**Journal of Family Medicine and Health Care**
2017; 3(1): 6-11
http://www.sciencepublishinggroup.com/j/jfmhc
doi: 10.11648/j.jfmhc.20170301.12
ISSN: 2469-8326 (Print); ISSN: 2469-8342 (Online)

# Screening for Gestational Diabetes Among Pregnant Women Attending a Rural Family Health Center- Menoufia Governorate- Egypt

**Nora A. Khalil[1], Waleed M. Fathy[2], Nariman S. Mahmoud[3]**

[1]Family Medicine Department, Menoufia University, Menoufia Governorate, Egypt
[2]Clinical Pathology Department, Menoufia University, Menoufia Governorate, Egypt
[3]Menouf Primary Health Care Unit, Ministry of Health, Menoufia Governorate, Egypt

## Email address:
nora_abdelhady@yahoo.com (N. A. Khalil)

## To cite this article:
Nora A. Khalil, Waleed M. Fathy, Nariman S. Mahmoud. Screening for Gestational Diabetes Among Pregnant Women Attending a Rural Family Health Center- Menoufia Governorate- Egypt. *Journal of Family Medicine and Health Care.* Vol. 3, No. 1, 2017, pp. 6-11.
doi: 10.11648/j.jfmhc.20170301.12

**Received**: December 12, 2016; **Accepted**: December 28, 2016; **Published**: January 16, 2017

**Abstract:** *Objectives:* Study prevalence of gestational diabetes mellitus (GDM) among pregnant females attending family health center between 24 and 28 weeks of gestation and assessment of risk factors among the studied group. *Background:* Gestational diabetes mellitus (GDM) is the most prevalent metabolic disorder during pregnancy. It is defined as any degree of glucose intolerance during pregnancy. It affects between 2-14% of pregnancies. Screening for (GDM) during pregnancy is highly recommended. *Material and Methods:* The study was conducted on 250 pregnant women between 24 and 28 weeks gestation who attended a rural family health center in Menufia Governorate, Egypt. Selected participants were interviewed during their antenatal care visits using a questionnaire to assess different demographic criteria of the participants and potential risk factors for GDM. Initial screening was done by a glucose challenge test with 50 g glucose. If the 1-hour blood glucose level exceeded 130 mg/dl, then a 3-hour oral glucose tolerance test (OGTT) with 100g glucose was performed and diagnosis was established. *Results:* Prevalence of GDM among the studied group was 8%. Risk factors found to be significantly associated with GDM were advancing age & BMI ≥ 30, high BP> 140/90, previous history of pre-eclampsia, family history of diabetes and positive obstetric history for induced labor, abortion and large size baby. However socioeconomic status, previous history of hypertension and family history of hypertension failed to demonstrate significant associations with GDM. *Conclusion:* The prevalence of GDM was found to be 8% among pregnant females attending the studied rural family health center. Controlling risk factors and Screening for early detection are mandatory for better maternal and fetal health.

**Keywords:** Gestational Diabetes Mellitus, Prevalence, Risk Factors, Screening for GDM

## 1. Introduction

Gestational diabetes mellitus (GDM) is considered to be the most prevalent metabolic disorder during pregnancy. It is defined as glucose intolerance of varying severity diagnosed during pregnancy that usually resolves postpartum. It typically occurs during the second trimester of pregnancy and is diagnosed at 24 to 28 WK of gestation with an oral glucose tolerance test [1].

Numerous epidemiological studies show that this disorder affects between 1% and 18% of pregnancies, depending on the populations studied and the diagnostic criteria. Its incidence is constantly rising [2].

The prevalence of (GDM) among pregnant women in the united states worldwide ranges from 3% to 7%, depending on the population studied [3].

Factors that already reported to influence the risk of gestational diabetes mellitus (GDM) among mothers are: previous history of gestational diabetes mellitus (GDM), family history of diabetes, obesity, recurrent urinary tract infections, infertility treatment, unexplained neonatal death, macrosomic babies, premturity, pre-eclampsia and advanced maternal age [4].

