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# Physiological Alterations in Blood and Kidney Function in Malnourished Patients Implications for Health Management

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**Abstract**

**Background**
Malnutrition is a serious public health issue in low-income countries, particularly in Yemen. The early detection and management of malnutrition are crucial for preventing complications and improving patient outcomes. Blood tests can be used as a diagnostic tool for malnutrition, but their effectiveness in Yemen has not been adequately investigated. This study aimed to assess the blood and kidney function of malnourished patients in Yemen and identify markers for early detection and diagnosis of malnutrition.

**Methods**
A total of 10 clinically suspected malnourished patients were included in the experimental group, and 10 healthy individuals without any health problems were included in the control group. Blood and urine samples were collected from both groups, and a wide range of blood tests were conducted, including complete blood count, renal function tests, electrolytes, liver function tests, and lipid profile. Data were analyzed using statistical tests.

**Results**
The results showed a significant difference between the two groups in terms of White Blood Cell Count (WBC), Red Blood Cell Count (RBC), Hemoglobin (HB), and Platelet Count (PIT) counts (P=0.005). The laboratory investigations also revealed significant abnormalities in the blood and kidney function of the malnourished patients compared to the healthy controls, indicating that malnutrition negatively impacts blood parameters and kidney function.

**Conclusion**
The study identified markers for early detection and diagnosis of malnutrition and demonstrated the usefulness of blood tests as a diagnostic tool for malnutrition in Yemen. Early detection and management of malnutrition can help prevent complications and improve patient outcomes, highlighting the importance of proper nutrition for maintaining normal physiology, particularly in areas affected by malnutrition such as Hajjah City in Yemen.

**Keywords:** Malnutrition, Blood Tests, Kidney Function, Diagnosis, Early Detection

## 1. Introduction

Malnutrition is a global health problem that arises when an individual's diet lacks essential nutrients, either in quantity or quality, required for optimal health. Malnutrition is prevalent in low-income countries, and Yemen is no exception. According to the World Food Program, more than half of Yemen's population is food-insecure, and 75% of the population requires humanitarian aid to meet their basic needs (World Food Program, 2021). Malnutrition is a significant contributor to Yemen's high morbidity and mortality rates, particularly in children under five years old (Al-Rabeei et al., 2019; Al-Taiar et al., 2013). Malnutrition can lead to several physiological alterations, including impaired blood and kidney function, which can have severe consequences for an individual's health (Kovesdy et al., 2017; Kumar et al., 2017). Blood is a vital component of the human body, and its proper functioning is necessary for optimal health. Malnutrition can cause a decrease in the number of red blood cells, hemoglobin, and platelets in the blood, leading to anemia, thrombocytopenia, and other blood disorders (Allen et al., 2013; Black et al., 2013: Mohammed et al., 2016). Additionally, it can affect kidney function, leading to complications such as acute kidney injury, chronic kidney disease, and electrolyte imbalances (Hsu et al., 2017; Kovesdy et al., 2017). Hajjah City, located in the Hajjah City in Yemen, is one of the areas most affected by malnutrition. A recent study conducted in Hajjah City found that malnutrition prevalence was as high as 31%, with severe malnutrition being the most prevalent form (Al-Taiar et al., 2013). Malnutrition in Hajjah City is mainly due to poverty, conflict, and inadequate access to food and healthcare (UNICEF, 2021). Therefore, understanding the physiological alterations in blood and kidney function in malnourished patients in Hajjah City is crucial for effective health management. This study aimed to assess the blood and kidney function of malnourished patients who visited the emergency department at the Republican Hospital in Hajjah City, Yemen, to identify the markers for early detection and diagnosis of malnutrition. The study also aimed to compare the blood and kidney function of malnourished patients with healthy controls to highlight the extent of the physiological alterations caused by malnutrition. The findings of this study have significant implications for health management in Hajjah City and other areas affected by malnutrition. By identifying the markers for early detection and diagnosis of malnutrition, healthcare workers can provide timely interventions to prevent the progression of malnutrition and its associated complications. Additionally, understanding the extent of the physiological alterations caused by malnutrition can inform the development of effective treatment plans for malnourished patients. In conclusion, malnutrition is a significant public health concern in Hajjah City and Yemen, and it can lead to several physiological alterations, including impaired blood and kidney function. This study aims to shed light on the impact of malnutrition on blood and kidney function in malnourished patients and its implications for health management. The findings of this study can inform the development of effective interventions and treatment plans for malnutrition in Hajjah City and other areas affected by malnutrition.

