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COMPARISON OF FRESH SERUM TOTAL CHOLESTEROL RESULTS WITH THOSE OF SERUM STORED AT ROOM TEMPERATURE FOR 6 HOURS AT JATI PADANG GENERAL HOSPITAL.

PERBANDINGAN HASIL KOLESTEROL TOTAL SERUM SEGAR DENGAN SERUM YANG DISIMPAN PADA SUHU RUANG SELAMA 6 JAM DI RSUD JATI PADANG

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Abstract

Exposure to X-ray radiation in conventional radiology procedures can pose a health risk, especially for accompanying caregivers of pediatric patients who only bear the risk without gaining any benefit. This study aims to determine the estimated equivalent dose received by accompanying caregivers of pediatric patients and the safest points during conventional radiology examinations. The method used in this research is a field survey, involving the measurement of equivalent radiation doses inside and outside the examination room using a personal dosimeter, as well as measuring the radiation dose rate at 6 points using a surveymeter. The data was processed to obtain the highest and lowest values, as well as the percentage of equivalent dose obtained compared to the established Dose Limit Value (DLV). The results showed that the highest radiation dose received by accompanying caregivers inside the examination room reached 13,46 µSv, with a percentage of 0,27% relative to the DLV, while the lowest dose recorded was 1,12 µSv, with a percentage of 0,0224% relative to the DLV. Analysis of the radiation dose rate distribution revealed that the greater the distance of the measurement point from the radiation source (tube), the smaller the dose received. In conclusion, the radiation dose received by accompanying caregivers is still below the Dose Limit Value (DLV) for caregivers, which is 5.000 µSv. However, to minimize stochastic effects, the implementation of additional protective measures, such as the use of lead aprons and selecting safer locations within the examination room, is highly recommended. These

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findings are expected to serve as a guide in enhancing the safety of accompanying caregivers of pediatric patients in conventional radiology units.

Keywords : Pediatric Patient Companion, Equivalent Dose, Dose Limit Value (DLV)

Abstrak

Kadar kolesterol total dalam serum merupakan salah satu parameter penting dalam penilaian risiko penyakit kardiovaskular. Faktor praanalitik seperti lama penyimpanan dan suhu penyimpanan serum dapat memengaruhi akurasi pengukuran kadar kolesterol total. Penelitian ini bertujuan untuk membandingkan hasil pemeriksaan kolesterol total antara serum segar dan serum yang disimpan pada suhu ruang selama 6 jam di RSUD Jati Padang. Desain penelitian yang digunakan adalah deskriptif komparatif dengan pendekatan cross-sectional. Sampel diambil dari pasien yang menjalani pemeriksaan kolesterol total, kemudian dibagi menjadi dua kelompok: serum yang diperiksa segera (segar) dan serum yang disimpan pada suhu ruang (20–25°C) selama 6 jam sebelum dianalisis. Hasil penelitian menunjukkan adanya perbedaan kadar kolesterol total antara serum segar dan serum yang disimpan, dengan nilai kolesterol total pada serum yang disimpan cenderung mengalami penurunan dibandingkan serum segar. Uji statistik menunjukkan perbedaan ini signifikan. Temuan ini menegaskan pentingnya pengelolaan dan penanganan sampel secara optimal dalam proses pemeriksaan laboratorium untuk menjaga validitas hasil, khususnya pada parameter kolesterol total.

Kata Kunci : Kolesterol total, serum segar, penyimpanan suhu ruang

1. INTRODUCTION

Non-communicable diseases, particularly cardiovascular diseases such as heart disease and stroke, have become an increasing health challenge in the modern era. Stroke, caused by a disruption in blood flow to the brain due to blocked blood vessels, is often associated with elevated cholesterol levels in the blood. Total cholesterol, which consists of low-density lipoprotein (LDL), high-density lipoprotein (HDL), and triglycerides, is an important indicator in assessing the risk of atherosclerosis and cardiovascular diseases. In this context, cholesterol testing serves as a primary diagnostic tool to aid in the detection and management of cardiovascular disease risks. However, total cholesterol test results can be influenced by various factors, including blood sample quality, serum storage conditions, and the analysis methods used. Therefore, it is crucial to understand the impact of these factors to maintain the accuracy of laboratory results.

