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Differences in Cholesterol Test Results Between POCT (Point of Care Testing) and Photometer Methods

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ABSTRACT

Background & Objective: Cholesterol is one of the components of fat or lipids that is essential for the body, in addition to carbohydrates, proteins, vitamins, and minerals. Cholesterol testing in the laboratory can be performed using two types of methods, namely automatic technique testing (POCT) and simple technique testing (photometer). This study aims to determine the difference in cholesterol test results using the POCT method and the photometer method. **Method:** This study is analytical in nature, using 30 venous blood samples from outpatients at Kraton Pekalongan Regional General Hospital. The examination was conducted using the POCT method with a photometer. The data were analyzed using normality tests and Wilcoxon tests using SPSS. **Result:** The average cholesterol test result using the POCT method was 173.37 mg/dl, while the photometer method yielded a result of 127.77 mg/dl. The statistical test results showed (sig value = 0.000 < 0.05), indicating a significant difference between the two methods. **Conclusion:** There is a significant difference between the cholesterol results obtained by the POCT method and the photometer.

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Introduction

Cholesterol is one of the components of fat or lipids that are essential for the body, in addition to carbohydrates, proteins, vitamins, and minerals. Cholesterol acts as the basic material for the production of steroid hormones. High cholesterol levels can increase the process of atherosclerosis, and artery cells that are clogged with fat lose their elasticity in regulating blood pressure. As a result, various diseases occur, such as hypertension, arrhythmia, heart attack, and stroke. Several factors that influence total cholesterol include a diet high in fiber and fat, smoking, gender, obesity, and physical activity (Rika Widianita 2023).

The main factors causing increased cholesterol in the blood are heredity and high fat intake. A high dietary fat intake can affect blood cholesterol, especially LDL cholesterol. Consumption of saturated fats and high cholesterol can increase the concentration of LDL cholesterol in the blood. On the other hand, unsaturated fats have a different effect. Unsaturated fatty acids can lower blood cholesterol levels by reducing LDL cholesterol levels and increasing HDL cholesterol levels. In addition, fiber also plays an important role in lowering blood cholesterol. Consuming at least 28g of fiber per day can lower cholesterol levels by 15-19% (Yuliantini et al. 2015).

Cholesterol is produced naturally by the body, with the rest obtained from animal-based foods such as meat, poultry, fish, margarine, cheese, and milk. Plant-based foods such as fruits, vegetables, and grains do not contain cholesterol (Sri Gustini Husein, Melianasari, and Handayani 2020). In the process, cholesterol is transported by LDL lipoprotein from the liver to the cells of the body that need it. Excess cholesterol is then transported back by HDL lipoprotein to the liver to be broken down and excreted into the gallbladder as bile acid. The difference between LDL and HDL lies in their fat content and density. LDL contains more fat than HDL, so it floats in the blood. Meanwhile, HDL has less fat content and high density, making it heavier (Indasah and Utama 2021).

According to the global burden of disease attributed to high low-density lipoprotein cholesterol, the number of deaths due to cholesterol is 1.47% (Zheng et al. 2022). Based on data from the 2018 Basic Health Research (RISKESDAS), the prevalence of cholesterol sufferers in Indonesia is 7.6% (RI 2018).

In order to diagnose or determine cholesterol levels, a clinical laboratory test is required. Cholesterol testing, as part of clinical specimen testing in the field of clinical chemistry, requires samples or materials derived from and taken from the human body for diagnostic, research, development, educational, and other analytical purposes, including new-emerging and re-emerging diseases, and potentially pandemic infectious diseases. Accurate laboratory testing is crucial in this diagnostic process. To achieve this accuracy, cholesterol testing in laboratories can be performed using two types of methods: automatic techniques and simple techniques. Automatic testing uses automated equipment that meets standards, while simple techniques use photometers, dipsticks, rapid testing methods, and simple microscopes that meet standards (Ministry of Health 2010).

Cholesterol testing with a photometer uses serum and plasma samples. This method has high sensitivity and selectivity, is easy to measure, and has fast spectrophotometer performance, but it depends on reagents that require a special place. In the spectrophotometer method, calculations are based on color changes formed from the intensity of absorbed light. Meanwhile, cholesterol testing with POCT uses a small amount of blood sample that can be done outside the laboratory. Test results are available quickly because they do not require specimen transportation and preparation. This method can also be used in urgent situations, such as power outages or damage to spectrophotometer equipment. However, it also has several drawbacks, such as limited types of tests, poor accuracy and precision, lack of standards, inadequate quality control processes, and higher testing costs (Gusmayani, Anggraini, and Nuroini 2021).

According to research conducted by Dea Erlina Nur Atika (2022) on the Results of Glucose and Cholesterol Testing Using Point of Care Testing (POCT) and Photometry Using Venous Blood, the average POCT result was 179.2 mg/dl and the

average photometry result was 187.85 mg/dl with a significant value of 0.527, which means there was no significant difference (Atika and Aryani 2022). However, another study conducted by Rahmi Agu Saputri (2020) on the Comparison of Total Cholesterol Levels Using the Enzymatic Colorimetric Method (Spectrophotometry) with the POCT (Point of Care Testing) Method found that the average result using the spectrophotometry method was 235.47 mg/dl ± 49.157 mg/dl and the average result using the POCT method was 271.80 mg/dl ± 55.205 mg/dl, meaning that there was a significant difference (Saputri 2020).

