Adverse maternal outcome and its association with gestational diabetes among women who gave birth in selected public hospitals in Eastern Ethiopia

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ABSTRACT

Purpose: The purpose of this study was to assess the adverse maternal outcome and its assocoation with gestational diabetes among mothers who gave birth at selected public hospitals in Eastern Ethiopia.

Patients and Methods: This study conducted from December 2015 to April 2017. We recruited a total of 1834 delivering mothers, and took equal number of mothers in both hospitals. Structured and pretested questionnaires were used to collect the sociodemographic, obstetrics history, and maternal outcome data during the study. Mothers who have a risk factor for gestational diabetes mellitus underwent oral glucose tolerance test to confirm the diagnosis. The collected data was entered into EPI-info version 3.5.1 and then exported to SPSS version 20.0 software for analysis.

Results: Pre-eclampsia was the major 169 (9.2%) adverse pregnancy outcome observed among the study participants, which was followed by obstetric hemorhhage 107 (5.8%). Premature rupture of membrane and preeclampsia were found to have an association with gestational diabetes with AOR=3.44 [95% CI = 1.69–6.97] and AOR = 4.15 [95% CI = 2.16–7.95], respectively.

Conclusion: In our study, we found that the major adverse outcome among women who delivered in Hiwot Fana and Dilchora hospitals were preecalampsia and obstetrics heamorhage which are the major causes of maternal mortality in developing countries. Among different adverse maternal outcomes observed PROM and preeclampsia were found to have a significant association with gestational diabetes.

Key words: Adverse outcome, gestational diabetes, preeclampsia, PROM.

Introduction

The number of people with diabetes is increasing due to population growth, aging, urbanization, and increasing prevalence of obesity and physical activities. As the incidence of diabetes continue to rise and increasingly affects individuals of all age, including young adults, and children, women of childbearing age are at increased risk of diabetes during pregnancy.[1,2]

Gestational diabetes mellitus (GDM) is a glucose intolerance disorder that occurs or is diagnosed for the first time during pregnancy and is one of the most common pregnancy complications. GDM represents approximately 90% of these

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cases and it affects 2–5% of all pregnancies and varies in direct proportions to type 2 diabetes mellitus in the background population.[3,4]

Studies conducted in different areas and period indicates that GDM increases the risk of adverse maternal outcomes such as preeclampsia, pregnancy induced hypertension, recurrent vulvovaginal infections, increased incidence of operative deliveries, obstructed labor, and development of diabetes mellitus later in life.[5]

Poor outcomes in pregnancies among women with diabetes are in most cases preventable by optimizing glycemic control. Both maternal and neonatal mortality and morbidity resulting from GDM can be prevented by proper antenatal supervision and institutional care. The major problems in developing countries are lack of education and sociocultural taboos leading to improper and substandard antenatal care, failure of screening of high-risk pregnancies and their referral to the appropriate health facilities at the proper time.

The information on maternal adverse outcome and its association with GDM is not well known in Hiwot Fana and Dilchora hospitals. Therefore, this study was conducted to assess the adverse maternal outcomes and its association with gestational diabetes among women who gave birth in selected public hospitals in Eastern Ethiopia.

Material and Methods

Study period and area
The study duration was 1 year and 3 months from December 2015 to February 2017. The period of data collection was 8 months (May to October 2016). This study was conducted in Hiwot Fana and Dilchora referral hospitals. Harar town is located 526 km from Addis Ababa to the Eastern part of Ethiopia. According to the central statistics authority of Ethiopia 2007, Harari regional state has population of 183,415 of these 92,316 were males and 91,099 were females. Hiwot Fana specialized hospital was established in 1941. It is a referral hospital in Harar town and its surroundings, which has been delivering health care services. Dilchora Referral Hospital is found in Dire Dawa city administration council and located 501 km to East of Addis Ababa. The hospital is serving an estimated 2 million population found in Dire Dawa City administration and nearby Oromia and Somali regions having total beds of 268 distributed in medical, pediatrics, surgical, gynecology, and obstetrics ward.

Study design
Case control study design was used to conduct this study. The study population was mothers who gave birth in Hiwot fana and Dilchora hospitals during the data collection period.