Previous studies have shown that total cholesterol levels in fresh serum tend to be more stable and yield more accurate results compared to serum that has undergone storage, especially at room temperature or in cold conditions. For example, research by Afrilika (2020) and Damayanti (2022) found a significant but relatively small decrease in total cholesterol levels in serum stored for a certain period compared to fresh serum. Storing serum at room temperature for 6 hours can lead to biochemical changes that affect cholesterol stability, potentially compromising accurate cardiovascular risk assessment. These findings emphasize the importance of proper serum collection and storage procedures to ensure the validity of laboratory tests.

In light of these conditions, this study was conducted at Jati Padang General Hospital (RSUD Jati Padang), a healthcare facility that serves a large number of elderly patients at high

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risk for cardiovascular diseases. The aim of this study is to compare total cholesterol levels between fresh serum and serum stored at room temperature for 6 hours to determine the impact of storage on total cholesterol test results. It is hoped that the findings from this study will provide practical recommendations for laboratory procedures, ensuring more reliable cholesterol measurements and aiding accurate clinical decision-making, ultimately improving healthcare quality at the hospital, especially for patients at risk of cardiovascular diseases.

At the Medical Laboratory Unit of Jati Padang General Hospital, many elderly patients undergo total cholesterol testing. Given this situation, the author was interested in comparing the total cholesterol levels in fresh serum and serum stored at room temperature for 6 hours, and conducting research with the title Comparison of Fresh Serum Total Cholesterol Results with Serum Stored At Room Temperature For 6 Hours At Jati Padang General Hospital.

2. RESEARCH METHOD

This research uses a simple experimental design with a one-group pretest-posttest layout to compare total cholesterol levels in fresh serum and serum stored at room temperature for 6 hours within a temperature range of 20–25°C. The simple experimental approach was chosen because the focus of the study is to examine the effect of a single independent variable, which is serum storage, on total cholesterol levels as the dependent variable.

The one-group pretest-posttest design was selected because it allows for the measurement of total cholesterol levels in fresh serum (pretest) and then compares these levels with those after storage (posttest) within the same sample group, thus effectively controlling for confounding variables. Additionally, this design is efficient in terms of resource usage and is relevant to the research goal of directly measuring the impact of serum storage on changes in total cholesterol levels, providing clear and detailed results for further analysis.

3. RESULTS AND DISCUSSION

Research Results

From the research conducted at Jati Padang General Hospital (RSUD) from April to June 2025, 63 elderly patient serum samples were obtained, who underwent total cholesterol testing referred by the Internal Medicine Clinic. The respondent characteristics were categorized into two groups: based on age and gender. The data obtained is as follows:

Table 1. Frequency Distribution of Respondents Based on Age Group

Age (Years)	Frequency	Percentage (%)
50 - 59	46	73,02
60 - 70	17	26,98
Total	**63**	**100**

Based on Table 1, the majority of patients undergoing cholesterol testing are aged 50-59 years, with 46 patients (73.02%), while the 60-70 age group consists of 17 patients (26.98%). Therefore, most respondents are in the 50-59 age group.

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Table 2. Frequency Distribution Based on Gender

Gender	Frequency	Percentage (%)
Male	29	46.03
Female	34	53.97
Total	**63**	**100**

Based on Table 2, the majority of patients undergoing cholesterol testing are female, with 34 patients (53.97%), while male patients total 29 (46.03%). After gathering the necessary data, the next step was to analyze this data to obtain the average, standard deviation, and the minimum and maximum total cholesterol levels from all the samples.

Table 3. Mean Total Cholesterol Levels in Fresh Serum and Stored Serum

Cholesterol Level (mg/dL)	**Mean**	**±SD**	**Min**	**Max**
Fresh Serum	200.33	±31.68	130	278
Stored Serum	206.95	±31.77	142	283

Based on Table 3, the average and standard deviation of total cholesterol levels in fresh serum are lower than in serum stored for 6 hours at room temperature. The average for fresh serum is 200.33 ± 31.68 mg/dL, and for stored serum, it is 206.95 ± 31.77 mg/dL. The minimum and maximum cholesterol levels in fresh serum are 130 mg/dL and 278 mg/dL, respectively, while in stored serum, they are 142 mg/dL and 283 mg/dL.

To compare the total cholesterol levels between male and female patients, an analysis based on the mean values of fresh serum was conducted to ensure more accurate results, as shown in Table 4.

Table 4. Mean Total Cholesterol Levels for Male and Female Samples

Gender	**Mean Cholesterol Level (mg/dL)**
Male	205.897
Female	195.855

Based on Table 4, the average total cholesterol level in males is higher than in females, with 205.897 mg/dL for males and 195.855 mg/dL for females.

