INDOGENIUS

ISSN 2828-1365

Volume 4, Issue 3 : 747 - 752

Differences in Blood Glucose Levels Between POCT (Point of Care Testing) and Spectrophotometer Methods

Fitri Yatun Khasanah[1], Suparyati[1]
[1]*Akademi Analis Kesehatan Pekalongan, Jawa Tengah, Indonesia*

Article Info

Keywords :
Blood Glucose, POCT, Spectrophotometer

Corresponding Author :
Fitri Yatun Khasanah
E-mail : fitriatun2019@gmail.com
Phone Number : 089669869854

ABSTRACT

Background & Objective: Blood glucose is a sugar found in the blood that is formed from carbohydrates in food and stored as glycogen in the liver and muscles. Glucose is one of the important carbohydrates used as the main source of energy in the body. Blood glucose test results exceeding the normal level of 200 mg/dl may indicate that a person has diabetes mellitus. This study aims to determine the difference in blood glucose levels between the POCT method and the spectrophotometer. **Method:** The study design is analytical, using random sampling with 30 participants, and statistical analysis was performed using the Paired T-Test and Wilcoxon test. **Result:** The results of this study using the Paired T-Test showed that POCT data is normally distributed (sig value = 0.208 > 0.05), while spectrophotometer data is not normally distributed (sig value = 0.003 < 0.05). Meanwhile, the Wilcoxon test yielded a sig value of 0.000 < 0.05. **Conclusion:** The results of blood glucose level measurements using the POCT method showed an average value of 128.83 mg/dl, while the spectrophotometer results showed an average value of 88.07 mg/dl. Based on the statistical test results, the sig value was 0.000 (p<0.5), meaning H0 was rejected. This means that the difference between the two measurement methods is statistically significant.

DOI: https://doi.org/10.56359/igj.v4i3.645

Introduction

Blood glucose is the sugar present in the blood, derived from carbohydrates in food and stored as glycogen in the liver and muscles. Glucose is one of the essential carbohydrates used as the primary energy source in the body. A blood glucose test result exceeding the normal range of 200 mg/dl may indicate a diagnosis of Diabetes Mellitus (Anisa, 2022).

Laboratory test results are not only required to be accurate but also fast, especially in emergency cases, and they should also provide satisfaction for patients undergoing the tests (Maulidiyanti, 2017). Clinical laboratories have also seen advancements in technology and scientific knowledge in the modern era, particularly with the development of healthcare infrastructure and the increasing variety of supporting facilities used to enhance healthcare services. One such facility is the clinical laboratory healthcare unit, which serves as the primary tool in assisting with disease diagnosis (Anisa, 2022). Laboratory examinations are also a crucial diagnostic tool for establishing a diagnosis of a disease, including determining blood glucose levels.

Blood glucose testing can be performed using POCT (*Point-of-Care Testing*) or a spectrophotometer. POCT uses capillary blood samples, while the spectrophotometer uses serum/plasma samples. POCT for blood glucose testing consists of a glucometer, test strips, an autoclave, and a lancet (sample collection needle), while a spectrophotometer uses glucose reagents, requiring a larger serum/plasma sample and taking longer to process.

POCT (*Point-of-Care Testing*) has advantages, including ease of use and can be performed by medical staff, nurses, patients, and family members for patient monitoring. It requires a smaller sample volume, can be performed while lying down, has a compact device that is easy to carry, and does not require a special room. However, POCT has the disadvantage of having lower precision and accuracy compared to the reference method (spectrophotometer) (Firgiansyah, 2016).

Spectrophotometers also have advantages, including high sensitivity and selectivity, ease of measurement, and greater accuracy. The drawbacks of spectrophotometers include dependence on reagents, requiring electrical power, and needing a dedicated space, which makes them relatively expensive and time-consuming to use (Gusmayani et al., 2021). However, spectrophotometers are frequently used in government laboratories such as hospitals (RS), community health centers (Puskesmas), and clinics as an accurate tool for determining blood glucose levels. Typically, spectrophotometers are used as the standard for accuracy in blood glucose level testing. Blood glucose measurement using a spectrophotometer employs an enzymatic principle specific to blood glucose, namely the enzymatic conversion of glucose into a product based on a color change reaction (colorimetry) as the final reaction in a series of chemical reactions (Mariady et al., 2013).

