

# EYETONE REFLECTANCE COLORIMETER AS AN AID FOR BLOOD GLUCOSE ESTIMATION

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Seventeen hundred and eighty samples of venous blood were collected and estimated for glucose by both Nelson Somogyi (NS) and Eytone Reflectance Colorimeter (ETRC) methods. The samples were subgrouped according to the blood glucose values (NS) less than 50, 51-100, 101-200, 201-300, 301-400 and more than 400 mg./dl. The values (Mean  $\pm$  SD in mg/dl) of the different subgroups were  $40.7 \pm 5.1$ ,  $81.6 \pm 11.3$ ,  $160.39 \pm 28.5$ ,  $246.9 \pm 31.7$ ,  $339.7 \pm 18.9$ ,  $456.3 \pm 31.3$  by SN method. The corresponding values by ETRC method were  $42.2 \pm 7.3$ ,  $85.4 \pm 14.0$ ,  $175.82 \pm 23.2$ ,  $275.3 \pm 20.3$ ,  $382 \pm 17.5$  and  $539.6 \pm 40.7$ . The differences were significant in all groups ( $P < 0.002$ ) for the range of 51-100 mg./dl and ( $P < 0.001$ ) in the range of less than 50 and more than 100 mg./dl. However the correlation of these blood glucose results with those obtained with NS was very high ( $r=0.96$ ). Taking the WHO criteria (1980), 37 subjects were over diagnosed as either diabetic or having impaired glucose tolerance by ETRC method. Thus blood glucose estimations by Eytone using Dextrostix gives significantly higher values compared to NS method even when venous whole blood is tested and as such not reliable for diagnostic purposes.

## Introduction

Blood glucose determination has been increasingly felt necessary both for detection as well as management of diabetes subjects. In screening large group of subjects it is needed to use a simple, less time consuming yet accurate procedure. Besides, for rigid control of diabetes home blood glucose monitoring (HBGM) is essential. ETRC using Dextrostix (DX) has been recently used for HBGM as well as for quick or mass scale blood glucose estimations. After one of us (BNJ) had sufficient experience with the machine an attempt was made to compare the whole blood glucose values estimated by NS and ETRC methods to find out the reliability of ETRC method in our hands.

## Materials and Methods

Seventeen hundred and eighty samples of venous blood were collected from diabetics as well as non-diabetic subjects. From all the samples a drop of blood was directly put on DX strip and blood glucose was estimated by ETRC (Miles India Ltd.). One ml. of blood was collected in tubes containing 1 mg of Fluoride and 2 mg of oxalate for glucose determination by NS method.

In the ETRC method care was taken for daily calibration check, standardization and precise timing during different steps. The machine was put on uninterrupted for a period not exceeding one hour and was handled by one of us (BNJ).

At random some samples were also processed by NS method in Department of Biochemistry of the institution which maintains WHO quality control, to compare the corresponding results obtained by NS method in our own laboratory.

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## Results

The samples were subgrouped according to the blood glucose values (NS) and the corresponding data are shown (Table-I)

**Table-I**

Range of blood Glucose (mg/dl.)	No. of samples	Mean blood glucose mg/dl		% higher	P value	% higher by 20%
		ETRC	NS			
<50	39	42.2 ± 7.3	40.7 ± 5.1	3.68	< 0.001	5.5
50-100	397	85.4 ± 14.0	81.6 ± 11.3	4.65	< 0.02	11.7
100-200	418	175.8 ± 23.2	160.4 ± 28.5	9.62	< 0.001	17.1
200-300	341	275.3 ± 20.3	246.9 ± 31.7	11.5	< 0.001	17.3
300-400	398	382.1 ± 17.5	339.7 ± 18.9	12.48	< 0.001	29.5
More than 400	187	539.6 ± 40.7	456.3 ± 31.3	18.25	< 0.001	33

The difference in the results obtained by the two methods was significant ( $P < 0.02$ ) within the range of 50-100 mg/dl and highly significant ( $P < 0.001$ ) in the range of less than 50 and more than 100 mg/dl. It was observed that the ETRC method-over estimated the blood glucose values in most of the occasions and the difference was wider at higher blood glucose levels. When compared with the NS method, ETRC values were higher of 20% or more in 5.5% of samples having blood glucose less than 50 mg/dl to 33 % at 400 mg/dl values. However the correlation of these blood glucose results with those obtained with NS was very high ( $r=0.96$ )

Taking the WHO criteria (1980) 37 subjects were overdiagnosed as either diabetic or having impaired glucose tolerance by ETRC method.

## Discussion

Visual inspection of Dextrostix is not very reliable for practical day to day clinical use. Eytone reflectance colorimeter using Dextrostix is good to be sufficiently accurate for potential use in home monitoring of blood glucose concentration.<sup>1</sup> This study compared the blood glucose values obtained by autoanalyser and the co-efficient of correlation ( $r$ ) was reported to be 0.952. Similar results were reported by Shapiro et al (1981)<sup>2</sup>. In another study only 65% of Dextrostix/Dextrometer observations were within 20%, of plasma glucose results determined with the glucose analyser ( $P=0.19$ ). These workers reported that Dextrostix/Dextrometer readings error almost exclusively under estimates. Our study reveal that ETRC using Dextrostix gives a significantly higher blood glucose value in all ranges compared to NS method. This difference is more pronounced at higher blood glucose level.

## **Conclusion**

Eyestone reflectance colorimeter using Dextrostix is not ideal for diagnostic purposes and when used for HBMG, one should keep in mind that the system over estimates blood glucose.

## **References**

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