THE 75 AND 50G OGTT RESPONSE IN NORMAL PREGNANT WOMEN

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ABSTRACT

The 75 and 50g OGTT (Oral Glucose Tolerance Test) responses were studied in 86 normal healthy pregnant women (mean age 28.7 ± 0.4 (SEM) years) at 28 and 32 weeks respectively. Of these were 50 Chinese, 20 Malays and 16 Indians. Mean glucose responses at fasting, 1 and 2h post glucose load were 78.3 ± 0.7, 132.2 ± 2.8 and 116.2 ± 2.1 mg/dl respectively for the 75g OGTT and 78.5 ± 0.7, 130.5 ± 2.5 and 106.7 ± 1.8 mg/dl respectively for the 50g OGTT. Except for the 2h responses, corresponding responses between both OGTTs were not significantly different. All races showed a similar OGTT response. Using a set criteria for diagnosis of abnormals resulted in gross inconsistency in the number of abnormals diagnosed for both OGTTs. However, the use of 95th percentile shows a closer agreement in the diagnosis of abnormal cases for both OGTTs. Also, the 2h OGTT response for the 75g OGTT is higher than that of WHO's criteria for impaired glucose tolerance. This emphasizes the need to establish our own reference range.

Keywords: OGTT, normal pregnancy

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INTRODUCTION

The detection of diabetes in pregnancy is vital for the well-being of both mother and child. Various criteria for diagnosis of diabetes based on an oral glucose tolerance test (OGTT) have been proposed.

The National Diabetes Data Group, USA, proposed a 3h test after a 100g glucose load[1]. The British Diabetic Association's criteria is based on a 2h test after a 50g glucose load[2]. To standardize the different protocols, the World Health Organization (WHO) Expert Committee on Diabetes Milletus proposed a 2h test after a 75g glucose load[3]. Their reference values based on a general population are also adopted for the gestational diabetic. Since there are no reference values for the pregnant women in our unique multiracial composition, we studied the 2h response to both 75 and 50g OGTT performed in the same patient during late pregnancy. This study is an ongoing study and the present paper reports on the first 86 subjects that had completed the study.

MATERIALS AND METHODS

Eighty-six pregnant women comprising 50 Chinese, 20 Malays and 16 Indians, from the Department of Obstetrics and Gynaecology, National University Hospital, were recruited for the study. Subjects were not known to be diabetics nor do they have risk factors like family history of diabetes, previous big baby, bad obstetric history, etc[4]. They were also not on hormones or diabetogenic drugs for at least 3 months prior to the test.

A 75g OGTT followed by a 50g OGTT was performed in the same subject at 28 and 32 weeks of gestation respectively. The glucose load was given to subjects after an overnight fast of at least 12h. Two ml venous blood was collected in fluoride oxalate tubes before administration (0h) and at 1 and 2 h after the glucose load. Plasma was separated immediately and glucose concentration estimated by the hexokinase method[5,6] in the Vision Analyzer (Abbot).

The following criteria based on the 2h plasma glucose were used for both 75 and 50g OGTT:

Normal = <120 mg/dl

Borderline = 120-139 mg/dl

Abnormal = >/= 140 mg/dl

For comparison of OGTT responses for statistical significance, the student's t-test was used. The paired and unpaired t-test was used for comparison of responses within each group and between different groups (races) respectively.

RESULTS

Mean age, BMI and parity were 28.7 ± 0.4 years, 21.7 ± 0.4 kg/m and 0.6 ± 0.1 respectively (Table I). Except for the Chinese who were significantly older ($p<0.01$) and taller ($p<0.05$) than the Malays, all races were matched for age, BMI and parity.

Fig 1 shows the mean glucose responses of all women at 28 and 32 weeks of gestation. Mean glucose responses (± SEM) at fasting, 1 and 2h post glucose load were 78.3 ± 0.7, 132.2 ± 2.8 and 116.2 ± 2.1 mg/dl respectively for the 75g OGTT and 78.5 ± 0.7, 130.5 ± 2.5 and 106.7 ± 1.8 mg/dl respectively for the 50g OGTT. Responses at fasting and 1h were not significantly different but the 2h response after the

Table I. Age, BMI and parity (mean±SEM) for each race.

