

Prevalence of gestational diabetes mellitus and associated factors in Southern Ethiopia



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ABSTRACT

Background: Presence of gestational diabetes mellitus during pregnancy has serious complications for both mother and child. Its burden is increasing in low and middle-income countries but, little is known about its contribution in Ethiopia.

Aims and Objective: The aim of this study was to determine the prevalence of gestational diabetes mellitus and to identify associated factors in Wolaita Zone, Southern Ethiopia.

Materials and Methods: Institution based cross sectional study was carried out from August to October 2017 in Wolaita Zone, southern Ethiopia. A total of 518 pregnant women were participated from 2 hospitals and 4 health centers. Capillary blood samples were collected at fasting and 2 hours after 75gm glucose load to measure blood sugar and diagnosis of gestational diabetes mellitus was made by using 2013 World Health Organization (WHO) criteria. Binary logistic regression model was applied to assess risk factors of gestational diabetes mellitus.

Results: Prevalence of gestational diabetes mellitus was 4.2% (95% CI, 2.5, 6.2) with mean post glucose load level of 160.1 mg/dl (6.3) and 15(4%) among urban residents and 7(4.9%) among rural residents. The proportion of gestational diabetes mellitus increases with increase in number of pregnancies. Previous history of spontaneous abortion (AOR: 3.5; 95%CI: 1.7-14.6), family history of type II diabetes (AOR: 4.3; 95%CI: 1.3-8.7) and previous caesarean section (AOR: 7.5; 95%CI: 1.3-14.4) were found to be significantly associated with gestational diabetes mellitus.

Conclusions: The prevalence of gestational diabetes mellitus is higher as compared to other studies conducted in the country. Strengthening screening, care and prevention strategies for gestational diabetes mellitus are important to improve maternal and child health.

Key words: Gestational diabetes mellitus; Southern Ethiopia; Diabetes in pregnancy; Wolaita Zone

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INTRODUCTION

Gestational diabetes mellitus (GDM) is a glucose intolerance of altering degrees of seriousness which starts or identified for first time during pregnancy. ¹Globally, prevalence of hyper-glycaemia in pregnancy among women of reproductive age group was approximated to be 16.9% and, about 90% of cases were estimated to happen in developing countries.¹

The health situation of pregnant mother with diabetes and

her unborn child can be endangered with different levels of complications. These complications can lead to death in worst situations.²

Gestational diabetes mellitus has also long-term public health importance. It contributes to the rising type 2 diabetes epidemic. It is a momentary phenomenon for the pregnant mother, but more than 50% of the women develop type 2 diabetes in future life and the tendency of their children to develop obesity as young children and type 2 diabetes later on is found to be higher.³

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The magnitude of GDM differs across countries based on some reasons like ethnic groups, life style, level of educational, family history of diabetes and many other factors.⁴

The most common cause of hyperglycaemia occurring during pregnancy is GDM, and its contribution is about 90% of all diabetes during pregnancy.⁵ It has been reported that GDM affects up to about 1 in 10 pregnancies, and its prevalence has been progressively increasing.⁶

Currently, availability of factors like changes in life style, dietary habits, urbanization, physical inactivity, the tendency towards delayed marriage and older maternal age in different parts of the globe are making favourable ground and the prevalence of GDM may very well be on the rise.⁷

Because of cost, numerous countries in Africa detect blood glucose level of pregnant women to diagnose GDM based on identified risk factors selectively and the proportion of women suffering from the case and the magnitude of the problem are unclear.⁸

In Ethiopia, although diabetes mellitus is recognized as one of the major non-communicable diseases, the magnitude of GDM among pregnant mothers and factors associated with it were not well researched.

Identifying the prevalence of the problem and common risk factors would be important to mitigate the problem on timely bases and helpful to health policy and program improvement.

Therefore, the study aimed to identify the prevalence of gestational diabetes mellitus among pregnant mothers and associated factors in Southern region of Ethiopia.

