**Sudan University of Science and Technology**

**College of Graduate Studies**

# Effect of Ramadan Fasting on Platelet Indicesand

# C - reactive protein in Patients with Rheumatoid Arthritis inKhartoum state.

# تأثير صيام رمضان على الصفائح الدموية ومؤشراتها والبروتين المتفاعل –Cلدى مرضى إلتهاب المفاصل الرثياني في ولاية الخرطوم.

A thesis submitted for partial fulfillment of the requirements for M.Sc. Degree in Medical Laboratory Science (Haematology and Immunohematology)

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# الآية

**قال تعالى :**

﴿إِنَّمَا أَمْرُهُ إِذَا أَرَادَ شَيْئًا أَنْ يَقُولَ لَهُ كُنْ فَيَكُونُ﴾ ٨٢

**صدق الله العظيم**

سورة يس الاية (82)

## Dedication

*I dedicate this research to myfather, mother, brothers and sister*

# ACKNOWLEDGEMENTS

First thanks to my God

It gives me great pleasure to conduct this study, and I would like to thanks everyone who has made this possible. It is most appropriate that I begin by expressing my undying gratitude to my supervisor Dr. Selma E. Abdalla, for her invaluable guidance with her super talent, professional expertise and immense patience, showing great care and attention to details and without her guidance this study would have been impossible. My thanks also go to everyone, who helped me in this work to see the light.

# Abstract

This is a cross-sectional case-control study conducted in rheumatic patients and healthy volunteers as control group at Omdurman Military Hospital and Rayan Specialized Laboratory in Khartoum state from May to November 2019. The study included 60 Sudanese rheumatic patients, 30 of them were fasting and other 30 were non fasting and 60 healthy individual as control. All participant age was between (26-69) years.Data was collected by using laboratory investigations and questionnaire. 5ml of venous blood sample was collected from each participates in containers containing EDTA and plan containers, analyzed automatically to measure platelets count and platelets indices and C-reactive protein .The data analyzed using SPSS(version 20.0)computerized program. The result showed that there is no significant difference between the fasting andnon-fastingpatients in the platelet count ($P \geq 0.320$) andMPV ($P \leq 0.324$) andPDW ($P \leq 1.000$) and PCT (0.115).Higher significant different between the fasting andnon-fasting in the hs-CRP ($P \geq 0.000$).The result showed that there is high significant different between the case (RA patients) and control (normal healthy individual) in the platelet count and MPV and PDW and PCT (P=0.000).

Dietary changes during Ramadan could be effective to a reduction the inflammatory response in patients with RA.

## المستخلص

هذه دراسة تحليلية حاله وحاله ضبط اجريت علي الاشخاص السودانين الذين يعانون من التهاب المفاصل الروماتزمي في ولاية الخرطوم كمجموعة دراسية واصحاء كمجموعة ضبط وقد اجريت في الفترة من مارس الي نوفمبر (2019) في مستشفي السلاح الطبي العسكري ومعمل الريان.

هذه الدراسة شملت ستون من المشاركين الاصحاء وستون من المشاركين يعانون من التهاب المفاصل الروماتزمي ثلاثون منهم صائمون وثلاثون غير صائمين تراوحت اعمارهم من (26–69) سنة ، جمعت المعلومات باستخدام النتائج المعملية وتم جمع 5 مل من الدم الوريدي في مانع التجلط وبواسطة الاجهزة تم قياس عدد الصفائح الدموية وموشرات الصفائح الدموية والبروتين المتفاعل –C لدي المشاركين ، تم تحليل النتائج باستخدام برنامج الحزم الاحصائية للعلوم الاجتماعية (الاصدار 20) .

اظهرت النتائج انه لا يوجد فرق ذو دلالة معنوية بين الصائمين وغير الصائمين الذين يعانون من التهاب المفاصل الروماتزمي في عدد الصفائح الدموية ($P\geq0.320$) ومؤشراتها ($P\leq0.115$) ($P\leq1.000$ )($P\leq0.324$)لكن يوجد فرق في البروتين المتفاعل –C )($P\geq0.000$) كما اظهرت النتائج انه يوجد فرق ذو دلالة معنوية بين الذين يعانون من التهاب المفاصل الروماتزمي والاصحاء في عدد الصفائح الدموية ومؤشراتها . )(0.00) =P.

