

# LAMPIRAN

## **Prosedur Kerja Pemeriksaan Hemoglobin :**

### 1. Metode otomatis (Hematology Analyzer)

#### Prinsip kerja:

Pemeriksaan dengan cara mengukur serta menghitung sel darah secara otomatis berdasarkan impedansi aliran listrik atau berkas cahaya terhadap sel-sel yang dilalui.

#### Alat dan Bahan :

Tabung dengan antikoagulan EDTA , darah vena, hematology analyzer

#### Reagen :

Diluen, hypoclean, lyse, control (Normal, Low, High), Cleaner

#### Pengambilan Darah Vena :

- a. Lakukan palpasi pada bagian lengan yang akan ditusuk, lalu lakukan pembendungan menggunakan tourniquet, bersihkan area lengan yang akan ditusuk dengan kapas alkohol 70%/ menggunakan alkohol swab, biarkan kering,
- b. Lakukan penusukan dengan sudut 15° dan lubang jarum menghadap ke atas, tusuk secara perlahan, lepaskan tourniquet saat darah sudah masuk ke jarum, jika volume darah dirasa cukup lepaskan jarum tutup dengan kapas beri plester, masukkan darah kedalam tabung dengan antikoagulan EDTA homogenkan.

#### Cara Kerja Pemeriksaan Hemoglobin :

- a. Nyalakan alat dengan menghidupkan tombol power pada bagian belakang alat
- b. Sebelum digunakan pastikan diluent, lyse, dan cleaner cukup, Check limbah, buang limbah jika sudah hampir penuh, lalu lakukan priming reagen,
- c. Lakukan blank test dengan cara: tekan blank yang ada di monitor tekan tombol "RUN" , lakukan QC sebelum melakukan pemeriksaan sampel

#### Cara melakukan QC :

1. Pilih home- Quality Control
2. Pilih level dan lot control yang akan di runing

3. Pilih next untuk expiration date
  4. Pilih measure, homogenkan contoh lalu masukkan ke adapter
  5. Pilih run, hasil QC akan terlihat di layar
- d. Sebelum sampel di periksa homogenkan terlebih dahulu,
  - e. Masukkan identitas pasien pada alat,
  - f. Masukkan sampel ke dalam jarum penghisap, tekan tombol dibelakang jarum penghisap, tunggu hingga hasil keluar,
  - g. Setelah selesai digunakan matikan alat dengan cara : pada layar screen pilih exit shutdown, tunggu beberapa saat sampai muncul pesan pada monitor dan instrumen mengeluarkan bunyi panjang, Matikan alat dengan menekan main power di belakang alat ke posisi off (Syarifah, 2020).

## 2. Metode cyanmethemoglobin

Prinsip : Hemoglobin akan diubah menjadi methemoglobin oleh  $K_3 Fe(CN)_6$  yang kemudian akan menjadi Hb Sianida (HiCN) oleh KCN. Intensitas warna yang terbentuk berbanding lurus dengan konsentrasi hemoglobin yang diukur secara fotometrik.

Alat dan bahan : mikropipet, tip, tabung reaksi, darah EDTA, Reagen drabskin, alat spektrofotometer.

Cara Kerja :

- a. Dipipet 5 ml reagen drabskin kedalam 2 tabung reaksi
- b. Tambahkan 20  $\mu$ l darah EDTA ke dalam tabung kedua dan homogenkan
- c. Biarkan selama 3 menit
- d. Intensitas warna yang terjadi dibaca terhadap blanko (tabung pertama) menggunakan alat spektrofotometer (Arianda, 2017)

## 3. Metode Sahli

Prinsip Kerja: Hemoglobin akan dihidrolisis oleh HCl menjadi globin ferroheme. Ferroheme akan dioksidasi oleh oksigen yang ada diudara menjadi ferrihemechlorid yang juga disebut hematin atau hemin yang berwarna coklat. Warna yang terbentuk ini dibandingkan dengan warna standar dengan mata telanjang.

Alat dan bahan : hemometer, pipet tetes, alat penyedot darah, darah EDTA,

aquades, HCl 0,1N

Cara kerja :

- a. Diambil larutan HCl 0,1N kedalam tabung hemometer sampai tanda 2.
- b. Darah dihisap dengan pipet sahli sampai tepat 20  $\mu$ l. Kelebihan darah yang menempel pada dinding pipet dihapus dengan tisu secara hati-hati
- c. Darah dimasukkan kedalam tabung yang berisikan larutan HCl, sebelum diangkat pipet dibilas dengan cara menghisap dan mengeluarkan larutan HCl secara berulang kali
- d. Tunggu 5 menit untuk pembentukan hematin asam, hematin asam diencerkan dengan aquades setetes demi tetes sambil diaduk sampai sama dengan warna standar.
- e. Tentukan kadar Hemoglobin dengan cara membaca pada miniskus bawah dan nyatakan dalam g/dl (Syarifah, 2020).

## Study of relationship of tobacco smoking with haemoglobin concentration in healthy adults

Ashish Goel<sup>1\*</sup>, Desh Deepak<sup>2</sup> & Naveen Gaur<sup>3</sup>

<sup>1</sup> Assistant Professor, Department of Physiology, Uttarakhand Forest Hospital Trust Medical College, Haldwani (Nainital) Uttarakhand, India.

<sup>2</sup> Assistant Professor, Department of Physiology, VCSG Government Medical Sciences and Research Institute, Srinagar, Uttarakhand, India.

<sup>3</sup> Assistant Professor, Department of Physiology, Subharti Medical College, Meerut, Uttar Pradesh, India.

**Objective:** The blood haemoglobin concentration is one of the most frequently used laboratory parameters in clinical settings. Smoking is one of the important factor which should be taken care of in the estimation of haemoglobin concentration. The study was designed to evaluate the relationship of tobacco smoking with haemoglobin concentration.