MATERIALS AND METHODS

The study was conducted in Southern part of Ethiopia from August 2017 to October 2017. The study site is one of the nine regions in Ethiopia and it consists of many different languages and ethnic groups within own diverse culture. The area of the region covers 10% of the national landmass and its boundary shows; there is Kenya to the south, Sudan to the southwest, Gambela regional state of Ethiopia to the west and Oromia regional state of Ethiopia to the North and North-East. The region is composed of 13 zones and of which Wolaita Zone is the one and situated in the south central part of the region, 330 km distance from Addis Ababa. The Zone has total population of about 2 million in 2017 as projected from 2007 national census. Wolaita zone is one of the most densely populated

areas in the country with an average of 640 people living per square kilometre. There are 3 Hospitals, 70 health centers and 380 health posts in the study area and among these 12 Health Centers and all three hospitals provide diagnostic and management service for pregnant women with diabetes mellitus.⁹

Cross sectional study design was employed. Mothers with gestational age of 24-28 weeks who were attending antenatal care service in selected 2 hospitals and 4 health centers during the survey period were included. The health facilities were selected randomly from total facilities providing treatment and care for pregnant women with gestational diabetes. The proportion from study conducted in Northern Ethiopia was used to calculate sample size.¹⁰ Our assessment involved 518 eligible mothers and all of them were willing for blood glucose level test. Women with previously diagnosed diabetes were excluded from the study. All mothers attending antenatal care service in the selected health facilities within study period were screened for GDM.

Structured questionnaire was used, and details pertaining to socio-demography, family history, medical and obstetric history were collected. Blood pressure was measured, 75 gm oral glucose administered, capillary glucose level was measured at 0hr and 2hr using HemoCue Glucose and GDM was diagnosed based on 2013 WHO criteria.¹¹

We used Epi Info 7 and STATA 14 (StataCorp, College Station, TX, USA) programs for data entry and analysis. Descriptive figures, frequency and percentages were calculated. Tables and figures were used to show descriptive findings. Multivariable logistic regression model was used to compute adjusted odds ratio and to evaluate the relationship between variables. *P*-values less than .05 were considered for statistical significance.

The study was approved by Institutional Review Board of Addis Ababa University. Wolaita Zone health department wrote letter of support and confirmed their willingness to conduct the research prior to the study. We got written consent from all participants before starting any component of data collection. Confidentiality was clarified and guaranteed. Women diagnosed with GDM and other medical problems were referred to appropriate care and management.

RESULTS

Socio demographic Characteristics

Total sample size required for the study was 564, among these 518 pregnant women participated in the study and making the response rate of 91.8%. Of 518 women

included in the study, 376(72.6%) were urban residents. Majority, 388(74.9%), were 21-30 years old. The mean age was 25.7 (4.4), nearly all, 506(97.7) were married. Most of the mothers, 422(81.5%), were from Wolaita ethnic group and 89 (17.2%) had not attended any formal education. Nearly half, 242 (46.7%) were housewives and working as government employee is the leading occupation of their partners, 205(40.5%) (Table 1).

Obstetric characteristic of respondents

Basic obstetric characteristics were assessed in this study. Screening of GDM was carried out at 24 to 28 gestational weeks. Of the 518 study participants, majority, 372(71.8%) had two or more pregnancies, with mean gestational age of 26 weeks. More than one third of the respondents, 187(36.1%), were multi-para. Out of 372 mothers who had two or more pregnancies, 45(12.1%) had previous history of still birth, 67(18%) had previous history of abortion, and caesarean section rate was 16.1% (Table 2).

Prevalence of GDM

Overall prevalence of gestational diabetes mellitus was 4.2% with mean post glucose load level of 160.1 mg/dl (6.3) and 15(4%) among urban residents and 7(4.9%) among rural residents. The proportion of gestational diabetes mellitus increases with increase in number of pregnancies (Figure 1).

Gestational diabetes mellitus was more common in multiparaous pregnant women, GDM was diagnosed in 4(2.3%) of primiparaous, 7(4.5%) of multiparaous and 11(33.3%) of grand multiparaous mothers and in other words 18%, 32% and 50% of total diagnosed cases were primiparaous, multiparaous and grand multiparaous mothers respectively.

Risk factors associated with gestational diabetes mellitus

Factors associated with GDM were identified by using binary logistic regression model. In bivariate logistic regression model, previous history of still birth (COR:4.8; 95%CI:1.9-12.3), previous history of spontaneous abortion (COR: 4.2; 95%CI: 1.8-10.4), family history of type II diabetes (AOR:6.2; 95%CI: 1.4-9.8) and previous caesarean section (COR: 7.5; 95%CI: 3.1-18.4) were identified to be statistically significant.