تغيير النظام الغذائي في رمضان قد يكون له تأثير في خفض الالتهاب عند الاشخاص الذين يعانون من التهاب المفاصل الروماتزمي.

# LIST OF CONTENTS

# LIST OF TABLES

# LIST OF FIGURES

# LIST OF ABBREVIATIONS

| | |
|---|---|
| **ACRSRA** | American College of Rheumatology Subcommittee on RheumatoidArthritis |
| **CBC** | Complete Blood Count |
| **CCP** | Cyclic citrullinated peptide |
| **EDTA** | Ethylene Di amine Tetra Acetic Acid |
| **ESR** | Erythrocyte sedimentation rate |
| **HLA** | Human leukocyte antigen |
| **Hb** | Hemoglobin |
| **HS.CRP** | Hight sensitive C-reactive protein |
| **HiCN** | Cyanomethemoglobin |
| **LCD** | Liquid Crystal Display |
| **MPV** | Mean platelet volume |
| **PCT** | Plateletcrit |
| **PDW** | Platelet distribution width |
| **Plts** | Platelets |
| **RA** | Rheumatoid arthritis |
| **RBC** | Red blood cell |
| **WBC** | White blood cell |
| **SD** | Standard Deviation |
| **SPSS** | Statistical Package of Social Sciences Program |

# Chapter I

# Introduction

# CHAPTER I

## 1.1. INTRODUCTION:

Rheumatoid arthritis (RA). Is one of the most common autoimmune diseases characterized by chronic and progressive inflammation of diverse organs, mainly the synovial of the joints leading to joint damage (Abd-Elazeem and Mohamed , 2018). The synovial tissue proliferates in an unregulated manner leading to excess fluid production, destruction of cartilage, erosion of marginal bone and stretching and damage of the tendons and ligaments. This ultimately leads to joint damage and deformities, which are the hallmark features of advanced disease also systemic inflammatory response leads to dysfunction of other organ systems including endothelial damage and an increased risk of coronary artery disease and congestive cardiac failure (Mathew and kumar, 2018). The majority of studies estimate a prevalence of 0.5-1%, and the incidence of RA is higher in females than male ( Yildirim *et al* . ,2015).

For patients with rheumatoid arthritis (RA) . there are some biochemical parameters showing the amount of inflammation. Erythrocyte sedimentation rate (ESR). And C-reactive protein (CRP). Concentration are the most commonly used parameters , previous studies discovered the association between platelet indices [plateletcrit (PCT). platelet distribution width (PDW). and mean platelet volume (MPV)] with inflammation (Isik *et al*., 2014). Also RA patient may present an increasing count of platelets during active stages and that will decline in number with the remission of the inflammation. But the activation status of the platelets is unknown. Several studies reported that platelet histogram indices mean platelet volume (MPV). and platelet distribution width (PDW). Might be considered as platelet activation markers , as during the activation process the platelets became larger. PDW, also routinely reported by modern analyzers together with MPV, might be regarded as a marker of platelets activation, in fact reflecting a more important heterogeneity of the platelets dimensions (Muddathir and Haj , 2013).

Fasting has been shown to remodel clinical manifestations of rheumatoid arthritis (RA). But the mechanisms by which this occurs are largely unknown. Suggested explanations for such

improvement include reduced food intolerance, diminished gastrointestinal permeability, and decreased intake of precursors of the inflammatory mediators (Hafstrom *et al*., 1988).

## 1.2. Rationale

Rheumatoid arthritis is a chronic inflammatory disease in which the synovial membrane of the joint becomes inflamed, resulting in a swelling, stiffness, pain, limited range of motion, joint deformity and disability. Platelet indices which are routinely measured by automated hematology analyzers are significantly elevated in RA (Muddathir and Haj ,2013) .

They is relationship between fasting and Rheumatoid arthritis , fasting reduces disease activity in patients with rheumatoid arthritis (Hafstrom *et al* ,.1988) . so this study conducted to define the effect of fasting on platelet indices and CRP .