**Material and methods:** 150 healthy adults participated in the present study. Anthropometric measurements which include height, weight, BMI was taken and information of smoking habits were obtained by a questionnaire. Blood samples were taken for assessment of haemoglobin using MS-9 automated hematology cell counter.

**Observations and results:** The mean value of HAEMOGLOBIN in smokers was  $14.22 \pm 0.79$ , while in non-smokers was  $13.27 \pm 1.32$  and the difference was statistically highly significant ( $p = 0.001$ ) which indicated that tobacco smoking has a significant impact on haemoglobin concentration in healthy adults.

**Conclusion:** It can be concluded that smoking should be considered as one of the important factor affecting the haemoglobin concentration while interpreting their values which is indicated by high haemoglobin concentration in the healthy adults smokers as compared to healthy non-smokers.

**Key words:** Haemoglobin, Tobacco smoking, Body mass index.

### Introduction:

The blood haemoglobin estimation is one of the most frequently used laboratory parameters in clinical settings. Hemoglobin values, however, vary with age, sex, and stage of pregnancy, and they are also affected by ethnicity, altitude, and smoking<sup>[1]</sup>. It is well known fact that smoking does affect the health. It increases the heart rate, blood pressure, cardiac output, stroke volume, velocity of contraction, myocardial contraction force and myocardial oxygen consumption, development of arrhythmia and alteration of electrocardiographic and ballistocardiographic patterns<sup>[2]</sup>. Tobacco use including both the smoking and the nonsmoking forms of tobacco is common in India<sup>[3]</sup>. The number of smokers in the population of the Third World will increase from 4.5 billion to 7.1 billion by 2025. There are now tens of thousands of studies linking cigarette smoking to increased morbidity and mortality from cardiovascular diseases, various forms of cancer and chronic obstructive pulmonary disease<sup>[4]</sup>. The World Health Organization reported that tobacco smoking killed 100 million people worldwide in the 20th century and warned that it could kill one billion people around the world in the 21<sup>st</sup> century<sup>[5]</sup>. Tobacco smoking rates have decreased in industrialized countries since 1975, but there has been a corresponding 50% increase in smoking rates in low- income countries<sup>[6]</sup>. For these reasons, it is important to adjust for these factors in population based surveys when interpreting hemoglobin values. The present study investigates the relationship of tobacco smoking with haemoglobin concentration in healthy adults.

### Materials and methods:

The present study was carried out in the department of physiology at Himalayan Institute of Medical Sciences, Swami Ram nagar, Dehradun, India. A total of 150 clinically healthy volunteers of Dehradun, in the age group of 21-55 years participated in the present study. Individuals with history of smoking cigarettes/bidis daily for at least one year were considered as smokers. Ex-smokers or past smokers were excluded from the study. Classification criteria as suggested by WHO (1998), were used as below: Smoker (Someone who, at the time of the study, smokes any tobacco product either daily or occasionally), Non-smoker (Someone who, at the time of the study, does not smoke at all) and Ex-smoker (Someone who was formerly a daily or occasional smoker but currently does not smoke at all)<sup>[7]</sup>.

Unhealthy adults with any history of acute or chronic illness, bleeding and bleeding disorders, drug addiction and if they had donated blood within the previous 6 months were not included in the study. Pregnant women and those who had delivered within 3 months were also excluded.

Written informed consent was taken from the subjects. Anthropometric parameters which include height, weight and body mass index (BMI) were taken. Information of smoking habits was obtained by a questionnaire. After taking antiseptic precautions blood samples were drawn from the antecubital vein and collected into 3ml EDTA vacutainers (Akuret, eastern medkit limited). The EDTA blood samples were processed by using MS-9 automated

**Influence of chronic Cigarette Smoking on Serum Biochemical Profile among Sudanese smokers**Mutwakil H. Alhibri<sup>1</sup>, AbdElkarim A. Abdrabo<sup>\*2</sup>, Mohamed F. Lutfi<sup>3</sup><sup>1</sup>Department of Clinical chemistry, Faculty of Medical Laboratory Sciences, Sudan International University- Sudan<sup>2</sup>Department of Clinical chemistry, Faculty of Medical Laboratory Sciences, Al Neelain University - Sudan<sup>3</sup>Department of Physiology, Faculty of Medicine and Health Sciences, Al Neelain University- Sudan

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**ABSTRACT**

**Context:** Cigarette smoking is a risk factor for wide range of diseases; however, still there are no laboratory screening tests for early detection of the possible biochemical derangements induced by smoking.

**Aim:** to evaluate serum cholesterol, liver enzymes, uric acid and hemoglobin concentrations in smokers regardless of their present complain.

**Materials and Methods:** the study involved a control group of apparently healthy non-smokers (N = 105) matched for age with a test group of smokers (N = 105). The age range of both groups was 25-63 years. Random blood glucose (RBG), serum cholesterol, uric acid, liver enzymes and haemoglobin concentrations were measured according to the standards. Appropriate statistical tests were used to assess significant difference in the means of the studied concentrations between smokers and the control group.

**Results:** The smokers showed significantly higher RBG (M±SD = 143.7±27.0 mg/dl), aspartate transaminase (M±SD = 26.2±6.0 U/L), alanine transaminase (25.0±5.3 U/L) and haemoglobin (M±SD = 13.5±2.0 g/dl) levels compared to with non-smokers (M±SD = 127.9±26.4 mg/dl, 23.9±6.1 U/L, 22.6±10.1 U/L, 12.8±1.9 g/dl respectively, *P* < 0.05). In contrast, uric acid concentrations were less in smokers (M±SD = 4.9±0.8 mg/dl) compared with the control group (M±SD = 5.1±0.7 mg/dl and, *P* = 0.048). Cholesterol and alkaline phosphatase concentrations were not significantly different in the studied groups.