## 2. Martials and Methods

### 2.1. Location of the Study: An Analysis of Hajjah City in the Republic of Yemen

This study was conducted in the Hajjah city, one of the largest governorates in the Republic of Yemen. The Hajjah City is located in the northwestern corner of the Republic of Yemen, on the border with the Kingdom of Saudi Arabia, between latitudes 15-30-37-16 North and longitudes 30-42-30-30 East. Its area is 8288.3 square kilometers. It is bordered to the north by the Kingdom of Saudi Arabia, and the Saada city, to the south by the Al-Mahwit city and Al-Hudaydah, to the east by the Amran city, and to the west by the Red Sea.

### 2.2. Chemicals and Materials Procured for a Study

In this study, a range of materials were used, including tubes for anticoagulation of blood, specifically Ethylenediaminetetraacetic acid (EDTA) tubes. Empty tubes for blood collection, specifically Gel - Clot - Activator tubes, were also utilized. Regular tubes for storing serum after separating it from blood for the study of blood components, specifically Blood Collection Tubes with Dipotassium

Ethylenediaminetetraacetic acid (BDU) (K), were used. Holders were also employed for carrying the tubes during the study. Additionally, sensitive X-ray films, pencils, notebooks, and special markers to label the sample tubes were used. Records and reports related to patients with gout were also included in the materials. Finally, Micropipette tips were used for sample measurement during the study. These materials were purchased from the chemical shop "Al-Jazeera Chemicals" in Yemen.

### 2.3. Assessing Malnutrition: A Study of Clinical Patients and Healthy Individuals at the Republican Hospital in Hajjah City, Yemen

This study was conducted at the Republican Hospital in Hajjah City, Yemen, from March 10th to June 8$^{th}$, 2022. The study participants were divided into two groups: an experimental group consisting of 10 patients clinically suspected of having malnutrition, and a control group comprising 10 healthy individuals without any health problems.

### 2.4. Finding the Right Participants: Inclusion Criteria for Malnutrition Study

The inclusion criteria for the experimental group were patients who presented to the emergency department with symptoms of malnutrition, such as weight loss, fatigue, and weakness. The control group was selected from healthy individuals who volunteered to participate in the study.

### 2.5. Selecting the Ideal Participants: Exclusion Criteria for Malnutrition Study

The exclusion criteria were patients with a history of chronic kidney disease, liver disease, or any other chronic medical condition that could affect blood and kidney function.

### 2.6. Blood Sampling Methodology for a Study on Malnourished Patients

In this study, a total of 10 clinical blood samples were collected over a period of two months, starting from March 10th, 2022 to June 8th, 2022. The samples were collected from malnourished patients and clients of both genders who visited the laboratory department of the Republican Hospital in the city of Hajjah, Yemen. This hospital was chosen due to the high number of patients it receives compared to other hospitals in the area. From each patient, two samples were collected. The first sample was placed in a tube containing Ethylenediaminetetraacetic acid (EDTA) anticoagulant to examine blood functions such as red blood cells, white blood cells, hemoglobin, and platelets using a Hematology Auto device. The second sample was placed in a tube without anticoagulant to examine kidney functions such as urea, creatinine, and uric acid. The collected blood samples were then analyzed to identify physiological changes in blood functions and kidney functions in malnourished individuals.

### 2.7. Transforming Blood Function Testing through Innovation: An Automated Methodology for CBC Test with Enhanced Sensitivity and Specificity

The CBC test is a blood function test that examines the total number of red blood cells, white blood cells, platelets, and hemoglobin. This test is performed using an automated blood analysis device, which separates and counts the blood components to determine the number of each cell type present. To perform the test, a blood sample is placed in the device, and a needle draws a sample of blood. The sample is then diluted with a diluent to reduce its density, and the diluted sample is passed through a chamber that contains a very narrow opening that only allows one blood cell to pass through at a time. This narrow opening is made of a special conductive material with electrodes at its ends. When the opening is empty, it has a specific level of electrical resistance. However, when a blood cell passes through the opening, the electrical resistance increases significantly. The microprocessor of the device counts the number of times the electrical resistance increases and the volume of the increase. Some models have separate chambers for counting white blood cells (WBC), red blood cells (RBC), and platelets. To determine the amount of hemoglobin in the blood, a sample of blood is passed through a special chamber containing a substance called Lyse, which breaks down the red blood cells to release the hemoglobin. The resulting solution is then passed through a light cell that absorbs the hemoglobin and provides a measurement of its presence in the sample.