## 1.3. Objectives:

### 1.3.1 General objective:

To study the effect of the fasting on platelet indices and CRP in patients with Rheumatoid arthritis .

### 1.3.2 Specific objective

1-To compare mean of MPV and PDW and PCT and PLT between fasting and non-fasting Rheumatic patient .

2-To compare CRP between fasting and non- fasting Rheumatoid arthritis patients.

3-To compare mean of MPV and PDW and PCT and PLT between Rheumatoid arthritis patient and control.

# CHAPTER II

## Literature Review

# CHAPTER II

## 1.2. Literature Review:

### 1.2.1 Blood:

The average human possesses 5L of blood , blood transports oxygen from lung to tissues , clears tissues of carbon dioxide , transports glucose , proteins and fats and moves wastes to the liver and kidneys . The liquid portion is plasma , which transports and nourishes blood cells. There are three families of blood cells , red blood cells (RBCs). or erythrocytes , white blood cells (WBCs). or leukocyte and platelets or thrombocytes , red blood cells are a nucleate biconcave cells which transports oxygen and carbon dioxide , white blood cells or leukocyte they are protecting their host from infection and injury , platelets or thrombocytes which maintain blood vessel integrity by instigating vessel wall repairs ( Keohane,2012).

### 1.2.2 Platelets:

Platelets are a nucleate blood cells that circulate in amounts of 150 to 450 × 109/L, with mean counts slightly higher in women than in men. Platelets trigger primary hemostasis on exposure to endothelial, sub endothelial, and plasma pro coagulants in blood vessel injury. They have an average diameter of 2.5 μm, corresponding to a mean platelet volume (MPV). of 8 to 10 fL in an isotonic suspension, is granular but scarcely visible using light microscopy. Platelets arise from unique bone marrow cells called Megakaryocytes . Megakaryocytes are among the largest cells in the body and each megakaryocyte is 30 to 50 μm in diameter (Keohane ,2012) . One megakaryocyte produces about 4000 platelets and Lifespan of platelets is about 9–12 days and Production of platelet is regulated by hormone called thrombopoietin produced in liver . (Agarwal .,2013). By light microscopy on Romanowsky stained peripheral blood smear platelets appear as small (diameter of 2-3 μm, approximately 1/5 the diameter of red blood cell). round, anuclear cells with prominent reddish purple granules (Ramadas and Sharada , 2012).

### 1.2.2.1 Platelet indices

Platelet indices are biomarkers of platelet activation. They allow extensive clinical investigations focusing on the diagnostic and prognostic values in a variety of settings . Among these platelet indices, plateletcrit (PCT). mean platelet volume (MPV). And platelet distribution width (PDW). are a group of platelet parameters determined together in automatic CBC profiles; they are related to platelets' morphology and proliferation kinetics ( Budak *et al*.,2016).

### 1.2.2.2 Platelets count:

Normal platelet count ranges from 1, 50,000 – 4, 00,000/cu mm (150–400 × 109/L). and it has a normal life span of 8-10 days (Turgeon ,2017).

### 1.2.2.3 Mean Platelet Volume (MPV):

The mean platelet volume (MPV). Is a precise measurement of their dimension, calculated by hematological analyzers on the basis of volume distribution during routine blood morphology test. MPV ranges between 7.5 and 12.0 fl. In physiological conditions, MPV is inversely proportional to the platelet count, which is associated with hemostasis maintenance and preservation of constant platelet mass. This means that the increased production of platelets is accompanied by a reduction in their mean volume. In various pathologies, this physiological proportion is disturbed. Therefore, possible application of these parameters to the diagnosis of certain diseases has been suggested. Moreover, MPV correlates with platelet activity and is thus considered a marker of platelet activity (korniluk *et al*., 2019).

### 1.2.2.4 Platelet distribution width (PDW):

This is analogous to the red cell distribution width. It compares the uniformity and heterogeneity of platelet size. Normal rang (9-13fl). ( Agarwal ,2013). PDW is an indicator of volume variability in platelet size and is increased in the presence of platelet anisocytosis (Osselaer *et al*., 1997). It has been found to be of some use in distinguishing essential thrombocythaemia from reactive thrombocytosis (Dacie and lewis, 2006).