**Conclusion:** the study added further evidences for the possible harmful consequences of smoking including augmented oxidative stress as indicated by low serum uric acid levels and high liver transaminases concentrations, hyperglycaemia and high haemoglobin concentrations.

**Keywords:** Cigarette smoking, biochemical derangements, Random blood glucose, harmful consequences.

**1. INTRODUCTION**

The hazards of cigarette smoking are well recognized worldwide<sup>[1, 2]</sup>, yet significant numbers of people continue to smoke in the developing countries<sup>[3, 4]</sup>. In Sudan, prevalence of cigarette smoking in the adult population reached 12%<sup>[4]</sup>. Alternatively in the some developed countries, although prevalence of cigarette smoking is almost double that of Sudan, it started to decrease over the last year<sup>[5]</sup>.

Cigarette smoking is a known risk factor for respiratory<sup>[6, 7]</sup>, cardiovascular<sup>[8, 9]</sup>, neoplastic<sup>[10, 11]</sup> and other diseases

<sup>[12, 13]</sup>. The common pathophysiologies of most smoking-related diseases are imbalance of systemic oxidants and antioxidants<sup>[14, 15]</sup>, enhanced inflammatory reactions<sup>[16]</sup>, insulin resistance<sup>[17-20]</sup>, dyslipidemia<sup>[21]</sup> and others<sup>[22-24]</sup>. In spite of the growing knowledge regarding the detrimental effects of smoking, there are no routine laboratory tests used for early detection of biochemical derangements in cigarette smokers. Simple investigations like lipid profile, hepatic enzymes, inflammatory markers, uric acid and hematological counts may gives clues about

\*Corresponding author: AbdElkarim A. Abdrabo | Department of Clinical chemistry, Faculty of Medical Laboratory Sciences, Al Neelain University - Sudan | Email: abdrabokarim@hotmail.com

## GAMBARAN KADAR HEMOGLOBIN PADA PEROKOK AKTIF DI TERMINAL KAYURINGIN KOTA BEKASI

Moudy Ramadhanti<sup>1</sup>, Ria Amelia<sup>2</sup>, Danny Luhulima<sup>2,3</sup>

1. Mahasiswi Program Studi D3 Teknologi Laboratorium Medik, STIKes Mitra Keluarga, Jl. Pengasinan Rawa Semut, Margahayu, Bekasi Timur
2. Dosen Program Studi D3 Teknologi Laboratorium Medik, STIKes Mitra Keluarga, Jl. Pengasinan Rawa Semut, Margahayu, Bekasi Timur
3. Dokter Patologi Klinik RS. Mitra Keluarga Bekasi Timur

### Abstrak

Perilaku merokok berdampak yang buruk terhadap kesehatan. Salah satu zat berbahaya dalam asap rokok yaitu karbon monoksida. Karbon monoksida yang sangat mudah berikatan dengan hemoglobin dibandingkan dengan oksigen maupun karbondioksida. Ikatan karbon monoksida dengan hemoglobin dapat beresiko terjadinya kondisi hipoksia. Jika kondisi ini dibiarkan maka dapat menyebabkan kematian sel. Penelitian ini dilakukan untuk melihat gambaran kadar hemoglobin pada perokok aktif di Terminal Kayuringin Kota Bekasi. Jenis penelitian yang dilakukan adalah penelitian deskriptif dengan menggunakan desain penelitian *cross sectional*. Jumlah responden sebanyak 31 perokok aktif yang diperoleh melalui wawancara dan kadar hemoglobin diperiksa dengan menggunakan alat *hematology analyzer* ABX Micros 60. Hasil penelitian kadar hemoglobin pada 31 responden perokok aktif diperoleh nilai rata-rata sebesar 14,5 g/dL, dengan standar deviasi 1,0942 g/dL, nilai tertinggi 16,9 g/dL dan nilai terendah 12,3 g/dL. Berdasarkan hasil tersebut dapat disimpulkan bahwa kadar hemoglobin pada 31 responden perokok aktif masih dalam kadar normal. Kadar hemoglobin normal pada perokok aktif diduga sebagai respon tubuh untuk memenuhi oksigen dan menjaga homeostatis agar metabolisme tubuh berjalan normal.

**Kata kunci :** *hematology analyzer*, kadar hemoglobin, perokok aktif

### Abstract

Smoking behavior has a negative impact on health. One of the dangerous substances in cigarette smoke is carbon monoxide. Carbon monoxide is very easy to bind to hemoglobin compared to oxygen and carbon dioxide. Carbon monoxide bonds with hemoglobin can be at risk for hypoxic conditions. If this condition is allowed, it can cause cell death. The purpose of this research was to describe hemoglobin levels on the active smokers in Terminal Kayuringin Bekasi. The type of this research was descriptive research with cross sectional design study. Total samples of 31 active smokers got by interview, and hemoglobin levels checked by *hematology analyzer* ABX Micros 60. Based on result, average values of hemoglobin that is 14,5 g/dL, with a standard deviation of 1,0942 g/dL, maximum value is 16,9 g/dL, and minimum value is 12,3 g/dL. The conclusion is levels of hemoglobin on the 31 active smokers still in normal levels. Based on these results it can be concluded that hemoglobin levels in 31 active smokers were still normal. Normal hemoglobin levels in active smokers are thought to be the body's response to fulfill oxygen and maintain homeostasis so that the body's metabolism is in normal condition.