The clinical presentation of diabetes mellitus in pregnancy

may be quite varied, but the classical triad of the symptoms of polydipsia, and polyuria may not be reported by most patients during pregnancy. The patients may present with previous history of medical complications of diabetes mellitus (chronic hypertension/chronic renal disease) and obesity [5].

International Association of diabetes and pregnancy study groups (IADPSG) based has introduced a gestational diabetes mellitus (GDM) criteria in an attempt to unify the gestational diabetes mellitus (GDM) criteria throughout the world. The IADPSG criteria require three samples i.e., fasting, 1 h, and 2 h after 75g glucose, whereas the WHO criteria need two samples namely the fasting and 2 h [6].

Gestational diabetes mellitus (GDM) is a reversible condition and women who have adequate control of glucose levels can effectively decrease the associated risks and give birth to healthy babies [7].

*Objectives:*

Study the prevalence of (GDM) among pregnant females attending to a rural family health center between 24 and 28 weeks of gestation and assessment of risk factors for (GDM) among the studied group.

## 2. Subjects and Methods

This study was carried out during the period from the 1st of January 2015 till the end of July 2016 in Monshaat sultan family health center, Menoufia governorate, Egypt. The study protocol was reviewed and formally approved by ethics committee of Faculty of Medicine, Menoufia University.

In this study, the calculated sample size was calculated using Raosoft on line sample size calculator based on the world wide prevalence of GDM (ranges from 3% to & 7%) -with relative error of 5% at level of significance of 95%- and the size of the studied population. A sample of 230 eligible subjects was required and was increased to 250 for any data loss.

All pregnant women with estimated gestational age between 24th and 28th weeks attending the selected FHC for their antenatal care visits were included in the study. All women were informed about the nature of study and those who consented were included in the study. Women who were known diabetics, or who were suffering from any chronic illness were excluded from the study.

All pregnant women included in the study were interviewed using a questionnaire that included questions to collect personal data (age, education, occupation) and determine socioeconomic standard according to the scoring system of Ibrahim and Abdel Ghaffar; after modification to suit the current socioeconomic status in Egypt. It includes education of the mother, occupation and education, family size, and income. The socioeconomic scores were as follows: high (9–12), middle (5 to <9), and low (<5).

Also it included questions to assess potential risk factors for GDM in their obstetric history, life style habits (as smoking), medical history which includes: Chronic diseases (as diabetes, hypertension) and drug intake, and previous operations. Other risk factors of the disease involving BMI before pregnancy, blood pressure measurement, previous history of Large size baby (4 kg or more ), Pre-eclampsia, Still birth and previous history of abortions.

Initial screening was done by a glucose challenge test with 50 g glucose. If the 1-hour blood glucose level exceeded 130 mg/dl, then a 3-hour oral glucose tolerance test (OGTT) with 100g glucose was performed and diagnosis was established according to American Diabetes Association criteria (Principle: Glucose is phosphorylated by ATP in the presence of Hexokinase and $Mg^2$. The glucose-6-phosphate formed is oxidized by glucose-6-phosphate dehydrogenase (G-6-PD) to 6-phosphogluconate in the presence of nicotineamide-adenine dinucleotide ($NAD^+$). The amount of NADH produced is directly proportional to the amount of glucose in the sample and is measured by absorbance at 340 nm) [8].

The following are the values which the American Diabetes Association considers to be abnormal during the 100 g OGTT: [Fasting plasma glucose level ≥ 105mg/dl (5.8mmol/L), 1hr plasma glucose level ≥ 190mg/dl (10.6mmol/L), 2hrs plasma glucose level ≥165mg/dl (9.2mmol/L) and 3hrs plasma glucose level ≥ 145mg/dl (8mmol/L)]. Two or more criteria must be met or exceeded for a positive diagnosis [9].