### 1.2.2.5 Plateletcrit ( PCT) :

It is the volume (total platelet mass) occupied by platelets in the blood stream as a percentage volume of PCT varies depending on MPV and platelet count according to the formula PCT= PLT x MPV/10.000 (Charadrashekar, 2013).

## 1.2.3 C-reactive protein (CRP) :

C-reactive protein (CRP). Is a phylogenetically highly conserved plasma protein, with homologs invertebrates and many invertebrates, that participates in the systemic response to inflammation. Its plasma concentration increases during inflammatory states, a characteristic that has long been employed for clinical purposes and it is a pattern recognition molecule, binding to specific molecular configurations that are typically exposed during cell death or found on the surfaces of pathogens. Its rapid increase in synthesis within hours after tissue injury or infection suggests that it contributes to host defense and that it is part of the innate immune response. Recently, an association between minor CRP elevation and future major cardiovascular events has been recognized, leading to the recommendation by the Centers for Disease Control and the American Heart Association that patients at intermediate risk of coronary heart disease might benefit from measurement of CRP. Also it is an ancient protein whose initial role as a pattern recognition molecule may have been to defend against bacterial infections, but whose present biological role appears quite complex. It is protective against a variety of bacterial infections and inflammatory stimuli in mice. It is likely that the activity of CRP in humans, either pro- or anti-inflammatory is dependent on the context in which it is acting ( Black *et al* . , 2004).

## 1.2.4 Fasting :

Ramadan is the holiest month in the Islamic calendar and Muslims fast during this month. Believers are commanded to abstain from food, drink and conjugal relationships from sunrise to sunset as a sign of restraint and introspection. The period in which the person fasts may vary depending on the geographical location of the country and the season of the year, and can be as long as 18 hours/day in the summer of temperate regions ( Ziaee *et al*., 2006).

### 1.2.5 Rheumatoid arthritis:

Rheumatoid Arthritis (RA). Is the most common chronic inflammatory disorder, associated with progressive destruction of synovial joints and physical disability (Alamanos *et al*., 2006). RA is an autoimmune disease, in which a person's immune system attacks his or her own healthy tissues (Lee, 2007). Autoimmune diseases are illnesses that occur when the body's tissues are mistakenly attacked by their own immune system. The immune system contains a complex organization of cells and antibodies designed normally to "seek and destroy" invaders of the body, particularly infections. Patients with autoimmune diseases have antibodies and immune cells in their blood that target their own body tissues, where they can be associated with inflammation (Majithia and Geraci,2007).

RA resulting in warm, swollen, and painful joints which are typically involved symmetrically, the majority of studies estimate a prevalence of 0.5-1%, and the prevalence of RA is higher in females than males (Alamanos *et al*., 2005, Kvien *et al*., 2006). And it is the most common inflammatory arthritis across the world. Although the etiology of RA remains a mystery, a variety of studies suggest that a blend of environmental and genetic factors are responsible and both affecting the prevalence of autoimmune disease (Turhanoglu *et al*., 2010).

The name (RA) is based on the term" rheumatic fever", an illness which includes joint pain and is derived from the Greek word rheumatos ("flowing"). The suffix-oid ("resembling") gives the translation as joint inflammation that resembles rheumatic fever. About 0.6% of the United States adult population has RA, women two to three times as often as men (Helmick *et al.*,2008). The incidence is reported to be higher 4-5 times below the age of 50, but above 60-70 years the female/male ratio is only about 2(Kvien *et al*.,2006). Similar to many rheumatic diseases, RA has a highly variable course with activation and remission periods over time (Jayakumar *et al*., 2012).

### 1.2.5.1 Epidemiology

According to latest review, the annual incidence of RA has been reported to be around 40/100,000 worldwide, being women 2:1 to 3:1 more likely to be affected than men. Overall the lifetime risk of RA in adults is 3.6 percent (1 in 28). for women and 1.7 percent (1 in 59). For men (Kourilovitch *et al*., 2014).

### 1.2.5.2 Etiology

The etiology of rheumatoid arthritis remains unclear, but there is evidence of genetic predisposition to the disease (Akil , 1995) . Rheumatoid arthritis is one of the complex immune-mediated diseases for which an understanding of the etiology is dependent on the definition of environmental triggers that, in a restricted genetic context, may initiate immune reactions having the potential to contribute to disease development (Klareskog et al., 2006). 50 percent of RA risk attributable to genetic factors ( Wasserman ,2011).