**Keywords :** *hematology analyzer*, hemoglobin levels, active smokers

## Effects of smoking on hemoglobin level Men in Salah al-Din

MoozeyyianFadhly Namik<sup>1</sup>, Iktefa Abdul Hamid Mohammed Saeed<sup>2</sup>, Enas GaziYahay Alobadi<sup>3</sup>

<sup>1</sup>Department of Biology, College of Education for Pure Sciences, Tikrit University, Iraq,

<sup>2</sup>Department of Biology, College of Education for Women, Tikrit University, Iraq, <sup>3</sup>Salahaldin Health Department Operations and Emergency Medicine Department-Blood Bank Division, Tikrit, Iraq

### Abstract

This work has been involved in the study of the effect cigarette smoking on hemoglobin level of students with the age between (21-33) years old. The results show the difference in the concentration of hemoglobin between the group of smokers compared to the group of non-smokers also shows the number of cigarettes per day and the concentration of hemoglobin compared with the group of non-smokers. After a statistical analysis is performed, the results indicated a significant increase in the hemoglobin level of smokers' students as compared with control students (21-26) years old, also, we cannot see a significant strong relationship between the number of cigarettes taken/day and the hemoglobin concentration of smokers' students ( $r=0.78, p<0.025$ ).

**Aim of this study:** to give a simple realistic idea about cigarette smoking risk to collegians students.

**Key words :** Cigarette, hemoglobin, smokers.

### Introduction

The main component of red blood cell cytoplasm is hemoglobin, which is a red dye that appears in a bright red color when combined with oxygen. This dye gives the red blood cells a name called <sup>(1)</sup> Hemoglobin is one of the most important types of body proteins. Tetrameric consists of four groups of hem, Each consisting of four sequences of polypeptides, two  $\alpha$ -type and two  $\beta$ -type, each hem group containing an iron atom Fe (II) at its center, and four sites of those six coordinate sites surrounding the iron atom that are associated with nitrogen atoms of the flat porphyrin ring, the site of coherence etc is related to the side of nitrogen for amino acid histidine associated with the end of the amino acids by molecular protein chain, the latter consistency site shall be fit for the correlation between molecular hemoglobin with oxygen <sup>(2)</sup>.

The mechanism of transport of hemoglobin to oxygen can be explained as follows:

The first oxygen molecule slowly collides with the T position of the hemoglobin and thus moves and stimulates a change in the shape of the molecule, making the following three oxygen molecules bond with the remainder of the hemic groups rapidly and at high affinity,

thus turning the molecule into a stable R state. The same mechanism takes place if the oxygen is removed from the molecule. The first oxygen molecule of hemoglobin and then the remaining three molecules rapidly leaving the hemoglobin molecule back to its stable state (T) <sup>(4)</sup>. This phenomenon is called cooperatively, which is the driving force behind the success of <sup>(1,2)</sup>.

The increase in the proportion of hemoglobin Polycythemia is a condition caused by an abnormal increase in the number of red cells (anemia) where the red cells in this case, more than 65% of the blood volume, while the normal proportion of blood cells make up 45%. The plasma is reduced and the blood becomes viscous and passes slowly through the blood vessels. Although the proportion of red cells is high but tissues fail to receive sufficient amount of oxygen due to slow movement of blood. One of the causes of this disease is malignant cancer that affects red cells <sup>(1)</sup>.

There are different types of anemia, all of which have the same symptoms as the blood's capacity to transport oxygen decreases, making people feel tired in the course of their duties. Cigarettes can be thought to cause some types of anemia, such as hypoxic anemia caused by carbon monoxide poisoning in cigarette smoke, where a carboxy hemoglobin compound is formed that is unable

## Artikel Penelitian

## Hubungan Derajat Merokok Berdasarkan Indeks Brinkman dengan Kadar Hemoglobin

Rizky Amelia<sup>1</sup>, Ellyza Nasrul<sup>2</sup>, Masrul Basyar<sup>3</sup>

### Abstrak

Salah satu zat yang terdapat dalam asap rokok adalah karbon monoksida yang sangat mudah berikatan dengan hemoglobin, sehingga tubuh mengalami hipoksia dan berusaha meningkatkan kadar hemoglobin. Tujuan penelitian ini adalah untuk menentukan hubungan derajat merokok berdasarkan Indeks Brinkman dengan kadar hemoglobin. Desain penelitian ini adalah *cross-sectional study* yang dilakukan terhadap pendonor darah di Palang Merah Indonesia cabang Padang. Jumlah subjek sebanyak 65 orang yang diambil secara *accidental sampling* dengan kriteria inklusi adalah perokok dan berjenis kelamin laki-laki. Data derajat merokok diperoleh melalui wawancara dan kadar hemoglobin diperiksa dengan menggunakan metode sianometemoglobin. Hubungan antara derajat merokok dengan kadar hemoglobin digunakan uji statistik Anova, dengan nilai  $p < 0,05$ . Hasil penelitian diperoleh rerata lama merokok responden  $19,65 \pm 10,95$  tahun dan jumlah rokok yang dihisap perhari  $19,28 \pm 11,88$  batang. Derajat perokok terbanyak adalah perokok ringan sebanyak 27 orang (41,5%). Rerata kadar hemoglobin responden adalah  $15,47 \pm 1,41$  gr/dl. Kesimpulan hasil studi ini ialah tidak didapatkan hubungan antara derajat merokok berdasarkan Indeks Brinkman dengan kadar hemoglobin.

**Kata kunci:** derajat merokok, indeks Brinkman, kadar hemoglobin

### Abstract

*One of the substances contained in cigarette smoke is carbon monoxide which is very easy to bind on hemoglobin, so the body gets hypoxia and strive to increase the levels hemoglobin. The objective of this study was to determine the relationship between the degree of smoking based of Brinkman Index and hemoglobin levels. The design of this research was cross sectional study. Population were blood donors in Indonesian Red Cross Padang. The total samples of 65 people taken by accidental sampling with inclusion criteria was smoker and a male. The data degree of smoking got by interview and hemoglobin levels checked by using cyanmethemoglobin method. The relationship between the degree of smoking and hemoglobin levels used Anova statistical test, with p value  $< 0.05$ . The result show that average smoking duration is  $19.65 \pm 10.95$  years and the average of cigarette that they smoke in a day was  $19.28 \pm 11.88$  stems. Highest degree was mild smokers by 27 people (41.5%). The mean hemoglobin level was  $15.47 \pm 1.41$  gr/dl. The conclusion is no relationship between the degree of smoking by Brinkman Index and hemoglobin levels.*

