

Preterm Birth and Associated Factors among Mothers Who gave Birth in Debremarkos Town Health Institutions, 2013 Institutional Based Cross Sectional Study

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Abstract

Background: The birth of a preterm infant results in significant health consequences to the infant and emotional and economic costs for families and communities. About 75% of perinatal deaths and 50% of neurological abnormalities are directly attributed to preterm. The main aim of this study was to assess the prevalence and associated factors of pre-term birth North West Ethiopia.

Methods: An institutional based cross sectional study was conducted. Systematic sampling was used to get the total sample size of 422 participants. The data was entered, cleaned and edited using EPI INFO version 2002 and exported to SPSS version 16.0 software packages for analysis. Both bivariate and multiple logistic regression were fitted and odds ratio and 95% CI were computed to identify associated factors and determine the strength of association. A p-value of <0.05 was considered as statistical significant.

Result: This study showed that 11.6% from the total 422 mothers gave a preterm birth. Presence of chronic illness (AOR=4.5; 95% CI: 2, 10.2), problem in current pregnancy (AOR=2.9; 95% CI: 1.3, 6.7), premature rupture of membrane (AOR=6.2; 95% CI: 2.7, 14), low income <600 birr (AOR=2.6 ; 95% CI: 1.1, 6.6), has antenatal follow up (AOR=0.24; 95% CI: 0.09, 0.6), and hematocrit level <33 (AOR=7.2; 95% CI: 3.1-16.8) were found to be significantly associated with preterm birth on the multi variate logistic regression.

Conclusion: Prevalence of preterm birth was found to be higher in Debremarkos town. The main factors for this were maternal history of chronic illness, problem in current pregnancy, presence of premature rupture of membrane, low income, has no antenatal follow up and hematocrit level <33.

Keywords: Preterm birth; Prevalence; Risk factors

Background

According to the World Health Organization (WHO) Preterm birth is birth of the baby before 37 completed weeks of gestational age [1].

The birth of a preterm infant results in significant health consequences to the infant and emotional and economic costs for families and communities. Although advances in prenatal and neonatal care have improved the survival for preterm infants those infants who do survive have a greater risk of developmental disabilities, health, and growth problems than infants born at full term [2]. About 75% of perinatal deaths and 50% of neurological abnormalities are directly attributed to preterm [3,4].

The majority of preterm birth remains vulnerable to long term complications that may persist all over their lives. Among the main resulting morbidities are neurosensory deficits (blindness, deafness), necrotizing enterocolitis, intraventricular hemorrhage, and delay in physical and mental development [5,6]. According to the report from 'white paper on preterm birth' on 2009, of all 4 million annual early neonatal deaths (deaths within the first 7 days of life) that are not related to congenital malformations, 28% are due to preterm birth [7].

The major cause of preterm delivery were low monthly income, absent or inadequate prenatal care, no contraceptive use, caesarean delivery and clinical complications during pregnancy [8,9].

Globally, an estimated 13 million babies are born before 37 completed weeks of gestation annually. Rates are generally highest in low and middle income countries, and increasing in some middle and high-income countries [10].

The highest rates of preterm birth occurred in Africa and North America [11]. In Ethiopia about 12% of under-five deaths is attributed to preterm birth [11].

According to a meta-analysis reported by Philip Steer the overall estimates of preterm birth rates range from 5% in developed countries to 25% in developing countries [12].

According to Ethiopian Demographic and Health Survey in 2011, In Ethiopia, high rate of neonatal mortality (37 deaths per 1,000 live births) is reported and preterm birth is believed to be a major and direct cause of neonatal mortality.

Therefore this study investigated the major risk factors of preterm birth which will help to guide health professionals and health policy makers to identify indicators for monitoring preterm birth strategy and applying necessary preventive and appropriate measures to decrease preterm birth. May ultimately it will help to reduce child mortality rate, also it will help to fill the research gaps in the study area and as base line information for other areas of the country.