### 1.2.5.3 Pathogenesis :

Like other autoimmune disease RA is a complex disorder in which genetic and environmental factors contribute to the breakdown of tolerance to self antigens. The specificity of the pathogenic T and B cells remains un clear , although both B and T cells that recognize citrullinated peptides have been identified .susceptibility to RA is linked to the HLA-DR4 haplotype and to a few other HLA-DR alleles,all of which share a 5-residue segment (called the shared epitope ). In the epitope –binding groove –Recent genome –wide association studies have revealed a large number of genetic polymorphisms associated with RA including the gene encoding a tyrosine phosphatase ( Abul Abbas, 2012).

Environmental factors, such as smoking and infection, may also influence the development, rate of progression and severity of RA. Various immune modulators (cytokines and effector cells). And signalling pathways are involved in the pathophysiology of RA . The complex interaction of immune modulators is responsible for the joint damage. Synovitis is caused by the influx or local activation, or both, of mononuclear cells (including T cells, B cells, plasma cells, dendritic cells, macrophages and mast cells) and by angiogenesis. The synovial lining then becomes hyperplastic, and the synovial membrane expands and forms villi . The osteoclast-rich

portion of the synovial membrane, or pannus, destroys bone, whereas enzymes secreted by neutrophils, synoviocytes and chondrocytes degrade cartilage (Choy, 2012).

### 1.2.5.4 Clinical manifestations:

Early symptoms of RA may appear as unclear pain with gradual appearance without classic symptoms of joint swelling or tenderness. These unusual symptoms are usually nonspecific, and may persist for prolong period. Early articular manifestations of RA may be indistinguishable from other rheumatic diseases. Prolong duration of morning stiffness with arthralgia, or arthritis in a limited number of joints may be a clue for considering RA diagnosis. Involvement of small joints of the hands or feet with swelling and tenderness particularly symmetric pattern of involvement along with positive compression test is highly suggestive of RA. Presence of some clinical features such as polyarthritis, symmetric arthritis,hand arthritis, pain upon squeezing the metcarpophalangeal or metatasophalangeal joints, and morning stiffness greater than 30 minutes can be helpful not only in estimating the future course of arthritis but also in limiting the spectrum of differential diagnosis. Identification of all involved joints by precise clinical examination is essential. Counting the tender and swollen joints, and calculation of disease activity score are logical methods for the determination of disease severity and response to treatment (Heidari, 2011).

### 1.2.5.5 Diagnosis of RA:

Autoimmune diseases such as RA are often characterized by the presence of auto antibodies. Rheumatoid factor is not specific for RA and may be present in patients with other diseases (Wasserman, 2011). No single diagnostic test definitively confirms the diagnosis of rheumatoid arthritis. However, several tests can provide objective data that increase diagnostic certainty and allow disease progression to be followed. The American College of Rheumatology Subcommittee on Rheumatoid Arthritis (ACRSRA). Recommends that baseline laboratory evaluations include a complete blood cell count with differential, rheumatoid factor, and erythrocyte sedimentation rate (ESR). Or C-reactive protein (CRP). Baseline evaluation of renal

and hepatic function also is recommended because these findings will guide medication choices (Adam and Daniel, 2005).

Anti-CCP antibodies are reported to have a remarkably high specificity for RA (Jansen et al., 2015). These autoantibodies recognize a group of autoantigens which are post-translationally modified by peptidyl arginine deaminase (PAD). Enzymes, leading to the conversion of an arginine to citrulline (Habets et al.,2015) these antibodies can be observed as early as 5 to 10 years before clinical rheumatoid arthritis symptoms appear (Nazario, 2018).

### 1.2.5.6 Treatment:

Two classes of medicines are used in treating RA fast acting (first –line drugs). And slow acting (second line drugs). The first –line drugs such as aspirin and cortisone which used to reduce pain and inflammation. The slow –acting second –line drugs such as methotrexate and hydroxychloroquine , which promote disease remission and prevent progressive joint destruction (William and Shiel , 2019).

