy-induced hypertension, previous history of preterm birth, presence of chronic medical diseases, maternal age between 40 and 44 years, and having abortion history were significant predictors of preterm birth. Therefore, as an important recommendation, health professionals and hospital administrative staff should work with their maximum effort to decrease the magnitude of preterm births and on early identification and management of mothers at risk to have a preterm birth.

Corresponding author

Ebissa Bayana Kebede, School of Nursing and Midwifery, Faculty of Health Sciences, Institute of Health, Jimma University, Jimma, Ethiopia; P.O. Box: 378; mobile: +251912799655; email: ebissa12@gmail.com.

How to cite

Introduction

According to the World Health Organization (WHO), preterm birth is defined as all viable births before 37 completed weeks of gestation or less than 259 days since the first day of a woman's last normal menstrual period [1, 2]. Preterm birth is the primary cause of mortality and morbidity in infants worldwide [1, 3] and it is the main reason of adverse birth outcomes, in terms of their survival and life quality in the future [4].

Globally, greater than one in ten (10%) births are born prematurely every year. Above one million of these premature babies die after birth; uncountable others acquire a permanent physical or neurological disability, which leads to a great cost to families and society as a whole [5, 6]. Yearly, 35% of neonatal death is due to preterm birth and it is also the major causes of under-five deaths [7, 8].

In low-income countries like in Africa, the risk of neonatal death related to preterm birth complications is a minimum of ten times higher than high-income countries [9, 10]. In developing countries, including Ethiopia even in the best setup, rescue is hard below 37 weeks of gestation and 50% of the babies born at 32 weeks die due to lack of feasible and cost-effective care (like warmness, breastfeeding and basic neonatal care) [11]. Prematurity is one of the most determinants of neonatal health and it is affected by the health and socio-economic condition of the mother [12].

The effect of preterm birth is not only affecting the health of the infant, but it also causes significant economic expenses for the parents and societies. Even though preterm birth survival is improved due to the advancement of perinatal and neonatal care, those surviving neonates have a higher risk of health, growth, and developmental problems than those born at term [7, 13]. About 75% of perinatal deaths and a half (50%) of neurological abnormalities are directly associated with prematurity [14, 15]. In Ethiopia, preterm birth accounted for 12.5% of all deaths of under-five children and 23% of neonatal deaths [16, 17].

Jimma zone is a highly populated area with an estimated population of 3,261,371, of which 49.9% are women. Of the total women, 23.1% are in the reproductive age [18]. Jimma Medical Center is a huge hospital serving more than 6,000 deliveries yearly from its catchment area, and it is an institution strongly working on preterm birth reduction [19]. The Ethiopian Federal Ministry of Health is working on reducing preterm births by providing essential obstetric care, delivering continuous health information to urban and rural communities, and early detection and treatment of chronic diseases [20]. Despite solutions undertaken by the Federal Ministry of Health, the magnitude of preterm birth increased consistently, which is estimated with 320,000 preterm births happening every year in our country [21]. Little is known about the predictors of preterm births in our setup. Therefore, this study is aimed to assess predictors of preterm births in Jimma town public hospitals.

Methods

A cross-sectional study was done at governmental hospitals in Jimma town, Jimma Medical Center and Shenen Gibe Hospital, which is located at 346 km from Addis Ababa to the southwest. Jimma Medical Center is the only referral hospital and it serves as a teaching hospital and Shenen Gibe Hospital is a district hospital located in Jimma town, Oromia Region, southwest Ethiopia. The study was conducted from March 12 to May 12, 2019, at governmental hospitals in Jimma town. The sample size was calculated by using single population proportion formula with consideration of confidence level (95%), margin of error (d) = 0.05 and 16.15% of prevalence taken from the study done in Addis Ababa (Ethiopia) [22]. Ten percent (10%) was considered a non-response rate and the final sample size was 319. Mothers who had a preterm birth in both hospitals were included. Sample sizes were proportionally allocated to each hospital to get the required sample. Interviewer administered

