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A COMPARATIVE STUDY OF ORAL GLUCOSE CHALLENGE TEST VERSUS SINGLE STEP GLUCOSE TOLERANCE TEST IN ANATENATAL SCREENING FOR GESTATIONAL DIABETES MELLITUS

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ABSTRACT

Background: Aim: To compare the efficacy of one step and two step tests in detection of GDM during the pregnancy and to confirm the efficacy by diagnostic test. **Methodology:** The study was conducted in a tertiary level teaching hospital. 348 AN mothers were randomly allotted to each group and screened one group by one step test and another by two step test. The mothers were advised to undergo diagnostic test for confirmation. **Results:** The two step and one step tests statistically significantly screened 3.2% and 8.0% of GDM mothers respectively ($P < 0.01$). Both groups the GDM mothers significantly positively correlated with their age ($r = 0.869$). Early pregnancies the detection of GDM was not so significant in both groups ($P > 0.05$). In late (third trimester) pregnancies the one step test detected (4.8%) and two step detected (1.5). The detection was significant ($P < 0.05$). Similar observations were made in term deliveries, caesarean deliveries and normal birth weight of babies ($P < 0.05$). GDM mothers were strongly associated with one step test ($P < 0.01$). The odds likelihood + ratio of one and two step tests were 322 times and 35.1 times respectively. **Discussions:** The one step test predicted positives effectively than the two step test. The effectiveness of the test was reflected in late pregnancies, term and caesarean deliveries and normal birth weight of babies. The positive predictions of one step test was significantly 287 times more than that of two time test. **Conclusion:** By considering simplicity and one time effective application and prediction the one step test may be advocated to the expectant mothers.

Key words: AN Mothers, GDM, one step, two step tests, efficacy, comparison.

1. INTRODUCTION AND AIM OF THE STUDY

To compare the efficacy of 50 g 1 hour OGCT with 75 g 2 hour OGTT in screening of antenatal women for gestational diabetes mellitus.

To compare the efficacy of 75 g oral glucose tolerance test (One step test) with 50 g oral glucose challenge test (Screening test) followed by 75 g oral glucose tolerance test as confirmatory test (Two step test).

To validate the efficacy of one step procedure, 75 g GTT is also performed on the one test group after 3 days.

2. METHODOLOGY

This comparative study was conducted in the antenatal clinic outpatient department of Obstetrics and Gynecology, Tirunelveli Medical College and Hospital, Tirunelveli from November 2012 to October 2013.

2.1 Materials and methods

The study included 348 pregnant women in single step group and 348 pregnant women in two step procedure. No histories of diabetes pregnant women were allocated to their group randomly. Antenatal women were followed up from the time of their first visit till delivery.

2.1.1 One step procedure

75 g glucose was administered with 300 ml of water to pregnant women allotted to this group irrespective of their last meal. Plasma glucose was estimated after 2 hour from the venous blood sample. They were asked to come after 3 days in fasting state and venous blood sample was taken. 75 g of glucose in 300 ml of water is administered and venous blood sample was taken after 1 hour and 2 hour and plasma glucose estimated.

2.1.2 Two step procedure

50 g glucose was administered with 150 ml of water to pregnant women allotted to this group irrespective of their last meal. Plasma glucose was estimated after 1 hour from the venous blood sample. They were asked to come after 3 days in fasting state and venous blood sample was taken. 75 g of glucose in 300 ml of water is administered and venous blood sample was taken after 1 hour and 2 hour and plasma glucose estimated.

2.2 Data analysis

The study subjects were compared between the two procedures and interpreted by the Z or t tests of proportions where ever applicable. The P values less than or equal to 0.05 ($P \leq 0.05$) were considered as statistically significant.

3. RESULTS

The study participants were 348 pregnant women in each group.

Table-1: Percentage distribution of test wise GDM according to Age group

Age Group (years)	Two Step Group			One Step Group			Comparison of GDM	
	Total	GDM		Total	GDM		Z	Sig
		No	%		No	%		
15 -19	44	0	0.0	57	1	1.8	2.630	P<0.01
20 -24	192	1	0.5	165	6	3.6		
25 -29	71	6	8.4	86	13	15.1		
30 -34	40	4	10.0	37	5	13.5		
35 -39	1	1	100.0	3	3	100.0		
Total	348	12	3.4	348	28	8.0	F=1.148	P>0.05
Mean± SD	24.1±4.2			24.1±4.5				

The above table -1 states the age and test wise comparison of GDM. The mean ages of the two groups were 24.1±4.2 years and 24.1±4.5 years. Both groups, the mean ages were equal. But the standard deviations (SD) were differed. The difference of the SD between the two groups was not statistically significant ($P > 0.05$). The percentages of the GDM of the two groups were 3.4% and 8.0%. The difference was statistically significant ($P < 0.01$). The age group wise GDM relationship between the two groups was $r = 0.869$. The increasing trend of GDM according to the age was statistically significant ($P < 0.05$).