Statistical analysis

Data was statistically analyzed using SPSS with statistical package version 16. Numerical data were expressed as mean and standard deviation or median and range as appropriate. Qualitative data were expressed as frequency and percentage. Chi-square test (Fisher's exact test) was used to examine the relation between qualitative variables. For quantitative data, Student's t-test, was used to collectively indicate the presence of any significant difference between two groups for a normally distributed quantitative variable. P-value < 0.05 was considered significant difference & p-value >0.05 was considered non-significant difference.

## 3. Results

Present study found that 22.4% Of pregnant women between 24- 28 weeks gestation were + ve for GDM when screened by one-hour OGCT Figure (1).

Among those with +ve one-hour oral glucose challenge test (OGCT) only 35.7% of them have +ve three- hours oral glucose tolerance test (OGTT) Figure (2).

Overall Prevalence of gestational diabetes mellitus (GDM) according to screening with three- hour oral glucose tolerance test (OGTT) was 8% among the studied pregnant women Figure (3).

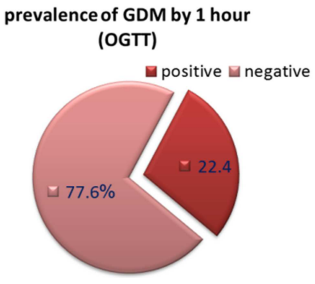


***Figure 1.*** *Prevalence of GDM according to screening with one- hour (OGCT) among the studied pregnant women.*

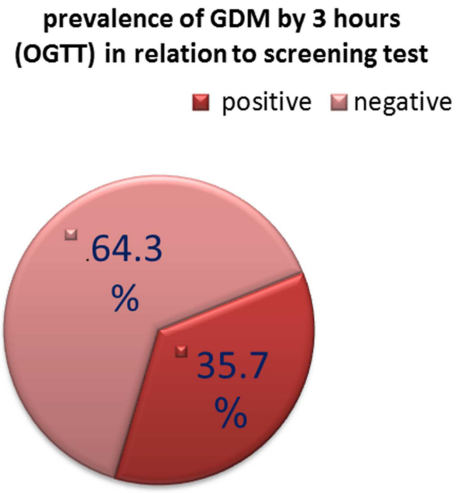


***Figure 2.*** *Prevalence of GDM according to screening with three- hour (OGTT) among the studied pregnant women with + ve one-hour (OGCT).*

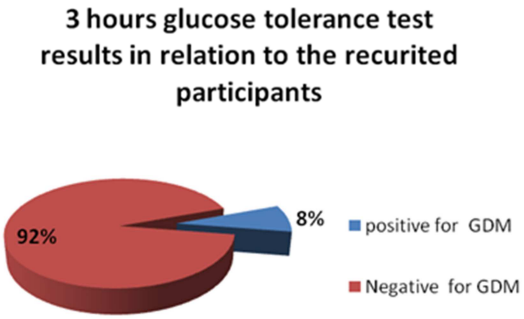


***Figure 3.*** *Overall prevalence of GDM among the studied pregnant women.*

The total number of pregnant females included in the study was 250 between 24- 28 weeks for gestational age. There was statistically significant difference between cases of GDM and control group regarding age, education and occupation; being more prevalent at age ≥ 30 years old, among those with secondary educational level and governmental employee. However, no significant relation was found between the two groups regarding socioeconomic level Table (1).

There was no statistically significant difference between group of cases and negative group for GDM regarding previous history of HTN and family history of HTN. However there was a significant difference between them regarding previous history of preeclampsia as 100% of the control groups have negative history for preeclampsia (P. value <0.001). The mean ± SD for measured blood pressure was significantly higher among +ve cases for GDM. About 45% of cases with GDM had a family history of DM, this association was found to be significant(P value < 0.001). Table (2).

There was statistically significant difference between positive and negative groups for GDM regarding parity, previous history induction of labor, previous history of abortion and large size baby; as, 85% of cases are multiparous, and 98.7% of the negative groups have negative history of large size baby. Table (3).

