Original Article

Prevalence of Gestational Diabetes and Its Risk Factors in Meibod-Yazd 2013-2014

Mahmood Vakili[1], Mozhgan Modaressi[1], Razieh Zahabi[2], Arezoo Aghakoochak[3]*

1. Department of Community Medicine, School of Medicine, Shahid Sadoughi University of Medical Sciences, Yazd, Iran.
2. School of Medicine, Shahid Sadoughi University of Medical Sciences, Yazd, Iran.
3. Health Monitoring Research Center, Shahid Sadoughi University of Medical Sciences, Yazd, Iran.

Received: 2016/08/05 **Accepted:** 2016/11/20

Abstract

Introduction: Diabetes is the most common and important metabolic disorder in pregnancy period. This study aimed to determine the prevalence of gestational diabetes and its risk factors in Meibod County

Materials and Methods: This cross-sectional study was carried out using registered data of diabetes screening program for all pregnant women living in Meibod town during the years 2013-2014. In first gynecology visit, FBS test was conducted for 1209 pregnant women who had no past record of diabetes. According to existence or lack of risk factors, participants went through glucose 3-hour tolerance test (OGTT) with 75 grams of glucose. The data were analyzed using SPSS software (Vs. 18) by Chi-squared, t-test, and logistic regression test.

Results: Mean age of women with gestational diabetes was 27.8±5.85 while it was 26.1±5.35 for healthy women. There was significant relation between age, body mass index, parity, family record of the diabetes, and history of gestational diabetes (P=0.000). There was no significant relationship between gestational diabetes and history of hypertension, gestational diabetes, stillbirth, spontaneous abortion, child's weight of 4 kg or more at birth, and fetal abnormalities in previous pregnancies. There was also a significant correlation between gestational diabetes and number of risk factors (P<0.001).

Conclusion: According to the results, the prevalence of gestational diabetes was high in Meibod town and more studies are needed in this area.

Keywords: Prevalence, Gestational diabetes, Risk factors, Meibod-Yazd**.**

* **Corresponding author: Tel**: :+3538203410 **email**: a.aghakoochak@yahoo.com

[Downloaded from jhr.ssu.ac.ir on 2026-10-09]

Introduction

Gestational diabetes mellitus (GDM) is defined as any degree of glucose intolerance with onset or first recognition during pregnancy [1]. It represents the most common metabolic complication of pregnancy. GDM is associated with maternal and fetal morbidities [2]. Therefore, early diagnosis of GDM is essential to reduce maternal and fetal morbidity and to allow subsequent attempts to prevent from or delay the onset of type 2 diabetes [3]. The prevalence may range from 1% to 18% in all pregnancies, depending on the population studied and the diagnostic tests employed [4-5].

The prevalence of gestational diabetes in Iran was estimated at 5.88 % in a review study [6]. Various studies have shown that women with record of gestational diabetes are prone to glucose intolerance and diabetes type 2. Further, nearly 40 % of women with diagnosed gestational diabetes will be affected with apparent diabetes within 30 years [7]. In societies with higher rates of this type of diabetes, disease type 2 is more widespread. In fact, diabetes type 2 and gestational diabetes are interrelated [8]. Gestational diabetes increases the chance of diabetes for mothers after giving birth and causes some disorders in both children and mothers during pregnancy which include preterm labor, infections outcomes, polyhydroamniose, and increase of blood pressure. The problems for babies include intrauterine death, inherent disorders, problems related to growth (macrosomia, intra uterine growth retardation), metabolic disorders (hypoglycemia, hypocalcaemia), respiratory distress syndrome, prenatal mortality, and unjustified death in newborns [9]. Universal screening has been recommended since1980 while the Fourth Workshop on Gestational Diabetes [1] and more recently, the American Diabetes Association suggested selective screening for GDM only in women at high risk of glucose intolerance. Gestational diabetes screening has also been conducted in Iran.

Hence, considering gestational diabetes as a crucial medical, social, and economic issue, high prevalence of diabetes in Yazd province, and availability of data in Meibod with a population of nearly 80,000 people, this study was carried out to determine the prevalence of gestational diabetes and its risk factors in pregnant women in this town.