questionnaires and chart review was used to collect the data and gestational age was determined by the last normal menstrual period and/or ultrasound check-up result. A systematic sampling technique was used to select study participants from each hospital. To ensure the quality of data, a pretest was done on 5% of the sample size. Based on the pretest, the necessary modifications were made. Additionally, training was given for data collectors on objectives and methods of data collection. After data collection, internal consistency was checked by cross-checking the collected data on a daily basis and supervision was made by the investigators. Data were checked, coded, cleaned and entered into EpiData version 3.1 and exported into the Statistical Package for Social Sciences (SPSS®) version 23 for analysis. Data analysis involved both bivariable and multivariable logistic regression analysis on the identification of predictors of preterm birth. Variables with a p-value of less than 0.25 in the bivariate logistic regression analysis were considered into the multivariable analysis. Crude and adjusted odds ratios (COR and AOR) with a 95% confidence interval (95%CI) were calculated. Variables having a p-value of less than 0.05 in the multivariable logistic regression analysis were declared as statistically significant. The study was first approved by research Committees of the School of Nursing and Midwifery, Institute of Health, Jimma University. A formal letter obtained from the School was submitted to Jimma Medical Center and Shenen Gibe Hospital to obtain their cooperation. Informed consent was obtained from all the study subjects.

Results

Socio-demographic variables

A total of 319 mothers from Jimma town government hospitals participated in the study. The majority, 101 (31.7%), was between 25-29 years. Out of the total respondents, more than half, 171 (53.6%), were rural residents. With regard to the occupation of mothers, 156 (48.9%) were housewives. Regarding the mothers' income, 146 (45.8%) earn less than 1,000 Ethiopian Birr monthly (**Tab. 1**).

Maternal related factors

Out of respondents involved in the study, 43 (13.5%) had pregnancy-induced hypertension, 33 (10.3%) had previous history of abortion,

188 (58.9%) were multiparous, 261 (81.8%) had antenatal care (ANC) follow-up, 183 (57.4%) gave birth via spontaneous vaginal delivery (SVD) and 235 (73.7%) had a pregnancy interval of more than 2 years (**Tab. 2**).

Table 1. Socio-demographic variables of the mothers at governmental hospital in Jimma town, Ethiopia, 2019.

Variables		Frequency	Percent
Maternal age (years)	**< 19**	3	0.94
	20-24	81	25.4
	25-29	101	31.7
	30-34	55	17.2
	35-39	50	15.7
	40-44	17	5.3
	45-49	12	3.8
Maternal residence	**Urban**	148	46.4
	Rural	171	53.6
Occupational status	**Housewife**	156	48.9
	Governmental employee	80	25.1
	Private/Non-governmental	83	26.0
Monthly income (ETB)	**< 1,000**	146	45.8
	1,000-1,500	35	11.0
	1,501-2,000	11	3.4
	2,001-2,500	27	8.5
	> 2,500	100	31.3

ETB: Ethiopian Birr.

Table 2. Maternal related factors at governmental hospital in Jimma town, Ethiopia, 2019.

Variables		Frequency	Percent
Pregnancy-induced hypertension	**Yes**	43	13.5
	No	276	86.5
History of abortion	**Yes**	33	10.3
	No	286	89.7
Parity	**Primipara**	131	41.1
	Multipara	188	58.9
ANC follow-up	**Yes**	261	81.8
	No	58	18.2
Mode of delivery	**SVD**	183	57.4
	CS	110	34.5
	Instrumental	26	8.2
Previous preterm	**Yes**	79	24.8
	No	240	75.2
Chronic disease	**Yes**	45	14.1
	No	274	85.9
Pregnancy interval	**< 24 months**	84	26.3
	≥ 24 months	235	73.7

ANC: antenatal care; SVD: spontaneous vaginal delivery; CS: Cesarean section.

Prevalence of preterm birth

Of all of 319 mothers included in the study, 44 (13.8%) gave preterm birth. Gestational age from the last normal menstrual period and/or ultrasound result was used to diagnose these preterm births.

