Screening For Gestational Diabetes

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Abstract: Traditionally, screening for gestational diabetes mellitus (GDM) has been done only for those women with identifiable risk factors. To determine the value of screening all pregnant women, 363 consecutive patients were tested for GDM using a glucose challenge test (GCT). The test measured plasma glucose 1 hour after administration of a 50-gram oral glucose load. Those patients with a plasma glucose greater than 140 mg/dL were given a standard 3-hour glucose tolerance test (GTT) using 100 g of oral glucose. Patients with risk factors were compared with those without risk factors. There was no significant difference between the two groups for number of abnormal 3-hour GTTs. We conclude that in order to identify GDM, all pregnant patients must be screened. Universal screening was found to be simple and cost effective. (JABFP 1988; 1:98-100.)

The identification and treatment of gestational diabetes mellitus (GDM) has been shown to reduce perinatal mortality and morbidity[1-3]; however, routine screening of all prenatal patients for this condition has not been accepted universally.[4,5] Screening only women with recognized risk factors for diabetes has been found to be inadequate in detecting this condition.[6,7] We present the results of a screening program for GDM for patients attending obstetrical clinics at our affiliated community hospitals where they were cared for by senior family practice residents. Our objectives were to determine the validity of screening all patients and to determine the cost effectiveness of such a screening program.

Methods

All patients entering the obstetrical clinics at our teaching hospitals between August 1, 1984, and July 30, 1985, were tested, most between 24 and 28 weeks of gestation. After consuming a 250-gram carbohydrate diet for 3 days and then fasting overnight, they each were fed 50 grams of glucose, and one hour later, their plasma glucose levels were measured.[8] Patients whose plasma glucose levels were 140 mg/dL or greater were considered positive, and a standard 100-gram, three-hour glucose tolerance test (GTT) was done at a later time. We used O'Sullivan's diagnostic criteria[9] for interpretation, which corrects for serum as compared to whole blood determinations. The patients were divided into two cohorts for analysis of data: (1) those with risk factors, either historical or clinical, for GDM[10]; and (2) those who had no risk factors. The relation of the glucose challenge test (GCT) value to the likelihood of an abnormal GTT was determined by chi-square analysis and Student's t-test. A cost analysis of the screening program was performed by calculating the total cost of screening and follow-up examinations.

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Results

Three hundred sixty-three consecutive patients underwent screening with the one-hour GCT. The average age of these patients was 21.3 years (range 13 to 43 years). There were 214 (59 percent) white and 149 (41 percent) nonwhite patients. One hundred fifty-two (41.9 percent) were nulliparous. Fifty-two (14.3 percent) of the patients had abnormal GCTs.

Two cohorts of patients were identified and compared. Cohort one consisted of 140 patients (38.6 percent) with at least one risk factor for diabetes (Table 1). Cohort two patients did not have any of the risk factors listed and included 2 patients with abnormal GCTs who were lost to follow-up before the GTT could be obtained. The prevalence of GDM was defined by an abnormal GCT followed by an abnormal GTT. Four (2.9 percent) of the 140 patients in cohort one had abnormal GTTs, and 6 (2.7 percent) of the 223 patients in cohort two had abnormal GTTs (no significant difference, $P > 0.5$). All patients with abnormal GTTs were in class A per White's classification.[11]

Table 1. *Risk Factors for Diabetes.*

Previous delivery of macrosomic infant
Previous delivery of stillborn
Previous delivery of infant with congenital malformation
History of three or more spontaneous abortions
Previous delivery complicated by gestational diabetes mellitus
Family history of diabetes
Obesity (weight > 90.72 kg)
Glucosuria
Polyhydramnios
Intrauterine growth consistent with large gestational-aged infant

An attempt was made to determine the optimum lower limit of the GCT for screening. Five patients who had a plasma glucose of 130 to 139 mg/dL had normal GTTs. Most of the patients found to have GDM had GCTs in the 140 to 149 mg/dL range. Raising the lower limit for further testing to 150 mg/dL would have led to our missing over half of the diagnoses of GDM in this population.