According to previous research conducted by Andi Firgiansyah (2016) on the comparison of blood glucose levels using a spectrophotometer and a glucometer, the average blood glucose level measured by the glucometer was 142.50 mg/dL, which was higher than the average blood glucose level measured using a spectrophotometer, which was 90.46 mg/dL (Firgiansyah, 2016).

The results of a study conducted by Anisa Yahya (2022) on the differences in blood glucose test results using a glucometer and a spectrophotometer in pregnant women in the second and third trimesters showed that the average blood glucose level using a glucometer in pregnant women in the second trimester was 123.00 mg/dL and in the third trimester was of 136.00 mg/dL. Blood glucose levels measured using a spectrophotometer in pregnant women in the second trimester had an average value of 110.50 mg/dL, and in the third trimester, the average value was 132.43 mg/dL. There was a significant difference in blood glucose levels measured using a

glucometer and spectrophotometer in pregnant women, with a p-value of 0.049 (Anisa, 2022).

The difference between this study and previous studies is that the studies conducted by Andi Firgiansyah (2016) and Anisa Yahya (2022) focused on the differences in blood glucose test results using spectrophotometers and glucometers, while this study analyzes the extent of differences in blood glucose test results using POCT (*Point Of-Care Testing*) and spectrophotometers.

Based on the above background, the author is interested in conducting research with the title "Differences in blood glucose test results using POCT (*Point Of-Care Testing*) and spectrophotometers."

Objective

To compare the results of glucose level measurements using the POCT (*Point Of-Care Testing*) method with those using a spectrophotometer.

Method

The research design used was analytical, namely to determine differences in blood glucose levels using the POCT (*Point Of Care Testing*) method with a spectrophotometer. The research was conducted in May-June 2025. The population in this study consisted of 30 samples of students from the Pekalongan Health Analyst Academy, which were taken using random sampling. The examinations were conducted at the Pekalongan Health Analyst Academy Laboratory. Statistical analysis was performed using the Paired T Test. If the data were found to be non-normally distributed, the Wilcoxon test was used.

Results

Based on the results of blood glucose level tests using POCT and spectrophotometers at the Pekalongan Health Analyst Academy Laboratory on 30 samples, the results are as follows:

TABLE 1. Results of Blood Glucose Level Tests Using POCT and Spectrophotometer at the Pekalongan Health Analyst Academy

Sample Number	POCT	Spectrophotometer
S1	154 mg/dl	120 mg/dl
S2	118 mg/dl	96 mg/dl
S3	95 mg/dl	75 mg/dl
S4	113 mg/dl	74 mg/dl
S5	113 mg/dl	94 mg/dl
S6	106 mg/dl	94 mg/dl
S7	104 mg/dl	82 mg/dl
S8	108 mg/dl	98 mg/dl
S9	113 mg/dl	100 mg/dl
S10	118 mg/dl	90 mg/dl
S11	138 mg/dl	94 mg/dl
S12	154 mg/dl	118 mg/dl
S13	166 mg/dl	79 mg/dl
S14	119 mg/dl	78 mg/dl
S15	147 mg/dl	92 mg/dl
S16	163 mg/dl	80 mg/dl
S17	191 mg/dl	138 mg/dl
S18	134 mg/dl	89 mg/dl

S19	136 mg/dl	74 mg/dl
S20	136 mg/dl	83 mg/dl
S21	128 mg/dl	70 mg/dl
S22	138 mg/dl	74 mg/dl
S23	181 mg/dl	98 mg/dl
S24	123 mg/dl	85 mg/dl
S25	106 mg/dl	66 mg/dl
S26	91 mg/dl	74 mg/dl
S27	152 mg/dl	88 mg/dl
S28	125 mg/dl	85 mg/dl
S29	98 mg/dl	75 mg/dl
S30	97 mg/dl	79 mg/dl
Average	128.83	88.07

Based on Table 1, it can be seen that the average blood glucose level measured using the POCT (Point Of Care Testing) method reached 128.83, while the blood glucose level measured using a spectrophotometer showed an average of 88.07.

