



## ANALYSIS OF FASTING ON BLOOD TESTS

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### Abstract

As a procedure to obtain information with bodily fluid samples, a laboratory test is complementary to a diagnostic assessment. One parameter of laboratory tests is hematology, for which a blood profile is used to evaluate clinical conditions and provide diagnostic information about hematological abnormalities, prognosis, and response treatment. Nowadays, accessibility to laboratory tests has been made easier with medical checkups integrated into the Occupational Health and Safety program, which a company is obliged to have to check on its employees' health status. Our study analyzed the results of fasting blood tests on the employees of The College of Health Sciences of Al-Irsyad Al-Islamiyyah Cilacap. This College is known for the practice of Islamic and religious values, including fasting, among its employees. Taking the employees as a population and samples, the research included variables of levels of erythrocytes, leukocytes, hemoglobin, and hematocrit in the descriptive analysis method. We gained eleven respondents, 8 males, and 3 females, and used a cluster sampling method with appropriate criteria. The data of obtained samples were analyzed and processed based on the interpretation of the results. The results of routine blood examinations on fasting showed 90.90% normal hemoglobin levels and 72.70% normal hematocrit levels. Conclusively, our results of the blood profile examination on hemoglobin and hematocrit in fasting people showed that fasting is metabolically healthy and produces no indication of anemia.

**Keywords:** *Blood Profile; Employees; Fasting*

### 1. Introduction

Laboratory tests become initial measures to look into a person's health by body samples and may aid in determining a diagnosis. As a crucial lab parameter, a hematological test analyzes blood state and components to detect disturbances in its amounts and functions. Commonly used for clinical conditions, blood test

findings can provide information regarding diagnosis, prognosis, and response to treatment (Handayani, 2021). It consists of routine blood tests, complete blood tests, and specific blood tests. A routine blood test is the early step with the main parameters of hemoglobin and hematocrit and usually precedes further checkups (Menit & Ilmiah, 2016). A company often sends its employees to take routine blood tests as medical checkups as part of its Occupational Health and

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Safety/OHS Program required by the Government. Employee medical checkup is one of OHS's efforts to determine the health conditions of employees and incumbents, describing their working ability from a health perspective (Nurhayati & Cahyati, 2016). However, in reality, it is never carried out in a systematic and scheduled manner, such as the case with the employees at the College of Health Science Al-Irsyad Al-Islamiyyah Cilacap.

College of Health Science Al-Irsyad Al-Islamiyyah Cilacap is a higher education institution with excellent Islamic and religious values, whose employees often practice fasting. Fasting in Islam is an effort to increase spiritual discipline and self-control, and practiced tremendously such as in Ramadhan fasting, Monday and Thursday fasting, David fasting, Muharram fasting, and Ayyamulbidh fasting. Fasting is believed to be beneficial both physically and spiritually. Here, we are interested to explore the results of routine blood tests with parameters of hemoglobin, hematocrit, leukocytes, erythrocytes, and platelets in people who are fasting.

## 2. Method

This study used a descriptive analysis method by analyzing routine blood tests on fasting people. The research has been conducted from February to June 2021 and is located in Clinical Pathology Laboratory, Mini Hospital. The employees of the College of Health Science Al-Irsyad Al-Islamiyyah Cilacap were taken as the population.

Our sampling criteria resulted in 11 respondents. The criteria included respondents' willingness, non-menstrual (if female), and sunnah fasting (Mondays and Thursdays). Fasting in Islamic tradition is the condition without food nor water from dawn to dusk, both when the adhan (the call for praying) is sounded. (Ammar & Boujelbane, 2022).

The sampling technique in this study uses the cluster sampling method, thus analysis results

can be divided into effective minor groups. The research variables included the levels of erythrocytes, leukocytes, hemoglobin, hematocrit, and platelets which were analyzed using the Hematology Analyzer Rayto RT 7600.

The instruments used in this research included a 3 mL syringe, tourniquet, plaster, 70% alcohol swab, vacutainer tube, and Haematology Analyzer Rayto RT 7600. Respondents were prepared and sampled by taking 3 mL of venous blood using syringes. The sampled blood was given anticoagulant EDTA to prevent clots. The blood was tested using the Hematology Analyzer Rayto RT 7600 and then validated on an interpretational basis.

Data obtained were analyzed and interpreted in the resulting tables as categories of normal, high, and low according to respective ranges.

## 3. Result and Discussion

Eleven respondents were participating in this study.

**Table 1.** Frequency Distribution of The Blood Profile Tests Results Based on Gender. Variable (gender)

Variable	Frequenc y	Percentage (%)
Men	8	72.7
Women	3	27.3
Total	11	100

Based on the data on the distribution of gender respondents, the number of respondents was 11 people, including 8 men and 3 women. The number of male respondents is greater because the employees at the College are dominated by men.

A median of 2.00 was obtained on all test parameters. Hematocrit (HCT) became the parameter with the highest mean (2.27 in %), while Platelet (PLT) was the lowest (1.73, in  $10^3/\mu$ ). On standard deviation (SD) the same results were obtained for HCT and PLT, while the lowest SD was for Red Blood Cells (RBC).