Race	Chinese	Malays	Indians	All races
Age (yrs)	29.7±0.6	26.5±0.8	28.3±0.9	28.7±0.4
BMI (kg/m)	21.3±0.4	23.1±1.0	21.4±0.7	21.7±0.4
Parity	0.6±0.1	0.6±0.2	0.7±0.2	0.6±0.1

N.B. Subjects were matched for all physical parameters except that the Chinese were significantly older ($p<0.01$) and taller ($p<0.05$) than the Malays.

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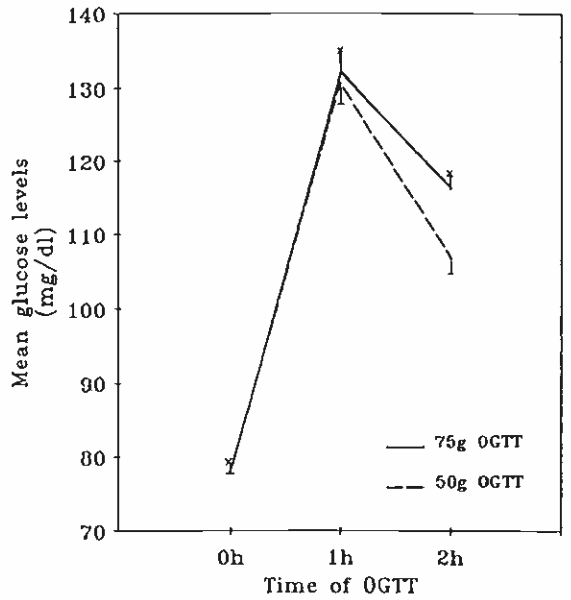
75g OGTT was significantly higher than the corresponding response after the 50g OGTT (p<0.001).

Fig 1. 75 & 50g OGTT responses (mean + SEM) in pregnant women at 28/52 and 32/52 respectively.



* 2h response between 75 and 50g OGTT - p<0.001

Table II shows the 2h response to both the 75 and 50g OGTT using the above mentioned criteria. A higher number of borderline and abnormal cases were observed with the 75g OGTT (25 borderline and 14 abnormals) than the 50g OGTT (16 borderline and 2 abnormals). Of the 25 borderline cases with 75g OGTT, only 6 had a borderline response with 50g OGTT while the rest showed a normal response. Among the 14 cases of abnormal responses with 75g OGTT, only 6 showed a borderline response and 1 had an abnormal response with 50g OGTT. Of the 16 borderline cases observed with 50g OGTT, 6 of each were found to have a borderline or abnormal response with the 75g OGTT earlier. Among the 2 abnormal cases of 50g OGTT, 1 was observed to be abnormal and the other normal during the 75g OGTT.

Using WHO's criteria for the 75g OGTT, 14 cases of impaired glucose tolerance were observed. The respective 95th percentile of 2h glucose response for the 75g and 50g OGTT was 155.6 and 140.3 mg/dl. Using these limits, only 1 and 2 cases of abnormal responses were observed for the 75g and 50g OGTT respectively.

Table II. The 2h plasma glucose level of 75g OGTT compared to 50g OGTT.