### 2.8. Advancing Kidney Function Testing through Serum Analysis with Spectrophotometry

In this study, blood samples were taken from the patients by drawing blood from a vein and placing it in a gel-clot activator tube. The blood components were separated using a centrifuge to obtain serum, which was then analyzed for kidney function using a chemical spectrophotometer. The following kidney function tests were performed: urea, creatinine, and uric acid. The results obtained from the spectrophotometer were recorded and analyzed to evaluate the kidney function of the patients.

### 2.9. Optimizing Urea Analysis: A Spectrophotometric Method for Reliable Blood Urea Level Measurement

This study aimed to measure the level of urea in blood samples using a spectrophotometric method. Urea is the principal and final product of protein metabolism in mammals, and it is formed in the liver and excreted through the kidneys in urine. Ammonia (NH3) is involved in the formation of urea, which is a toxic substance produced by the breakdown of amino acids. The level of urea in the blood ranges from 45 to 7.0-3.5 mmol/L or 25 mg/dL, while the level of blood urea nitrogen (BUN) ranges from 2.9-8.9 mmol/L or 25 mg/dL. Blood samples were collected from the patients, and the serum was separated using a centrifuge. The spectrophotometric method was used to measure the level of urea in the serum. The results obtained were recorded, and statistical analysis was performed to determine the significance of the findings.

### 2.10. Quantifying Creatinine in Serum Spectrophotometrically

This research aimed to measure the concentration of creatinine in blood samples using a spectrophotometric technique. Creatinine is a waste product generated from the breakdown of creatine in the liver and kidneys. It is then transported through the bloodstream to the muscles and brain to provide energy for their functions. When energy is consumed, phosphocreatine is transformed into creatinine, which is excreted by the kidneys in urine. The concentration of creatinine in the blood and urine is directly proportional to the muscle mass of the body, and it is not affected by fasting, making it an optimal measurement for assessing kidney function. The level of creatinine in the blood ranges from 0.4 to 1.4 mg/dL or 60-123 µmol/L. Blood samples were collected from the participants, and serum was obtained using a centrifuge. The spectrophotometric method was employed to quantify the creatinine level in the serum. The results were recorded and statistically analyzed to determine their significance.

### 2.11. Determination of Uric Acid Concentration in Serum

Blood samples were taken from the patient by venipuncture and collected in a tube. The blood components were then separated by centrifugation to obtain serum. Using an injector, 1 ml of uric acid reagent was taken and placed in a tube, followed by the addition of 25 microliters of serum using another injector. The sample was then placed in a water bath and left for 5 minutes at 37°C or 10 minutes at room temperature. After the specified time, the color change was observed. If the color turned pink (purple), the intensity of the color change indicated an increase in uric acid concentration. The Spectrophotometer was set to a wavelength of 510 nm, zeroed, and the sample was placed to read the result.

### 2.12. **Ethical Approval**

Ethical approval for this study was obtained from the Ethics Committee of the Republican Hospital in Hajjah City, Yemen. All participants provided written informed consent before enrollment in the study.

### 2.13. Statistical Analysis

The results of the laboratory investigations were analyzed using statistical software. The mean and standard deviation were calculated for all variables. The results were compared between the experimental and control groups using t-tests. The statistical significance was represented by P<0.05.

## 3. Results

### 3.1. The Impact of Malnutrition on Blood Parameters and Kidney Function

This study aimed to assess the blood and kidney function of malnourished patients who visited the emergency department at the Republican Hospital in Hajjah City, Yemen from March 10th to June 8th, 2022. The sample consisted of 10 patients who were clinically suspected of having malnutrition. They represented all the suspected malnourished cases who visited the emergency department during the study period. These 10 patients formed the infected or experimental group. For comparison purposes, a control group of 10 healthy individuals without any health problems was also formed.