**Keywords:** degree of smoking, Brinkman index, hemoglobin levels

**Afiliasi penulis:** 1. Prodi Profesi Dokter FK UNAND (Fakultas Kedokteran Universitas Andalas Padang), 2. Bagian Patologi Klinik FK UNAND, 3. Bagian Pulmonologi FK UNAND

**Korespondensi:** Rizky Amelia, Email : rizkyamelia1@gmail.com, Telp: 085274703410

### PENDAHULUAN

Rokok adalah hasil olahan tembakau terbungkus termasuk cerutu atau bentuk lainnya yang dihasilkan oleh tanaman *Nicotiana tabacum*, *Nicotiana rustica* dan spesies lainnya atau sintesisnya yang

## **Hubungan Merokok dengan Kadar Hemoglobin dan Trombosit pada Perokok Dewasa**

<sup>1</sup>Devina V. Wibowo  
<sup>2</sup>Damajanty H. C. Pangemanan  
<sup>2</sup>Hedison Polli

<sup>1</sup>Program Studi Pendidikan Dokter Fakultas Kedokteran Universitas Sam Ratulangi Manado  
<sup>2</sup>Bagian Fisiologi Fakultas Kedokteran Universitas Sam Ratulangi  
Email: devina.wibowo@yahoo.com

**Abstract:** Smoking is one of the leading causes of death world wide. that cause death. The World Health Organization (WHO) shows that 6 millions of people died as active smokers and 890.000 as passive smokers. Several studies suggest that smoking can influence blood components, such as erythrocytes, leukocytes, and platelets. This study was aimed to determine the correlation between smoking to hemoglobin and platelet levels in adult smokers. This was an analytical descriptive study with a cross sectional design that was conducted on 30 students of Mechanical Engineering, Faculty of Engineering, Sam Ratulangi University Manado. Data were analyzed with the One Way Anova test on hemoglobin levels and the Kruskal-Walis test on thrombocyte levels. The results showed that of the 30 respondents, 21 (70%) had normal hemoglobin levels and 9 (30%) had high hemoglobin levels. The One Way Anova test obtained a *P* value of 0.634. All respondents (100%) had normal platelet counts. The Kruskal-Walis test obtained a *P* value of 0.471. **Conclusion:** There was no significant relationship between smoking with hemoglobin and platelet levels.  
**Keywords:** smoking, hemoglobin level, platelet level.

**Abstrak:** Merokok merupakan salah satu penyebab masalah kesehatan terbanyak di dunia yang menyebabkan kematian. World Health Organization (WHO) menunjukkan bahwa 6 juta orang meninggal sebagai perokok aktif dan 890 ribu orang meninggal sebagai perokok pasif. Beberapa penelitian menyatakan bahwa merokok dapat memengaruhi komponen – komponen darah, misalnya eritrosit, leukosit dan trombosit. Penelitian ini bertujuan untuk mengetahui hubungan merokok dengan kadar hemoglobin dan trombosit pada perokok dewasa. Jenis penelitian ialah deskriptif analitik dengan desain potong lintang yang dilakukan pada 30 mahasiswa Jurusan Teknik Mesin Fakultas Teknik Universitas Sam Ratulangi Manado. Uji statistik menggunakan *One Way Anova* pada kadar hemoglobin dan uji Kruskal-Walis pada kadar trombosit. Responden terbanyak memiliki kadar hemoglobin normal yaitu 21 orang (70%) dan kadar hemoglobin tinggi sebanyak 9 orang (30%). Hasil uji *One Way Anova* mendapatkan nilai *P* = 0,634. Seluruh responden (100%) memiliki kadar trombosit normal. Hasil uji *Kruskall-Walis* mendapatkan nilai *P* = 0,471. **Simpulan:** Tidak terdapat hubungan bermakna antara merokok dengan kadar hemoglobin dan trombosit.  
**Kata Kunci :** merokok, kadar hemoglobin, kadar trombosit

Menurut data Riset Kesehatan Dasar (Riskesmas) tahun 2013, rerata persentase perokok di Indonesia ialah 29,3%. Persentase perokok terbanyak di Provinsi Kepulauan Riau (27,2%), kemudian

Provinsi Bengkulu dan Jawa Barat (27,1%), diikuti Provinsi Gorontalo dan Nusa Tenggara Barat (26,8%). Provinsi Sulawesi Utara memiliki persentase perokok sebesar 24,6%<sup>1</sup> dengan kabupaten/kota. Persentase

## HUBUNGAN KADAR HEMOGLOBIN DAN NILAI HEMATOKRIT PADA PEROKOK AKTIF

*Relationship Of Hemoglobin Levels and Hematocrit Value Inactive Smokers*

Nuradi<sup>1</sup>, Jangga<sup>2</sup>

<sup>1</sup>Jurusan Analisis Kesehatan Poltekkes Kemenkes Makassar

<sup>2</sup>Universitas Mega Rezky Makassar

Koresponden : [nuradi.poltekkes.mks@gmail.com](mailto:nuradi.poltekkes.mks@gmail.com)/085255668090

### ABSTRACT

*Active smokers are people who smoke actively or continuously. Cigarettes contain toxic substances and have an opiate effect. The presence of tar and free radicals from cigarette smoke can cause erythrocyte hemolysis. Also, the content of cigarette smoke can lead to increased levels of hemoglobin mediated by exposure to carbon monoxide (CO). The large affinity of carbon monoxide against hemoglobin makes it easier for the two compounds to bind together to form carboxyhemoglobin (HbCO), this will also cause an increase in hematocrit value. The purpose of this study was to find out the relationship between hemoglobin levels and hematocrit values in active smokers by using a person correlation test. The number of samples used was 33 samples with purposive sampling techniques. The results showed the average hemoglobin level in smokers was 14.13 g / dl, the average hematocrit value of smokers was 41.58%. The results of the person correlation test between hemoglobin levels and hematocrit values obtained a calculated r-value (0.93) > r table (0.344), conclusion H<sub>0</sub> rejected and H<sub>a</sub> received which means there is a relationship between hemoglobin and hematocrit levels in active smokers. Hemoglobin is positively related to hematocrit.*