Exclusion criteria
1. Mothers who had diabetes mellitus before pregnancy.
2. Mothers who had other medical illnesses.
3. Who were severely ill during data collection time

Sample size determination
The required sample size of the study population is calculated by using the formula for single population proportion based on the following assumption;

n = the required sample size

Z = standard error corresponding to 95% confidence interval level = 1.96

P = proportion of mothers with GDM in Tigiray, North Ethiopia (3.7%) (1).

d = the margin of error (0.9%)

$$n = Z^2 P (1 - P)/d^2$$
$$n = (1.96)^2 (0.037)^* (1 - 0.037)/(0.009)^2$$
$$n = 1687 \text{ (by adding 10\% non response rate)}$$
$$n_f = 1855$$

All mothers who came to Hiwot Fana and Dilchora hospitals during the study period were interviewed by using the structured questionnaire until the required sample size was obtained.

Operational definitions
• Adverse maternal outcomes are any complications related to pregnancy and include pregnancy-induced hypertension, increased rates of C/S and induction, perineal laceration, polyhydramnios, and antepartum hemorrhage.

Data collection procedure
By using structured and pretested questionnaires, three trained midwives collected the data about sociodemographic characteristics of mothers, obstetrics history, medical history, and adverse maternal outcomes. Meters and digital balance were used to measure the weight and height of the mothers. Sociodemographic data, obstetrics history, medical history of the pregnant women was obtained during the face-to-face interview. The diagnoses of GDM were made by midwives who worked in antenatal care unit based on oral glucose test (OGTT) after 24 weeks of gestational age. Maternal adverse outcomes were observed by midwives (data collectors) for all mothers who gave birth during the data collection period.

Data analysis
The collected data entered into EPI-info version 3.5.1 and then exported to SPSS version 21.0 software for analysis. After cleaning the data for internal consistency, descriptive statistics such as frequencies and percentages

Table 1: Socio demographic characteristics of women who gave birth in Hiwot fana and Dilchora hospitals during June 2016 to April 2017 G.C

Variables	Number (*n*=1834)	Percentage
Age of mothers		
<18	21	1.1
18-24	718	39.1
25-29	660	36.0
30-34	324	17.7
>35	111	6.1
Marital status		
Single	19	1
Married	1744	95.1
Divorced	36	2
Widowed	29	1.6
Separated	6	0.3
Ethnicity		
Oromo	1204	65.6
Amahara	359	19.6
Adare	148	8.1
Others	123	6.8
Religion		
Muslim	1275	69.5
Orthodox	430	23.4
Protestant	117	6.4
Others	12	0.7
Educational status		
Unable to read and write	738	40.2
Grade 1-8	533	29.1
Grade 9-10+2	419	22.8
Grade 12+	144	7.9
Occupation		
Government employee	194	10.6
Private employee	209	11.2
Housewife	861	46.9
Merchant	248	13.5
Farmer	219	11.9
Others	103	5.6
Income		
<1200	638	34.8
1200-4999	1164	63.5
>5000	32	1.7

Table 2: Obstetrics characteristics and adverse maternal outcome among women who gave birth in Hiwot fana and Dilchora hospitals during June 2016 to April 2017

Variables	Number (*n*=1834)	Percentage
Family history of DM		
Yes	1776	96.8
No	58	3.2
Gravidity		
Primigravida	539	29.4
Multigravidas	1295	70.6
Parity		
Primipara	659	35.9
Multipara	1023	55.8
Grand multipara	151	8.2
Body Mass Index (BMI)		
Under Weight	426	23.2
Normal	1162	63.4
Over weight	242	13.2
Obese	4	0.2
Ante partum Hemorrhage (APH)		
Yes	1727	94.2
No	107	5.8
Preeclampsia		
Yes	169	9.2
No	1665	90.8
Polyhydramnios		
Yes	81	4.4
No	1753	95.6
Induction		
Yes	146	8.0
No	1688	92.0
Augmentation		
Yes	128	7.0
No	1706	93.0
Premature Rupture of Membrane (PROM)		
Yes	234	12.8
No	1600	87.2
Caesarean section		
Yes	410	22.4
No	1424	77.6
Perineal laceration		
Yes	121	6.6
No	1713	93.4

were calculated. *P* value less than 0.05 was considered to decide statistical significance. Moreover, multivariate logistic regression analysis was employed to control confounders.