**Table 2.** Blood profile Results Based on the Average (Mean), Middle Value (Median), Standard Deviation (SD), Lowest Value (Min) and Highest Value (Max)

Parameter	Mean	Median	SD	Min	Max
RBC 10 <sup>6</sup> /μl	2.00	2.00	0.00	2	2
WBC 10 <sup>3</sup> /μl	1.82	2.00	0.40	1	2
HGB g/dL	2.09	2.00	0.30	2	3
HCT %	2.27	2.00	0.46	2	3
PLT 10 <sup>3</sup> /μ	1.73	2.00	0.46	1	2

All respondents had normal RBC parameters. Meanwhile, on the WBC, two respondents had above-normal and 9 respondents had normal results. On the hemoglobin parameter, 10 respondents had normal and 1 below-normal results. On hematocrit, 8 respondents had normal and 3 below-normal results. Lastly, the platelet checks resulted in 3 above-normal and 8 normal respondents.

**Table 3.** Examination Results Based on Normal, Below Normal, Above Normal Values

Parameter	High (%)	Normal (%)	Low (%)	Total (%)
RBC	0 (0 %)	11 (100%)	0 (0 %)	11 (100 %)
WBC	2 (18.2%)	9 (81.80%)	0 (0 %)	11 (100 %)
HGB	0 (0 %)	10 (90.90%)	1 (9.10%)	11 (100 %)
HCT	0 (0 %)	8 (72.70%)	3 (27.3%)	11 (100 %)
PLT	3 (27.30%)	8 (72.70%)	0 (0 %)	11 (100 %)

This research was conducted from 26 to 27 July 2021 at the Clinical Pathology Laboratory at the College of Health Science Al-Irsyad Al-Islamiyyah Cilacap. The research impediment, the small number of respondents, was because it was undertaken during the Covid-19 outbreak. As many were self-isolating and some employees were exposed to Covid-19, a large number of the population did not match the criteria of being respondents.

The respondents' routine blood test samples were examined using a Hematology Analyzer Rayto RT 7600, whereas the blood group tests the slide method to show the reaction between antigens in humans and antisera. The automatic Hematology Analyzer method can count the number of routine blood cells more precisely and

accurately. This minimizes errors in reading the result of the Hematology Analyzer and avoids patients' results being misinterpreted as false positives or false negatives (Darmayani, Hasan, & A, 2018).

These results' values distribution was most likely affected by the gender criteria, where the men's ratio is higher than the women's. A medical check-up is one of the occupational health and safety programs by a company to check on the current condition of employees' health. As part of workforce maintenance, a company needs to determine regularly whether an employee is fit to do job responsibilities from a health perspective. Although supporting a safe work environment is more secure, ensuring employees' health is equally important to prevent illness or accidents from unexpected work-hazard. When these happen, not only employees' performance and productivity but also the whole company's reputation is at stake (*Manfaat Medical Check Up Karyawan Potensi Bahaya Dan Risiko Lingkungan Kerja Jenis Medical Check Up Karyawan Peringatan ;*, n.d.).

A complete blood count (CBC) is a blood test that is requested by the doctor to find out the patient's blood cells. CBC functions as a screening test to support diagnosis to check out how the body responds to a disease and to see progress or response to therapy (Ramdhani, I. N. F. Mentari, & B. Atfal, 2019). CBC is also used for clinical tests, the most commonly required test to assess the manifestations of pathological conditions in the blood (Agarwal, Sarkar, Bhowmik, Mukherjee, & Chakraborty, 2020). Several parameters may be seen on a CBC, such as red blood cells, white blood cells, platelets, hematocrit, and many other parameters (Sastri & Lestari, 2016). Changes in these cells are related to health conditions including anemia, infection, inflammation, bleeding, cancer, and other dysfunctional disorder of blood (Rosenfeld, 2012).

The cell types mostly focused on are Hemoglobin (Hb), Red Blood Cells (RBCs), White Blood Cells (WBCs), and blood cell fragments that help with clotting (Platelets/PLT). Hemoglobin (Hb) is the most commonly used marker of anemia. Contributing to tissue perfusion, hemoglobin is a protein in the cytoplasm of red blood cells consisting of heme ring protoporphyrins and globin. On the other hand, RBC counts reflect the number of circulating red blood cells in our bodies. RBC count is especially useful in identifying erythrocytosis; a Normal RBC count with an increase in either Hbs or hematocrit indicates relative erythrocytosis

(dehydration), while an increased RBC count indicates absolute erythrocytosis (polycythemia) (Erhabor O, Muhammad HA, Muhammad K, Onwuchekwa C, & Egenti NB, 2021). Our finding on the low Hbs, the 1% value below-normal, is indicative of anemia, based on the low RBC and index value (MCH, MCV, and MCHC). The level of hemoglobin is used to monitor anemic treatment and determine the amount of blood needed for transfusion (Erhabor O et al., 2021).