### 1.2.6 Previous Studies:

In the study done by Muddathir and haj (2013). In a Sudanese population, patients with RA have higher values of MPV and PDW than controls. These finding were similar with the studies by Yazici, *etal*.,(2010). Was equally discovered that higher values of MPV in patients with RA. Another study on platelet indices in patient with RA conducted by Mathew and kumar,(2018). There was an increase in platelet count and plateletcrit with disease activity, while MPV showed a decrease with active disease. Which similar with the studies by Moghimi, *etal* .,(2017). Comparing mean MPV values between the groups showed no significant difference in MPV levels. Another study by Talukdar,*etal*.,(2017) . Showed that platelet count increases with increase in disease activity in RA patients also Zolfaghari, *et al*., (2015). Report that Fasting decreases the C-reactive protein (CRP).

# CHAPTER III

# MATERIALS AND METHODS

# CHAPTER III

# MATERIALS AND METHODS

## 3.1. Study design:

This is a cross-sectional case - control study designed to determine the effect of fasting on platelet indices and CRP in patient with Rheumatoid Arthritis.

## 3.2. Study area:

The study conducted in Sudanese rheumatic patients at Omdurman Military Hospital and Rayan Specialized Laboratory in Khartoum state- Sudan.

## 3.3. Study duration:

The study conducted during the period from May to November 2019.

## 3.4. Study population:

The study included 60 Sudanese rheumatic patients, 30 of them were fasting until the day of sampling and other 30 were non fasting and 60 healthy individual as control.

## 3.5. Data collection:

Data was collected using a design questioner by interviewed and some data was collected from record file to rheumatoid arthritis to obtain information that helped in study.

## 3.6. Sample collection:

Blood is withdrawn from an antecubital vein or other visible veins in the forearm by means of 5ml of clean dry sterile syringe after check patients identity, Skin was been cleaned by 70% alcohol and allowed to dry before punctured. After blood is withdrawn, the blood was placed in sterial EDITA anticoagulant containers and mix gentley for CBC and a plain container for the CRP and RF tests.

## 3.7. Sample technique:

Complete blood count was done using hematological analyzer sysmex kx21n.

## 3.7. 1. Complete blood count(CBC):

Measurement of blood cells (RBCs, WBCs, and platelet). And Hb concentration obtained by aspiration of small volume of well mixed K2 EDTA blood by sample probe and mixed with isotonic diluents in nebulizer. Diluted mixture aspiration delivered to RBC aperture bath for providing information about RBC and platelet based on cell size, particles of 2 to 20 fl counted platelets, above 36 fl counted as red cells. Some portion of aspirated mixture induced into WBC bath in which hemolytic reagent (Stromatolyzer). was added to automatically to measure Hb concentration in a build calorimeter, based on cyanomethemoglobin (HiCN).Blood cell counted and size information generated in tripilicate pulses according to electronic conductivity, and translated into digital number using in build calculator programmed and designed for that RBC, WBC count hence three values were directly measured (RBC, WBC, Hb). and displayed on (LCD). Other values of red cell indices, platelet count, leukocyte differential and absolute count calculated from given information and automated constructed histograms, the result printed out according to the setting mode .

### 3.7.2 .High Sensitivity C-reactive Proteins:

A fully Automated ELISA device was used, using Aptec CRP kit .

Serum samples were also used in this test. A fully automated ELISA device was used for the estimation of hs-CRP .

Method: Measurement of antigen-antibody reaction by the end-point method

- First, the samples and control were uploaded into the wells, around 16 ul from each .
- Reagent 1 was added, mixed and incubated for 2 minutes, the Absorbance was read using wavelength 340nm .
- Reagent 2 was added immediately after the first reading, incubated and the absorbance was read after 5 minutes using wavelength 340 nm

## 3.8. Ethical clearance:

The study was approved by the committee of Hematology Department at the College of Medical Laboratory Science of Sudan University of Science and Technology. A verbal informed consent was obtained from each participant.

## 3.9. Inclusion criteria:

Sudanese male and female who were diagnosed with rheumatic diseases patients were enrolled in this study after their approval and no other medical conditions rather than rheumatoid arthritis. Healthy individuals as control group for comparison.

