



ORIGINAL RESEARCH PAPER

Biochemistry

COMPARATIVE STUDY DONE IN FASTING BLOOD GLUCOSE OF TYPE 2 DIABETIS MELLITUS PATIENTS BETWEEN FULLY AUTOMATED ANALYSER, SEMI AUTOMATED ANALYSER, AND COLORIMETER IN A TERTIARY HOSPITAL AT MADURANTHAGAM"

KEY WORDS: Type 2 Diabetes Mellitus, Fully Automated analyser, Semi Autoanalyser, Colorimeter, Fasting Blood Glucose(FBG).

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ABSTRACT Diabetes mellitus is an emerging medical health problem in both developed and developing countries. The early diagnosis and management helps in reducing the complications of the disease. Hyperglycemia is dangerous but hypoglycemia is fatal. The treatment for both hyperglycemia and hypoglycemia is different but timely management saves the life of the patient. In emergency situations fully automated analyser play an important role compared to semi-auto and colorimeter because earlier restoration prevents irreversible neuronal damage. The present study is an attempt to explore any difference in the readings obtained from fully automated, semi-automated and colorimeter. The study included 40 Type 2 diabetes mellitus patients attending Karpaga Vinayaga Institute of Medical Sciences, Maduranthagam. Blood samples are collected. The blood glucose levels are estimated by Glucose Oxidase – Peroxidase method in auto analyzer, semi auto analyzer and in colorimeter. The data were analyzed and expressed as mean ± standard deviation.

INTRODUCTION:

The definition of a normal fasting plasma glucose level has recently been revised by the Expert Committee on the Diagnosis and Classification of Diabetes Mellitus of the American Diabetes Association. An impaired fasting plasma glucose level is now considered to include the range of 100 to 109 mg per deciliter (5.55 to 6.05 mmol per liter)^[10]. Although it raises considerable controversy regarding the implications for health care policy^[11-15]. The concept that persons with fasting plasma glucose levels of 100 to 109 mg per deciliter are at increased risk for the development of type 2 diabetes, as compared with those with fasting plasma glucose levels of less than 100 mg per deciliter, is substantiated by data^[14,16,17].

India is ranked second in the world in diabetes prevalence, just behind China. In 2014, the International Diabetes Federation estimated that 387 million people around the world had DM, and by 2035 this number is likely to rise to 592 million. Such factors as inactive lifestyle, dietary modifications, ethnicity, and obesity have led to a remarkable increase in the occurrence of DM, particularly in the twenty-first century.^[8]

Diabetes mellitus (DM) is almost certainly one of the oldest diseases known to man. It was first reported in Egyptian manuscript about 3000 years ago.^[4]

According to the International Diabetes Federation, 61.3 million people in India had diabetes in 2011 and that figure is projected to rise to 101.2 million by 2030. India aims to combat rising diabetes healthcare costs through the diabetes screening program; the National Program for Prevention and Control of Cancer, Diabetes, Cardiovascular Disease and Stroke (NPCDCS), that was approved in 2010 by the Cabinet Committee of Economic Affairs for 100 districts across 15 states and Union Territories. The program plans to screen 150 million people across the country.^[1] A national project to screen school children was also rolled out in March 2011 to identify diabetes prevalence in school.

Glucose is the major carbohydrate found in the blood and is the chief source of energy in human body. The nervous system, including the brain, totally depends on glucose from the surrounding extra cellular fluid (ECF) for energy. The concentration of glucose in the ECF must be maintained within a narrow range. When the concentration falls below a critical level, the nervous tissues lose the primary energy source and are incapable of maintaining normal function.

Blood Glucose level monitoring is very important in an intensive care unit especially for diabetic patients. Only the chemical analyzer (colorimeter, semi-auto and auto analyzer) will provide

the accurate results. Compared to semi-auto analyzer, auto analyzer has minimum errors because more manual work is done in semi-auto analyzer and in colorimeter. Auto-analyzer gives the most accurate results. The aim of the current study was to determine the accuracy of using the fully auto, semi auto and colorimeter for blood glucose measurement.

MATERIAL AND METHODS:

This study included 40 Type 2 diabetes mellitus patients attending Karpaga Vinayaga institute of Medical Sciences. Blood samples were collected from venous blood from each patient in Sodium fluoride container for measuring blood glucose using the auto analyzer (BIO SYSTEM -200) and semi auto analyzer (BIO SYSTEM) and colorimeter (Digital) by Glucose Oxidase – Peroxidase method. The data were analyzed and expressed as mean ± standard deviation.

