Journal of Population Therapeutics & Clinical Pharmacology

RESEARCH ARTICLE
DOI: 10.53555/0hrmca61

ASSESSMENT OF HEMATOLOGICAL PARAMETERS IN YOUNG SMOKERS: A CASE STUDY FROM FAISALABAD, PAKISTAN

Tehmina Khalid[1], Syed Kashif Raza[2], Furkhanda Kalsoom[3], Iqra Nawaz[4], Muhammad Sarwar Hayat[5], Riffat Yasmin[6*]

[1,3,4,6*]Department of Medical Laboratory Technology, Riphah International University, Faisalabad
[2,5]Department of Allied Health Sciences, Superior University, Faisalabad Campus

***Corresponding Author:** Riffat Yasmin
*Email; riffatwajid@yahoo.com

Abstract
Cigarette smoking carries higher risks for most of the chronic diseases. It also has chronic and acute effects on the hematologic system. This study explores the effects of cigarette smoking on some blood values of healthy young male smokers. One hundred male participants were taken in this study. In which 50 were smokers and 50 were non-smokers. The smoker consumes 7-10 cigarettes daily and they were addicted to smoking for more than 3 years. Complete blood cell counts were measured on a CBC analyzer and the results was compared by Statistical Analysis.
There is found a significant change in WBC, RBC, Hemoglobin, Hematocrit, lymphocytes, and Neutrophils. In conclusion, our findings showed that continuous cigarette smoking has severe adverse effects on hematological parameters (e.g., hemoglobin, hematocrit, WBC count, and RBC count) and these alterations might be associated with a greater risk for developing atherosclerosis, polycythemia Vera, chronic obstructive pulmonary disease and/ or cardiovascular diseases.

Key Words: Cigarette smoking, Hematological parameters, Blood cells count, Respiratory issues

INTRODUCTION

Smoking is the act of inhaling smoke produced by burning tobacco, whether it be birri, pipe, or cigarette. The World Health Organization reports that approximately 5 million people worldwide die each year due to diseases that are caused by smoking. If this trend continues, the number is expected to reach 10 million by 2015. World Health Organization data 2 shows that 2.4 billion people have consumed tobacco worldwide in various forms, including chewing, snuffing, or dipping. WHO estimates that the number of deaths related to tobacco will reach 8.3 million by 2030, and 1 billion in the 21st Century (Asif et al., 2013).

According to estimates, each cigarette smoking takes about 7 minutes off your life (Deutsch et al., 2007). Smoking start at the age of 15 years old results in an 8-year average reduction in longevity. Starting after 25 is a 4-year average reduction. The majority of deaths due to smoking cigarettes are caused by coronary heart disease, lung cancer, and other respiratory diseases (Granger & Harris, 2012). The most serious public health issue is smoking. Numerous studies have shown its detrimental effects on the respiratory and cardiovascular systems. It contains 6000 chemicals that have pharmacological effects, mutagenic effects, carcinogenic effects, and toxic and inflammatory

ones (Öztuna, 2004). The smoke from cigarettes is a mixture of many chemicals. Carbon monoxide, hydrogen cyanide, and nitrogen oxides are all gases. Other volatile chemicals, like formaldehyde and benzene, are found in the liquid-vapor portion (Buist et al., 2008).

Smoking has a severe and persistent effect on blood hematology. Different hematological parameters like leukocyte count, erythrocyte count, as well as Hematocrit/PCV (packed cell volume), are found to be altered in smokers. Hematological parameters not only provide information about the unstable condition of the environment, but it also gives information regarding the condition of organism health (Francesco et al., 2012).

Complete blood count (CBC), a common blood test, provides information on the various cellular components in blood. The CBC includes measurements for the following parameters.

Hemoglobin is the protein found in red blood cells and is responsible for delivering oxygen to tissues. A sufficient level of hemoglobin is required to ensure that tissues are adequately oxygenated. The amount of hemoglobin is expressed as grams per deciliter. Normal Hb levels for men are 14-18 g/dl, and for women 12-16 g/dl. Anemia is diagnosed when the hemoglobin levels are low. An erythrocytosis occurs when there are too many red blood cells are produce. This results in hemoglobin values above normal (Adamson & Finch, 1975)

The hematocrit is the ratio of the volume of blood (red blood cells plus plasma) to the total volume. Normal hematocrits for men are 40-54%, and for women 36-48%. This value can either be calculated or determined by micro hematocrit concentrating. Automated cell counters can calculate the hematocrit using the red cell count (in millions/mm3) multiplied by the mean volume of the cell. The red blood cells transport oxygen from the lungs to all of your cells. Your cells require oxygen to stay healthy, grow and make new cells. Normally, all of your red blood cell sizes are about the same. If your RDW is high, it means there's an important difference in size between your smallest and biggest red blood cells.

This could be a sign that you have a medical problem. Neutrophils are white blood cells that help the immune system heal and fight infection. The most common white blood cells in the body are neutrophils. The absolute neutrophil counts can be used to determine if you have enough neutrophils in your body or if it is within a healthy range (Lukács & Valkó, 2021).

The lymphocyte is a type of immune cell that is made in bone marrow, and found in blood and lymph tissue. B lymphocytes, and T lymphocytes, are the two major types of lymphocytes. B lymphocytes produce antibodies and T lymphocytes are involved in the control of immune responses and the killing of tumor cells.

A white blood cell, a lymphocyte is one type (Grčević et al., 2023).The immune system contains white blood cells called monocytes. When an invader such as a germ or bacteria infiltrates your body, monocytes become macrophages or dendritic cells. These cells can either destroy the invading germ or bacteria, or they can alert other blood cells to help them kill it and prevent infection (Sun et al., 2020).