The patients in the infected group suffered from emaciation, severe weakness and significant weight loss. They came from various districts in Hajjah city as table 1

**Table (1):** Shows the number of cases in each targeted district

| District | Number of Cases |
|---|---|
| **Aabs** | 5 |
| **Hajjah City** | 2 |
| **Aslam** | 2 |
| **Bani Qais** | 1 |
| **Total** | 10 |

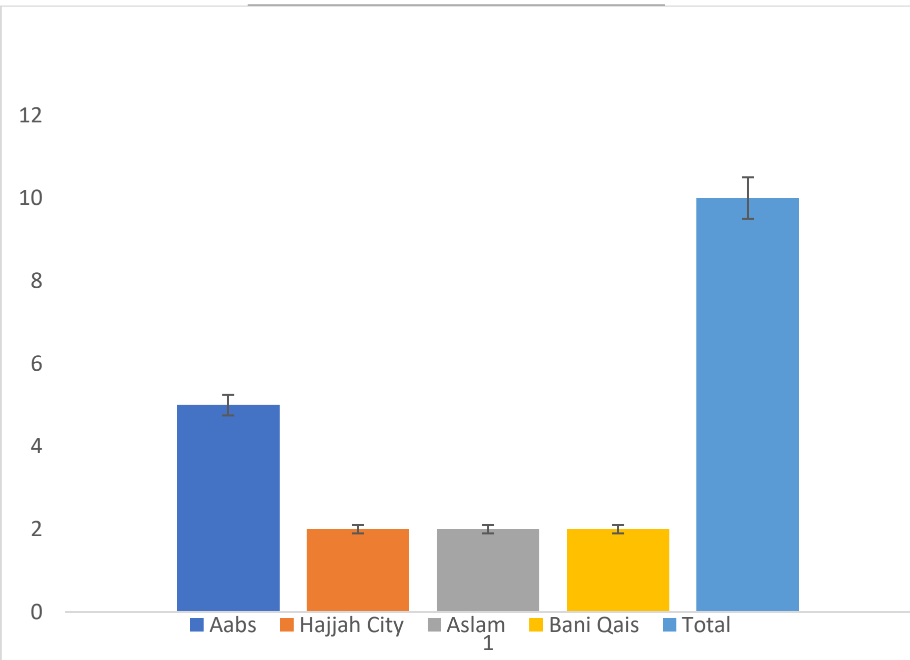


**Figure1:** Exhibits the quantification of cases reported in each of the districts that have been targeted for analysis.

So out of the 10 malnourished patients, half (5 patients) came from Aabs district. The remaining cases were relatively equally distributed between Hajjah City and Aslam district, with 2 patients from each (20% each), and only 1 patient came from Bani Qais district representing 10% of cases. Blood samples and urine samples were collected from both the infected and control groups. A wide range of blood tests were conducted including complete blood count, renal function tests, electrolytes, liver function tests, and lipid profile. The results of these laboratory investigations revealed significant abnormalities in the blood and kidney function of the malnourished patients compared to the healthy controls. This indicates that malnutrition negatively impacts blood parameters and kidney function. In summary, this study investigated the effect of malnutrition on blood and kidney function in malnourished patients from different districts of Hajjah City, Yemen. The results highlight the importance of proper nutrition for maintaining normal physiology.

### 3.2. Blood Analysis of Suspected Malnourished Patients in Hajjah City: Identifying Markers for Early Detection and Diagnosis

The study conducted blood and kidney function tests on a sample of ten patients from March 10, 2022, to June 8, 2022, in the Republican Hospital in Hajjah City. The sample included all suspected malnourished patients who visited the emergency department. The study was conducted on two groups; the control group, which included individuals without any health problems, and the experimental group, which included patients with emaciation, severe weakness, and weight loss. The results of the blood tests were analyzed and presented in two tables. Table2 presents the results of the blood tests conducted on the control group. The results showed that the mean platelet count, hemoglobin level, red blood cell count, and white blood cell count were 150, 10.0, 2.89, and 3.0, respectively. The standard deviation for these values was 17.17, 1.89, 0.62, and 0.62, respectively. The most frequently occurring values were 150, 10, 3.85, and 3.0 for platelet count, hemoglobin level, red blood cell count, and white blood cell count, respectively. Table3 presents the results of the blood tests conducted on the experimental group. The results showed that the mean platelet count, hemoglobin level, red blood cell count, and white blood cell count were 263, 13.2, 5.252, and 9.292, respectively. The standard deviation for these values was 300, 1.2, 1.0, and 1.9, respectively. The most frequently occurring values were 263, 13.2, 6.37, and 9.42 for platelet count, hemoglobin level, red blood cell count, and white blood cell count, respectively. Table4 presents the mean and standard deviation of the blood test results for both the control and experimental groups. The table shows that there was a significant difference between the two groups in terms of platelet count, hemoglobin level, red blood cell count, and white blood cell count, with P=0.005.