Fig-1: Age group wise percentage distribution of two and one step tests

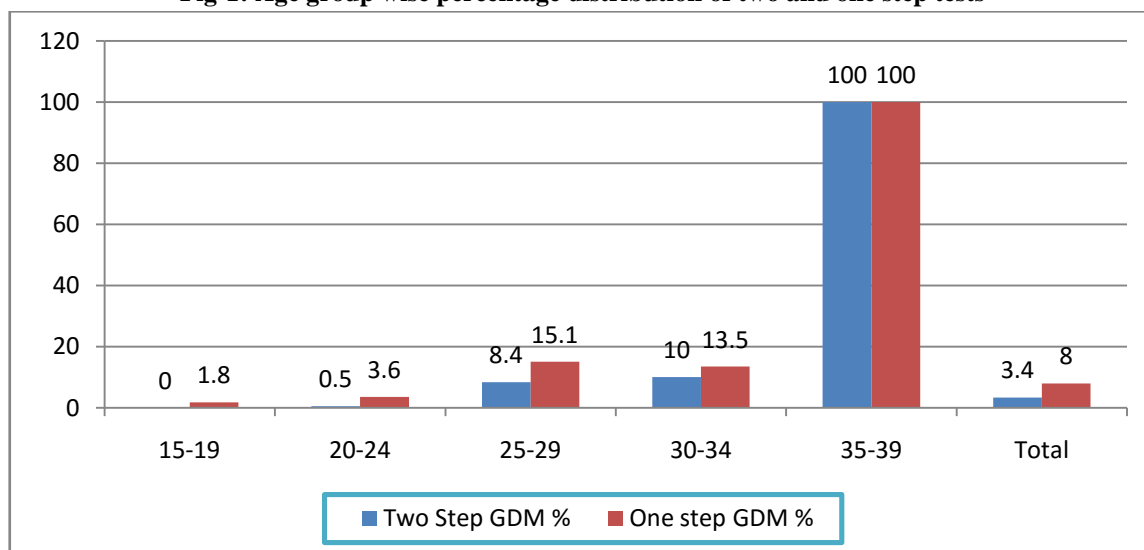


Table 2: Time of Diagnosis according to trimester in two tests

Trimester	Two Step Group		One Step Group			Z	Sig	
	Total	GDM		Total	GDM			
		No	%		No			%
First	348	2	0.6	348	4	1.2	0.838	P>0.05
Second	346	5	1.4	344	8	2.3	0.877	P>0.05
Third	341	5	1.5	336	16	4.8	2.462	P<0.05

The GDM subjects detected by the two tests were stated in the above table -2. First and second trimesters the GDM detection were in test two step 0.6% and 1.4% respectively. In one step group the same was 1.2% and 2.3% respectively. The differences were not statistically significant (P>0.05). But in the third trimester, the detection of one step was 4.8% and two steps was 1.5%. The difference between the two tests was statistically significant (P<0.05)

Fig-2: Trimester wise comparison of GDM in two tests

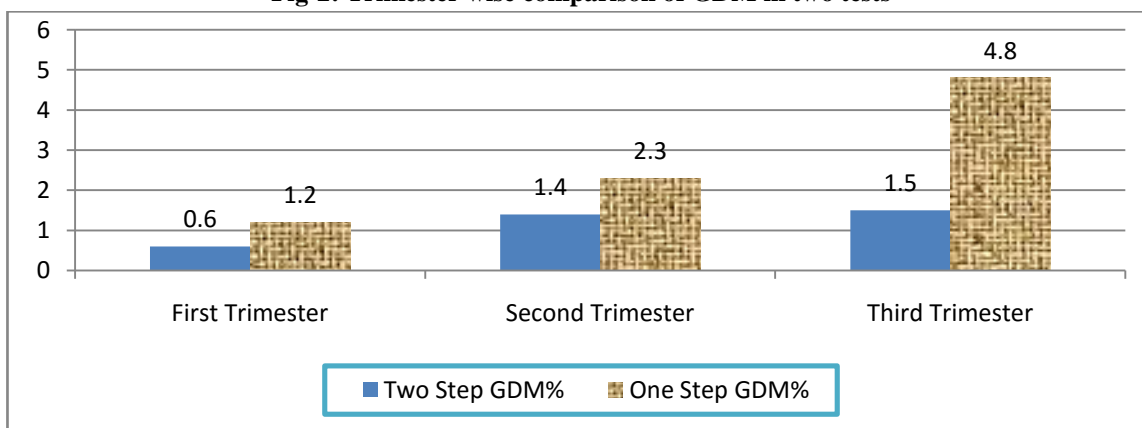


Table-3: Comparison of delivery between two groups at gestational age

Gestational age	Two Step Group		One Step Group	
	No	%	No	%
Term	316	90.8	332	95.4
Preterm	18	5.2	6	1.7
Post dated	14	4.0	10	2.9
Total	348	100.0	348	100.0