There was statistically significant difference between both groups regarding passive smoking and BMI; as 85% of +ve cases for GDM have been exposed to passive smoking (P value < 0.001), and 80% of them group had history of obesity (BMI ≥30) before pregnancy (P value < 0.001) Table (4).

***Table 1.*** *Comparison between negative and positive cases for GDM regarding socio-demographic criteria of the studied pregnant women.*

| **Socio-demographic data** | **Studied women** | | | | $\chi^2$ | **P value** |
|---|---|---|---|---|---|---|
| | **+ve cases (No=20)** | | **-ve cases (No=230)** | | | |
| | **No.** | **%** | **No.** | **%** | | |
| Age (years): | | | | | | |
| - <30 | 5 | 25 | 214 | 93 | 78.4 | 0.00** |
| - ≥30 | 15 | 75 | 16 | 7 | | |
| Education: | | | | | | |
| - High* | 2 | 10 | 75 | 32.6 | 7.76 | 0.00** |
| - Secondary | 12 | 60 | 128 | 55.6 | | |
| -Primary or less | 6 | 30 | 27 | 11.7 | | |
| Occupation: | | | | | | |
| House wife | 7 | 35 | 179 | 77.8 | 14.2 | 0.00** |
| Governmental employee* | 8 | 40 | 36 | 15.6 | | |
| Non governmental employee | 5 | 25 | 15 | 6.5 | | |
| Socioeconomic level: | | | | | | |
| Low | 7 | 35 | 67 | 29.1 | | |
| Moderate | 11 | 55 | 134 | 58.3 | 0.35 | 0.8 |
| High | 2 | 10 | 29 | 12.6 | | |

***Table 2.*** *Relationship of GDM to medical and family of the studied pregnant women.*

| Hypertension | Studied Women | | | | $\chi^2$ | P value |
|---|---|---|---|---|---|---|
| | +ve Cases (No=20) | | -ve cases (No=230) | | | |
| | No. | % | No. | % | | |
| Previous history of hypertension: | | | | | | |
| Yes | 2 | 10 | 6 | 3 | 3.25 | 0.25 |
| No | 18 | 90 | 224 | 97 | | |
| Previous history of preeclampsia: | | | | | | |
| Yes | 6 | 30 | 0 | 0 | 70.6 | 0.00* |
| No | 14 | 70 | 230 | 100 | | |
| Family history of hypertension: | | | | | | |
| - Yes | 8 | 40 | 71 | 32.1 | 0.52 | 0.64 |
| - No | 12 | 60 | 150 | 67.9 | | |
| Family history of diabetes: | | | | | | |
| Yes | 9 | 45 | 12 | 5.2 | 37.8 | 0.00** |
| No | 11 | 55 | 218 | 94.8 | | |
| Measured blood pressure | Mean ± SD | | Mean ± SD | | t test | P value |
| Mean blood pressure | (87.5±12.89) | | (79.3±9.95) | | 2.78 | 0.001* |

***Table 3.*** *Relationship of GDM to obstetric history of the studied pregnant women.*

| Obstetric history | Studied Women | | | | $\chi^2$ | P value |
|---|---|---|---|---|---|---|
| | +ve Cases (No=20) | | -ve Cases (No=230) | | | |
| | No. | % | No. | % | | |
| Number of previous pregnancies: | | | | | | |
| Primigravida | 1 | 5 | 35 | 15.2 | 114.3 | 0.00** |
| 1-2 | 2 | 10 | 183 | 79.6 | | |
| ≥3 | 17 | 85 | 12 | 5.2 | | |
| Mode of previous labour (no= 216): | | | | | | |
| Spontaneous labour | 8 | 42 | 173 | 88.7 | 28.8 | 0.00** |
| Induction of labour | 11 | 58 | 22 | 11.3 | | |
| Previous history of abortions: | | | | | | |
| Yes | 6 | 30 | 22 | 6.5 | 13.2 | 0.001* |
| No | 14 | 70 | 215 | 93.5 | | |
| Large size baby: | | | | | | |
| Yes | 7 | 35 | 3 | 1.3 | 54.4 | 0.00** |
| No | 13 | 65 | 227 | 98.7 | | |