TABLE 2. SPSS Results of Normality Test for Blood Glucose Level Measurement Using POCT and Spectrophotometer

	Shapiro-Wilk		
	Statistic	**df**	**sig**
POCT Glucose Level	.200	30	.208
Spectrophotometer Glucose Level	.191	30	.003

Based on the results of the Paired T Test shown in Table 2, using the Shapiro-Wilk method, it is known that the POCT data is normally distributed because (sig value = 0.208 > 0.05), while the data from the spectrophotometer is not normally distributed because (sig value = 0.003 < 0.05).

TABLE 3. Based on the SPSS Statistical Test Results for Blood Glucose Testing Using POCT and Spectrophotometer

	Spectrophotometer and POCT Glucose Levels
Z	-4.783a
Asmyp.sig.(2-tailed)	.000

Based on the data in Table 3, the Wilcoxon non-parametric statistical test produced a significance value of 0.000 < 0.05. This indicates that the null hypothesis (H0) is rejected, so it can be stated that there is a significant difference between blood glucose level tests using the POCT method and the spectrophotometer.

Discussion

Based on the results of a study of 30 blood glucose samples at the Pekalongan Health Analyst Academy, it was found that there were differences in blood glucose measurement results between the POCT (*Point Of Care Testing*) method and the spectrophotometer method. The average blood glucose level measured using the POCT method was 128.83 mg/dl, while the spectrophotometer method showed an average of 88.07 mg/dl.

A normality test using the Shapiro-Wilk method showed that the data from the POCT method were normally distributed (p-value = 0.208 > 0.05), while the data from the spectrophotometer were not normally distributed (p-value = 0.003 < 0.05). This

difference in distribution indicates that the measurement results from the POCT method have a higher level of variation.

Furthermore, the non-parametric Wilcoxon statistical test yielded a significant value of 0.000 ($p < 0.05$), thus rejecting the null hypothesis (H0). This means that the difference between the two measurement methods is statistically significant. In other words, the difference in results obtained is not solely due to random variation but indicates a substantial difference.

The significant difference in results from the two testing devices may be attributed to various factors, including pre-analytical or analytical stages. In the pre-analytical stage, several contributing factors include sample preparation processes, potential contamination of samples by certain substances that may affect results, and uncalibrated devices that may produce false-positive results (Pharmacy, 2018). In the analytical stage, common errors include improper sample handling, incorrect incubation time, inadequate reagent mixing time, and temperature inconsistencies prior to testing. Additionally, the primary cause of differing results is the lack of validation of the results obtained from the equipment used.

The advantages of the POCT (*Point of Care Testing*) method include rapid results, minimal sample requirements, no need for specialized reagents, and practical and easy use. However, this method has limitations, including unverified accuracy of results and potential factors such as hematocrit levels, the presence of interfering substances (such as vitamin C, lipids, bilirubin, and hemoglobin), temperature, and insufficient sample volume.

The spectrophotometer method has the advantages of high accuracy and precision, good specificity, and resistance to external interference such as hematocrit levels, vitamin C, lipids, sample volume, and temperature. However, this method has drawbacks, including dependence on specific types of reagents, the need for a larger blood volume, and the requirement for a dedicated space to store the equipment and reagents (Nining Kurniati et al., 2022).