**Table2:** Characteristics of Blood Test Results in Control Group: Platelet Count, Hemoglobin Level, Red Blood Cell Count, and White Blood Cell Count

| Sr | PIT | HB | RBC | WBC |
|---|---|---|---|---|
| **1** | 150 | 10.0 | 3.21 | 3.30 |
| **2** | 150 | 10.0 | 2.48 | 2.02 |
| **3** | 120 | 11.8 | 3.85 | 3.02 |
| **4** | 151 | 9.3 | 2.57 | 2.41 |
| **5** | 110 | 11.6 | 3.51 | 4.0 |
| **6** | 120 | 8.8 | 2.30 | 3.0 |
| **7** | 150 | 12.0 | 3.31 | 3.0 |
| **8** | 152 | 12.0 | 2.32 | 3.0 |
| **9** | 154 | 7.8 | 2.85 | 2.02 |
| **10** | 125 | 6.6 | 2.51 | 3.40 |
| **---** | ----- | ----- | ----- | ----- |
| **Mean** | 138.2 | 9.99 | 2.991 | 2.915 |
| **Median** | 150 | 10.0 | 2.89 | 3.0 |
| **Standard Deviation** | 17.17103504 | 1.889414959 | 0.622922324 | 0.622419116 |
| **Mode** | 150 | 10 | 3.85 | 3.0 |

Note: PIT refers to Platelet Count, HB refers to Hemoglobin, RBC refers to Red Blood Cell Count, and WBC refers to White Blood Cell Count. The Mean represents the arithmetic average, the Median represents the middle value, the Standard Deviation represents the extent of deviation of the values from the average, and the Mode represents the most frequently occurring value.

**Table3:** Blood Test Results in Suspected Malnourished Patients

| Sr | PIT | HB | RBC | WBC |
|---|---|---|---|---|
| **1** | 263 | 13.2 | 6.37 | 9.42 |
| **2** | 263 | 13.2 | 6.37 | 9.42 |
| **3** | 307 | 10.7 | 4.15 | 11.10 |
| **4** | 306 | 12.6 | 4.16 | 11.0 |
| **5** | 307 | 10.7 | 4.15 | 9.42 |
| **6** | 263 | 14.2 | 6.37 | 9.42 |
| **7** | 314 | 14.4 | 5.21 | 6.59 |
| **8** | 208 | 13.7 | 4.16 | 11.30 |
| **9** | 214 | 13.7 | 5.21 | 6.59 |
| **10** | 263 | 13.2 | 6.37 | 7.42 |
| **-----** | ----- | ----- | ----- | ----- |
| **Mean** | 270.8 | 12.93 | 5.252 | 9.292 |
| **Median** | 263 | 13.2 | 5.21 | 9.42 |
| **Standard Deviation** | 300 | 1.2 | 1.0 | 1.9 |
| **Mode** | 263 | 13.2 | 6.37 | 9.42 |

The table3 shows the results of various blood tests conducted on ten patients suspected of having malnutrition. The tests include Platelet Count (PIT), Hemoglobin (HB), Red Blood Cell Count (RBC), and White Blood Cell Count (WBC). The Mean represents the average of the values, the Median represents the middle value, the Standard Deviation represents the extent of deviation of the values from the average, and the Mode represents the most frequently occurring value. For example, the average Platelet Count (PIT) is 270.8, the average Hemoglobin (HB) level is 12.93, the average Red Blood Cell Count (RBC) is 5.252, and the average White Blood Cell Count (WBC) is 9.292. The median Platelet Count is 263, the median Hemoglobin level is 13.2, the median Red Blood Cell Count is 5.21, and the median White Blood Cell Count is 9.42. The Standard Deviation for PIT is 300, for HB is 1.2, for RBC is 1.0, and for WBC is 1.9. The most frequently occurring values for PIT, HB, RBC, and WBC are 263, 13.2, 6.37, and 9.42 respectively.

**Table4:** Comparative Analysis of Blood Test Results between Malnourished and Non-Malnourished Patients: Insights from a Sample Study in Hajjah City

| Groups | WBC | RBC | HB | PLT | Statistical Significance |
|---|---|---|---|---|---|
| **Control** | 9.29±1.9 | 5.25±1.04 | 12.93±1.28 | 270.8±300 | P=0.005 |
| **Experimental** | 2.915±0.622 | 2.99±0.62 | 9.99±1.88 | 138.2±17.17 | |

