Short note

Glucometer against laboratory blood glucose test: results efficiency

Amna Omer Abdalrahman **Alrayah**[1,*], Mohammed Ibrahim Osman **Ahmed**[2], Fiza Ahmed saaed **Mosa**[1], Safa Babiker **Alamin**[1]

1. Department of Medical Surgery, Faculty of Nursing Sciences, Shendi University, Shendi, Sudan, [*]amonaty210@gmail.com

[2.] Faculty of Nursing Sciences, El Imam El Mahdi University, Sudan

Abstract

This study was conducted at Elmek Nimer University Hospital, Shendi, Sudan from March to July 2019 to compare the efficiency of laboratory blood glucose test with a glucometer. Thirty participants with mean age 56 years were included. Capillary blood glucose level was measured using a glucometer with plasma obtained from finger tip under aseptic technique. While a blood drawn from peripheral vein was examined using glucose oxide enzyme. Results showed that the mean reading of the glucometer test was 180mg/dl and for the laboratory test it was184mg/dl. Accordingly, the laboratory test was more accurate than the glucometer. Nearly half of the participants were found to be normal, less than a third had a high reading and nearly a third were reading low relative to the normal range of the tests.

Keywords: Glucometer, laboratory blood glucose test, efficiency.

Introduction

Diabetes is a rising global health concern and about 425 million people are living with this disease worldwide. Most of these individuals, (79%) live in low and medium income countries; it is estimated that by 2045, this number may increase to 629 million. The laboratory assessment of venous plasma glucose is the gold standard for making a diagnosis of diabetes mellitus and screening at-risk populations [1,2].

Diabetes is the most common metabolic disorder in nearly 5-10 % of western population aged more than 40 years. In developing country like India, its prevalence is rapidly increasing since last few decades. WHO has specified the criteria for diagnosis of diabetes and impaired glucose tolerance for only venous plasma sample. Blood glucose estimation is the main stay of diagnosis and management of diabetes [3].

Self monitoring of blood glucose plays an important role in the safety and efficacy of current therapy for diabetes mellitus, because most dosing decisions are based on blood glucose value obtained by measuring a finger stick capillary blood specimen on a home glucose meter, the safety and effectiveness of continuous glucose monitors, and automated glucose management systems that utilize them as component parts, are also critically dependent on accurate blood glucose measurements for calibrations [4].

Glucometers are small self-monitoring devices that can be used to measure capillary blood glucose using just a drop of blood. With advancing technology and the

need to increase turnaround time for improved patient management, the use of point of care test equipment such as glucometers has gained increasing popularity in this environment. Glucometers are used in the clinics and wards routinely as a form of support for the laboratory accepted and in some countries, glucometers are used to make a diagnosis of diabetes [5,6]. In some countries, glucometers are used to make a diagnosis of diabetes. However, this is strongly discouraged by some diabetes associations and most endocrine groups in the world. It has become obvious that the efficient use of glucometers in the clinical and private setting is essential for the effective management of all types of diabetes mellitus including gestational diabetes. Effective glycaemic control is necessary to prevent or reduce the evolution of diabetic complications. Personal involvement of the index patient in the day to day monitoring of glucose is necessary and has been found to be advantageous. It could promote better health-seeking behaviour which would improve lifestyle compliance [7].

Materials and methods

This study was conducted at Elmek Nimer University Hospital, Shendi, Sudan from March to July 2019 to compare the efficiency of the laboratory blood glucose level test and the glucose meter.

Thirty patients with diabetes mellitus were included. Capillary blood glucose level was measured using a glucometer (model No TD-4251 code14, normal stander 116-156 mg/dl) with plasma obtained from finger tip under aseptic technique. At the same time 2ml of venous blood drawn from peripheral vein was sent to laboratory for determination using glucose oxidize enzyme.

Data were analyzed using the statistical software (SPSS, version 20). Ethically, the study was approved by the Research Committee of the Faculty of Nursing Sciences, Shendi University, and then permission was taken from the Elmek Nimer University Hospital. Purpose of the study was explained verbally to the participants and they had an opportunity to refuse or continue.

Results and discussion

The mean age of the participants was 56 years (30-80). Regarding the laboratory random blood glucose test with normal reference range (140-200mg/dl), it was found that the mean of reading was 184mg/dl ± 874. For the glucometer blood glucose test, the normal reference reading (116-156mg/dl), the mean of reading was 180mg/dl ±761. Random laboratory results for blood glucose seem to be more near to the standard reference reading rather than the glucometer results. This may due to

some factors starting from storage of strips, handling of the test by nurse and efficiency and calibration of the device and its calibration; the accuracy of the laboratory result may be due to its low exposure to contamination. This result disagree with previous study done in India which reported that capillary blood glucose estimation by glucometer is a better alternative to venous plasma glucose estimation for diagnosis; follow up and in emergency conditions in diabetic as well as non diabetic patients. Venous blood glucose estimation by glucometer is not advisable as a routine method, but it is advocated when patient refuses for a second pin prick of finger [3]. Concerning the variation in reading, 46% of the laboratory blood glucose test result was normal, while 23% was high and 30% was low. For a glucometer reading, the normal and high were 40% while the low was 20%.

In conclusion, it is found that the laboratory test is more accurate than the glucometer. Precautions should be taken when using the glucometer, such as cleaning hands before use, keeping the device under the optimum temperature and making sure the device is fully charged.

Acknowledgements

The authors would like to thank the regional bodies and Elmek Nimer University Hospital authorities, as well as Dr. Hijazi Awad for their assistance in carrying out this work.

References

[1] World diabetes foundation, IDF. 2017. Atlas. 8th Ed. (Chapter 3): 43.

[2] Fasanmade OA, Dagogo-Jack S. 2015. Diabetes care in Nigeria. *Ann Glob Health*. 81: 821–829.

[3] Patel N, Patel K. 2015. A Comparative study of venous and capillary blood glucose levels by different methods. *GCSMC J Med Sci* 4(1).

[4] Ekhlaspour L, Lautsch N, Hillard M, Radocchia L, Esmaeili A, Russell S. 2017. Comparative accuracy of 17 point of care glucose meters. *J Diabetes Sci Technol* 11: 558–566.

[5] Unachukwu CN, Young EE, Uchenna DI. 2011. Self blood glucose monitoring among diabetic patients in Port Harcourt, Nigeria. *Afr J Diabetes Med* 9: 19–20.

[6] Suresh Babu G, Babu Rao R, Shwetha K, Imran AS, Ratna Kumari V. 2015. Comparing the glucose values by glucometer and laboratory methods in the diagnosis of gestational diabetes mellitus: A hospital based study. *Int J Cur Med Apl Sci* 7(1): 21–29.

[7] Otokunefor O, Ogu R. 2018. Comparing the glucose results by glucometer and laboratory methods: a prospective hospital based study. *J Adv Med Med Res* 26(3): 1–7.