75g OGTT	50g OGTT Normal	Borderline	Abnormal	Total
Normal	42	4	1	47
Borderline	19	6	0	25
Abnormal	7	6	1	14
Total	68	16	2	86

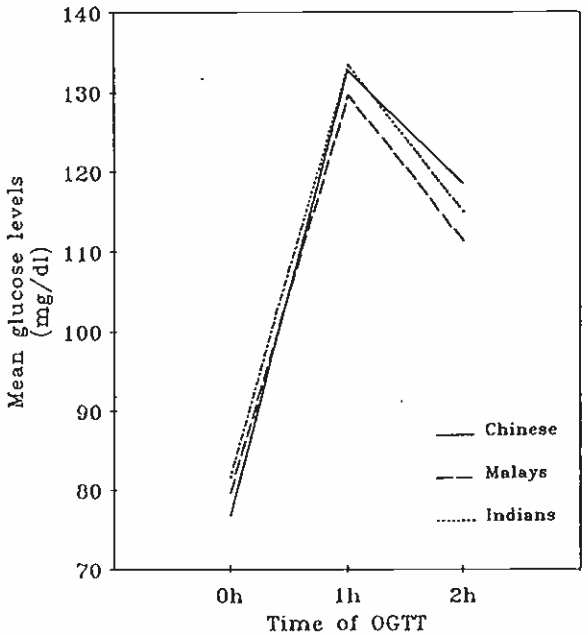
Table III shows the mean ± SEM responses of the various racial groups to the 75 and 50g OGTT. These responses are shown graphically in Fig 2 and 3. While mean fasting levels of the Chinese were lowest, there was no significant differences between them except for the 75g OGTT when the Indians appeared to have a significantly higher mean fasting level than the Chinese.

Table III. Mean glucose responses (±SEM) of various racial groups to the 75 and 50g OGTT.

Race	Mean glucose response (mg/dl) at 0h	1h	2h
Chinese:			
75g OGTT	76.7±0.8	132.6±3.7	118.5±2.8**
50g OGTT	77.9±0.9	133.3±3.2	107.4±2.1
Malays:			
75g OGTT	79.6±1.4	129.7±5.8	111.4±4.3
50g OGTT	79.3±1.7	127.6±6.1	106.1±4.6
Indians:			
75g OGTT	81.6±1.5	133.9±6.5	114.9±4.7*
50g OGTT	79.5±1.6	125.4±5.3	105.1±4.7

N.B. * p<0.05 (75 vs 50g OGTT); ** p<0.001 (75 vs 50g OGTT); Indians have a significantly higher 0h than Chinese during 75g OGTT.

Fig 2. 75 g OGTT responses in normal pregnant Chinese, Malays and Indians

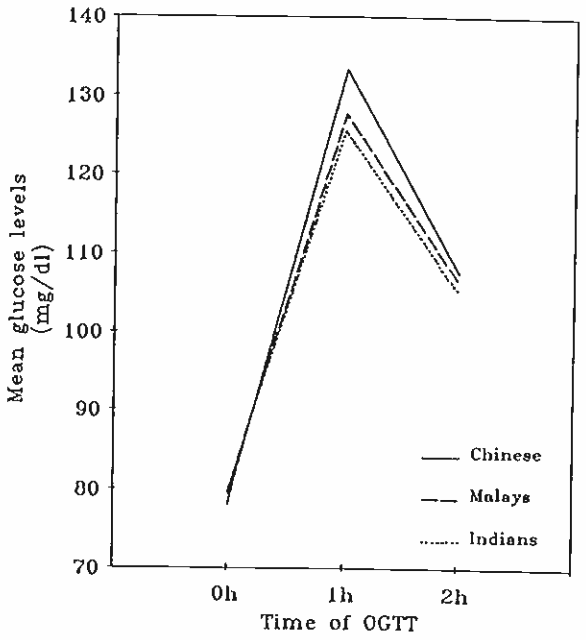


As with the overall response, both the Chinese and Indians showed a significantly higher glucose level at 2h for the 75g OGTT than the 50g OGTT. However, this difference in Malays did not reach statistical significance. Between the races, there was no difference in glucose responses in both the 75 or 50g OGTT.

