A 75 g glucose load for diabetic screening in pregnancy — an evaluation

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Summary

Screening for impairment of glucose tolerance in pregnancy is mandatory if a satisfactory standard of antenatal care is to be achieved. This is especially so in a population in which the prevalence of diabetes is unusually high such as in South African Indians. A number of screening systems have been devised utilising different glucose loads for glucose tolerance tests. Using the 75 g load recommended by the World Health Organisation our mean glucose value was 8,4 mmol/l. The sensitivity of this test was 83% with a specificity of 90,7%. A protocol of screening at an antenatal clinic is presented.

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The high perinatal mortality and significant morbidity rates associated with diabetes in pregnancy makes it imperative that the condition be diagnosed early. With early recognition and satisfactory management the perinatal problems of the diabetic infant can be reduced to levels similar to those in the general population.[1]

Until about a decade ago certain clinical and historical risk factors were used as a means of identifying a population at risk of developing diabetes during pregnancy. Barden and Knowles[2] defined 16 different historical or clinical risk factors that have been employed by 23 different groups of investigators to define this high-risk population. O'Sullivan *et al.*[3] and Macafee and Beischer[4] demonstrated that screening only those women with these factors will detect approximately 50% of all women with gestational diabetes. Some of these risk factors are listed in Table I.

TABLE I

Historical factors
- **Previous pregnancy complicated by gestational diabetes**
- **A first-degree relative with diabetes**
- **Previous macrosomic baby > 4 000 g**
- **Previous unexplained perinatal death**
- **Previous baby with significant congenital malformations**
- **A history of recurrent abortion**

Clinical risk factors
- **Obesity > 120% of ideal body weight**
- **Monilial vaginitis**
- **Glycosuria**
- **Polyhydramnios**
- **An infant suspected of being large for gestational age**

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A number of screening methods for diabetes in pregnancy have been investigated. Originally O'Sullivan *et al.*[3] recommended a 50 g glucose load and a 1-hour blood glucose level for screening for diabetes. The 1-hour 50 g glucose load with a cut-off at 7,8 mmol/l (venous plasma) was accepted by the Second International Workshop Conference on Gestational Diabetes Mellitus in Chicago in 1984.[5]

Lind and Anderson[6] used a timed sample after breakfast. The 99% cut-off values were 6,1 mmol/l within 2 hours of a meal or 5,6 mmol/l for more than 2 hours. This study, however, had a positive yield of only 0,25% which is unacceptably low.

Stangenberg *et al.*[7] studied random capillary blood glucose measurements and found a mean of 4,6 mmol/l and a 95% confidence limit of 6,3 mmol/l. The sensitivity was at best only 71% and there was no information on how many diabetics might have been missed.

Coustan *et al.*[8] studied 50 presumably normal women and 20 known gestational diabetics. The challenge was a breakfast of 600 kcal. The mean glucose value was 6,7 mmol/l and this test had a sensitivity of 75% and a specificity of 94%. These results concur with a 50 g glucose load test and the authors claim it has the advantage of patients not having to ingest a large unpalatable volume.

Subjects and methods

The patients for this study were recruited from the antenatal clinics of R. K. Khan Hospital in Chatsworth, Durban. This hospital serves the Indians of the greater Durban area. The prevalence of non-insulin-dependent diabetes among Indians in Natal has been quoted as being as high as 13,5% and impaired glucose tolerance as 4,8%.[9] The coexistence of pregnancy and diabetes must therefore be high.

A total of 500 mothers who attended the antenatal clinic were studied. Known diabetics were excluded. The mothers in the study group had no dietary preparation, were not starved, and had no knowledge that they were to be screened for diabetes until they arrived at the clinic. The patients were given 75 g of monohydrate glucose dissolved in 300 ml of water. They then went about the normal routine of a clinic visit: being examined by the medical attendant, having an ultrasonographic scan, urine testing and education (including lectures about pregnancy by a midwife).

One hour after ingestion of the glucose, venepuncture was performed and blood taken for glucose testing in addition to routine tests such as blood group, Wassermann reaction and haemoglobin level. The plasma glucose value was analysed by the glucose oxidase method. The patients were called back 2 weeks later and instructed to have their last meal at 22h00 on the night preceding their appointment. A full glucose tolerance test (GTT) was then performed using a 75 g glucose load and interpretation was by World Health Organisation criteria.[10] Patients who did not return as requested were again called up by the author so that all 500 patients were fully investigated. The results are tabulated in Table II. The mean ($\pm$ SD) blood glucose value at hour 1 after a 75 g glucose load was 6,1 $\pm$ 1,1 mmol/l. Of the 500 patients studied, 55 or 11% of the study population had 1-hour levels $\geq$ 8,4 mmol/l.

TABLE II. RESULTS

Patient particulars	Results
Age (yrs)	**20,6 ± 6,1**
Parity (%)	
Primiparous	**32**
Multiparous	**68**
Gestational age (wks)	**18,2 ± 2,2**
Risk factors present	**60%**
Maternal weight (kg)	**60,8 ± 5,8**

Of these 55 patients, 2 were found to have diabetes and 8 had impaired glucose tolerance, as defined by the World Health Organisation. In addition there were 2 other patients whose 1-hour level was < 8,4 mmol/l but whose full GTT was indicative of impaired glucose tolerance. Thus of the 500 study patients, 2 had diabetes (prevalence 4/1 000) and 10 had impaired glucose tolerance (prevalence 20/1 000).