Materials and Methods

This analytical cross-sectional study was carried out using statistics obtained from gestational diabetes screening program in all pregnant women living in Meibod. 1245 pregnant women with census sampling were studied from Jan, 2013 to Des, 2014 in Meibod. Then, 36 women were excluded from the study due to their record of diabetes before pregnancy, use of drugs which affects glucose metabolism such as steroids, and having history of chronic hepatic illness. The participants' first day of menstruation,, age, height, weight, history of diabetes in first-degree relatives, marital status, history of

[Downloaded from jhr.ssu.ac.ir on 2026-10-09]

earlier high-risk pregnancy (miscarriage, giving birth to babies with more than 4 kilograms of weight), and blood pressure were recorded at first visit. If the pregnant women did not have past record of diabetes, they would have to take the test of fasting blood sugar (FBS) with standard situations (at least 8 hours fasting). American Diabetes Association (ADA) criteria were used to diagnose GDM. If results of the two FBS tests were equal or higher than 126, the testee was recognized to have diabetes. If FBS was in the range of 92-126 mg/dl, it was considered as gestational diabetes. If FBS was less than 92 mg/dl participants were tested for existence of gestational diabetes' risk factors, and then decisions were made according to the final results. High risk pregnant women had one risk factor of GDM including: age over 30 years, history of gestational diabetes in a previous pregnancy, history of pre-diabetes (IGT or IFG), history of diabetes in first-grade family (father , mother, sister , brother), history of hypertension, birth of a child over 4 kg, BMI equals to or greater than 30 kilograms per square meter before pregnancy, 2 or 3 unreasonable spontaneous abortion , history of stillbirth, and finally history of fetal abnormalities in previous pregnancies. The other participants would be classified as non-risky women. In high-risk women, if diabetes type 2 or GDM was not certainly diagnosed after previous stages and FBS test, they should take the standard triple OGTT test with 75 grams of glucose after 3 days of diet without any limitation on carbohydrate intake (150-200 grams) as soon as possible. Normal levels of plasma glucose in this test are the fasting plasma glucose of less than 92 mg/dl, plasma glucose after one hour OGTT of less than180 mg/dl, and plasma glucose after two hours OGTT of less than 153 mg/dl. Then, decisions should be made according to the results of OGTT. In the three above mentioned measurements, even one abnormal test result was considered as gestational diabetes. If OGTT results were normal, GDM test should be repeated in 24-28 weeks of pregnancy. In pregnant women without risk factors, OGTT test should be carried out in 24-28 weeks of pregnancy then the decision was made on the basis of the test results. Analysis was carried out through SPSS software (Version 18) and by chi-squared, t-test, and logistic regression test. The significance level was set at less than 0.05.

Results

The age range of participants was within15-46 years with the mean of 26.6±5.5 years. The mean number of pregnancy was 1.9 ±1.03. The mean of gestational age on admission was 11.2±5.6 weeks. The BMI mean was 25.03±5.09. The mean age of women with and without gestational diabetes were 27.8± 5.85 and 26.1±5.35, respectively (P <0.0001). Results showed a significant relation between age and prevalence of GDM (figure 1); 47.4% in women of 40 years and older. The body mass index mean in women with gestational diabetes and healthy women were respectively 26.9±5.48 and 24.6±4.78 (P <0.0001). The mean number of pregnancy in women with gestational diabetes was 2.15±1.12 while it

[Downloaded from jhr.ssu.ac.ir on 2026-10-09]

was 1.85±0.96 in women without gestational diabetes (P <0.0001).

