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RESEARCH ARTICLE

MATERNAL AGE AND SCREENING FOR GESTATIONAL DIABETES MELLITUS IN NEPALESE WOMEN

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ABSTRACT

Gestational diabetes mellitus is the most common metabolic complication of pregnancy, and causes fetal mortality and morbidity. The prevalence of gestational diabetes is increasing all over the world. Worldwide prevalence is estimated to be between 2.8% (in Washington DC, USA) and 22% (in Sardinia, Italy). In our study, oral glucose tolerance test was done after fasting plasma glucose in 2336 pregnant women of different age groups (15-25, 26-35 and 36-45 years). Out of 2336 subjects, 112 patients (4.8%) were selectively diagnosed as gestational diabetes mellitus and another 112 subjects were included as normal subjects in this study. The values of fasting and 1 hour post glucose load in all three maternal age groups were 102.10±4.63, 106.37±7.06, 110.8±8.9 and 205.07±3.19, 205.60±4.06, 226.1±5.23 respectively, which were significantly higher with that of normal subjects (p=0.000). Results of our study indicates that rate of gestational diabetes mellitus has an increasing notion in Nepalese women. The main factor responsible for this increasing trend of gestational diabetes in Nepalese women may be due to the modern trend of either delay marriage or early marriage.

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INTRODUCTION

Diabetes mellitus is a metabolic disorder that either arrives during the early years of life (juvenile diabetes) or later in life (maturity onset diabetes) (Caspary *et al*., 1974). This disorder results from a defect in insulin production, insulin action, or both (Kumar and Clark; 2002). National Diabetes Data Group classified diabetes into 2 major types according to descriptive of their clinical presentation: insulin dependent diabetes mellitus (IDDM or type 1) or non-insulin dependent diabetes mellitus (NIDDM or type 2). The new classification system identifies four types of diabetes mellitus: type 1, type 2, other specific types and gestational diabetes (Mayfield; 1998). It is estimated that in 2010 there were globally 285 million people (approximately 6.4% of the adult population) suffering from this disease. This number is estimated to increase to 430 million by 2030 in the absence of better control or cure (Kaul *et al*., 2012). Gestational diabetes mellitus (GDM) is defined as any degree of glucose intolerance resulting in hyperglycemia with onset of first recognition during pregnancy (American Diabetes Association; 2003). Whilst for most women, glucose intolerance resolves after birth, there is up to 50% chance of developing type 2 diabetes within 5 years of delivery (Hirst *et al*., 2012). GDM affects approximately 7% of all pregnancies, resulting in more than 200,000 cases per year (Tracy *et al*., 2005). Pregnancy is a diabetogenic condition characterized by insulin resistance with a compensatory increase in β-cell response and hyperinsulinemia. Insulin resistance usually begins in the second trimester and progresses throughout the remainder of the pregnancy. Insulin sensitivity is reduced by as much as 80%. Placental secretion of hormones, such as progesterone, cortisol, placental lactogen, prolactin, and growth hormone, are the major contributor to the insulin-resistant state seen in pregnancy. The insulin resistance likely plays a role in ensuring that the fetus has an adequate supply of glucose by changing the maternal energy metabolism from carbohydrates to lipids and the consequent result is hyperglycemia (Caspary *et al*., 1974). World Health Organization (WHO) diagnostic criteria are based on 2 hour 75g oral glucose tolerance test (OGTT). GDM is diagnosed by WHO criteria if either the fasting glucose is > 126 mg/dl or the 2-hour glucose is > 140 mg/dl (Setji *et al*., 2005).