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Methods

Institutional based cross sectional study was conducted at Debremarkos Town health institution which is located in north western Ethiopia, in Amhara National Regional State, at a distance 300 km from Addis Ababa. According to the National Population and Housing Census carried out in 2007 by Central Statistical Authority, the population of the town was 62,497. Out of this 29,921 (47.87%) were Males and 32,576 (52.1%) were females. Regarding health services in this town there are 4 health institutions which provide services related to delivery service. All the health institutions are Governmental. The study was conducted from June to August, 2013.

Study population was mothers who gave birth in Debremarkos health institutions during the study period. All mothers who gave birth in Debremarkos Town health institutions during the study period were included in the study. Systematic sampling method was employed to select the study participants after the average numbers of clients who deliver during data collection period in all health institutions were estimated from the patient flow registration book of each health institutions. The total sample size was allocated from each health institutions. Then the total number of study subjects were selected through systemic random sampling with $K=N/n$, where N is total number of deliveries in all health institutions during the study period and n is study population. By using a single population proportion formula and by adding 10% non-response rate the final sample size was 422.

The first study participant was selected by lottery method, then every 2nd mothers were interviewed, gestational age of the newborn was calculated based on mother LMP or early ultrasound result, in estimating gestational week, when there are extra days it is counted to the near lowest gestational age.

Data was collected by face to face interview using a structured and pre-tested questionnaire to assure quality of data pre -testing of the questionnaire were performed on 20 study subjects in Fenote Selam Hospital. And the completeness of the data obtained from the questionnaire was confirmed from this pre-testing. Both the data collectors and supervisors were given one days training before the actual work all the questionnaires were checked visually, coded and entered into EPI Info 2002 and exported to SPSS version 20 software packages for analysis. Binary logistic regression was used to identify the associations between the dependent and independent variables. Those variables with p-value of ≤ 0.2 on bi-variate analysis were transferred to multiple logistic regressions. The degree of association between independent and dependent variables were assessed using odds ratio with 95% confidence interval.

Ethical clearance was obtained from institutional Review Board (IRB) of University of Gondar. Formal letter of cooperation was written from the university of Gondar ethical clearance committee to Debremarkos Hospital and the Health institutions. Verbal informed consent was obtained from each study subject after informing the objectives and the possible discomforts.

Results

Socio-Demographic characteristics of the respondents

The total number of the study subjects participated in this study was 422. The mean age of the study participants was 28.57 with SD of 6.1. Eighteen years old is the minimum and forty-six years old is the maximum ages of clients participated in this study. The majority of the study participants were below 20 and 34 years old, four

hundred (94.8%) of the respondent belongs to Amhara by ethnicity, and 381(90.3%) were Orthodox Christians in religion, regarding the Marital status of the respondents, majority 39(92.7%) of them were married. One hundred sixty one (38.1%) of the mothers were unable to read and write (Table 1).

Obstetrics and maternal factors

More than 17.1% of the respondents have a history of one or more of the chronic medical illnesses shown in (Table 2) and about 20% had one or more of pregnancy related complications. About 6.6% of the study participants are found to be HIV positive. Most of the respondents had a history of contraceptive use prior to this pregnancy, planned pregnancy and has no ANC follow up (Figure 1).

Prevalence of pre-term birth

The prevalence of pre-term birth in this study was found to be 11.6%.

All independent variables were analyzed using binary logistic regression with the dependent variable preterm birth using SPSS version 20 and those which were significant at a p-value of <0.2 were fitted to a multivariate logistic regression to check their association with the outcome variable at a p-value of <0.05 .

Hosmer-Lemeshow test of goodness of fit was performed to check the appropriateness of the model for analysis.

Variables found to be significant at a binary logistic regression were chronic illness, ANC, PROM, current pregnancy complication, contraceptive use, age, hematocrit level, parity and income. After analysis with multivariate logistic regression, chronic illness, current

Variable	Frequency: n(%)
Age	
<35 yrs	319 (76%)
≥35 yrs	101 (24%)
Residence	
Urban	184 (43.6%)
Rural	238 (56.4%)
Ethnicity	
Amhara	400 (94.8%)
Oromo	20 (4.7%)
Tigre	2 (0.5%)
Religion	
Orthodox	381 (90.3%)
Muslim	37 (8.8%)
Protestant	4 (0.9%)
Education	
Illiterate	262 (62.1%)
Literate	160 (37.9%)
Husband education	
Illiterate	200 (47.4%)
Literate	222 (52.6%)
Marital status	
Married	391 (92.7%)
Unmarried	23 (5.5%)
Divorced	6 (1.4%)
Income	
Low	246 (58.3%)
Above low	174 (41.7%)

Table 1: Socio-Demographic characteristics of the study participants in DM town from June to August, 2013.