***Table 4.*** *Relationship of GDM to smoking and BMI before pregnancy among the studied pregnant women.*

| Smoking | Studied Women | | | | $\chi^2$ | P value |
|---|---|---|---|---|---|---|
| | Cases (No=20) | | Controls (No=230) | | | |
| | No. | % | No. | % | | |
| smoking: | | | | | | |
| Passive | 17 | 85 | 50 | 21.7 | 34.4 | 0.00** |
| No exposure to smoking | 3 | 15 | 180 | 78.3 | | |
| Body mass index: | | | | | | |
| Not obese < 30 | 8 | 20 | 210 | 91.3 | 38.9 | 0.00** |
| Obese ≥30 | 12 | 80 | 20 | 8.7 | | |

# 4. Discussion

Gestational Diabetes Mellitus (GDM) is a glucose tolerance disorder that occurs or diagnosed for the first time during pregnancy. It has been reported that GDM affects 1%–14% of all pregnancies, and that its incidence has been steadily rising [10]. It is associated with an increased risk of complications for mother and child during pregnancy and birth.

In the current study, prevalence of GDM among the studied pregnant females was 8%. These results come in parallel to the results of a studies [11] in India and Nigeria [12] which reported 7.7% and 8.3% prevalence of GDM respectively. However, a study conducted in Iran [13] reported 3.41% prevalence of GD. This difference may be related to difference in diagnostic criteria used or population studied.

In current study, increasing age was associated with more chances of gestational diabetes as it was more frequent among those above 30 years old, this is in agreement with Seshiah et al study [14] in South India and Zokaie et al. study [15] in Iran; who observed significant increase in the prevalence of GDM with increased maternal age. Also, Kanadys [16] in Polanda showed that age more than 35 years increased the risk for GDM more than threefold (OR, 3.10).

Prevalence of GDM in present study was found to be statistically related to parity ≥ 3. This is in agreement with

*Yang et al* study [17] in China which found greater ratio of women with GDM in the group with parity >2. Seghieri et al study [18] in Italy observed that parity is not directly linked to insulin sensitivity deterioration or to GDM appearance, unless it is linked to the effect of progressive ageing and weight gain either before or during pregnancy. Also a study in Pakistan [19] reported that number of parity has no effect on the risk of GDM. This difference could probably be explained on the basis of the differences in study populations in terms of sample size or age.

As regard family history of diabetes; the present study reported a significant association between family history of diabetes and development of GDM among the studied group. This results comes in parallel to the findings of Soheilykhah et al study [20] in Iran, Rajput et al study [21] in India and Erem et al in Turkia [22] which reported that GDM was significantly associated with history of diabetes in first-degree relatives of the pregnant women.

In the present study, Birth of child weighting ≥ 4000 g, was significantly associated with development of GDM. This is in agreement with studies in Yemen [23] and Iran [15] in which there was an observed significant association between GDM and previous history of macrosomic baby.

Among participants in our study, the mean ± SD for measured blood pressure was significantly higher among +ve cases for GDM. This comes in agreement with *Leng et al study* [24] in China and *Erem et al study* [22] *in* Turkia which observed that higher systolic, and diastolic BP positively associated with increase the risk of GDM. However, *Zokaie et al study* [15] in Iran found no significant difference between cases of GDM and the control group regarding blood pressure measurement.

In our results, there was a significant relation between previous history of preeclampsia and development of GDM in the current pregnancy. A study in Thailand [25] stated that women who experienced preeclampsia had significantly higher rates of obesity and poor glycemic control at GDM diagnosis

In this study we observed significant relation between GDM and both of previous history of induced labor and the previous history of cesarean section (CS). This comes in agreement with *studies* in Turkia [26] and Australia [27] showed that there is significant association between previous history of induced labor and GDM, increased cesarean section rate.