Recommendations in 2011 for diagnosis of GDM were developed by the American Diabetes Association (ADA) and the International Association of Diabetes and Pregnancy Study Groups (IADPSG), and it is recommended that patients at increased risk for type 2 diabetes be screened for diabetes using standard diagnostic criteria at their first prenatal visit. At 24 to 28 weeks of gestation, all women not known to have diabetes (including high-risk women if the initial testing was normal) should undergo a 75g OGTT, with diagnosis of GDM based upon the finding of one abnormality (rather than the previously recommended) (Pettitt, 2001). The ADA adapted most of the IADPSG proposals, and recommends that a diagnosis of gestational diabetes can be made in women who meet either of the following criteria: fasting plasma glucose ≥92 mg/dl, but <126 mg/dl at any gestational age (fasting plasma glucose ≥126 mg/dl is consistent with overt diabetes). Further at 24 to 28 weeks of gestation: 75 gram two hour OGTT with at least one abnormal result: fasting plasma glucose ≥92 mg/dl but <126 mg/dl or one hour plasma glucose ≥180 mg/dl or two hour plasma glucose ≥153 mg/dl will recommend the diagnosis of GDM (Lisa *et al*., 2012). Gestational diabetes is associated with important prenatal and long-term health risks and many of the risks increases in relation to the severity of maternal hyperglycemia (Kamla, 2005). GDM causes significant and often potentially maternal and fetal complications including preeclampsia,

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polyhydramnios, fetal macrosomia, birth trauma, operative delivery, neonatal metabolic complications and perinatal death (Sela *et al*; 2009). The prevalence of gestational diabetes (GDM) is increasing all over the world (Berner *et al*., 2011). Worldwide prevalence is estimated to be between 2.8% (in Washington, DC, USA) and 22% (in Sardinia, Italy) (Sela *et al*., 2009). Approximately, 40% of women with GDM during their pregnancy will go on to develop type II diabetes (Kamla; 2005). There are limited data regarding the prevalence of GDM worldwide (Pettitt, 2001). The prevalence of type 2 diabetes mellitus and gestational diabetes mellitus has been increasing as the Asian countries undergoing economic, social and nutritional transition and also the modern trend of either delay marriage or early marriage. This condition is associated with the adverse effect on mother and fetus, so it is important to find out the GDM by screening of all the pregnant women (Shrestha and Chawla, 2011). Prevalence of gestational diabetes mellitus has not been adequately studied in Nepal. Therefore, the present study was aimed to determine the prevalence rate of gestational diabetes mellitus on patient of different maternal age group attending the OPD of Chitwan Medical College Teaching Hospital, Nepal on the basis of fasting glucose and oral glucose tolerance test.

MATERIALS AND METHODS

Study area: The study was carried out at outpatient department of Chitwan Medical College Teaching Hospital, Bharatpur, Nepal.

Study designation: Cross sectional study was carried out to identify the prevalence of gestational diabetes mellitus on hospital based data.

Study duration: The study was conducted for a period of 2 years starting from February 2011 to February 2013.

Inclusion criteria: Patients of 15-45 years maternal age group confirmed of having diabetes on the basis of fasting glucose and oral glucose tolerance test were included in this study.

Exclusion criteria: Patients <15 and >45 years maternal age group and who were diagnosed diabetes not on the basis of OGTT were excluded.

Methods

Venous blood samples were drawn in the morning by standard 3 ml disposable syringe, after subjects had fasted for 8-10 hours (overnight) for fasting blood glucose analysis. For oral glucose tolerance test, 4 blood samples were drawn at 30 minutes interval after 75g glucose load. Blood samples were collected in the vial containing sodium fluoride and sent to the laboratory within one hour of collection, and centrifuged at 3000 RPM for 10 minutes. Then plasma samples were analyzed for blood glucose using a Human automatic analyzer HumaStar300. Blood glucose estimation was carried out by oxidase/peroxidase method using commercially supplied reagents (Barham and Trinder, 1972).

Data analysis

The statistical software SPSS (version 17) was used for data analysis. The mean values of plasma glucose (fasting and OGTT) were analyzed. Data were expressed as mean ± SD. Unpaired student's t-test was used for group wise comparisons and p-value of <0.05 was considered statistically significant.