**Keywords:** Active Smokers, Hemoglobin, Hematocrit

### ABSTRAK

Perokok aktif merupakan orang yang merokok secara aktif atau terus menerus. Rokok mengandung bahan beracun dan berefek candu. Adanya tar dan radikal bebas dari asap rokok dapat menyebabkan hemolisis eritrosit. Selain itu, kandungan dari asap rokok dapat menyebabkan peningkatan kadar hemoglobin yang dimediasi oleh paparan karbonmonoksida (CO). Afinitas karbon monoksida yang besar terhadap hemoglobin memudahkan kedua senyawa tersebut untuk saling berikatan membentuk karboxihemoglobin (HbCO), hal ini juga akan menyebabkan peningkatan pada nilai hematokrit. Tujuan dalam penelitian ini adalah untuk mengetahui hubungan antara kadar hemoglobin dan nilai hematokrit pada perokok aktif dengan menggunakan uji korelasi person. Jumlah sampel yang digunakan sebanyak 33 sampel dengan teknik *purposive sampling*. Hasil penelitian menunjukkan kadar hemoglobin rata-rata pada perokok adalah 14.13 g/dl, nilai hematokrit rata-rata para perokok adalah 41.58%. Hasil uji korelasi person antara kadar hemoglobin dan nilai hematokrit didapatkan nilai r hitung (0.93) > r tabel (0.344), kesimpulan H<sub>0</sub> ditolak dan H<sub>a</sub> diterima yang berarti terdapat hubungan antara kadar hemoglobin dan hematokrit pada perokok aktif. Hemoglobin berhubungan secara positif terhadap hematokrit.

Kata kunci : Perokok Aktif, Hemoglobin, Hematokrit

## Pengaruh Kebiasaan Merokok Terhadap Kadar Hemoglobin dan Tingkat Kebugaran Jasmani pada Mahasiswa Fakultas Kedokteran Unisba

Effect of Smoking Habit Due to Levels Hemoglobin And Level of Physical Fitness in Student Faculty of Medicine Unisba

<sup>1</sup>Kipyatullizam, <sup>2</sup>M.Rizki Akbar, <sup>3</sup>Yani Triyani

<sup>1,2,3</sup>Prodi Pendidikan dokter, Fakultas Kedokteran, Universitas Islam Bandung  
Jl. Tamansari No.1 Bandung 40116

email: <sup>1</sup>Kipyatullizam12@gmail.com, <sup>2</sup>m\_rizki\_a@ymail.com, <sup>3</sup>y3yani78@gmail.com.

**Abstract.** Smoking is a habit that can affect health, smoking behavior increase at the age above 15 years old in Indonesia. Smoking can cause various diseases because the content in cigarettes. Nicotine is a content of cigarettes that can increase the resistance of the lungs for entry the air and carbon monoxide which can increase bond with oxygen, so it can reduce the physical fitness and increase hemoglobin. The purpose of this research was to analyze the effects of tobacco smoke due to levels hemoglobin and level of physical fitness on the students of the Medical Faculty in Bandung Islamic University. This research was an analytical study using cross-sectional method. The subjects of the research were the students of Medical Faculty of Bandung Islamic University that divided into 2 groups, 29 students smokers and 29 students non smokers. Samples chosen by simple random sampling method. This research was done by analyzing and the results of physical fitness test with Harvard Step Test method and results of hemoglobin levels with automated hemoglobin analyze. The results showed that smokers respondents have higher hemoglobin levels than non-smokers: 15.32 g/dL (smoker) and 14.60 g/dL (non-smoker), while the physical fitness level of the smokers respondent is lower than non-smokers: 87.5 (smoker) and 90 (non-smoker). This research has been analyzed using normality test Shapiro Wilk test, Mann Whitney test and t-test independent which using confident interval 95% showed significant results  $p < 0,05$  with p value for effect of smoking on the level of hemoglobin: 0,008 and the level of physical fitness: 0,004. The conclusion of this research that smoking habit can increase level of hemoglobin and reduce level of physical fitness.

**Keywords:** Hemoglobin, Physical Fitness and Smoking

**Abstrak.** Merokok merupakan suatu kebiasaan yang dapat memengaruhi kesehatan. Di Indonesia kebiasaan merokok terus mengalami peningkatan pada usia 15 tahun keatas. Merokok dapat menimbulkan berbagai macam penyakit karena kandungan didalamnya. Rokok mengandung nikotin yang dapat meningkatkan resistensi masuknya udara kedalam paru-paru dan memiliki karbon monoksida yang dapat meningkatkan ikatannya terhadap oksigen sehingga dapat menurunkan kebugaran jasmani dan meningkatkan hemoglobin. Tujuan penelitian ini adalah menganalisis pengaruh kebiasaan merokok terhadap kadar hemoglobin dan tingkat kebugaran jasmani pada mahasiswa Fakultas Kedokteran Unisba. Penelitian ini menggunakan metode survei analitik dengan rancangan studi potong lintang. Subjek penelitian adalah mahasiswa Fakultas Kedokteran Unisba yang terbagi ke dalam 2 kelompok, kelompok perokok 29 responden dan bukan perokok 29 responden. Sampel dipilih dengan menggunakan metode *simple random sampling*. Penelitian ini dilakukan dengan cara menganalisis hasil tes kebugaran jasmani dengan metoda *Harvard Step Test* dan hasil kadar hemoglobin dengan *Automated Hemoglobin Analyzer*. Hasil penelitian menunjukkan responden yang perokok memiliki kadar hemoglobin lebih tinggi dibandingkan yang bukan perokok yaitu: 15,32 (perokok) dan 14,60 (bukan perokok) sedangkan tingkat kebugaran pada responden perokok lebih rendah dibandingkan responden yang bukan perokok yaitu: 87,5 (perokok) dan 90 (bukan perokok). Analisis data pada penelitian ini menggunakan Uji normalitas *Shapiro Wilk test*, Uji *Mann Whitney*, serta *t-independent* yang menggunakan interval kepercayaan 95% menunjukkan hasil yang signifikan  $p < 0,05$  dengan nilai p pengaruh rokok terhadap kadar hemoglobin: 0,008 dan nilai p untuk tingkat kebugaran jasmani: 0,004. Dapat disimpulkan dari hasil penelitian ini bahwa kebiasaan merokok dapat meningkatkan kadar hemoglobin dan menurunkan tingkat kebugaran jasmani.

