



## COMPARATIVE STUDY OF GLUCOMETER AND GOD POD FOR ESTIMATION OF BLOOD SUGAR LEVELS IN DIABETICS IN A TERTIARY CARE CENTRE OF CENTRAL INDIA.

**Dr. Renu Waghmare**

Assistant Professor, Department of Community Medicine, Amaltas Institute of Medical Sciences, Indore

**Dr. N. Pragathi Kumar\***

Senior Resident, Community Medicine department, Kakatiya Medical College, Warangal, Telangana. \*Corresponding Author

### KEYWORDS :

#### INTRODUCTION

Diabetes is fast gaining the status of a potential epidemic in India with more than 62 million Diabetic individuals currently diagnosed with the disease.<sup>1,2</sup> The prevalence of diabetes being a Quarter in rural than in urban and it also varies geographically.<sup>3</sup>

Estimation of blood glucose is influenced by various factors, including the origin of the sample (capillary or venous), sample preparation, method of analysis, and whether the estimation is done using whole blood, plasma, or serum. Although the oral glucose tolerance test (OGTT) using venous plasma glucose (VPG) is recognized as the "gold standard" for diagnosis of diabetes, there remain numerous logistic issues in carrying out venous plasma estimation. There is a need for an accurate, easy, portable, and cost-effective method of glucose estimation to carry out large-scale screening for diabetes, glucometers being one of such tools, the question then arises to their validity and reliability and also whether the capillary whole-blood glucose values obtained from the glucometers are comparable to the VPG values. Although there are many controversial results regarding VBG and CBG estimation with respect to blood sugar levels<sup>4,5</sup>.

The susceptibility of diabetics to complications is driven by both modifiable and non-modifiable risk factors. Obesity is one of the major risk factors for diabetes, although modifiable, yet there has been little research focusing on this risk factor across India.

#### OBJECTIVES:

- To compare the blood glucose values by Glucometer and GOD-POD, the laboratory testing method.
- To find the precision and accuracy of glucometer values compared to GOD-POD the laboratory testing method.

#### METHODOLOGY

This cross sectional study was conducted from 1<sup>st</sup> May to 30<sup>th</sup> June 2017 in a tertiary care centre of Indore. All known cases of diabetes mellitus coming in OPD or admitted in the hospital were selected for the study (according to nationwide prevalence).<sup>6</sup> All diabetics of age group >18yrs will be selected for the study as they can give a legal consent, amongst those who were not ready for giving consent, critically ill and those suffering from debilitating disease were excluded from the study. A sample size of 142 patients and ethical clearance was obtained. After taking the consent height, weight and waist hip ratio was measured. Body weight was measured by standard and calibrated weighing machine with least count of 0.1 kg, the height was assessed on the stadiometer in centimetre with body erect in frankfurt plane, patient looking in front and heels in close proximity. All the patients with BMI >27.5 were taken as obese, the cut off for Asian population<sup>7</sup>.

Immediately before the venipuncture the sample for CBG estimated was obtained from fourth finger of the non dominant hand.<sup>8</sup> The accurate active glucometer<sup>8</sup>, functionally active with sterile lancet, strip loaded and battery intact is used. As we know that the depth of the prick is slightly deeper than the length of the lancet used, length ranges from 0.85 -2.2 mm, from 1 to 5 ascending the numbering in depth for various glucometers, average 1.5 mm at level 2 was used. After wearing latex gloves clean the fourth finger of the non dominant hand with alcohol swab and allow it to dry. With the dominant hand, prick the finger with a new and sterile lancet already given with the glucometer at the centre

of the ball, apply gentle pressure, express the first drop of the blood and wipe it off with a dry cotton, express the second drop and gently touch the drop of the blood at the centre of the green field and hear the beep for the reading. Note the reading with respect to fasting /random/2hrs after the meals along with other details. Now the patient was asked for his routine blood estimation by intravenous access.

The collected data was put to excel sheet, unpaired t test will be applied between the glucometer readings and the god pod obtained values, also association of BMI and waist hip ratio was calculated and appropriate statistical analysis was done.