The table-3 states the gestational age at delivery. The term deliveries among the two step group were 90.8% and one step group was 95.4%. In pre term deliveries, the two step group was 5.2% and one step group was 1.7%.

Fig:3:Gestational Age at Delivery

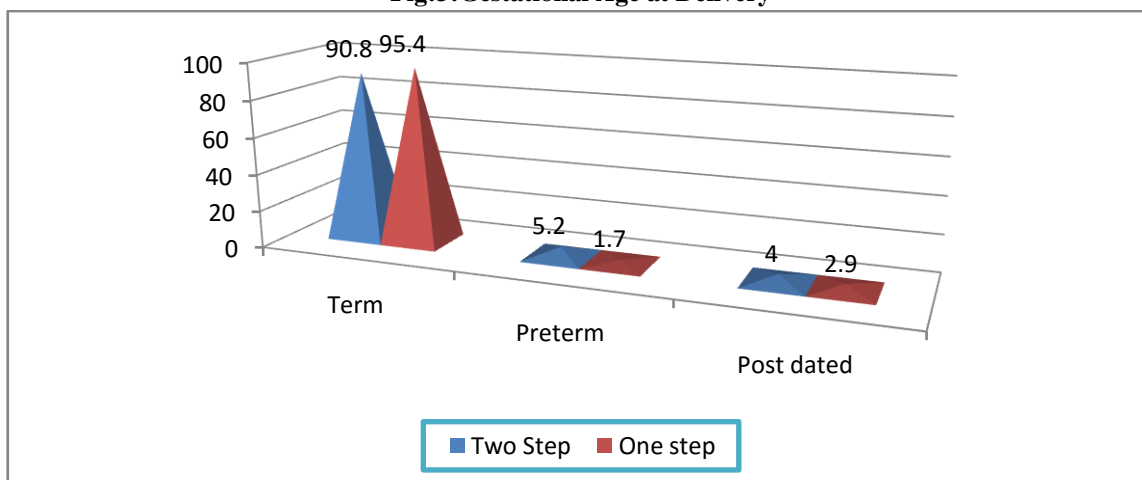


Table- 4: Type of Delivery and GDM mothers reported

Type of delivery	Two Step Group			One Step Group			Z	Sig
	Total	GDM		Total	GDM			
		No	%		No	%		
Labour Natural	226	5	2.2	233	12	5.2	1.712	P>0.05
Asst. Vagi delivery	15	0	0.0	12	0	0.0	0.0	0.0
Caesarean	107	7	6.5	103	16	15.5	2.028	P<0.05
Total	348	12	3.4	348	28	8.0	2.632	P<0.01

The above table-4, the type delivery of the groups were shown and compared. The GDM mothers in step two and one were 2.2% and 5.2% among the lab our naturals. The difference of percentages was not statistically significant (P>0.05). No GDM mothers were reported in both groups in respect of Assisted Vaginal deliveries. The Caesarean deliveries of GDM of Two step and one step groups were 6.5% and 15.5% respectively. The difference was statistically significant (P<0.05).