Multivariable analysis was used to control potential confounders. Accordingly, previous history of spontaneous abortion (AOR: 3.5; 95%CI: 1.7-14.6), family history of type II diabetes (AOR: 4.3; 95%CI: 1.3-8.7) and previous caesarean section (AOR: 7.5; 95%CI: 1.3-14.4) were found to be independently associated (Table 3).

Table 1: Selected Socio-demographic characteristics of respondents, Wolaita Zone, Southern Ethiopia, 2017

Characteristics	Number	Percent
Age (n=518)		
16-20	77	14.9
21-25	206	39.8
26-30	182	35.1
31-35	41	7.9
>35	12	2.3
Residence (n=518)		
Urban	376	72.6
Rural	142	27.4
Marital status (n=518)		
Married	506	97.7
Single/divorced/widowed	12	2.3
Religion (n=518)		
Protestant	342	66
Orthodox	137	26.4
Muslim	17	3.3
Catholic	11	2.1
Others+	11	2.1
Ethnicity (n=518)		
Wolaita	422	81.5
Amhara	47	9.1
Gamo	27	5.2
Guraghe	12	2.3
Others ++	10	1.9
Education of mother (n=518)		
No formal education	89	17.2
Primary	124	23.9
Secondary	150	29.0
Post- secondary	155	29.9
Occupation of mother (n=518)		
House wife	242	46.7
Government employee	174	33.6
Petty trade	60	11.6
NGO employee	26	5.0
Daily laborer	16	3.1
Spouse's education (n=506)		
No formal education	70	13.8
Primary	101	20.0
Secondary	127	25.1
Post -secondary	208	41.4
Spouse's occupation (n=506)		
Government employee	205	40.5
Petty trade	137	27.1
NGO employee	55	10.9
Daily laborer	82	16.2
Others+++	27	5.3

+ Apostolic, Traditional++Oromo, Tigrie, Silte +++ Farmer, Broker

DISCUSSION

The core purpose of this study was to measure the prevalence of GDM and to identify factors associated with it in Wolaita Zone, Southern Ethiopia. Total of 518 pregnant women with duration of 24-28 weeks of pregnancy were examined for gestational diabetes mellitus by using WHO 2013 recommendation. The overall prevalence of gestational diabetes mellitus was 4.2%, 15 (4%) among urban residents and 7(4.9%) among rural

Table 2: Selected obstetric and medical history of respondents, Wolaita Zone, Southern Ethiopia, 2017

Characteristics	Number	Percent
Gravidity		
One	146	28.2
Two	164	31.7
Three	107	20.7
Four	57	11.0
Five or more	44	8.5
Parity		
Nullipara	154	29.7
Para one	177	34.2
Multipara (2-4)	154	29.7
Grandmultipara (>5)	33	6.4
Gestational age in weeks		
24	124	23.9
25	86	16.6
26	88	17.0
27	93	18.0
28	127	24.5
Birth weight of previous child (n=308)		
Less than 2.5 kg	12	3.8
2.5-3.9 kg	236	76.6
4 kg or more	60	19.5
Previous still birth (n=372)		
Yes	45	12.1
No	327	87.9
Previous abortion (n=372)		
Yes	67	18.0
No	305	82.0
Previous caesarean section (n=372)		
Yes	60	16.1
No	312	83.9
Previous history of GDM (n=372)		
Yes	19	5.1
No	353	94.9
Family history of type II DM (n=416)		
Yes	57	13.7
No	359	86.3

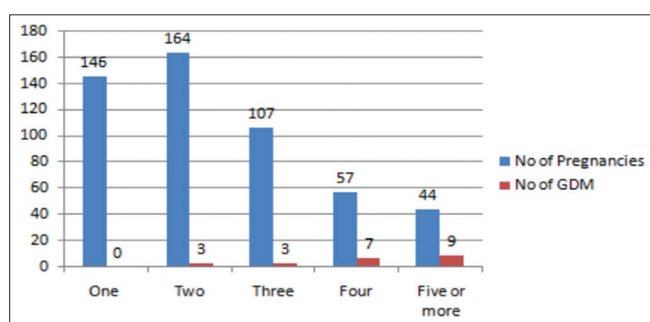


Figure 1: Number of Pregnancies and corresponding number of gestational diabetes mellitus of respondents in Wolaita Zone, Southern Ethiopia, 2017

residents which is relatively higher than previous point estimate of study conducted in Northern Ethiopia.¹⁰ It is also reported that GDM is increasing in most parts of the world during the past 20 years among several groups of population.⁷ This finding is almost comparable with findings of studies in Sri Lanka and Nigeria^{12,13} but lower

than some other countries' studies like India¹⁴, Qatar¹⁵, Argentina¹⁶, Pakistan¹⁷ and Tanzania.¹⁸ Differences in prevalence of gestational diabetes mellitus among different countries can be related to differences in socio-economic status, life style and variations in screening and diagnostic methods. Differences in screening technique and use of various diagnostic criteria have enacted difficulty in comparing the situation of GDM across countries; despite this fact, our finding indicates that the magnitude of the problem is increasing in the area.