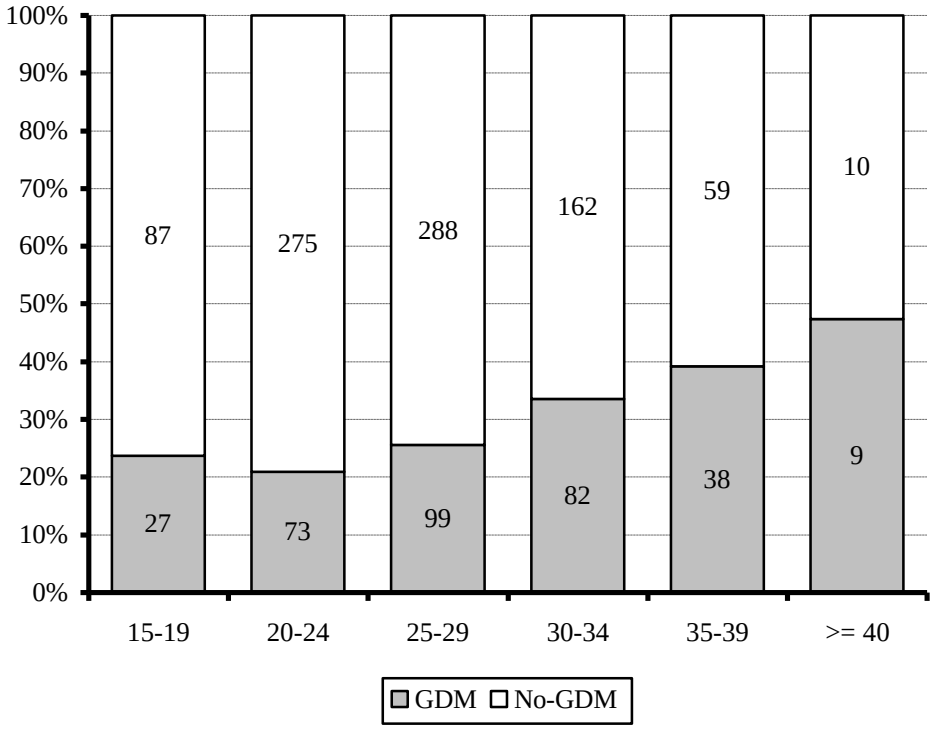

Fig. 1 - The frequency of gestational diabetes mellitus (GDM) by age-groups

In this study, 1209 pregnant women were screened, 559 women (46.2 %) did not have risk factors, consequently, the other 103 women (18.4%) had gestational diabetes. 645 women (53.4%) had at least one risk factor that results in a total number of 224 women (34.7%) with gestational diabetes. Data on risk factors of 5 women (0.4%) were missed. There was not any significant relationship between past records of blood pressure, gestational diabetes, stillbirth, abortion (two times or more), macrosomia, previous history of neonatal malformations, residential areas of urban or rural women, and gestational diabetes. There was significant correlation between gestational diabetes with age, history of diabetes in first-degree relatives, BMI (P<0.001), as well as number of risk factor (table1).

[Downloaded from jhr.ssu.ac.ir on 2026-10-09]

Table1: The frequency 0f gestational diabetes mellitus (GDM) by number of risk factors

Number of Risk factor	No GDM		GDM		Total	
	Number	Percent	Number	Percent	Number	Percent
0	456	81.6%	103	18.4%	559	100%
1	310	71.3%	125	28.7%	435	100%
2	90	54.5%	75	45.5%	165	100%
>=3	21	46.7%	24	53.3%	45	100%

χ^2=65.59 , p-value<0.0001

In logistic regression model predictive factors for gestational diabetes were history of diabetes in first-degree relatives, age and BMI. The chance of BMI ≥25 in women with gestational diabetic was 1.71 times higher than women without gestational diabetes.(OR:1.71, 95%CI: 1.30 – 2.25). The chance of positive history of diabetes in first degree (OR:1.88, 95%CI: 1.41 – 2.50) and age ≥ 30 (OR:1.60, 95%CI: 1.21 – 2.12) in women with gestational diabetic were 1.88 and 1.6 times higher than women without gestational diabetes respectively.

Discussion

This study was carried out to evaluate the prevalence of gestational diabetes and related risk factors in 1209 pregnant women living in Meibod who were screened for GDM. The results showed that the prevalence of gestational diabetes in the mentioned group is 27.1 %, which is considered to be high in comparison with other parts of Iran. The prevalence of gestational diabetes in previous studies conducted in different areas was 1-18%. Moreover, this difference is related to race, lifestyle, and differences in data collection methods, non-random selection, and diagnostic criteria. In a review paper carried out in 11 provinces of Iran (2009), prevalence of GDM was reported to be in the range of 1.3 - 8.9 % [10]. Moreover, Janghorbani showed that the prevalence of this disease in Iran varies from 1.3 to 11.9 %. The highest and the lowest rate belonged to Orumieh and Ardabil, respectively [11]. In the review study conducted by Mire in 2013 the prevalence of gestational diabetes was 4.9 %. The lowest rate belonged to Kermanshah with 0.7 % while the highest rate was in Karaj with 18.6 % [12]. The prevalence of gestational diabetes has been reported 3.8% in Isfahan, 5.1% in Birjand, and 8.05% in Babol in 2012 and 4.9% in Gorgan in 2013 [13-16]. Almasi and Salehi Nia in their review investigated 12 provinces of Iran and reported the prevalence of GDM as 5.88%. This rate has had changes in various studies from 1.3 to 18.6 %. The lowest rate was in Ardebil (1.3%) and the highest rate was in