Predictors of preterm birth

According to this study, mothers who were living in urban areas were 63% less likely (p = 0.003, AOR = 0.37, 95%CI [0.11, 0.65]) to have preterm birth compared to those who lived in rural areas. Concerning the previous history of preterm birth, mothers who had a history of preterm births were two times (p = 0.000, AOR = 1.83, 95%CI [0.93, 4.85]) more likely to give preterm birth compared to mothers who had no history of previous preterm births. Regarding the pregnancy interval, mothers with pregnancy interval of less than 24 months were four times (p = 0.023, AOR = 3.91, 95%CI [1.25, 7.30]) more likely to give preterm birth compared to mothers who had pregnancy interval greater than 24 months. Mothers who had pregnancy-induced hypertension were eight times (p = 0.000, AOR = 7.52, 95%CI [3.33, 14.23]) more likely to give preterm birth compared to those who had no pregnancy-induced hypertension. Mothers who had a chronic disease were six times (p = 0.000, AOR = 5.70, 95%CI [2.81, 8.01]) more likely to give preterm birth compared to those who had no chronic diseases. With regards to previous abortion history, mothers who had abortion history were three times (p = 0.038, AOR = 3.23, 95%CI [1.12, 10.42]) more likely to give preterm birth compared to those mothers who had no abortion history. Regarding the age of participants, mothers who were 40-44 years old were two times (p = 0.04, AOR = 1.62, 95%CI [0.21, 14.59]) more likely to give preterm birth when compared to mothers who were 25-29 years old (**Tab. 3**).

Discussion

This study revealed that the magnitude of preterm birth was 13.8%. This finding was almost consistent with the studies conducted in Debre Markos (Ethiopia) and India (11.6% and 15%, respectively) [23, 24]. This study finding was higher than the studies done in Gondar (Ethiopia) (4.4%) [25], Egypt (8.2%) [26] and Iran (6.3%) [27]. This difference might be due to the services provided. This finding was lower than the findings

Table 3. Multivariable factors associated with preterm births among mothers at governmental hospital in Jimma town, Ethiopia, 2019.

Variables		Preterm birth		COR (95%CI)	AOR (95%CI)	p-value
		Yes	No			
Maternal residence	Urban	11	137	0.34 (0.13, 0.48)	0.37 (0.11, 0.65)	0.003
	Rural	33	138			1
Previous preterm	Yes	16	63	1.92 (0.98, 3.79)	1.83 (0.93, 4.85)	0.000
	No	28	212			1
Pregnancy interval	< 24 months	22	62	3.43 (1.78, 6.61)	3.91 (1.25, 7.30)	0.023
	≥ 24 months	22	213			1
Pregnancy-induced hypertension	Yes	15	18	7.38 (3.36, 16.19)	7.52 (3.33, 14.23)	0.000
	No	29	257			1
Chronic disease	Yes	16	29	4.85 (2.34, 10.01)	5.70 (2.81, 8.01)	0.000
	No	28	246			1
History of abortion	Yes	9	24	2.68 (0.62, 11.57)	3.23 (1.12, 10.42)	0.038
	No	35	251			1
Maternal age (years)	< 19	0	3	197,446,925.237	130,432,849.284	0.99
	20-24	6	75	1.58 (0.54, 4.32)	0.81 (0.22, 2.94)	0.76
	25-29	11	90			1
	30-34	13	42	0.39 (0.16, 0.95)	0.09 (0.02, 0.34)	0.83
	35-39	10	40	0.48 (0.19, 1.24)	0.14 (0.03, 0.56)	0.71
	40-44	1	16	1.95 (0.24, 16.21)	1.62 (0.21, 14.59)	0.04
	45-49	3	9	0.36 (0.08, 1.56)	0.31 (0.05, 1.96)	0.68

Total number of preterm births = 44.