Frequency: n (%)	
Number of Parity	
1	172 (40.8%)
1-5	192 (45.5%)
6-9	52 (12.3%)
10-12	4 (0.9%)
Outcome of previous pregnancy	
Primi (none)	137(32.5)
Term alive	171(40.5)
Term still birth	39(9.2)
Preterm	31(7.3)
Abortion	44(10.4)
History of illness prior to this pregnancy	
None	369 (87.4%)
UTI	17 (4%)
Malaria	13 (3.1%)
Hypertension	8 (1.9%)
Cardiac disease	6 (1.4%)
Asthma	6 (1.4%)
Diabetic mellitus	1 (0.2%)
Contraceptive	
Yes	280 (66.4%)
No	142 (33.6%)
Inter pregnancy interval	
None	144(38.1)
1-23 month	81(19.2)
24-59 month	122(28.9)
60-240 month	75(17.8)
Is the current pregnancy planned?	
Yes	278 (65.9%)
No	142 (33.6%)
ANC follow up	
Yes	382 (90.5%)
No	38 (9%)
RH Factor	
Positive	390(92.7)
Negative	31(7.3)
HIV	
Negative	394 (5.9%)
Positive	25 (93.4%)
Do current pregnancy has complication	
Yes	82(19.4)
No	340(80.6)
Type of complication	
PIH	32(7.6)
APH	22(5.2)
Multiple pregnancy	22(5.2)
Polyhydraminous	6(1.4)
Cervical incompetenc	1(0.2)
PROM	
Yes	68(16.1)
No	352(83.9)
Anaemia	
Yes	76(18)
No	346(82)
Mode of delivery	
Spontaneous	298(70.6)
Elective	124(29.4)

Table 2: Obstetrics and maternal condition of the study participants in DM town from June to August, 2013.

pregnancy complication, PROM, low income, no ANC, and <33 hematocrit level were found to be statistically significant at p-value of <0.05 (Table 3).

In this study history of chronic illness was found to be significantly associated with preterm birth. Mothers who had one or more history of chronic illness (diabetic mellitus, hypertension, cardiac problem, or asthma) are 4.5 times more likely to have preterm birth in the consecutive pregnancy than mothers without history of these chronic illnesses (AOR= 4.5, 95% CI: 2-10.2).

Mothers who had current pregnancy complication were also found to be significantly associated with preterm birth. Mothers with one or more of current pregnancy complication (PIH, APH, multiple pregnancies, polyhydraminous and cervical incompetence) are 2.9 times more likely of develop preterm birth than mothers without any of the mentioned problems (AOR=2.9, 95% CI=1.3-6.7).

Mothers who developed PROM and anemia in this pregnancy had about 6.2 times (AOR= 6.2, 95% CI: 2.7-14) and 7.2 times (AOR=7.2, 95% CI: 3.1-16.8) respectively, increased risk of developing preterm birth than mothers who didn't had the problems.

Another significant association was found between income and preterm birth. Mothers who have family income<600 birr/month are 2.6 times more likely to have preterm birth than mothers who had income ≥ 600 birr/month (AOR=2.6, 95%CI: 1.1-6.6).

ANC visit during the index pregnancy was also found to be associated with preterm birth. Mothers who have ANC follow up are more than 75% decreased risk of for preterm birth than mothers who haven't ANC follow up (AOR=0.24, 95%CI: 0.09, 0.6).