Ethical consideration

The protocol was approved by the Haramaya University institutional health research Ethics review committee. Written and signed informed consent was obtained from each study participant prior to interview, as it is stated in participant information sheet. The data collection procedure was anonymous to keep the confidentiality of any information provided by the study participants. Study participants who are known to have gestational diabetes were linked to the service and were followed for any possible complications.

Results

A total of 1834 pregnant women in Hiwot Fana and Dilchora hospital were included in the study making the response rate 98.7%. The mean age of the mothers was 25.6 (SD ± 4.8) and majority of them 1744 (95.1%) were married. The majority of mothers were Oromo 1204 (65.6%) in ethnicity and Muslim 1275 (69.5%) by religion. More than one-third of the mothers

Table 3: Bivariate and multivariate logistic regression analysis showing relation between preeclampsia and selected variables of women who gave birth in Hiwot fana and Dilchora hospitals during June 2016 to April 2017

Variables	Preeclampsia		COR [95% CI]	AOR [95% CI]
	No (%)	Yes (%)		
Age				
<18	86 (84.3%)	16 (15.7%)	2.13[1.21-3.77]	2.83[1.51-5.30]*
≥35	386 (88.7%)	49 (11.3%)	1.47[0.79-2.70]	1.24[0.85-1.79]
19-29	1193 (92.0%)	104 (8.0%)	1	1
Gravidity				
Primigravida	498 (92.4%)	41 (7.6%)	1	1
Multigravidas	1167 (90.1%)	128 (9.9%)	1.33[0.92-1.92]	0.78[0.33-1.85]
Gestational Diabetes				
Yes	1631 (91.3%)	156 (8.7%)	1	1
No	34 (72.3%)	13 (27.7%)	3.99[2.07-7.73]	3.44[1.69-6.97]*
Parity				
Primipara	611 (92.7%)	48 (7.3%)	1	1
Multipara	1053 (89.7%)	121 (10.3%)	1.46[1.03-2.07]	2.01[0.9-4.49]
Body Mass Index (BMI)				
Normal	1453 (91.5%)	135 (8.5%)	1	1
Over weight	212 (86.2%)	34 (13.8%)	1.73[1.15-2.58]	1.45[0.94-2.23]

Table 4: Bivariate and multivariate logistic regression analysis showing relation between PROM and selected variables of women who gave birth in Hiwot fana and Dilchora hospitals during June 2016 to April 2017

Variables	PROM		COR [95% CI]	AOR [95% CI]
	No (%)	Yes (%)		
Age				
<18	92 (90.2%)	10 (9.8%)	0.73[0.37-1.43]	0.89[045-1.8]
≥35	379 (87.1%)	56 (12.9%)	0.99[0.72-1.37]	0.87[0.62-1.22]
19-29	1129 (87.0%)	168 (13.0%)	1	1
Gestational Diabetes				
Yes	1572 (88.0%)	215 (12.0%)	1	1
No	28 (59.6%)	19 (40.4%)	4.96[2.72-9.04]	4.15[2.16-7.95]*
Parity				
Primipara	589 (89.4%)	70 (10.6%)	1	1
Multipara	1010 (86.0%)	164 (14.0%)	1.37[1.01-1.84]	1.37[0.99-1.89]
Body mass index (BMI)				
Normal	1395 (87.8%)	193 (12.2%)	1	1
Over weight	205 (83.3%)	41 (16.7%)	1.45[1.0-2.08]	1.07[0.71-1.6]
Polyhydramnios				
No	1540 (87.8%)	213 (12.2%)	1	1
Yes	60 (74.1%)	21 (25.9%)	2.53[1.51-4.24]	1.97[1.14-3.4]*

738 (40.2%) had no formal education and almost half of the mothers 861 (46.9) were housewives. The mean monthly income of mothers was 1776.8 (SD ± 1051.3) [Table 1].