The results of this study showed that GDM was found to be significantly more prevalent among women with higher BMI (>30 kg/m2) and higher pre-pregnancy weight. This is in agreement with *Rajput et al study* [21] in India which reported significant association between prevalence of GDM and increasing BMI of participants. *Cypryk et al* [28] study had observed that occurrence of GDM in women with (BMI ≥25 kg/m2) was four times higher than in women with normal body weight. Also, a study conducted in Yemen [23] had observed that occurrence of GDM was as much as 3.76 times among the BMI group ≥30 kg/m2.

Prevalence of Passive smoking in the current study was significantly higher among cases of GDM. *Erem et al* study [22] in Turkia showed significant association between prevalence of GDM and smoking. Also *Leng et al* [24] in China founded that habitual smoker before or during pregnancy were positively associated with the risk of GDM (OR= 1.42).

## 5. Conclusion

The prevalence of GDM was found to be 8% among pregnant females attending the studied rural family health center. Controlling risk factors and Screening for early detection are mandatory for better maternal and fetal health.

## References

[1] Colberg SR, Castorino K, Jovanovic L. Prescribing physical activity to prevent and manage gestational diabetes. World J Diabetes. 2013; 4 (6): 256-262.

[2] Kaiser B, Razurel C, Jeannot E. Impact of health beliefs, social support and self-efficacy on physical activity and dietary habits during the post-partum period after gestational diabetes mellitus: study protocol. BMC Pregnancy Childbirth 2013;13 (1): 133.

[3] Vanlalhruaii, Ranabir S, Prasad L, Singh NN, Singh TP. Prevalence of gestational diabetes mellitus and its correlation with blood pressure in Manip. Indian J Endocrinol Metab 2013; 17 (6): 957-61.

[4] Khan R, Ali K, Khan Z. Maternal and fetal outcome of gestational diabetes mellitus. Gomal J Med Sci 2013; 11: 88-91.

[5] Al-Azemi N, Diejomaoh MF, Angelaki E, Mohammed AT. Clinical presentation and management of diabetes mellitus in pregnancy. Int J Womens Health 2013; 6: 1-10.

[6] Nallaperumal S, Bhavadharini B, Mahalakshmi MM, Maheswari K, Jalaja R, Moses A, Anjana RM, Deepa M, Ranjani HM Mohan V. Comparison of the world health organization and the international association of diabetes and pregnancy study groups criteria in diagnosing gestational diabetes mellitus in South Indians. Indian J Endocrinol Metab 2013; 17 (5): 906.

[7] Bhat M, Ramesha KN, Sarma SP, Menon S, Ganesh Kumar S. Outcome of gestational diabetes mellitus from atertiary referral center in South India: across-control study. J Obstet Gynaecol India 2012; 62 (6): 644.

[8] De Gurrola GC, Araúz JA, Durán E, Aguilar-Medina M, Ramos-Payán R, García-Magallanes N, Pacheco GV, Meraz EA. Kernicterus by glucose-6-phosphate dehydrogenase deficiency: a case report and review of the literature. 2008; 2 (1): 146.

[9] American Diabetes Association. Diagnosis and Classification of Diabetes Mellitus. Diabetes Care 2010; 33: S62.

[10] American Diabetes Association: Nutrition Recommendation and Interventions for Diabetes. Diabetes Care 2007; 30: S48-S65, 2007.

[11] Swami SR, Mehetre R, Shivane V, Bandgar TR, Menon PS, Shah NS. Prevalence of carbohydrate intolerance of varying degrees in pregnant females in western India (Maharashtra) - A hospital-based study. J Indian Med Assoc 2008; 106: 712-4.

[12] Anzaku AS, Musa J. Prevalence and associated risk factors for gestational diabetes in Jos, North-central, Nigeria. Arch Gynecol Obstet. 2013; 287 (5): 859–863.