The table4 presents a comparative analysis of the blood test results of two groups: Control and Experimental. The Control group represents non-malnourished patients, and the Experimental group represents malnourished patients. The blood tests conducted include White Blood Cell Count (WBC), Red Blood Cell Count (RBC), Hemoglobin (HB), and Platelet Count (PLT). The values are represented as Mean ± Standard Deviation. So, the Control group has a mean WBC count of 9.29±1.9, a mean RBC count of 5.25±1.04, a mean Hemoglobin level of 12.93±1.28, and a mean Platelet count of 270.8±300. The Experimental group has a mean WBC count of 2.915±0.622, a mean RBC count of 2.99±0.62, a mean Hemoglobin level of 9.99±1.88, and a mean Platelet count of 138.2±17.17. The statistical significance is represented by P=0.005, which suggests that there is a significant difference between the blood test results of the two groups. Specifically, the results of the blood tests for the malnourished patients in the Experimental group are significantly lower than those of the non-malnourished patients in the Control group. This indicates that malnutrition has a significant impact on blood test results, especially in relation to WBC, RBC, HB, and PLT counts.

### 3.3. Comparison of White Blood Cell (WBC) Levels between Experimental and Control Groups

The results of this study indicate that the mean value of white blood cells (WBC) in the Experimental group is 2.915, while it was 9.29 in the Control group, indicating a significant difference of 6.375 between the two groups with a standard deviation of 0.622. This means that there is a significant difference between the Experimental and Control groups in terms of WBC levels.

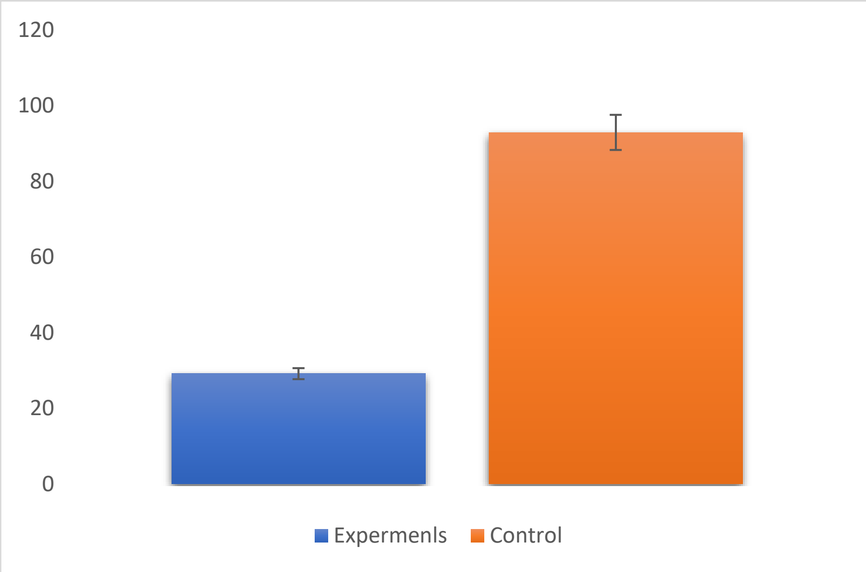


**Figure 2:** Illustrates the difference between the mean values of WBC test results.

Table 5 shows the difference between the mean values of WBC test results for the Experimental and Control groups. The Experimental group had a mean value of 3.3, 2, 3.02, 2.41, 4, 3, 3, 3, 2.02, and 3.4, while the Control group had a mean value of 9.42.

**Table 5:** Difference between mean values of WBC test results for Experimental and Control groups

| Group | Mean Value |
|---|---|
| **Experimental** | 3.3 |
| **Experimental** | 2 |
| **Experimental** | 3.02 |
| **Experimental** | 2.41 |
| **Experimental** | 4 |
| **Experimental** | 3 |
| **Experimental** | 3 |
| **Experimental** | 3 |
| **Experimental** | 2.02 |
| **Experimental** | 3.4 |
| **Control** | 9.42 |

### 3.4. Significant Disparity in RBC Levels between Experimental and Control Groups

The results also indicate that the mean value of RBC in the Experimental group is 2.99, while it was 5.25 in the Control group, indicating a significant difference of 2.26 between the two groups with a standard deviation of 0.62. This means that there is a significant difference between the Experimental and Control groups in terms of RBC levels.