To compare the total cholesterol levels between fresh serum and serum stored for 6 hours at room temperature, a t-test analysis was performed after first conducting a normality test using the Kolmogorov-Smirnov method, as presented in Table 5.

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Table 5. Normality Test Results (n=63)

Variable	Kolmogorov-Smirnov Sig	Result
Fresh Serum	0.20	Normal
Stored Serum	0.20	Normal

The normality test results in Table 5 show a value of 0.20. Since this value is greater than 0.05 (95% confidence), it can be concluded that the data is normally distributed. A dependent t-test was then conducted using SPSS to determine whether there is a significant difference between fresh serum and serum stored for 6 hours. The results of the dependent t-test can be seen in Table 6.

Table 6. Dependent t-test Results for Total Cholesterol Levels in Fresh Serum and Stored Serum

Cholesterol Level (mg/dL)	n	P Value	t Calculated	t Table
Fresh Serum Stored Serum	63	0.000	-13.15	1.67

Based on Table 6, the dependent t-test results show a p-value of 0.000, which is less than 0.05, indicating a significant difference between the average values of the two variables. The t-calculated value (-13.155) is greater than the t-table value (1.670), so the alternative hypothesis (H1) is accepted, meaning there is a significant difference in the average cholesterol levels between fresh serum and serum stored for 6 hours at room temperature (20-25°C). The negative sign indicates the direction of change, where the average value of fresh serum is lower than that of stored serum.

Discussion of Results

Based on 63 total cholesterol serum samples collected from the laboratory unit at Jati Padang General Hospital (RSUD), the average total cholesterol level in fresh serum was 200.33 ± 31.68, while in stored serum, it was 206.95 ± 31.77. There was a 3.3% increase in the average total cholesterol level from fresh serum to stored serum. This difference is influenced by several factors, such as suboptimal temperature, which can increase the activity of lipase enzymes in the serum. These enzymes break down fats into fatty acids and glycerol. The enzyme remains active during serum storage and can release esterified cholesterol into free cholesterol, thereby increasing the measurable cholesterol levels. Additionally, contamination of storage equipment can allow microorganisms such as bacteria and fungi to proliferate faster at room temperature, producing extracellular lipase enzymes and lipid metabolites that further increase serum cholesterol levels.

Afrilika's (2020) study showed that the total cholesterol level in fresh serum was higher than in serum stored for 48 hours at low temperatures (2–8°C). In contrast, recent studies have found that serum cholesterol levels increased after being stored for 6 hours at room temperature

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(20–25°C), because lipase enzymes are more active at room temperature, while they are almost inactive at lower temperatures, resulting in differing cholesterol levels.

The average total cholesterol level in male serum (205.897 mg/dL) was higher than in female serum (195.855 mg/dL), which is influenced by lifestyle factors such as smoking. Smoking, which is common among men, introduces carbon monoxide into the body, thickens the blood, lowers good cholesterol (HDL), and increases other fats in the blood.

After conducting a t-test on the two samples, a significance (Sig.) value of 0.001 was obtained, indicating that the relationship is significant at a 95% confidence level ($\alpha = 0.05$). The p-value from the paired t-test was also 0.001, showing that the difference before and after treatment is significant, as the p-value is < 0.05. Additionally, the calculated t-value of -13.155 was greater than the t-table value of 1.670, indicating a significant difference in the average cholesterol levels between fresh serum and serum stored for 6 hours at room temperature (20–25°C).

There is a significant difference between fresh serum and serum stored for 6 hours at room temperature (20–25°C), indicating that serum storage under these conditions is not recommended, as it can affect the results. Based on previous research conducted by Afrilika (2020), serum stored for 48 hours at 2–8°C showed changes in the average values compared to fresh serum, but the changes were not significant.

4. CONCLUSION

The conclusion of the study at Jati Padang General Hospital regarding the comparison of total cholesterol levels between fresh serum and serum stored at room temperature for 6 hours shows that in 63 samples, the total cholesterol level in fresh serum ranged from 130 mg/dL to 278 mg/dL with an average of 200.33 ± 31.68 mg/dL, while the stored serum at room temperature (20-25°C) had levels ranging from 142 mg/dL to 283 mg/dL with an average of 206.95 ± 31.77 mg/dL. Statistical analysis using an independent t-test resulted in a p-value of 0.001 ($p < 0.05$), indicating a significant difference in total cholesterol levels between fresh serum and serum stored for 6 hours at room temperature, suggesting that storage under these conditions has a significant effect on the total cholesterol levels in the samples.

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