[13] Jafari-Shobeiri M, Ghojazadeh M, Azami-Aghdash S, Naghavi-Behzad M, Piri R, Pourali-Akbar Y, Nasrollah-Zadeh R, Bayat-Khajeh P, Mohammadi M. Prevalence and Risk Factors of Gestational Diabetes in Iran: A Systematic Review and Meta-Analysis. Iran J Public Health. 2015; 44 (8): 1036–1044.

[14] Seshiah V, Balaji V, Balaji MS, Paneerselvam A, Arthi T, Thamizharasi M, Datta M. Prevalence of gestational diabetes mellitus in South India (Tamil Nadu) - a community based study. J Assoc Physicians India 2008; 56: 329-33.

[15] Zokaie M, Majlesi F, Rahimi-Foroushani A, Esmail-Nasab N. Risk factors for gestational diabetes mellitus in Sanandaj, Iran. Chronic Diseases Journal. 2014; 2 (1): 1-9.

[16] Kanadys WM. Occurrence of gestational diabetes mellitus: prognostic value of diabetes risk factors. Archives of Perinatal Medicine; 2009 15 (2), 106-111.

[17] Yang X, Hsu-Hage B, Zhang H, Yu L, Dong L, Li J, Shao P, Zhang C. Gestational diabetes mellitus in women of single gravidity in Tianjin City, China. Diabetes Care. 2002; 25 (5): 847–51.

[18] Seghieri G., De Bellis A., Anichini R., Alviggi L, Franconi F, Breschi MC. Does parity increase insulin resistance during pregnancy? Diabet. Med. 2005; 22: 1574-80.

[19] Duman NB. Frequency of gestational diabetes mellitus and the associated risk factors. Pak J Med Sci. 2015; 31 (1): 194–197.

[20] Soheilykhah S, Mogibian M, Saghand SR, Maryam, Rashidi, Soheilykhah S. Incidence of gestational diabetes mellitus in pregnant women. Iranian Journal of Reproductive Medicine 2010; 8 (1): 24-28.

[21] Rajput R, Yadav Y, Nanda S, and Rajput M. Prevalence of gestational diabetes mellitus & associated risk factors at a tertiary care hospital in Haryana. Indian J Med Res. 2013 Apr; 137 (4): 728–733.

[22] Erem C, Kuzu UB, Deger O, and Can G. Prevalence of gestational diabetes mellitus and associated risk factors in Turkish women: the Trabzon GDM Study Arch Med Sci. 2015; 11 (4): 724–735.

[23] Ali AD, Mehrass AA, Al-Adhroey AH, Al-Shammakh AA, and Amran AA. Prevalence and risk factors of gestational diabetes mellitus in Yemen Int J Womens Health 2016; 25 (8): 35-41.

[24] Leng J, Shao P, Zhang C, Tian H, Zhang F, Zhang S, Dong L, Chan JC, Hu G, Yang X. Prevalence of Gestational Diabetes Mellitus and Its Risk Factors in Chinese Pregnant Women: A Prospective Population-Based Study in Tianjin, China PLoS One 2015; 10 (3): e0121029.

[25] Phaloprakarn C, Tangjitgamol S. Risk assessment for preeclampsia in women with gestational diabetes mellitus. J. Perinat. Med. 2009; 37: 617–621.

[26] Aktun HL, Uyan D, Yorgunlar B, Acet M. Gestational diabetes mellitus screening and outcomes. J Turk Ger Gynecol Assoc. 2015; 16 (1): 25-9.

[27] Kirke AB, Evans SF, Walters BN. Gestational diabetes in a rural, regional centre in south Western Australia: predictors of risk. Rural Remote Health. 2014;14 (3): 2667.

[28] Cypryk K, Szymczak W, Czupryniak L, Sobczak M, Lewiński A. Gestational diabetes mellitus- an analysis of risk factors. Endokrynol Pol. 2008;59 (5): 393-7.