#### RESULTS

**Table 1: Table showing socio demographic status of study population:**

Variable		N=142
Age in years	20-30	6 (4.2%)
	30-40	37 (26.1%)
	40-50	25 (17.6%)
	50-60	74 (52.1%)
Religion	Hindu	110(77.5%)
	Muslim	12(8.5%)
	Christian	20(14.1%)
Sex	Male	35(24.6%)
	Female	107(75.3%)
BMI(>27)	Male	80(74.8%)
	Female	30(85.7%)

Table.1 shows most of the study population (52.1%) belongs to age group of 50-60, Hindus (77.5%) and females (75.3%).Both male (74.8%) and females (85.7%) are having high BMI(>27) with slight predominance in females.

**Table 2: Table showing comparison of FBS and PPBS values of study sample:**

	lab(GOD POD)value	glucometer value	t test+	p value
FBS	105	125.01	7.785	<0.00001*
RBS	93.33	121.33	2.11	0.051
PPBS	166.77	194.02	2.181	0.016*

**+Unpaired t test is applied. \*the p value is significant at p <0.05**

Table 2 shows that there is much difference between the glucometer as well as the laboratory values, and the difference is statistically significant for fbs (p=<0.00001) as well as ppbs (p=0.016).

**Table 3: Table showing comparison of adjusted FBS and PPBS of Glucometer for PRECISION of glucometer values.**

GLUCOMETER							
Adjusted FBS				Adjusted PPBS			
95% Confidence Interval for Mean		99% Confidence Interval for Mean		95% Confidence Interval for Mean		99% Confidence Interval for Mean	
Lower Bound	Upper Bound	Lower Bound	Upper Bound	Lower Bound	Upper Bound	Lower Bound	Upper Bound
117.41	122.66	116.55	123.53	110.94	128.26	113.15	126.06

FBS (adjusted as percentage) values of glucometer gave confidence interval (C.I) of 117.41 to 122.66 at 95%, 116.55 to 123.53 at 99%. It is Showing narrow C.I therefore HIGH PRECISE In nature.

PPBS (adjusted as percentage) values of glucometer gave confidence interval (C.I) of 110.94 to 128.26 at 95%, 113.5 to 126.06 at 99% It is Showing wide C.I therefore LOW PRECISE in nature when compared to FBS glucometer values.

**Table 4: Table showing ACCURACY of glucometer reading by percent error (% error)**

GLUCOMETER	Percent error
Adjusted FBS	+20.6%
Adjusted PPBS	+19.6%

Table 4 is showing percent error of glucometer by + 20.6% of original value of lab GOD-POD method for FBS and +19.6% for PPBS which shows its accuracy with nearly +20% error.

#### DISCUSSION:

Greater prevalence of obesity in diabetics can point towards rising diabetic epidemic in India and also proved lifestyle modification is urgent and first requirement in even first degree relatives of diabetes<sup>9</sup>, similar results were obtained in our study (85.7 % among study subjects).

The study by Suresh babu etal was carried out to compare capillary whole-blood glucose versus plasma glucose estimation to validate the use of capillary whole-blood glucose estimation by a glucometer as a screening tool for GDM and no significant differences were found which is contradictory to our study also Weiss PA et al.<sup>10</sup> study revealed that CBG values best approximated VPG values in healthy populations, that is in the diagnosis of GDM, the glucose measurement by CBG and VPG did not differ in the 1-h level (177 vs. 171 mg/dL) or the 2-h level (141 vs. 137mg/dL).

Colagiuri S and Foss-Freitas MC et al. found a difference of 5-9mg/dL of VPG from CBG at 2h post glucose load may not discourage the use of glucometer as more studies are coming up in favor of CBG<sup>11-14</sup>, the results being similar to our study.

There are no studies done to find the accuracy and precision of glucometers, although comparative studies with 2- glucometers and god pod method have been done<sup>7</sup> which does not reveal significant difference in glucometers' value but differences in lab and glucometer values are seen. Hence, the glucometer values as expected were nearly 10- 15 % higher in comparison to the GOD POD values, revealing highly precise values in FBS and of low precision in PPBS, indicating FBS values are more reliable to lab GOD POD values than PPBS.

#### CONCLUSION:

Patients who are in need of ambulatory estimation of blood sugar, heavily obese and where cost of health care is extremely higher, glucometers are admired. As seen in the paper above the FBS and PPBS both give precise values while FBS being more reliable and nearer to the god pod values, leading to early diagnosis and decreasing the morbidity and economic loss and also decreasing the health care cost and burden on health services in India.

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