Our results in the platelet (PLT) test showed above-normal in 3 respondents and normal in the other 8. Normal platelets are 1-3 $\mu$ m in diameter and irregular shapes with fine red grains that may be scattered or concentrated. Small numbers of larger platelets, up to 5 $\mu$ m in diameter, can be seen on normal films. In contrast, a high number of larger platelets may be seen in the blood on increased platelet production and hyposplenism, an instance in severe immune thrombocytopenia. A very high platelet count as a feature of myeloproliferative neoplasms may be associated with extreme platelet anisocytosis, with few platelets as large as red blood cells and often in the forms of multiple agranular or hypogranular. PLT count often increases with acute inflammatory stress or hemorrhage but rarely exceeds 1000 $\times$ 10<sup>9</sup>/l (Bain, 2017).

On the hematocrit (HCT) parameter, our study showed 8 normal and 3 below-normal respondents. In level 1 laboratories, tests of Hematocrit (HCT) or Packed Cell Volume (PCV) are performed manually by centrifugation. In others, it is calculated based on the number and the average size of RBCs using a quasi-direct measurement. Normal HCTs count ranges between 40.7 % to 50.3 % for men and 36.1 % to 44.3 % for women. The measurement depends on the number and size of the red blood cells, but for children and younger, the normal range varies by age and gender. Conditions associated with low hematocrit include anemia, associated long-term illnesses, infections or white blood cell disorders such as leukemia or lymphoma, vitamin or mineral deficiencies, and recent or long-term bleeding (Erhabor O et al., 2021).

According to researchers, Mondays-and-Thursdays sunnah fasting habits improve the immune system, as evidenced by findings on leukocyte counts. The comparative test results revealed an average value of 0% of eosinophil cells before fasting and 0.1% when fasting, which

was regarded as an increase despite being only a few percent. The most significant finding was in the lymphocyte cells, with average values of 28.3% before fasting and 29.9% after fasting. As we know, Lymphocyte cells are the body's defense system consisting of two components, T cells, and B cells against the immune system (Afandi, 2017).

The Mondays-and-Thursdays fasting practices have also been proven positive for spiritual and healthy beings. The fasting mechanism is capable of reaching 90% of the whole body's detoxification. Experts, Dr. Carlson and Dr. Kunde of the University of Chicago said that the fasting process involved detoxification which boosts the immune system. Research even suggested lymphocytes increase up to ten times during fasting. Although the total white blood cells did not change, the T cells increased rapidly (Afandi, 2017).

The advantage of fasting for metabolic processes to reach homeostasis. The detoxification manifested in the removal of toxic substances from the body due to a decrease in the hormone cortisol produced by the adrenals. During fasting, the adrenal glands also reduced stress levels. Fasting stimulated the parasympathetic nerves to prevent the heart muscle from contracting faster, retaining a feeling of calmness. Moreover, fasting retained a healthy environment of teeth and mouth as it reduced intake of the salivary secretion system and therefore decreased salivary pH (Ismail, Manaf, & Mahmud, 2019)

Fasting serves to reduce stress. When there is eustress (positive stress), pro-inflammatory cytokines will increase. It was observed that both acute and chronic fasting can improve cognitive function. Consistent with several studies, these findings also suggested that the fasting state can stimulate the brain to regulate inflammatory response pathways through different molecular mechanisms. Specifically, this signal is transmitted to anti-inflammatory immune cells to suppress pro-inflammatory cytokines (IL-6 and TNF- $\alpha$ ), thereby significantly reducing cortisol. Cortisol plays a role in cognitive dysfunction, and fasting has been shown to greatly suppress elevated cortisol and its side effects on the brain and cause significant improvements in learning and memory functions. The findings of other studies showed that fasting promotes better learning and memory and fear conditioning,

thicker CA1 pyramidal cell layers, higher expression of debris, dendritic protein, and lower oxidative stress than mice fed ad libitum. Fasting can also increase the tolerance of hippocampal neurons to excitotoxic stress in rats showing a neuroprotective effect. In conclusion, fasting can improve cognitive function and protect the brain from stress by regulating inflammatory response pathways (Fore, Indriputri, Mamutse, & Nugraha, 2020).

Based on anonymous research, Monday-Thursday sunnah fasting increases spiritual intelligence, which can be seen through values achievement. The values included flexibility and responsiveness, high self-intelligence, high curiosity, honesty, patience, generosity, compassion, peacefulness, simplicity, and empathy (Buku, 2016).

Nevertheless, our study is limited to an overview of the blood profile parameters of hemoglobin and hematocrit levels for an anemic body. Other equally interesting parameters in the case of fasting related to hormones, dental and oral health have been excluded.

#### 4. Conclusion and Suggestion

The results of routine blood group tests obtained from our 11 fasting respondents are mostly normal and healthy. Conclusively, they showed that fasting is metabolically healthy and produces no indication of anemia. Further research is needed to look at the parameters of iron deficiency anemia in the blood profile by looking at the levels of MCV, MCH, and MCHC and it is necessary to make a relationship between the blood profile and the hormones produced in fasting people.

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