The cost of the GCT at our laboratory is $10.00, and the GTT cost is $30.00. Therefore, all 363 patients were screened initially for $3,630.00. Fifty-two patients needed further testing with GTT for a cost of $1,560.00. The total cost for screening and follow-up was $5,190.00. The average cost per patient screened was $14.30, and the cost per case of GDM diagnosed was $519.00. This is somewhat higher than that obtained by other authors.[5,12] Such costs must be weighed against the potential costs incurred from the complications associated with undiagnosed GDM.

Discussion

Several conditions should be met when considering screening for a given disease[13]: (1) the disease should adversely affect the quality of life, (2) there should be an asymptomatic period during which recognition and treatment lead to improved outcome compared with treatment instituted after symptoms have become apparent, and (3) the sensitivity and risk of the screening program should be acceptable given the prevalence of the screened disease.

Pregnancies complicated by GDM may be associated with greater morbidity and mortality than other pregnancies.[1,6,14-16] Infants born of gestational diabetics are larger; are more likely to suffer birth trauma, hypoglycemia, hypocalcemia, and hyperbilirubinemia, and to be born by Cesarean section. Mothers with GDM are more likely to experience complications associated with Cesarean delivery[15] and to develop overt diabetes mellitus later in life.[6,17,18] The condition is often asymptomatic and may be recognized only after delivery of a macrosomic infant. Treatment with diet and/or insulin can affect the outcome with delivery of healthier infants.[2,3]

The prevalence of GDM varies greatly from study to study.[7,19-24] Chen, et al.[20] found a prevalence of 1.1 percent in their population, while Macafee and Beischen[21] found it in 18 percent of their patients. Most authors have reported GDM in 1.5 to 4.0 percent of patients screened.[7,21-24] It is more common than other commonly screened conditions, such as neonatal hypothyroidism and phenylketonuria, cervical cancer, and colon cancer. The frequency of GDM in our study was 2.7 percent.

Attempts to limit screening to subgroups of patients with historical and clinical risk factors, though widely used in the past, have recently come under closer scrutiny and criticism.[4,5] In our study, over half the cases of gestational diabetes would have been missed by relying on the presence of so called "risk factors" to direct screening of selected patients. In fact, the high-risk patients in this study had no greater risk of gestational diabetes than the low-risk group. These results suggest that all pregnant women should be screened for GDM in accord with recent recommendations.[25,26]

The true sensitivity of the GCT using 140 mg/dL as the lower limit of normal cannot be determined from this study because we did not perform GTTs on patients with lower GCT values. Evidence from other studies,[8,10] however, supports the view that few, if any, patients with GDM will have a screening value less than 140 mg/dL. Some authors[12,24] have recommended using a screening level of 150 mg/dL. In our study population, this would have resulted in our missing over half the cases of GDM.

Because of the small number of patients with GDM identified in this study, there is the possibility that a Type II error may have occurred, i.e., that we failed to demonstrate a real difference between the

groups of patients. However, the clinical significance of a small excess of GDM in patients with risk factors is debatable. In order to help determine who should be screened, risk factors should be able to identify the *majority* of patients likely to have GDM, and this is clearly *not* the case.

The cost of screening must be considered, though it is difficult to determine what is cost effective. Our costs were higher than those of other authors; however, it is difficult to quantify the benefits of screening in terms of dollar amounts or prevented suffering. The risks associated with screening are very low, and patients will not be inappropriately treated for false-positive tests because all positive glucose challenge tests must be followed by a 3-hour glucose tolerance test.

Conclusion

Universal screening of pregnant women for GDM was found to be simple and cost effective. This study demonstrates that a history of diabetic risk factors is an insensitive predictor for GDM. We conclude that in order to identify GDM, it is necessary to screen all pregnant patients. This is in keeping with the recent recommendations of the Second International Workshop—Conference on Gestational Diabetes Mellitus.[26] Our data support using a plasma glucose level of 140 mg/dL during the GCT as a minimum criterion for proceeding to the GTT.

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