[Downloaded from jhr.ssu.ac.ir on 2026-10-09]

Karaj (18.6%) [6]. Another study conducted in Northern California indicated that the highest incidence of gestational diabetes was among Asians (7.4%) [17]. The prevalence of GDM was 4% in the USA in 2012 [18] and 2-6 % in Europe in 2011. The rate has been reported to be within the range of 1.7 - 11.6 % in developed countries [19]. In 2013, the rate was 4.8% and 5.9 in Nigeria and Tanzania, respectively. Moreover, in 2008 the risk factor was up to 4.3 % in Greenland among pregnant women [20-22]. The spread in Bangladesh was 9.7 % in accordance with WHP criteria and 12.9 % according to ADA criteria [23]. In Vietnam also the spread was 6.1 % using ADA and up to 20.3% according to IADPG [24].

The results of the current research showed that the means of age and BMI in the earliest part of pregnancy in women diagnosed with GDM were significantly higher than no-GDM group. With an increase in age, body mass index increases as well, this surge, in part, causes tolerance to insulin. The spread of diabetes in age range of 30 or higher was 34.7 % while it was 22.8 % for ages of lower than 30 years. This shows that the frequency of GDM increases as one grows older than 30. This finding supports the previous researches conducted by Bouzari, Hedaiati, Gloi, and Eshghi [13-16]. In Orumieh in 2008 the frequency of GDM in ages of lower than 25 years was 2.89 % and in women older than 25 years was 26.6 % [25]. In Qatar, Nigeria, and Bangladesh the increase of age and body mass index were interrelated to the rate of gestational diabetes [26-20-13]. In Simas Study (2014) conducted on Hispanic women, age had significant relation with gestational diabetes but did not have any link with body mass index at the beginning and end of the pregnancy. It also had significant relationship with the extent of weight gaining during pregnancy [27]. However, in the study carried out by Pederson no significant relation was found between age and body mass index in the two groups [28].

In this study there was a significant relation between parity and gestational diabetes. With an increase in the number of pregnancies, the frequency of diabetes increases as well. It is natural that with growing the number of pregnancies, the woman's age and body mass index increase. This could explain the surge in the frequency of GDM with an increase in the number of pregnancies. Majlesi, Pederson, Jasmin, and Bener supported this statement [22-23-26-28]. However, in the study conducted by Hedaiati, Eshghi nia, and Marjan Goli no significant relationship was found between number of pregnancies and the increase in gestational diabetes [13-14-16].

The current study showed that there is a significant relationship between family past record of diabetes and gestational diabetes. This may be because gestational diabetes has similar risk factors as diabetes type 2 and the spread of these two medical conditions are the same. The results are consistent with findings of Marjangoli, Hedaiati, Bouzari, and Eshghinia [13-16]. In Mawnri's and Bener's study the spread of gestational diabetes in women whose first-degree relatives had diabetes, was higher. However, in Pederson

[Downloaded from jhr.ssu.ac.ir on 2026-10-09]

and Chinwe's study there was no significant link between the two groups with record of relatives [21-22-23-26]. Hedaiati, Marjangoli, Eshghinia, and Majlesi reported significant difference in their studies that could be due to the fact that in the current study the number of people who had gestational diabetes was rather low or the fact that the mean number of pregnancies was low [13-14-16-28].

In the present study there was not any significant relation between past records of hypertension, miscarriage, and macrosomian babies which was consistent with Hedaiati's study in this regard [14]. In Bouzari's study, however, there was significant difference between all the aforementioned factors for diabetic women and that of healthy women [15]. In Jesmin's study there was not any significant relation between fetal weight gain and miscarriage, and gestational diabetes [23].