**Kata Kunci:** Hemoglobin, Kebugaran Jasmani, Merokok

## **PERBANDINGAN KADAR HEMOGLOBIN DARAH PADA PRIA PEROKOK DAN BUKAN PEROKOK**

<sup>1</sup>Melkior T. Makawekes

<sup>2</sup>Sonny J. R. Kalangi

<sup>2</sup>Taufiq F. Pasiak

<sup>1</sup>Kandidat Skripsi Fakultas Kedokteran Universitas Sam Ratulangi Manado

<sup>2</sup>Bagian Anatomi-Histologi Fakultas Kedokteran Universitas Sam Ratulangi Manado

Email: melki.makawekes@gmail.com

**Abstract:** Smoking habits have a bad effect for health, especially for respiratory organs. Various lung diseases arising from smoking include lung cancer and chronic obstructive pulmonary disease. In Indonesia, the prevalence of smokers is increasing not only men but also women. This study was performed to compare the levels of hemoglobin blood of smokers and nonsmokers in male students semester seventh of Faculty of Medicine, University of Sam Ratulangi. This study was an observational study. The population in this study is male students semester seventh of Faculty of Medicine, University of Sam Ratulangi period January 2012. The total sample is 60 students, consisting of 30 smokers students and 30 nonsmokers students. Based on research data, average values of blood hemoglobin that is 16.263 (mg / dl), with a standard deviation of 0.9320 (mg / dl), whereas in the study sample 30 male nonsmokers had an average value of blood hemoglobin that is 15.723 (mg / dl), with a standard deviation of 0.8207 (mg / dl). Results of this study concluded that statistically there is comparison blood hemoglobin levels in student semester seventh period 2012 Faculty of Medicine, University of Sam Ratulangi both smokers and non smokers.

**Keywords:** hemoglobin, male smokers and nonsmokers.

**Abstrak:** Kebiasaan merokok mempunyai dampak yang buruk terhadap kesehatan terutama pada organ pernafasan. Berbagai penyakit paru timbul akibat rokok antara lain kanker paru dan penyakit paru obstruktif kronik. Di Indonesia prevalensi perokok makin meningkat tidak saja laki-laki namun juga pada perempuan. Penelitian ini dilakukan untuk mengetahui perbandingan kadar hemoglobin darah perokok dan bukan perokok pada mahasiswa pria Fakultas Kedokteran Universitas Sam Ratulangi semester tujuh. Adapun penelitian ini adalah penelitian *observasional*. Populasi dalam penelitian ini seluruh mahasiswa pria semester 7 Fakultas Kedokteran Universitas Sam Ratulangi Manado periode Januari 2012. Jumlah sampel 60 mahasiswa, yang terdiri dari 30 mahasiswa perokok dan 30 mahasiswa bukan perokok. Berdasarkan data hasil penelitian didapatkan nilai rata-rata hemoglobin darah yaitu 16,263 (mg/dl), dengan standar deviasi 0,9320 (mg/dl), sedangkan pada sampel penelitian 30 pria bukan perokok memiliki nilai rata-rata hemoglobin darah yaitu 15,723 (mg/dl), dengan standar deviasi 0,8207 (mg/dl). Hasil penelitian ini menyimpulkan bahwa secara statistik ada perbandingan kadar hemoglobin darah mahasiswa semester tujuh tahun ajaran 2012 Fakultas Kedokteran Universitas Sam Ratulangi Manado yang perokok dan bukan perokok

**Kata kunci:** kadar hemoglobin, pria perokok dan bukan perokok.

Rokok merupakan salah satu olahan tembakau dengan menggunakan bahan ataupun tanpa bahan tambahan. Rokok

dengan bahan tambahan berupa cengkeh disebabkan rokok kretek, sedangkan rokok tanpa bahan tambahan cengkeh disebut

*Original Article*

## THE EFFECTS OF CIGARETTE SMOKING ON HEMOGLOBIN LEVELS COMPARED BETWEEN SMOKERS AND NON SMOKERS

Shah BK<sup>1</sup>, Nepal AK<sup>1</sup>, Agrawal M<sup>2</sup>, Sinha AK<sup>2</sup>

<sup>1</sup>Department of Biochemistry and Medical Laboratory Technology, Sunsari Technical College, Dharan, Nepal. <sup>2</sup>Department of Pathology, BP Koirala Institute of Health Sciences, Dharan, Nepal.