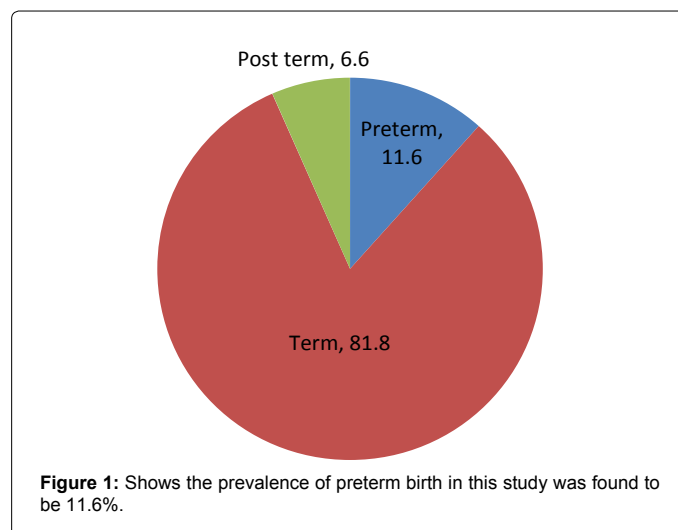
Discussion

Worldwide Preterm birth and its consequences constitute a major health problem. The birth of a preterm infant results in significant health consequences, mortality and subsequent disabilities to the infant and emotional and economic costs for families, communities and to the nation.

In this study the prevalence of preterm birth was found to be 11.6%. This finding is slightly higher than the prevalence of preterm birth in Ethiopia, 10.1%, which was reported by the Global Action Report on Preterm Birth in 2010 [13].

The finding on this study was also higher than a cross sectional study conducted in Addis Ababa on 2007, which reported the prevalence rate of 7.1% [14]. This discrepancy might be due to difference on exclusion criteria for multiple pregnancies. In our study mothers with multiple pregnancies were included, whereas these mothers were excluded from the mentioned study. Therefore lower incidence rate is expected in their study as twin pregnancy is a known cause for preterm birth. Another possible reason for the discrepancy could be due to the difference in study areas.

This finding is also higher than study findings conducted in



Variables		Preterm birth		COR(95%CI)	AOR (95% CI)	P-value
		Yes	No			
Chronic illness	Yes	29	43	11.1 (5.8-21.4)	32.7 (1.07-7)	0.036
	No	20	330	1	1	
Probl with current Px	Yes	32	89	6 (3.2-11.3)	4 (1.5-11)	0.006
	No	17	284	1	1	
PROM	Yes	32	96	5.4 (2.9-10.2)	6.6 (2.6-17)	<0.001
	No	17	277	1	1	
Income	Low	39	207	3 (1.5-6.4)	3.1 (1.03-9.7)	0.047
	Above low	10	164	1	1	
Px interval	No Previous Px	11	133	0.8 (0.36-1.7)	3.8 (0.6-23)	0.032
	< 24 months	19	62	2.8(1.4-5.7)	4.4 (1.4-14)*	
	≥ 24 months	19	178	1	1	
ANC	Yes	33	343	0.18 (0.09-0.37)	0.23 (0.064-0.78)	0.019
	No	16	30	1	1	
Previous outcome	Preterm	21	12	3.7(1.3-10.9)	2.25 (1.8-18.2)*	<0.001
	Term	19	193	2 (0.8-5.8)	3.8 (0.45-31)	
	Abortion	3	41	1.55 (0.37-6.47)	2.7 (0.24-29.7)	
	No prev. Hx	6	127	1	1	

Table 3: Bivariate and multiple logistic regression of selected variables in relation to preterm birth among newborn delivered in DM town health institution from June – August 2013.

developed countries. For Instance, the 2010 WHO bulletin on cross-sectional analyses of prospective surveys reported that preterm birth rates have been reported to range from 5% to 7% of births [11]. The main reasons for this discrepancy might be due to the increased risk of infection during pregnancy in our country than in developed countries, as presence of infection during pregnancy predisposes to preterm birth. Another reason could be due to resource gap between these two worlds. In situations with better resource early intervention may help reduce at least preventable preterm birth. Also better ANC follow up in developed countries will contribute for the reduced incidence of preterm birth.

The prevalence of preterm birth in our study was found to be lower than some studies conducted in different parts of the world. For instance in a cross-sectional study conducted in Nigeria on 2010, a prevalence rate of 19.9% was reported [15]. This higher prevalence of preterm birth in Nigeria might be due to the higher rate of multiple pregnancies in Nigeria, as this is a known predisposing factor for preterm birth.