DISCUSSION

The OGTTs were performed during the end of the second trimester and beginning of the last trimester as previous observations had indicated that any glucose intolerance was most likely to be detected during this period. The choice of 28 and 32 weeks of gestation for the 75 and 50g OGTTs respectively was for practical purposes to allow the patient to rest after each test and also glucose response is unlikely to be different during this interval. In an earlier report[7], results of glycosylated haemoglobins of 33 of these women estimated at the same time showed no significant differences between the 2 tests, suggesting that glucose responses during these periods were unchanged. The selection of subjects with no known medical complications was to provide a reference range for normal women.

Fig 3. 50 g OGTT responses in normal pregnant Chinese, Malays and Indians



The criteria that we have used to compare both the 75 and 50g OGTT has been used in our department for the diagnosis of the 50g OGTT. Since WHO's recommended criteria for the impaired 75g OGTT is similar to our criteria of abnormal 50g OGTT, we have used the same criteria for comparison of both OGTTs to illustrate the problems that would result by simply adopting a recommended standard.

The observation of a significantly higher glucose level at 2h for the 75g OGTT suggested a lower tolerance to a higher glucose load. This difference in 2h response is also reflected in the number of abnormals and borderline cases when the same criteria is used for both OGTTs.

Using our own criteria, a very much higher number of cases is classified as abnormal in the 75g OGTT. Of these cases, 50% (7/14), 43% (6/14) and 7% (1/14) had normal, borderline and abnormal response respectively to the 50g OGTT. Similarly, of the 25 borderline cases in the 75g OGTT, only 24%[6] had a borderline response with the 50g OGTT while the rest were found to have normal response. With WHO's classification on the 75g OGTT, the number of impaired 75g OGTTs is the same as the number of abnormal cases as detected using our own criteria. The use of our own criteria (a single criteria for both OGTTs) or WHO's criteria had resulted in gross inconsistency in number of abnormals and borderline glucose tolerance. While this may suggest an underdiagnosis for the 50g OGTT and an over-diagnosis for the 75g OGTT, it also emphasizes the need to establish different reference values for each OGTT.

Similar inconsistencies were observed by Li and colleagues[8,9] (1987a, 1987b). In both their studies, pregnant women at risk of developing diabetes in pregnancy had paired OGTTs using a 100g load followed by a 75g load two weeks later. Whether using a single criteria (WHO's) or different criteria (NDDG for the 100g load and WHO for the 75g load), they found that both tests agreed only in about half of the results (47-60%) and a higher number of abnormal results were detected in the test with the higher glucose load.

In our study, the 95th percentile of the 2h response of the 75g OGTT was much higher than the corresponding response of 50g OGTT (155.6 mg/dl compared to 140.3 mg/dl). Using these values, the number of abnormal responses (ie. impaired OGTT by WHO criteria) was greatly reduced to 1 for the 75g OGTT and remained the same (2 cases as expected since its 95th percentile is closed to our adopted criteria) for the 50g OGTT. This shows a better agreement on the number of abnormals and further confirms the need to establish our own reference range for the 75g OGTT.

The need to establish an individual range is also supported by other studies[10-13]. While both Friedman et al[10] (1985) and Hamada et al[11] (1987) observed that the upper limits of glucose response in the 75g OGTT were higher than WHO's limits, Li et al[12] (1988) found that the limits in their study were very close to those of WHO's and Okonofua et al[13] (1988), on the other hand, observed lower values in Nigerian women's response to a 50g OGTT than American women. The latter authors suggested that these differences may be a population characteristic or may be due to socio-economic level, diet and level of activity or genetics. On the other hand, we have observed no difference in OGTT responses between our various race groups. This may suggest that the OGTT responses are not ethnically dependent. However, it is noted that the numbers of subjects in each race group especially the Indians and Malays were small and the results may not be conclusive in this respect. When the project is completed following recruitment of more Indian and Malay subjects, any differences may be more clearly reflected.

The question whether there was an under-diagnosis of the 50g OGTT and an over-diagnosis of the 75g OGTT and at what glucose level is treatment necessary for the mother can be confirmed by studying the outcome of these pregnancies. This data is under collection and will be presented separately on completion of the project.

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