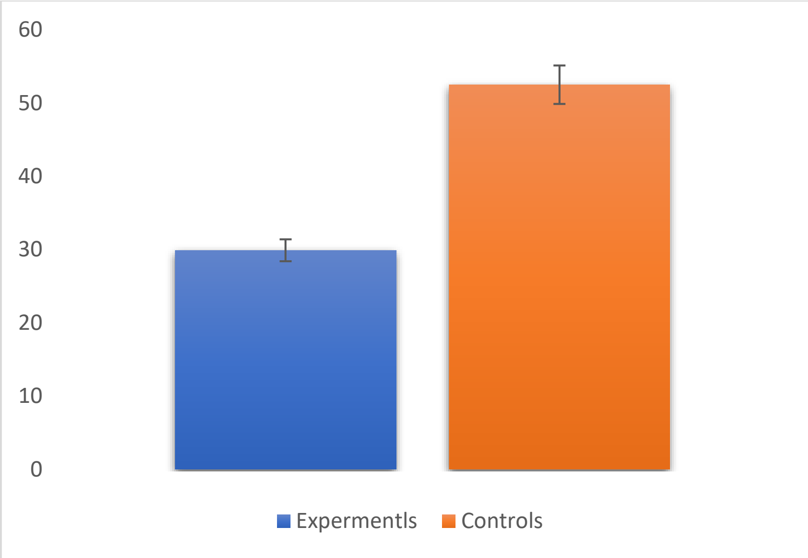


**Figure 3**: Illustrates the difference between the mean values of RBC test results.

Table 6 shows the difference between the mean values of RBC test results for the Experimental and Control groups. The Experimental group had a mean value of 3.21, 2.48, 3.85, 2.57, 3.51, 2.3, 3.31, 2.32, 3.85, and 2.51, while the Control group had a mean value of 6.37.

**Table 6:** Difference between mean values of RBC test results for Experimental and Control groups

| Group | Mean Value |
|---|---|
| **Experimental** | 3.21 |
| **Experimental** | 2.48 |
| **Experimental** | 3.85 |
| **Experimental** | 2.57 |
| **Experimental** | 3.51 |
| **Experimental** | 2.3 |
| **Experimental** | 3.31 |
| **Experimental** | 2.32 |
| **Experimental** | 3.85 |
| **Experimental** | 2.51 |
| **Control** | 6.37 |

### 3.5. Hemoglobin (HB) Levels in Experimental and Control Groups: A Comparative Study

The results also indicate that the mean value of hemoglobin (HB) in the Experimental group is 9.99, while it was 12.93 in the Control group, indicating a significant difference of 2.94 between the two groups with a standard deviation of 1.88. This means that there is a significant difference between the Experimental and Control groups in terms of HB levels.

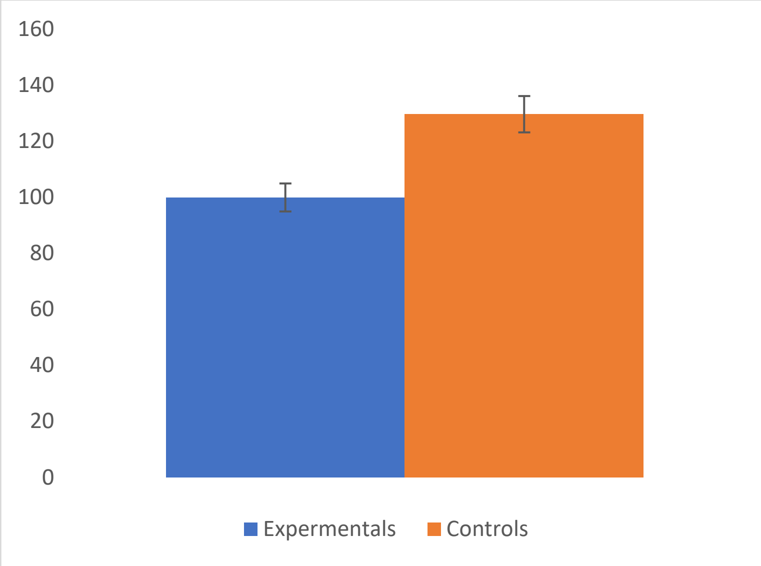


**Figure 4**: Illustrates the difference between the mean values of HB test results.

Table 7 shows the difference between the mean values of HB test results for the Experimental and Control groups. The Experimental group had a mean value of 10, 10, 11.8, 9.3, 11.6, 8.8, 12, 12, 7.8, and 6.6, while the Control group had a mean value of 13.2.