Based on the above description, the author was interested in conducting research on "Differences in Cholesterol Level Test Results Using the POCT (Point of Care Testing) Method and a Photometer".

Objective

The purpose of this study was to determine the results of cholesterol testing using the POCT method with a photometer.

Method

The type of research used was analytical, which is research that aims to find the causal relationship between one variable and another, and to compare or identify differences in one or more variables (Hariyono and Yuswatiningsih 2019). The population used in this study consisted of 30 outpatients who underwent cholesterol tests at the Kraton Regional General Hospital in Pekalongan Regency. Sampling was conducted over a period of one month at the Kraton Regional General Hospital in Pekalongan Regency.

This study was conducted in May 2025 at the Pekalongan Health Analyst Academy Laboratory. Sample testing used the POCT method with a photometer. The data for this study came from primary and secondary sources. Primary data was obtained from interviews with the Kraton District General Hospital laboratory and cholesterol test results using POCT and a photometer. Secondary data was obtained from supporting literature such as books, journals, articles, and others. The data obtained was then processed and tested in SPSS with a data normality test. If the results showed a normal distribution, the researcher used a Paired T-test to determine and compare the cholesterol level test results using the POCT and photometer methods. If the data did not show a normal distribution, a Wilcoxon test was used.

Results

A study on the differences in cholesterol test results between the POCT (Point Of Care Testing) method and the photometer on 30 samples from outpatients at the Kraton District Hospital in Pekalongan, conducted at the Pekalongan Health Analyst Academy laboratory on May 8, 2025, obtained the following results:

TABLE 1. Cholesterol test results using the POCT method and the photometer

No	POCT	Photometer
1	139	119
2	133	106
3	166	100
4	212	148
5	118	79
6	252	133

7	211	133
8	156	111
9	150	103
10	162	103
11	151	136
12	126	177
13	136	85
14	174	160
15	169	117
16	142	147
17	160	86
18	233	150
19	252	183
20	167	178
21	156	124
22	157	82
23	146	93
24	222	132
25	215	144
26	205	188
27	127	100
28	190	147
29	232	161
30	142	108
Mean	**173,37 mg/dl**	**127,77 mg/dl**

Based on the results of cholesterol testing using the POCT method with a photometer, the average result using POCT was 173.37 mg/dl, while using a photometer was 127.77 mg/dl.

TABLE 2. Normality test results

	Shapiro-Wilk		
	Statistic	**Df**	**Sig**
POCT	.915	30	**.**020
Photometer	.957	30	**.**262

Based on the normality test, it shows that POCT data is not normally distributed (sig value = 0.020 < 0.05), while photometer data is normally distributed (sig value = 0.262 > 0.05), which means there is a difference.

TABLE 3. Wilcoxon test results

	POCT cholesterol levels with a photometer
Z	-4.402
Asmyp, sig.(2-tailed)	.000

Based on the Wilcoxon test results, it shows that (sig value = 0.000 < 0.05). Therefore, H0 is rejected, which means that there is a significant difference between cholesterol testing using POCT and a photometer.

Discussion

Based on the results of research conducted on 30 cholesterol samples at the Kraton Regional General Hospital in Pekalongan Regency, this study found that the average cholesterol level measured using POCT was 173.37 mg/dl. Cholesterol levels using the POCT method increased due to the lack of accuracy of the POCT device compared to the photometer method. The POCT method has a sensitivity and specificity of ± 10 or 90% and uses a small amount of blood sample, making it difficult to determine the standard (quality) of the sample that affects the accuracy of the test results, such as samples with hemolysis, lipemia, and drugs (Rahmadila 2021).

The results of cholesterol level tests measured using a photometer obtained an average of 127.77 mg/dl. The results of cholesterol level tests using a photometer tend to be lower than those using POCT because photometers have good sensitivity and specificity, namely ± 10-4 to 10-6 or 99.9%. Therefore, this method is a quantitative test with relatively selective and specific results in accordance with the physiological condition of the body. However, testing using this method is more expensive than the POCT method (Rahmadila 2021).

Based on the analysis results obtained (sig value = 0.000 < 0.05), there is a significant difference between cholesterol testing using the POCT method and the photometer. Total cholesterol levels using POCT are higher than those using the photometer method. POCT testing, which is easy and fast, can lead to inaccurate testing, resulting in high test results due to the low sensitivity and specificity of the POCT method (Rahmadila 2021).

The difference in cholesterol test results using POCT and photometers is due to several factors, namely that the POCT method has limited measurement capabilities and can be influenced by other factors such as temperature, humidity, poor precision and accuracy of the device, and uncalibrated devices when compared to photometer devices. When using POCT with sticks, the stick bottle must be closed immediately after removing the stick. If the stick bottle is not closed immediately, it can damage the stick due to the high humidity in Indonesia, which can affect the accuracy of the test results (Gusmayani, Anggraini, and Nuroini 2021).

Conclusion

Based on the research conducted, it can be concluded that there are differences between POCT and photometer cholesterol tests in 30 outpatients at Kraton Regional General Hospital in Pekalongan Regency.

Recommendations for future researchers are to use the latest technology and more sophisticated equipment to improve research results and to give more consideration to other factors, such as blood sample quality.

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