1: reference category; AOR: adjusted odds ratio; COR: crude odds ratio; CI: confidence interval.

in Nigeria, which was 24% [28], in Kenya, which was 18.3% [29], and in Brazil, which was 21.7% [30]. This might be due to differences in multiple gestations, presence of chronic disease, maternal infections, being of advanced age during pregnancy, being multiparous and instant onset of labour or following pre-labour premature rupture of membranes. Additionally, social and environmental conditions may also play a role, though the pathophysiology remains unidentified.

In this study, the maternal residence was also identified as a predictor of preterm birth: living in a rural area was a predictor of preterm birth. This finding was almost in line with the study conducted in Bahirdar (Ethiopia) [31]. This might be due to low accessibility of maternal health care services and lack of awareness of the mothers in the rural area. Previous history of preterm birth was also another significant predictor of preterm birth in this study. This is consistent with studies conducted in Malawi [32] and Brazil [33]. The possible reason could be underlying maternal health problems and other unidentified factors that precipitate preterm deliveries in the subsequent pregnancies.

The current study showed that pregnancy-induced hypertension was another predictor of preterm birth. This finding is similar to studies conducted in Gondar [25], Iran [34], Kenya [29], Nigeria [35] and India [36]. Even though its pathophysiology remains difficult to understand, this might be due to decreased uteroplacental blood flow, which causes intrauterine growth restriction that results in preterm delivery. The other reason might be due to vascular damage to the placenta, which induces the oxytocin receptors, causing preterm labor and delivery as a result of secondary complications of pregnancy-induced hypertension.

According to this study, pregnancy interval < 24 months was a significant predictor of preterm birth. This finding is similar to the study conducted in Debre Markos [23] and Tanzania [37]. This might be due to the increased laxity of the maternal uterus among mothers with short pregnancy interval. Another reason could be the biological stresses imposed by the prior pregnancy, causing a decrease of macronutrient required for maternal body, cervical insufficiency, infections, partial healing of uterine scar and other unidentified factors.

In this study, chronic disease was also a significant predictor of preterm birth. This finding is similar to studies done in Debre Markos [23] and Jimma [38]. The possible reason could be

decreased placental oxygen and nutrients delivery to the fetus in the uterus, which later increases the chance of preterm birth.

We found that a history of previous abortion is another significant predictor of preterm birth. This finding is in line with studies done in Shire (Ethiopia) [39], Tanzania [40], and Iran [41]. This might be due to the risk of infection and vascular complications during pregnancy. An additional possible explanation might be a damage to the cervix caused by procedures during abortion, decreasing the tensile strength of the cervical plug, resulting in preterm birth. From our findings, maternal age between 40 and 44 years was a significant predictor of preterm birth. This finding is similar to studies done in Mekelle (Ethiopia) [42] and Cameroon [43]. The possible reason could be the fact that aged mothers face early labor induction for a medical condition. In addition to this, advanced maternal age might cause fetal distress, which contributes to the increased risk of preterm birth.

Conclusion

Place of residence, short pregnancy interval, pregnancy-induced hypertension, previous history of preterm birth, presence of chronic medical diseases, maternal age between 40 and 44 years, and having abortion history were significant predictors of preterm birth. Therefore, as an important recommendation, health professionals and hospital administrative staff should work with their maximum effort to decrease the magnitude of preterm births and on early identification and management of mothers at risk to have a preterm birth.

Abbreviations

ANC: antenatal care

AOR: adjusted odds ratio

CI: confidence interval

COR: crude odds ratio

CS: Cesarean section

SPSS®: Statistical Package for Social Sciences

SVD: spontaneous vaginal delivery

WHO: World Health Organization

Acknowledgment

Institutional Review Board approval

Ethical approval to conduct this research was obtained from the Research and Ethical Review of Institute of Health, Jimma University. Permission to conduct the study was also requested from each hospital administrative office. To keep confidentiality, all collected data was coded and locked in a separate place and it was used only for the research purpose. Ethical consideration was taken into account throughout the study.

Declaration of interest

The Authors declare that there is no conflict of interest.

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