## 3.10. Exclusion criteria:

Females and males with Rheumatoid arthritis with any other medical conditions that may affect the results were excluded from this study.

## 3.11. Data analysis:

Data was analyzed by using the Statistical Package of Social Sciences program (SPSS). Version (20.0). The analysis was performed using the Independent T-test. The data obtained were presented as mean ± SD.

# Chapter IV

# Results

# CHAPTER IV

# RESULTS

## 4.1. Demographic Data:

The study investigated the effect of fasting on platelet indices and CRP in Rheumatoid Arthritis patient. Fig 3.1 Indicate that about 39.7% of control are male and 60.3% are female and about 20% are male and 80% are female patients with Rheumatoid Arthritis.

## 4.2. Laboratory Data:

The mean values of platelet indices (Table 3.1). Shows the Plts value in RA patients was 350.87 c/cm compared to 294.48 c/cm in control group. The data indicated significant ($P \geq 0.000$). Higher value in case compared with normal group. The MPV value in case patients was 9.62 fl compared to 8.24 fl in normal group (control). The data indicated significant ($P \leq 0.000$). Higher value in RA patients compared with normal group.

The PDW value in RA patients was 11.37fl compared to 15.42 fl in normal group (control). Case patients had significantly ($P \leq 0.000$). Lower values compared with normal group.

The PCT value in RA patients was 0.241 compared to 0.316 in normal group (control) the data indicate significant ($P \leq 0.000$).

The mean values of platelet indices in patient with RA (Table 3.2). Shows the Plts value in fasting RA patients was 339.10 c/cm compared to 362.63 c/cm in non fasting group. The data indicated not significant ($P \geq 0.320$). Lower value in fasting compared with non fasting group.

The MPV value in fasting RA patients was 9.77 fl compared to 9.47 fl in non fasting group (control). The data indicated not significant ($P \leq 0.324$). Higher value in fasting RA patients compared with non fasting group.

The PDW value in fasting RA patients was 11.37fl compared to 11.37 fl in non fasting group (control). The data indicated not significantly ($P \leq 1.000$). Equal value in fasting RA patients compared with non fasting group.

The PCT value in fasting RA patients was 0.305 compared to 0.335 in non fasting group. The data indicate not significant ($P \leq 0.115$).

The CRP value in fasting RA patients was 6.88 compared to 19.24 in non fasting group. The data indicated significant ($P \leq 0.000$) lower value in fasting compared with non fasting group.