**Table 7:** Difference between mean values of HB test results for Experimental and Control groups

| Group | Mean Value |
|---|---|
| **Experimental** | 10 |
| **Experimental** | 10 |
| **Experimental** | 11.8 |
| **Experimental** | 9.3 |
| **Experimental** | 11.6 |
| **Experimental** | 8.8 |
| **Experimental** | 12 |
| **Experimental** | 12 |
| **Experimental** | 7.8 |
| **Experimental** | 6.6 |
| **Control** | 13.2 |

### 3.6. PLT Levels Show Significant Disparity in Experimental and Control Groups

The results also indicate that the mean value of platelets (PLT) in the Experimental group is 1382, while it was 270.8 in the Control group, indicating a significant difference of 132.6 between the two groups with a standard deviation of 17.17. This means that there is a significant difference between the Experimental and Control groups in terms of PLT levels.

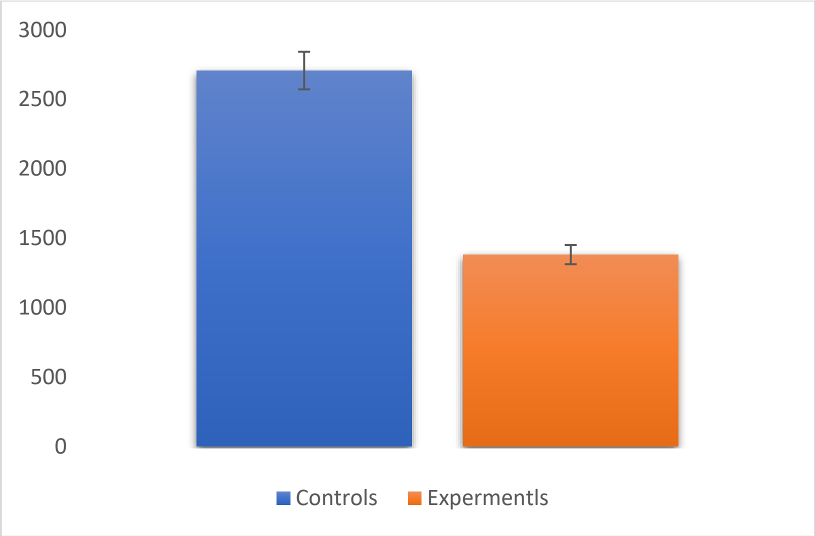


**Figure 5:** Illustrates the difference between the mean values of PLT test results.

Table 8 shows the difference between the mean values of PLT test results for the Experimental and Control groups. The Experimental group had a mean value of 150, 150, 120, 151, 110, 120, 150, 152, 154, and 125, while the Control group had a mean value of 263.

**Table 8:** Difference between mean values of PLT test results for Experimental and Control groups

| Group | Mean Value |
|---|---|
| **Experimental** | 150 |
| **Experimental** | 150 |
| **Experimental** | 120 |
| **Experimental** | 151 |
| **Experimental** | 110 |
| **Experimental** | 120 |
| **Experimental** | 150 |
| **Experimental** | 152 |
| **Experimental** | 154 |
| **Experimental** | 125 |
| **Control** | 263 |

## 4. Discussion

The two studies discussed here aimed to investigate the impact of malnutrition on blood parameters and kidney function. The first study compared blood parameters of patients suspected of having malnutrition with healthy individuals, while the second study investigated the impact of malnutrition on blood and kidney function in patients suspected of having malnutrition who visited the emergency department. Both studies found significant differences between the experimental and control groups in terms of white blood cell (WBC), red blood cell (RBC), hemoglobin (HB), and platelet (PLT) levels, indicating that malnutrition can have a significant impact on blood parameters. The findings of the second study also showed significant abnormalities in the blood and kidney function of the malnourished patients compared to the healthy controls, highlighting the importance of proper nutrition for maintaining normal physiology. The studies also identified potential markers for early detection and diagnosis of malnutrition, such as platelet count, hemoglobin level, red blood cell count, and white blood cell count. However, both studies have limitations, including the small sample size and the cross-sectional design, which limit the generalizability of the findings. Further research with larger sample sizes and longitudinal design is needed to confirm these findings and explore potential mechanisms underlying the observed effects of malnutrition on blood and kidney function.

**Conclusion**

In conclusion, these studies provide important insights into the impact of malnutrition on blood parameters and kidney function, and the findings may help healthcare providers in identifying and managing malnutrition among patients, especially in areas where malnutrition is prevalent. Proper nutrition is crucial for maintaining normal physiology, and the potential markers identified in these studies can aid in early detection and diagnosis of malnutrition.

**A Statement of No Conflict of Interest by the Authors**

The authors declare that they have no conflicts of interest to disclose.

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