In our study, the proportion of gestational diabetes mellitus increases with increase in number of pregnancies and was more common in multiparaous pregnant women; similar finding was reported by the study done in Qatar and it was indicated that the risk of GDM increases with number of pregnancy.¹⁹

In this study, GDM was associated with previous history of abortion; the odds of developing GDM was 3.5 times higher among women with previous history of abortion when compared with those who had no history of spontaneous abortion. This result is consistent with other study conducted in China and the study mentioned that previous history of spontaneous abortion was linked with elevated possibility of acquiring GDM.²⁰

Family history of type II diabetes mellitus was linked with the occurrence of GDM. From other evidence, those mother with positive family history of type II diabetes mellitus have higher risk of developing GDM.²¹

Previous history of caesarean section was independently predictor of gestational diabetes mellitus. This result is consistent with studies conducted in different countries. A study conducted in South Eastern Nigeria suggested that there is a significant relationship between previous history of caesarean delivery and occurrence of gestational diabetes.²² Similar findings have been stated in studies conducted in Tanzania¹⁷ and India²³, GDM was significantly associated with previous history of caesarean sections. There was no statistically significant association between mid-upper arm circumference and high blood pressure with occurrence of GDM.

CONCLUSION

The finding of this study point out that, the prevalence of GDM is higher as compared to other studies conducted in the country. The proportion of gestational diabetes mellitus increases with increase in number of pregnancies and was more common in multiparaous pregnant women. Previous histories of spontaneous abortion, family history of type II

Table 3: Bivariate and multivariate logistic analysis of factors associated with gestational diabetes mellitus among participants, Wolaita zone, Southern Ethiopia, 2017

Variable	Category	Gestational diabetes mellitus		COR (95%CI)	AOR (95%CI)
		Yes N (%)	No N(%)		
Residence	Urban	15 (4)	361 (96)	0.8 (0.3, 2.0)	3.6 (0.4, 13.6)
	Rural	7 (4.9)	135 (98.1)	1	1
Previous still birth	Yes	8 (36.4)	37 (10.6)	4.8 (1.9, 12.3)	2.8 (0.2, 3.5)
	No	14 (63.6)	313 (89.4)	1	1
Previous spontaneous abortion	Yes	10 (45.5)	57 (16.3)	4.2 (1.8, 10.4)*	3.5 (1.7, 14.6)*
	No	12 (54.5)	293 (83.7)	1	1
Birth weight of previous child	Less than 3999	14 (63.6)	228 (81.4)	1	1
	4000 gm or more	8 (36.4)	52 (18.6)	0.4 (0.2, 1.2)	0.7 (0.5, 1.8)
Previous caesarean section	Yes	12 (54.5)	48 (13.7)	7.5 (3.1, 18.4)*	7.5 (1.3, 14.4)*
	No	10 (45.5)	302 (86.3)	1	1
Family history of type II DM	Yes	11 (50)	57 (13.7)	6.2 (1.4, 9.8)*	4.3 (1.3, 8.7)*
	No	11 (50)	359 (86.3)	1	1
MUAC	Less than 28 cm	13 (59.1)	346 (69.8)	1	1
	More than 28 cm	9 (40.9)	150 (30.2)	0.6 (0.3, 1.5)	0.9 (0.1, 1.8)

diabetes mellitus and previous caesarean delivery were found to be risk factors of gestational diabetes. Health care providers should promote blood glucose level testing and strengthen gestational diabetes mellitus screening based on risk factors and putting preventive measures in place is helpful to prevent long term effects of GDM on the mother and newborn.

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Authors Contribution:

EW- Conceived and designed the study, reviewed the literature, performed analysis and interpretation of data, prepared the manuscript and critical revision of the manuscript; **WD**- Assisted with the study design, analysis and interpretation and critical revision of the manuscript; **AR**- Assisted interpretation and critical revision of the manuscript.

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