### ABSTRACT

**Background:** Smoking is one of the global problems causing different disease. Smoking cause variation in different parameters of blood among which hemoglobin is believed to be increased due to smoking. **Objective:** To compare the effect of cigarette smoking on hemoglobin levels between smokers and non smokers. **Materials and methods:** A cross-sectional comparative study was conducted in Department of Pathology, Hematology Laboratory, B.P. Koirala Institute of Health Sciences, Dharan, Nepal. Total of 100 sample size which comprised of 50 smokers and 50 non smokers were included the study. Hemoglobin was estimated by Cyanmethemoglobin method. Student 't' test was applied for parametric data and Chi-Square test was applied for categorical data. A p-value less than 0.05 was considered statistically significant. **Results:** Mean±SD of hemoglobin for smokers was 14.14±1.3 g/dl and for non smokers was 12.37±2.36 g/dl. The awareness about smoking effect in both smokers and non smokers group was not significantly different (p=0.15). Similarly the mean±SD age was 32.78±9.27 years for smokers and 35.68±11.11 years for non smokers, and was not significantly different (p=0.18). **Conclusion:** The present study showed that the hemoglobin level of smoker group was higher than the non-smoker group. Further substantial studies in large population should be conducted to generalize this findings.

### Introduction

Smoking is a practice in which substance like tobacco is burned and tasted or inhaled. Globally, smoking kills more than four million people every year and likely to cause more premature death by 2020.<sup>1,2</sup> The most common method of smoking is industrially manufactured cigarettes but also hand rolled from loose tobacco and rolling paper. Other smoking implements include pipes, cigar, bidis, hookahs, vaporizers and bongs. Toxic ingredients in cigarette smoke circulates throughout the body causing damage in several different ways. The burning tobacco and paper produce more than four

thousand chemical compounds in the form of gases, vapours and particulates like carbonmonoxide, hydrogen cyanide, phenols, ammonia, formaldehyde, benzene, pyrene, nitrosamines, nicotine and tar.<sup>3</sup>

Smoking is known cause of increase in hemoglobin (Hb) concentration, that is believed to be mediated by exposure of carbonmonoxide.

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Corresponding author:  
Bijay Kumar Shah, B.Sc. MLT  
Department of Biochemistry and Medical Laboratory  
Technology, Sunsari Technical College, Dharan,  
Sunsari Technical College, Dharan, Nepal  
E-mail: cool\_bijay51@yahoo.com

**KARTU KONSULTASI KTI**

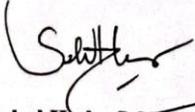
Nama Mahasiswa : Tiara Putri Anggraini

Judul KTI : Gambaran Kadar Hemoglobin Pada Perokok Aktif (Studi Pustaka)

Pembimbing Utama : Sri Nuraini, S.Pd., M.Kes

No	Hari/Tanggal	Kegiatan	Paraf
1.	Jum'at, 18 Desember 2020	Perbaikan Bab I, Bab II, Bab III	<i>[Signature]</i>
2.	Senin, 28 Desember 2020	Perbaikan sampul luar, daftar isi, Bab I, Bab II, Bab III	<i>[Signature]</i>
3.	Jum'at, 15 Januari 2021	Perbaikan Bab I, Bab II, Bab III	<i>[Signature]</i>
4.	Rabu, 10 Maret 2021	Perbaikan sampul luar, lembar Pengesahan Bab I, Bab II, Bab III	<i>[Signature]</i>
5.	Jum'at, 12 Maret 2021	ACC Proposal	<i>[Signature]</i>
6.	Kamis, 17 Juni 2021	Perbaikan Bab II, Bab VI, dan daftar pustaka	<i>[Signature]</i>
7.	Jum'at, 2 Juli 2021	Perbaikan Bab VI, Daftar pustaka, dan Lampiran	<i>[Signature]</i>
8.	Kamis, 12 Agustus 2021	Perbaikan Bab III, Bab VI, dan Lampiran	<i>[Signature]</i>
9.	Selasa, 24 Agustus 2021	ACC Karya Tulis Ilmiah	<i>[Signature]</i>
10.	Senin, 5 September 2022	Perbaikan Bab III, Bab VI, dan daftar pustaka	<i>[Signature]</i>
11.	Rabu, 7 September 2022	Perbaikan Bab VI, lampiran	<i>[Signature]</i>
12.	Rabu, 7 September 2022	ACC Cetak Karya Tulis Ilmiah	<i>[Signature]</i>

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Program Diploma Tiga**

  
**Misbahul Huda, S.Si., M.Kes**  
 NIP. 1969122219970320

### KARTU KONSULTASI

Nama Mahasiswa : Tiara Putri Anggraini

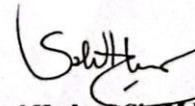
Judul KTI : Gambaran Kadar Hemoglobin Pada Perokok Aktif  
(Studi Pustaka)

Pebimbing Utama : Maria Tuntun Siregar, S.Pd., M.Biomed.

No	Hari/ Tanggal	Kegiatan	Paraf
	Minggu, 20 Desember 2020	Perbaikan Bab I, Bab II, Bab III dan daftar Pustaka	
	Senin, 4 Januari 2021	Perbaikan Bab I, Bab II, Daftar Isi	
	Selasa, 12 Januari 2021	Perbaikan Bab I, Daftar Pustaka, Bab II, Bab III	
	Selasa, 16 Februari 2021	Perbaikan Bab I, Bab II, dan Bab III	
	Selasa, 15 Maret 2021	Perbaikan Bab I, Bab II, dan Bab III	
	Jum'at, 26 Maret 2021	ACC PROPOSAL karya Tulis Ilmiah	
	Rabu, 19 Juli 2021	Perbaikan Bab IV, Bab V, dan daftar Pustaka	
	Kamis, 5 Agustus 2021	Perbaikan Bab IV, Bab V, dan Lampiran	
	Rabu, 25 Agustus 2021	ACC karya Tulis Ilmiah	
	Senin, 3 Oktober 2022	Perbaikan Bab IV, Bab V, Lampiran	
	Senin, 3 Desember 2022	Perbaikan Bab II, Bab IV, Lampiran	
	Senin, 2 Desember 2022	ACC cetak karya Tulis Ilmiah	

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Program Diploma Tiga



**Misbahul Huda, S.St., M.Kes**  
NIP. 196912221997032002