RESULTS AND DISCUSSION

The fasting plasma glucose and oral glucose tolerance tests were performed in all the pregnant women to screen out the women with GDM. It has been seen that the offspring of the women with GDM are at high risk of developing diabetes (Setji *et al*., 2005). It also shows the most common metabolic complications of pregnancy, and fetal mortality and morbidity. Therefore, early diagnosis of GDM is necessary to decrease maternal and fetal morbidity and to help to prevent or delay the onset of type 2 diabetes (Soheilykhah *et al*., 2010). Worldwide, incidence of gestational diabetes mellitus is approximately 4% of women population (Kamla, 2005). Several hypotheses have been proposed to explain why rates of GDM are higher in some Asian populations, often at lower BMI than western populations. Owing to the similarities in risk factors between GDM and type 2 diabetes, it has been suggested that the physiological insulin resistance of pregnancy may act as a 'stress test' for glucose tolerance, with GDM developing in those prone to developing type 2 diabetes later in life (Patrick, 2010). Due to their lack of awareness about the complication of early and late pregnancy in many rural or under developed areas and the community where the illiteracy rate is high, give many births during their child bearing age. Keeping this idea in mind that women in Nepal married either in early age (as in case of rural population) or in late age (as in case of urban population), we included the age groups from 15-45 years in our study.

Finding of fasting blood sugar level is tabulated in Table 1 and the OGTT value of different time interval is tabulated in Table 2. Among the 2336 diagnosed patients, 112 (4.8%) women were diagnosed with GDM. Here, OGTT 1 is the first glucose tolerance test performed after the time interval of 30 minutes following the 75g oral glucose load. OGTT 2, OGTT 3 and OGTT 4 are respectively carried out at the time interval of 1 hour, 1 hour and 30 minutes, and 2 hour after the oral glucose load. In all age groups i.e.; 15-25, 26-35 and 36-45, OGTT values are elevated (peak) at 1 hour post glucose load (2nd OGTT). The values of 2nd OGTT of different age groups (15-25, 26-35 and 36-45 years) are 205.07±3.19, 205.60±4.06 and 226.1±5.23 respectively which was significantly higher in GDM women with that of normal pregnant women (p=0.000). The value then tends to decrease with the increase in time interval (Table 2). The trend of our result indicates that the rate of GDM in women of our study population were higher which corroborates well with the earlier report (Lisa *et al*., 2012). Hence, from the findings of our study, we can conclude that the rate of GDM is quite high in Nepalese women which are in accord with the world GDM data (Hen *et al.*, 2009). The prevalence of gestational diabetes mellitus in Nepalese women has been increasing may be due to economic, social, nutritional transition or the modern trend of either delay marriage or early marriage.

Table 1. Fasting plasma glucose level of normal pregnant and gestational diabetic women of different age group

Maternal age	Parameter	Normal	Gestational diabetes mellitus	P-value
15-25		83.5±5.27	102.10±4.63	0.000
26-35	BSF (mg %)	88.5±5.27	106.37±7.06	0.000
36-45		91.1±5.27	110.8±8.9	0.000

Values are expressed as mean ± SD (n= 112).

Table 2. Determination of diabetes mellitus in pregnancy by OGTT

Maternal age	Parameters	Normal Pregnancy	Pregnancy with GDM	P-value
15-25	OGTT 1	83.5±5.27	114.1±8.90	0.000
	OGTT 2	126.27±7.78	205.07±3.19	0.000
	OGTT 3	106.4±4.77	168.0±3.78	0.000
	OGTT 4	85.93±4.43	158.13±5.24	0.224
26-35	OGTT 1	82.8±3.58	125.5±4.14	0.000
	OGTT 2	130.20±3.43	205.60±4.06	0.000
	OGTT 3	110.80±6.07	172.30±3.53	0.000
	OGTT 4	89.7±4.5	162.50±6.58	0.000
36-45	OGTT 1	92.0±4.08	127.3±3.80	0.000
	OGTT 2	132.9±4.53	226.1±5.23	0.000
	OGTT 3	115.6±7.21	179.8±3.73	0.000
	OGTT 4	99.4±2.41	164.7±4.51	0.000

Values are expressed as mean ± SD (n= 112).

Therefore, accurate screening and early diagnosis is very important to allow timely intervention in order to make certain satisfactory pregnancy outcome.

Conclusion

The 75g OGTT is feasible and convenient to find out GDM in various maternal age groups. In our study, 4.8% women were selectively diagnosed as having gestational diabetes mellitus. Result of our study indicates that the rate of GDM is quite high in Nepalese women. The increasing notion in the prevalence of gestational diabetes mellitus may be due to socio-economic and nutritional transition or the modern trend of either late marriage or early marriage of the Nepalese women.

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