Both methods require enzymatic reactions, but there are differences in their operating principles. The spectrophotometer method uses glucose oxidase (GOD) to catalyze the oxidation of glucose into gluconic acid and hydrogen peroxide. The hydrogen peroxide formed reacts with phenol and 4-amino phenazone, with the assistance of peroxidase, to produce a pink-colored compound, whose intensity is measured using a spectrophotometer. Meanwhile, the POCT method uses a reaction strip containing a glucose catalyst. When blood is dropped onto the reaction area, the glucose in the blood undergoes a reduction reaction, and the result of this reaction indicates the concentration of glucose in the blood (Fatin, 2018).

Conclusion

The results of blood glucose level tests using POCT (*Point Of Care Testing*) devices on 30 samples from students at the Pekalongan Health Analyst Academy showed an average value of 128.83 mg/dl, with the lowest value being 91 mg/dl and the highest value being 181 mg/dl. The results of blood glucose level tests using a spectrophotometer on 30 samples from students at the Pekalongan Health Analyst Academy showed an average value of 88.07 mg/dl, with the lowest value being 66 mg/dl and the highest value being 138 mg/dl. Based on the statistical test results, the significance level (sig) was 0.000 ($p < 0.05$), meaning that the null hypothesis (H0) was rejected, indicating a significant difference in the average blood glucose levels

measured using the POCT (*Point of Care Testing*) device and those measured using the spectrophotometer.

Acknowledgement

The author would like to thank all those who have helped in the implementation of this research.

References

Anisa, Y. (2022). Analisis Perbedaan Hasil Pemeriksaan Glukosa Darah Menggunakan Gukometer Dan Spektrofotometer Pada Ibu Hamil Trimester Ii Dan Iii. *Universitas Binawan*.

Farmasi, J. S. (2018). *Survei_Risiko_Penyakit_Diabetes_Melitus*. *5*(2), 134–141.

Fatin, Y. (2018). Pemeriksaan Glukosa Dengan Point Of Care Testing (Poct). *Bukit Tinggi:Rumah Sakit Stroke Bukit Tinggi.* Https://Repo.Upertis.Ac.Id/1535/1/Maini Roza.Pdf

Firgiansyah, A. (2016). Perbandingan Kadar Glukosa Darah Menggunakan Spektrofotometer Dan Glukometer. *Fakultas Ilmu Keperawatan Dan Kesehatan Universitas Muhammadiyah Semarang*, *13irgiansy*(1), 1–71.

Gusmayani, Y., Anggraini, H., & Nuroini, F. (2021). Perbedaan Kadar Kolesterol Serum Metode Spektrofotometri Dan Metode Point Of Care Testing (Poct). *Jurnal Labora Medika*, *5*(1), 24–28.

Mariady, F., Sugiarto, C., Sadeli, L., Mariady, F., Sugiarto, C., & Sadeli, L. (2013). Perbandingan Hasil Pemeriksaan Kadar Glukosa Darah Sewaktu Menggunakan Glukometer Dan Spektrofotometer Pada Penderita Diabetes Melitus Di Klinik Nirlaba Bandung Fakultas Kedokteran Universitas Kristen Maranatha Jl . Prof . Drg . Suria Sumantri No . 65 , B. *Bandung, Fakultas Kedokteran Universitas Kristen Maranantha*, *13*(1), 1–8.

Maulidiyanti, E. T. S. (2017). Perbedaan Hasil Pemeriksaan Kadar Glukosa Darah 2 Jam Pp Dengan Menggunakan Glukometer Dan Analyzer Pada Penderita Diabetes Melitus. *The Journal Of Muhammadiyah Medical Laboratory Technologist*, *1*(1), 16. Https://Doi.Org/10.30651/Jmlt.V1i1.978

Nining Kurniati, Putri Wulandari, & Wawan Sofwan Zaini. (2022). Perbandingan Hasil Pemeriksaan Gula Darah Sewaktu Metode Poct Dan Metode God-Pap Pada Pasien Diabetes Mellitus Dengan Nilai Kritis Di Igd Rsau Dr. M. Hassan Toto Bogor. *Jurnal Teknologi Kesehatan Borneo*, *3*(2), 76–80. Https://Doi.Org/10.30602/Jtkb.V3i2.251