Marjan Goli indicated no significant relationship between stillbirth, macrosomian baby, and gestational diabetes but found significant relations between stillbirth and babies with disorders in the two groups of healthy normal moms and mothers plagued with gestational diabetes [13]. In the study carried out by Eshghinia there was a significant relation between mocrosomain babies and gestational diabetes in the two groups of healthy mothers and moms who suffered from gestational diabetes, while no relation was reported between high blood pressure and birth of babies with disorders with gestational diabetes [16]. In Tanzania (2013) a significant relation was found between residential areas (i.e., rural or urban) and gestational diabetes; 1 % in rural women and 4.8 % in urban women. This nuance may be due to more physical activity and labor of rural than urban women as well as consumption of more healthy foods in rural area [21]. According to the studies carried out in different parts of the world screening methods for gestational diabetes are subject to question. According to various spread rates of the disease all across the world, various methods have been proposed to be used in different parts of the world. In this study, among 1245 women who were evaluated, 559 participants were in the low-risk category, meaning that they had no risk factor for gestational diabetes. Among them 103 people were diagnosed with gestational diabetes. Hence, the disease's spread rate in low-risk people was 18.4 % in this study. Further, Marjan Goly (2014) evaluated women and reported that 332 of them did not have any risk factor for the disease, only one had gestational diabetes (i.e. 0.3 % in low-risk people) [13]. At last the researchers concluded that in the aforementioned society the selective screening tests had priority over general ones. Only 0.3 % of low-risk people remain without diagnosis which is rather acceptable for a screening test [13]. According to the obtained results from this study and the high spread of gestational diabetes in the whole studied population, general screening is recommended. In selective screening studies, one criterion for the low risk group was not being resident of societies with high rate of gestational diabetes [26]. Given the high prevalence of diabetes in

[Downloaded from jhr.ssu.ac.ir on 2026-10-09]

our society universal screening is recommended. One of the limitations of the study was the fact that women did not know about their diabetes before conception time. Moreover, some participants were eliminated because the demographic information was not complete or did not follow up the results of their tests. Thus, access to total information for further analysis was impossible.

Conclusion

According to the findings, it seems that gestational diabetes had significant relation with older ages, increase in body mass index, positive past history of diabetes in first degree relatives, and number of risk factors in pregnant women. Moreover, because of GDM high prevalence in Meibod town, general screening is strongly recommended and more studies are needed to be conducted in this area and other parts of Yazd province.

Acknowledgment

We appreciate of the health center personnel of Meibod that helped us in this study.

Conflict of Interest

None

References

1. Metzger BE CD. Summary and recommendations of the Fourth International Workshop Conference on Gestational Diabetes Mellitus: The Organizing Committee. Diabetes Care. 1998;21 (Suppl) 2:161-167.
2. Kjos SL BT. Gestational diabetes mellitus. . New England Journal Medicine. 1999;341:1749-56.
3. Berkowitz K, Peters R, Kjos S, et al. Effect of troglitazone on insulin sensitivity and pancreatic beta-cell function in women at high risk for NIDDM. Diabetes. 1996;45(11):1572-9.
4. Jovanovic L PD. Gestational diabetes mellitus. . JAMA. 2001;286:2516-8.
5. Mellitus GD. Position statement American Diabetes Association. Diabetes Care. 2004;27(Suppl. 1):S88-S90.
6. Almasi S-Z, Salehiniya H. The prevalence of Gestational Diabetes Mellitus in Iran (1993-2013): A Systematic Review. Journal of Isfahan Medical School. 2014;32(299):1396-412.
7. Bian X, Gao P, Xiong X, et al. Risk factors for development of diabetes mellitus in women with a history of gestational diabetes mellitus. Chinese Medical Journal. 2000;113(8):759-62.
8. MacNeill S, Dodds L, Hamilton DC, et al. Rates and risk factors for recurrence of gestational diabetes. Diabetes Care. 2001;24(4):659-62.
9. Larijani B, Pajouhi M, Bastanhagh MH, et al. Prevalence of gestational diabetes in 2100 women in Tehran. Iranian Journal of Endocrinology & Metabolism. 1999;1(2):125-33.
10. Nikoo MK, Ahranjani SA, Larijani B. A review on the prevalence of gestational diabetes mellitus (GDM) in different regions of Iran. Iranian Journal of Diabetes and Lipid Disorders. 2009;1(8):47-56.
11. Janghorbani M, Enjezab B. Review of Epidemiology of Gestational Diabetes in Iran. Journal of Isfahan Medical School. 2010;28(110):1-16.
12. Sayehmiri F, Bakhtyari S, Darvishi P, et al. Prevalence of gestational diabetes mellitus in Iran: a systematic review and meta-analysis study. The Iranian Journal of Obstetric, Gynecology and Infertility. 2013;15:16-23.
13. Goli M, Firouzeh F. Prevalence of gestational diabetes and efficacy of risk factors in screening of referrals to health centers. Holistic Nursing And Midwifery Journal. 2014;24(3):56-63.