From a total of 1834 mothers, only 58 (3.2%) had family history of diabetes mellitus. The majority of women 1295 (70.6) were multigravidas and more than half 1023 (55.8) were multipara (who give birth more than once). Most of the mothers 1162 (63.4%) have normal body mass index (BMI). From the total of 1834 mothers who delivered in both hospitals, 107 (5.8%) and 169 (9.2%) of them had ante partum hemorrhage and preeclampsia, respectively [Table 2].

Only 81 (4.4%) were diagnosed with polyhydramnios while 146(8%) and 128 (7%) of the mothers underwent induction and augmentation, respectively. The proportions of mothers who developed premature rupture of membrane (PROM) were 234 (12.8%). Four hundred ten (22.4%) of the mothers underwent cesarean section to deliver their babies and only 121 (6.6%) of the mothers who gave birth vaginally had perineal laceration [Table 2].

In this study, we found that preeclampsia among mothers with gestational diabetes is more common than those who were not with GDM. The odds of preeclampsia was 3.4 times more likely among mothers with GDM, AOR = 3.44 [95% CI = 1.69–6.97]. In this study, we found that age was also independent predictor of preeclampsia. The mothers whose age was less than 18 years developed preeclampsia 2.8 times more likely than those aged between 19 and 29 years with AOR = 2.83 [95%, CI = 1.51–5.30] [Table 3].

Premature rupture of membrane cases were more common among gestational diabetic mothers than nongestational diabetic mothers. The odd of PROM was 4.15 times more likely among gestational diabetes with AOR = 4.15 [95% CI = 2.16–7.95] [Table 4].

Discussion

This study assessed the maternal and neonatal outcomes among mothers with gestational diabetes and associated factors in Hiwot Fana and Dilchora hospitals, Eastern Ethiopia. The major maternal adverse outcomes considered in this study were those that have an association with gestational diabetes in different literatures.

In the current study, prevalence of ante partum hemorrhage is 5.8% which is in line with study done in Jimma Ethiopia where the prevalence of APH was 5.1%; however, it was greater than what was reported from Nigeria (3.5%), the difference could be due to the difference in the study population and time.[6,7]

It is well known that preeclampsia is one of the major causes of maternal mortality and in this study the prevalence of preeclampsia was 9.2%. This finding is higher than the study done in north (8.5%) and south (2.23%) Ethiopia. The difference might be due to the difference in study patients and setting.[8,9]

In the current study, 12.8% of mothers had premature rupture of membrane which is similar with study done in Sweden (12.9%) (2). These days different studies are reporting that the prevalence of C/S is increasing. At present, 18.6% of all births occur by CS, ranging from 6% to 27.2% in the least and most developed regions, respectively.[10]

Our study revealed that 22.4% of mothers in this study gave birth by C/S which almost in line with what was reported from study done in Addis Ababa (19.2%). In the current study, the proportion of women who had second degree tear and above was 6.6% which is less than what was reported from Taiwan (10.9%), this might be due to the difference in study population and area.[11,12]

In the current study, preeclampsia was found to be the adverse maternal outcomes among mothers with gestational diabetes. This study revealed that the mothers with gestational diabetes were 3.44 times more likely to develop preeclampsia than women who did not develop gestational diabetes. This finding was supported by the study done in Saudi Arabia, Qatar and Addis Ababa Where the incidence of preeclampsia was higher among mothers with GDM than nondiabetic mothers.[13-15]

According to this study, PROM was also found to be one of the adverse maternal outcomes of mothers which have an association with gestational diabetes. The current study showed that the mothers diagnosed with gestational diabetes were 4.15 times more likely to develop PROMe than the normal mothers. This study was in line with study done in India where PROM was the most common complication of labor (OR = 1.66, P = 0.04).[16]

Conclusion

This study assessed the maternal and neonatal adverse outcomes and its association with GDM and risk factors associated with GDM. In our study we found that the preeclampsia, PROM, more than recommended CS delivery and perineal laceration were the common adverse maternal outcome among mothers delivered in Hiwot Fana and Dilchora hospitals. Preeclampsia, PROM, and macrosomia were more common among mothers with gestational diabetes than mothers who had no gestational diabetes and found to have significant association with the diagnosis of gestational diabetes.

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