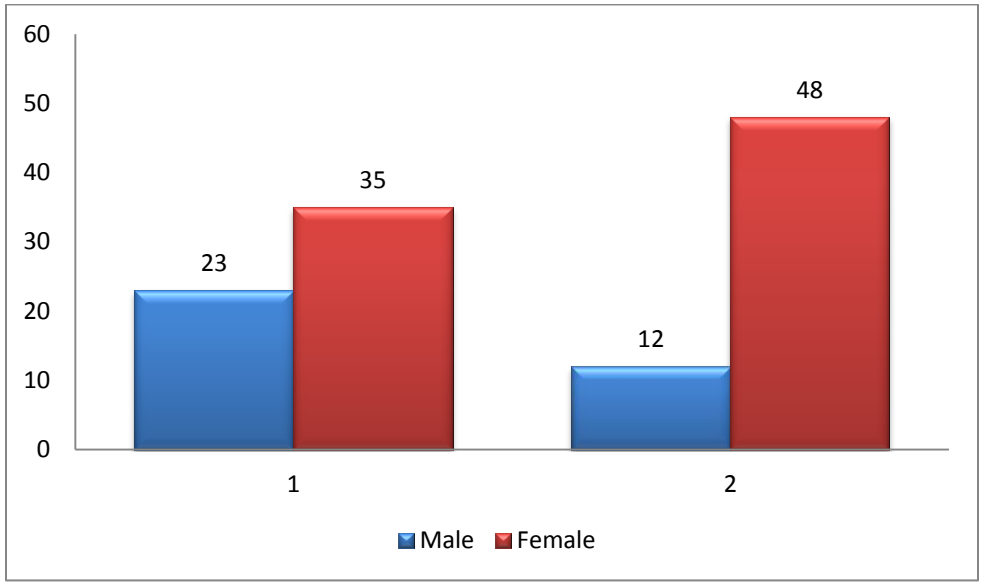


**Figure (3-1): Distribution of patient and control according to gender**

**Table 3-1Mean of platelet indices in case and control in the study**

**(n=120)**

| sample | N | Mean±SD | P.value |
|---|---|---|---|
| Plt control | 60 | 294.84±66.27 | |
| case | 60 | 350.87±90.93 | 0.000 |
| MPV control | 60 | 8.24±0.77 | |
| case | 60 | 9.62±1.16 | 0.000 |
| PDW control | 60 | 15.42±0.25 | |
| case | 60 | 11.37±1.64 | 0.000 |
| PCT control | 60 | 0.316±0.081 | 0.000 |
| case | 60 | 0.241±0.053 | |

## Table 3-2 Mean of platelet indices and CRP in RA patient (n=60)

| Sample | N | Mean | P.value |
|---|---|---|---|
| Plt c/cm fasting | 30 | 339.10±103.0 | 0.320 |
| Non fasting | 30 | 362.63±76.99 | |
| MPV fl fasting | 30 | 9.77±1.35 | 0.324 |
| Non fasting | 30 | 9.47±0.94 | |
| PDW fl fasting | 30 | 11.37±1.89 | 1.000 |
| Non fasting | 30 | 11.37±1.37 | |
| PCT fasting | 30 | 0.305±0.066 | 0.115 |
| Non fasting | 30 | 0.335±0.076 | |
| CRP fasting | 30 | 6.88±1.93 | 0.000 |
| Non fasting | 30 | 19.24±13.25 | |

# Chapter V

# Discussion, Conclusion, Recommendation

# Chapter V

# Discussion, Conclusion and Recommendation

## 5.1Discussion:

This was a cross-sectional case control study conducted in Rayan Specialized Laboratory and Omdurman Military Hospital during period from May to November 2019 to estimate hematological parameters ( platelets count, MPV, PDW) and CRP among Sudanese patients with rheumatoid arthritis. The study population was selected as 60 patients and 60 normal healthy individual as control group, the patients was classified into fasting and non fasting , age of participant was 26-69 years .

The results show that the patients with RA have higher values of MPV, PDW, PCT and PLT count than controls (P=0.00) this study agreed with Yazici, et al,(2010). who reported higher values of MPV in patients with RA , Furthermore the results agree with Jurcuț.c, et al,(2010) that showed higher values for PDW in RA patients compared to control, similar results have been reported by Muddathir and Haj,(2013) that show higher values of MPV and PDW , also result reported by Mathew,(2018) show increase in platelet count and plateletcrit with disease activity, while MPV showed a decrease with active disease , the result agree with Talukdar.,et al (2017) who reported that platelet count increases with increase in disease activity in RA patients.

The result show that there is no significant different between the fasting and non fasting in the platelet count ($P \geq 0.320$) and MPV($P \leq 0.324$) and PDW($P \leq 1.000$) and PCT($P \leq 0.115$). This study shows there was high significant different between the fasting and non fasting in the hs-CRP ($P \geq 0.000$). Agreeing with the results reported by Zolfaghari et al., (2015).

## 5.2Conclusions:

Study found that there is no statistical difference between the mean of platelet count and platelet indices in the fasting and non fasting and there was high significant different between the fasting and non fasting in the hs-CRP, dietary changes during Ramadan could be effective to a reduction the inflammatory response in patients with RA.

## 5.3 Recommendations

1- Physicians might need to take into account changes in diet to improve RA disease management during Ramadan.

2- Establish the association between platelet indices and disease activity scores using suitable disease activity score questionnaire (e.g. DAS-28).

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# Appendices

Sudan University of Science and Technology

College of Graduate Studies

Department of Hematology and Immnuohematology

Questionnaire

A: General information:-

ID: ……..…….……..

Name: ……..……..

Gender: Male Female

Age: …….…….……

Address: ……..……..

Telephone number: ……...

B: Clinical information:-

Onset of disease: …….

Underlying autoimmune disease: ……..

Laboratory findings: …….