[Downloaded from jhr.ssu.ac.ir on 2026-10-09]

14. Hedayati H, Khazaee T, Mogharrab M, et al. Prevalence of gestational diabetes mellitus and overt diabetes in perganant women in Birjand. Modern Care Journal. 2012;8(4):238-44.
15. Bouzari Z, Yazdani S, Abedi Samakosh M, et al. Prevalence of Gestational Diabetes and Its Risk Factors in Pregnant Women Referred to Health Centers of Babol, Iran, from September 2010 to March 2012. The Iranian Journal of Obstetrics, Gynecology and Infertility. 2013;16(43):6-13.
16. Mohammadzadeh FME, Eshghinia S, Kazeminejhad V, et al. Prevalence and risk factors of gestational diabetes in pregnant women in Gorgan (2011-2012). Iranian Journal of Diabetes and Lipid Disorders. 2013;12(3):204-10.
17. Ferrara A, Kahn HS, Quesenberry CP, et al. An increase in the incidence of gestational diabetes mellitus: Northern California, 1991–2000. Obstetrics & Gynecology. 2004;103(3):526-33.
18. Chasan-Taber L. Gestational Diabetes Is It Preventable? American Journal of Lifestyle Medicine. 2012;6(5):395-406.
19. Buckley B, Harreiter J, Damm P, et al. Gestational diabetes mellitus in Europe: prevalence, current screening practice and barriers to screening. A review. Diabetic medicine. 2012;29(7):844-54.
20. Ewenighi CO, Nwanjo HU, Dimkpa U, et al. Prevalence of gestational diabetes mellitus; risk factors among pregnant women (in Abakaliki Metropolis, Ebonyi State Nigeria.). National Journal of Integrated Research in Medicine 2013;4(1):56-61.
21. Mwanri AW, Kinabo J, Ramaiya K, et al. Prevalence of gestational diabetes mellitus in urban and rural Tanzania. Diabetes Research and Clinical Practice. 2014;103(1):71-8.
22. Pedersen ML, Jacobsen JL, Jørgensen ME. Prevalence of gestational diabetes mellitus among women born in Greenland: measuring the effectiveness of the current screening procedure. International Journal of Circumpolar Health. 2010;69(4):352-60.
23. Jesmin S, Akter S, Akashi H, et al. Screening for gestational diabetes mellitus and its prevalence in Bangladesh. Diabetes Research and Clinical Practice. 2014;103(1):57-62.
24. Hirst JE, Tran TS, Do MAT, et al. Consequences of gestational diabetes in an urban hospital in Viet Nam: a prospective cohort study. PLoS Med. 2012;9(7):e1001272.
25. Manafi M, Ansari MH, Rabieipour S, et al. Gestation Diabetes Mellitus Incidence in The Pregnant Women Referred to Urmia Medical Centers. The Journal of Urmia University of Medical Sciences 2008;19(2):158-162.[Persian]
26. Bener A, Saleh NM, Al-Hamaq A. Prevalence of gestational diabetes and associated maternal and neonatal complications in a fast-developing community: global comparisons. International Journal of Womens Health. 2011;3:367-73.
27. Moore Simas TA, Szegda KL, Liao X, et al. Cigarette smoking and gestational diabetes mellitus in Hispanic woman. Diabetes Reserch and Clinical Practice 2014;105:126-34.
28. Zokaie M, Majlesi F, Rahimi-Foroushani A, et al. Risk factors for gestational diabetes mellitus in Sanandaj, Iran. Chronic Diseases Journal. 2014;2(1):1-9.

[Downloaded from jhr.ssu.ac.ir on 2026-10-09]