STATISTICS:

The results were analysed on SPSS statistical software. All estimates were presented as Mean ±SD and statistical treatment were performed using student t test. P value <0.05 were considered as statistically significant.

DISCUSSION:

The present study aimed to compare the blood glucose values between auto, semi-auto analyzer and colorimeter. We have taken 40 type 2 diabetic patients. There are a number of opinions about 'Technical Accuracy' in measuring blood glucose when comparing auto, fully auto and colorimeter against a laboratory method^[5-8]. Blood glucose values were compared between auto-analyzer, semi-auto analyzer and colorimeter for type 2 diabetic patients and are clearly shown in table 1. Glucose values expressed as mean ± standard deviation were shown in table 2. The blood glucose values measured in colorimeter, semi auto analyser are less in compared to fully auto analyser. In rural areas, the transport of blood to laboratories for analysis is problematic. Analytes such as glucose have to be collected and processed in a timely fashion to ensure accurate results.

Comparison between colorimeter and semi auto analyser, colorimeter and fully auto analyser, p value <0.0001 is significant. n=40, comparing to colorimeter, semi auto analyser is significant. comparing colorimeter, fully auto analyser is significant. between fully and semi auto analyser, fully auto analyser is more significant.

Hence colorimeter is less significant than semi auto analyser and fully auto analyser.

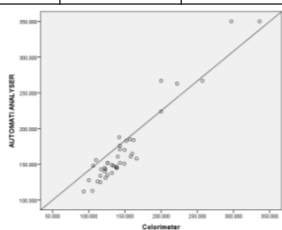
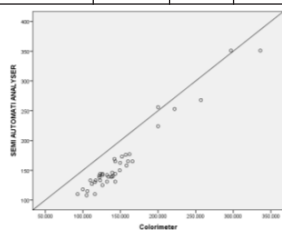
In our hospital, fully auto analyser is the best way to justify fasting blood glucose.

Table1: Comparison between Auto-Analyser , Semi-Auto Analyzer and Colorimeter

S.NO	AGE	SEX	AUTO-ANALYSER	SEMI AUTO-ANALYSER	Colorimeter
1	65	M	183	173	152
2	38	F	134	110	116
3	60	F	125	130	116
4	42	M	131	133	123
5	52	M	149	142	132
6	75	M	152	144	143
7	59	F	267	268	257
8	38	M	350	351	336
9	42	M	145	146	139
10	68	M	158	165	166
11	65	M	184	177	162
12	63	F	161	140	140
13	42	F	135	125	126
14	53	F	126	127	112
15	70	M	143	144	123
16	75	M	113	108	105
17	65	F	145	139	138
18	50	M	161	158	158
19	62	F	140	141	122
20	32	F	145	138	122
21	60	F	224	224	200
22	50	M	176	165	143
23	60	F	151	150	149
24	65	M	188	169	142
25	37	M	263	253	222
26	65	F	165	165	160
27	83	F	148	139	134
28	62	F	147	139	138
29	57	M	185	176	157
30	70	F	138	131	132
31	78	M	143	133	117
32	38	M	350	351	297
33	42	F	171	131	143
34	59	F	267	256	200
35	75	M	152	144	126
36	50	F	156	133	110
37	48	M	112	110	93
38	52	M	148	115	106
39	48	M	128	118	100
40	65	F	152	142	126

Table 2: Glucose values are expressed as Mean, median, ± Standard deviation .

	AGE	SEX	AUTO-ANALYSER	SEMI-AUTO-ANALYSER	Colorimeter
N	40	40	40	40	40
Mean	57	1.48	170.28	162.58	149.58
Median	59.5	1	151.5	142	138
Std. Deviation	12.846	0.506	55.831	57.747	50.885



GRAPH 1: COMPARISON OF GLUCOSE VALUES BETWEEN SEMI-AUTOANALYSER AND COLORIMETER

GRAPH 2: COMPARISON OF GLUCOSE VALUES BETWEEN AUTOANALYSER AND COLORIMETER

CONCLUSION:

We concluded that the auto-analyzer is more accurate compared to semi-auto analyzer and colorimeter for blood glucose

estimation. Although the values of blood glucose measured using fully automated analyser, semi auto analyser and colorimeter differ but for accurate values fully automated analyser is quiet fast, simple, reliable and accurate. On comparing fully automated analyser with semi auto analyser, it requires lot of labour like pipetting in which many error can occur further comparing with manual colorimeter in which much more human error can occur. Hence, it is concluded that fully automated analyser is the choice in STAT conditions rather than time consuming semi auto analysis and colorimeter. Error free fasting glucose level done saves the precious life of the patients.

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