The sensitivity (the proportion of individuals with the disease correctly identified by the test) was 83,3%. The specificity (the proportion of individuals free of the disease correctly excluded by the test) was 90,7%. The predictive value of a positive test, that is a value of ⩾ 8,4 mmol/l at 1 hour after ingestion of a 75 g glucose load, was 22,2%, whereas the predictive value of a negative test was 95,7%. Of significance was the fact that features listed in Table I were present in 60% of the study group, i.e. full GTTs would otherwise have to be performed on 300 patients. However, of the 12 patients identified by GTT as having glucose intolerance, only 7 had features listed in Table I, i.e. 5 patients with impaired glucose tolerance may have been missed. Therefore only 2 patients of 500 may have been missed using our screening criteria whereas if only clinical criteria had been used 5 patients with impaired glucose tolerance would have gone undetected.

Discussion

There is no doubt that screening for disturbances of glucose metabolism is absolutely mandatory if a satisfactory standard of antenatal care is to be achieved. This may be especially so in a group such as South African Indians where the prevalence of diabetes is unacceptably high.

Experience using a 75 g glucose load to screen for diabetes in pregnancy has been described. This amount of glucose was chosen because the WHO recommends this size of load for full glucose tolerance testing. Perhaps all future studies of diabetes will use the 75 g load. The author chose a 1-hour venous plasma value of 8,4 mmol/l. Merkatz *et al.*,[11] however, used a 2-hour value and they claim that the zero and 2-hour values of the WHO are acceptable for screening for glucose intolerance in pregnancy. The author prefers a 1-hour to a 2-hour screen since this reduces the time the patient has to spend at the clinic, improves efficiency and allows the patient to return to her other obligations earlier.

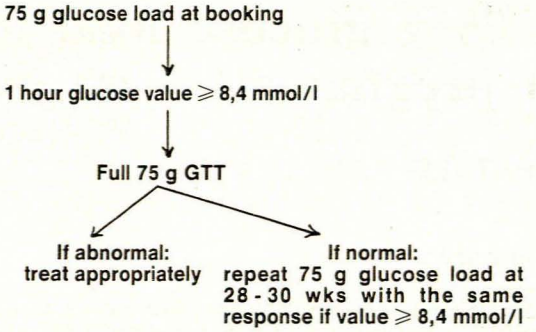

Fig. 1. Flow diagram.

There is no doubt that clinical and historical factors are of very little or no value because of their poor predictive value for diabetes in pregnancy. Perhaps the time has finally arrived for obstetricians with an interest in diabetes to condemn their use. Screening for diabetes of all women attending an antenatal clinic must be the standard procedure.

The time of screening is important. Perhaps the best time to screen from a metabolic point of view is between the 28th and 30th week of pregnancy. Jovanovic and Petersen[12] found the highest yield of diabetics is at this period of gestation. The disadvantage of screening late is that some diabetics may already have been missed and there will therefore be a delay before appropriate therapy is instituted. A proposal is therefore made that all patients booking for antenatal care are screened initially. Those found not to be diabetic should be subsequently rescreened. This is illustrated in the flow diagram (Fig. 1).

REFERENCES

1. Lavin JP, Lovelace DR, Miodovnih MK *et al.* Clinical experience with 107 diabetic pregnancies. *Am J Obstet Gynecol* 1983; **147:** 742-752.
2. Barden TP, Knowles HC. Diagnosis of diabetes in pregnancy. *Clin Obstet Gynecol* 1981; **24:** 3-19.
3. O'Sullivan JB, Mahan CM, Charles D, Darrow RV. Screening criteria for high risk gestational diabetic patients. *Am J Obstet Gynecol* 1973; **116:** 895-900.
4. Macafee CAJ, Beischer NA. The relative value of the standard indications for performing a glucose tolerance test in pregnancy. *Med J Aust* 1974; **1:** 911-914.
5. Summary and recommendations of the Second International Workshop Conference on Gestational Diabetes Mellitus. *Diabetes* 1985; **34:** suppl. 2, 123-126.
6. Lind T, Anderson J. Does random blood glucose sampling outdate testing for glycosuria in the detection of diabetes during pregnancy? *Br Med J* 1984; **289:** 1569-1571.
7. Stangenberg M, Persson B, Nordlander E. Random capillary blood glucose and conventional selection criteria for glucose tolerance testing during pregnancy. *Diabetes Res* 1985; **2:** 29-33.
8. Coustan DR, Widness JA, Carpenter MW, Rotondo L, Pratt DC. The 'breakfast tolerance test': screening for gestational diabetes with a standardised mixed nutrient meal. *Am J Obstet Gynecol* 1987; **157:** 1113-1117.
9. Omar MAK, Seedat MA, Dyer RB, Rajput MC, Motala AA, Joubert SM. The prevalence of diabetes mellitus in a large group of South African Indians. *S Afr Med J* 1985; **67:** 924-926.
10. Report of a World Health Organisation Study Group. Diabetes mellitus: definition, diagnosis and classification. *WHO Tech Rep Ser* 1985; No. 727, 9-14.
11. Merkatz IR, Duchon MA, Yamashita TS, Houser HB. A pilot community-based screening program for gestational diabetes. *Diabetes Care* 1980; **3:** 453-457.
12. Jovanovic L, Petersen CM. Screening for gestational diabetes: optimum timing and criteria for retesting. *Diabetes* 1985; **34:** suppl. 2, 21-23.