Fig-4: Type of Delivery with test wise GDM mothers

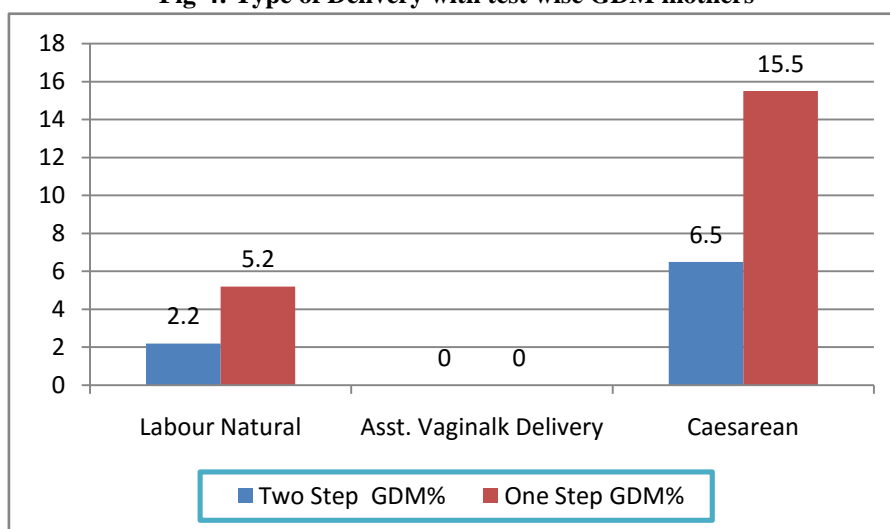


Table-5: Birth weight of babies in GDM mothers reported

Birth weight of babies (Kg)	Two Step Group			One Step Group			Z	Sig
	Total	GDM		Total	GDM			
		No	%		No	%		
< 2.5	35	1	2.9	42	4	9.5	1.236	P>0.05
2.5 – 4.0	311	10	3.2	304	22	7.2	2.238	P<0.05
> 4.0	2	1	50.0	2	2	100.0	1.386	P>0.05
Total	348	12	3.4	348	28	8.0	2.632	P<0.01

The table-5 the GDM mothers were compared according to birth weight of babies. The low birth weight and over birth weight babies' mothers were not statistically significantly in their GDM. Among the normal birth weight baby group the GDM mothers were statistically significantly differed (P<0.05).

Fig.-5: Percentage of birth weight of babies in GDM mothers reported

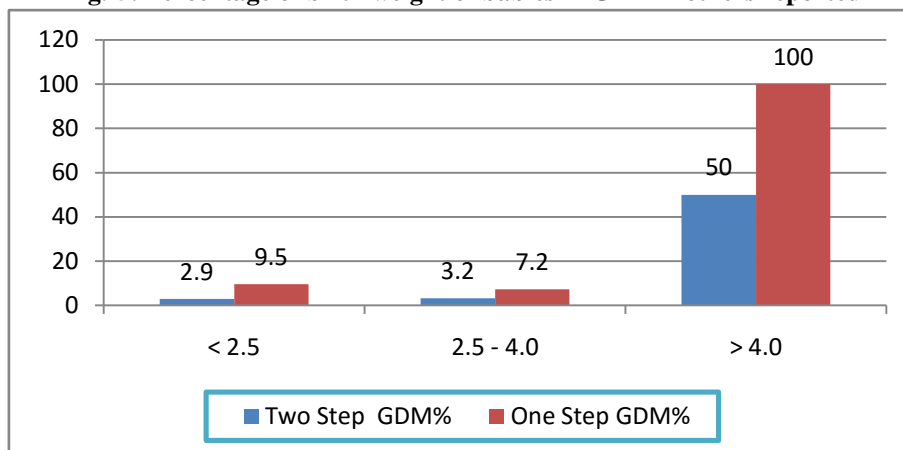


Table- 6: Management of GDM mothers in both groups

Managed by	Two Step Group		One Step Group		Z	Sig
	GDM	%	GDM	%		
Meal Plan	8	66.7	21	75.0	0.525	P>0.05
Insulin	4	33.3	7	25.0		
Total	12	100.0	28	100.0		

Among 12 GDM patients in two step group 8 were put on MNT (66.6%) and 4 (33.3%) on insulin and out of 28 GDM patients in single step group 21 (75%) were put on MNT and 7 (25%) on insulin. The proportions of the managements were not statistically significant (P>0.05).

Fig.-6: Percentages of management in two groups

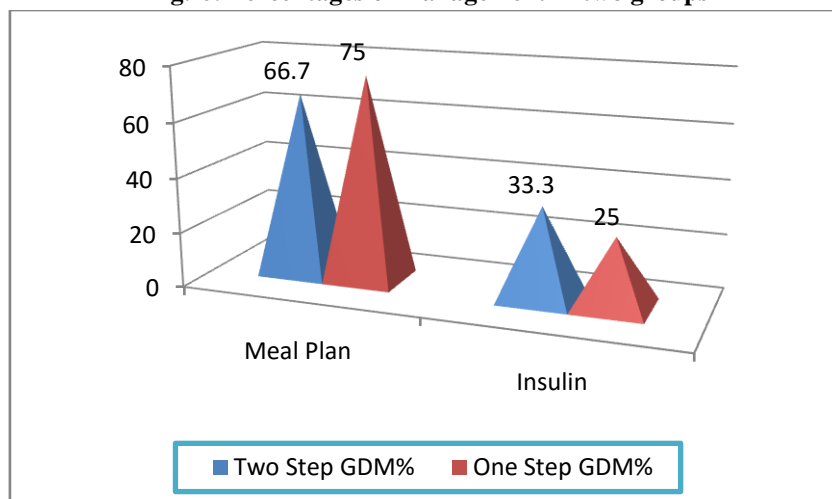


Table- 7: Association between the detection of GDM mothers of two groups

Category	One step group	Two step group	Total	Results
GDM	28	12	40	$\chi^2 = 6.790$
No GDM	320	336	656	df = 1
Total	348	348	696	P<0.01

The table-7 states the association between the detection of GDM mothers. The GDM mothers were very strongly associated with one step group.