Also a national cross-sectional study in Brazil showed that a prevalence of 21.7%, which is higher than this study [2]. Also a study done in USA at different times had reported higher rates of preterm birth, 12.5% in 2004 and 12.8% in 2006 [16,17]. Unlike other developed countries the higher prevalence rate in USA might be due to higher prevalence of elective CS. Another reason might be due to a trend of American women to give birth in their late reproductive ages.

This study revealed that a significant association was found between complications of current pregnancy and preterm birth. Mothers who had one or more of complications of pregnancy (PIH, APH, polyhydraminous or multiple pregnancy) had about 3 times increased risk of having a preterm birth than those mothers without these problems during their pregnancy [AOR= 2.9, 95% CI = 1.3-6.7, p=0.01]. This finding is in line with a cross sectional studies conducted in Brazil, Bangladesh in 2011, Ethiopia A.A in 2007 and another cross sectional study in Nigeria [6,7,9,14] respectively. The reason for this might be due to the fact that complications of pregnancy like PIH and APH can cause vascular damage to placenta. Multiple pregnancy and polyhydraminous can stretch the myometrium; this induces the oxytocin receptors, which results in preterm labor and delivery.

Another significant association was found between mothers who had one or more of the known chronic medical problems like DM, HTN, cardiac disease or asthma. These mothers had about 4.5 times higher risk of having preterm birth than mothers without chronic medical illnesses [AOR= 4.5, 95% CI = ([2-10.2), p< 0.001].

This finding is in consistence with cross sectional studies conducted in Ethiopia in 2007 [14] and Global report on preterm birth and stillbirth in 2010 [10]. The possible explanation might be due to chronic medical illnesses being able to cause utero-placental vasculopathy, this will activate premature fetal hypothalamic-pituitary-adrenal axis activation, which intern can result preterm birth [18-20].

In this study anemia is another independent variable which had significant association with the dependent variable. Anemic mothers have more than 7 times increased risk of developing preterm birth than those mothers who were not anemic (AOR 7.2, 95% CI (3.1-16.8), and p <0.001). This finding is in agreement with findings of across sectional studies conducted in China, Pakistan and Saudi Arabia [9,10,21] respectively.

Another significant association was found between mothers who had premature rupture of membranes (PROM) and Preterm birth. Mothers who had PROM were about 6 times more likely to have preterm birth [AOR= 6.2, 95CI (2.7-14), and p <0.001]. This finding is in consistence with findings of cross sectional study at Akbar-Abadi hospital in Iran in 2010 [2] and with other different studies [10-12,22,23]. This may be due to the fact that PROM elevated fetal plasma interleukin-6 indicating that this fetal response may trigger preterm labor correlated strongly with spontaneous delivery within 48 to 72 hours.

The other factor found to be associated with preterm birth in this study is ANC. Mothers who have ANC follow up are more than 75% decreased risk of preterm birth than mothers who haven't ANC follow up. (AOR=0.24, 95% CI = (0.09-0.6), p=0.004). This finding is in line with a cross sectional studies conducted in US on 2010, in Portuguese on 2004, in 2011 in Ghana, in 2010 in Nigeria, and in Brazil by 2012 [1,8,12-14,24-26] respectively.

This result might be due to if the clients have ANC follow up they will be informed about early identification of risk factors associated with

preterm birth and early sign of preterm labor then it might be possible to prevent, diagnose, and treat preterm births in health institutions.

Conclusion

The prevalence of preterm birth in Debremarkos town Health institution is high, which is higher than the overall prevalence of the problem in Ethiopia. Presence of chronic illness, problem with current pregnancy, PROM, being anemic, low capital wealth index and no ANC follow up were found to be statistically significant with the occurrence of preterm birth in current pregnancy.

Competing Interests

The authors declare that they have no competing interests.

Authors' Contributions

TB wrote the proposal, participated in data collection, analyzed the data and drafted the paper. AA and KZ approved the proposal with some revisions, participated in data analysis and revised subsequent drafts of the paper. All authors read and approved the final manuscript.

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