Table-8: Comparison of two groups in detection of GDM Mothers

Mothers.	Two step n=348		One step n=348		Z	Sig.
	No	%	No	%		
Not detected	6	33.3	1	3.4	2.576	P<0.01
Detected	12	66.7	28	96.6		
Total	18	100.0	29	100.0		

The table-8 shows the comparison of two tests in respect of detection capacity. The percentages of detections in two tests were 66.7% and 96.6% respectively. The difference was statistically highly significant (P<0.01).

Table-9: Comparison of two groups in detection of GDM Mothers in terms of Odds Likelihood ratio

Results	Two step test					One step test				
	GDM	Propo	No GDM	Propo	LR+	GDM	Prop	No GDM	Prop	LR+
+	12	0.667	6	0.018	37.1	28	0.966	1	0.003	322
-	6	0.333	324	0.982		1	0.034	318	0.997	
Total	18		330	1.0		29	1.0	319		

The table-9 states the likelihood + rates of the two tests. The likelihood+ of the two step was only 37.1 times and the same of the one step test was 322 times.

4. DISCUSSION

The positive correlation of age and blood glucose levels of both groups revealed that as the age increases the incidence of GDM increases in both the test groups.

The first and second trimester positive detections of the two tests were more or less equal, since the results of the two tests were not significant (P>0.05). But in the third trimester, the positive results were significant (P<0.05).

The term deliveries among the two step group were 90.8% and one step group was 95.4%. In pre term deliveries, the two step group was 5.2% and one step group was 1.7%.

Among the normal deliveries, the GDM mothers may be equal (P>0.05). Regarding the caesarean mothers, the GDM mothers were significantly more (15.5%) in one step group than the two step group (6.5%). The test results lead to save the mothers by conducting the caesarean section. In respect of babies birth weight also the same observation was made since the GDM mothers were significantly differed in normal birth weight babies (P<0.05).

The GDM mothers were strongly associated with one step test than the two step test (P<0.01). The prevalence of GDM in two step group was 3.4% and 8.0% in one step group revealed that more number of cases could be identified using the single test group which is simple, economical and diagnostic.

In this study 6 cases in two step group which were negative in the screening test was found positive in diagnostic test, but only one case was found positive in diagnostic test of single step test group.

The efficacy of one step test in terms of odds likelihood + ratio was 322 times, and the same of the two step test was 35.1 times.

V Seshiah et al study group shows above 50gms OGCT leaves 21.5% undiagnosed and it lacks specificity (41.8%) Sevkicelen et al study shows that one step method was preferred over two step method due to its diagnostic value and lower cost. But the test duration and number of blood sampling procedure was higher Anjalakshi et al compared two hour OGTT recommended by WHO done in a fasting state with blood sample at 0,60, 120mts with a two hour 75gm OGCT performed regardless the time of the last meal and showed no difference in the glycermic results. Balaji et al conducted a study in India with one step 75gm OGCT irrespective of last meal and blood sampling after two hours was found to be cost effective. Kavita Sharma et al in her study observed that there was no statistical difference between 2 hour – 75gm GCT and 2hr GTT recommended by WHO. It concludes single step procedure is cost effective evidence based and patient friendly approach to diagnose gestational diabetes mellitus. Single step 75gm OGTT is simple, economical, easy and single visit is needed. It is accurate as a 2 hr GTT also. It serves as screening and diagnostic procedure also.

5. CONCLUSION

The study concluded that the single test using 75 g oral glucose irrespective of last meal and venous blood glucose after two hours is better because.

1. It detects more number of cases, than the conventional 50gm OGCT
2. It is less cumbersome, as it avoids repeated visits of the antenatal women for screening and again for confirmation.
3. With limited resource and large number of antenatal women who need to be screened, it is economical also.
4. It can be used both as screening and diagnostic test.
5. In India where prevalence of GDM is higher more antenatal mothers are to be screened this method is useful to diagnose GDM early and reduce the material and perinatal morbidity also.
6. So present study supports that one step OGCT is an effective screening and diagnostic method for Gestational diabetes mellitus.

6. REFERENCES

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