The mean corpuscular volume is a laboratory measurement that determines the average size of a blood cell. The value can be used to determine anemia's etiology by multiplying the percent of hematocrit divided by the number of erythrocytes. MCV, along with hemoglobin, hematocrit, and other factors, can be used to classify anemia into microcytic or normocytic, depending on whether the MCV is below, within, or above the normal range. It is also useful in calculating red blood cell width (RDW) (Salim et al., 2022).

MATERIALS AND METHODS

Ethical Consideration

Ethical approval was obtained from Riphah International University Faisalabad Campus Ethics Review Committee. Permission to conduct the study was also approved from Al-Kabir International Diagnostic and research Laboratory Faisalabad. Written informed consent was obtained from each who participated in this study.

Study area

The research paper titled "A Study to Evaluate the Impact of Hematological Parameters in Young Smokers of Faisalabad, Pakistan". The study was take place in Riphah International university Faisalabad, to evaluate the differences in hematological variables between the two groups in order to uncover the pathophysiologic processes and potential hematological variables correlated with smoking.

Sample size

The size of the sample for our research paper entitled "A Study to Evaluate the Impact of Hematological Parameters in Young Smokers of Faisalabad, Pakistan" was determined to comprise 100 samples of blood; Of these 100 individuals were selected of which 50 are addicted smokers and 50 are non-smokers.

Participants

The 100 individuals were selected of which 50 are addicted smokers and 50 are non-smokers. The age of smokers and non-smokers is between 18-25 years. (Hemoglobin, WBC, RBC, PLT, HCT, MCHC, and MCV) are studied by using a complete blood count (CBC) with the help of a digital instrument.

Data Collection

After verbal consultation, we obtained a structured consent form by face-to-face interviews. As our Consent form is designed in the national languages of Urdu and English. A special questionnaire was designed and filled out to get all the information including age, sex, area, from how long addicted to smoking, and how much cigarettes consumed daily. We collect all the information.

Study Sample Inclusion Criteria

a. Healthy smokers and Non-smokers
b. 18 to 25 volunteer age
c. Those who are willing to take part in the study
d. Smokers consume at least 7-10 cigarettes daily
e. Smokers addicted to smoking for more than 3 years

Study Sample Exclusion criteria

a. Anemic patient
b. People who are not an addicted smoker
c. Below 18
d. How are not addicted to smoking

RESULTS & DISCUSSION:

The 100 individuals were selected of which 50 are addicted smokers and 50 are non-smokers. The age of smokers and non-smokers is between 18-25 years. All the data is analyzed by using Spss and the results are described below.

Age

Participants in the sample range from 18 to 25 years of age. The columns for frequency and percent indicate how many individuals are in the sample and what percentage of the total population they represent. The cumulative percent column shows the total percentage of individuals for each age group. This figure show the frequency distribution of age according to participants.

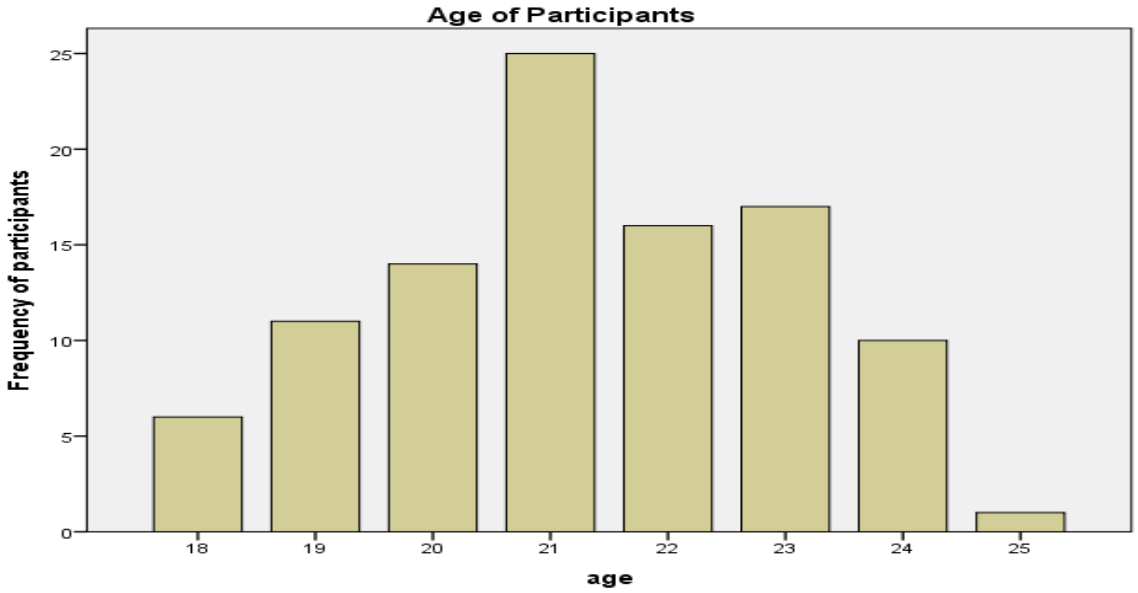

Figure 4.1: Age & Frequency among Participants

Duration

The statistics describe the distribution of duration in years of a sample of fifty individuals. The duration is between 3 and 10 years. The columns for frequency and percent represent, respectively, the number of people and the percentage that they represent in the sample. The cumulative percent column shows the percentage of individuals who have reached each category. The figure show the frequency and distribution of duration in years in a population of 100 individuals.

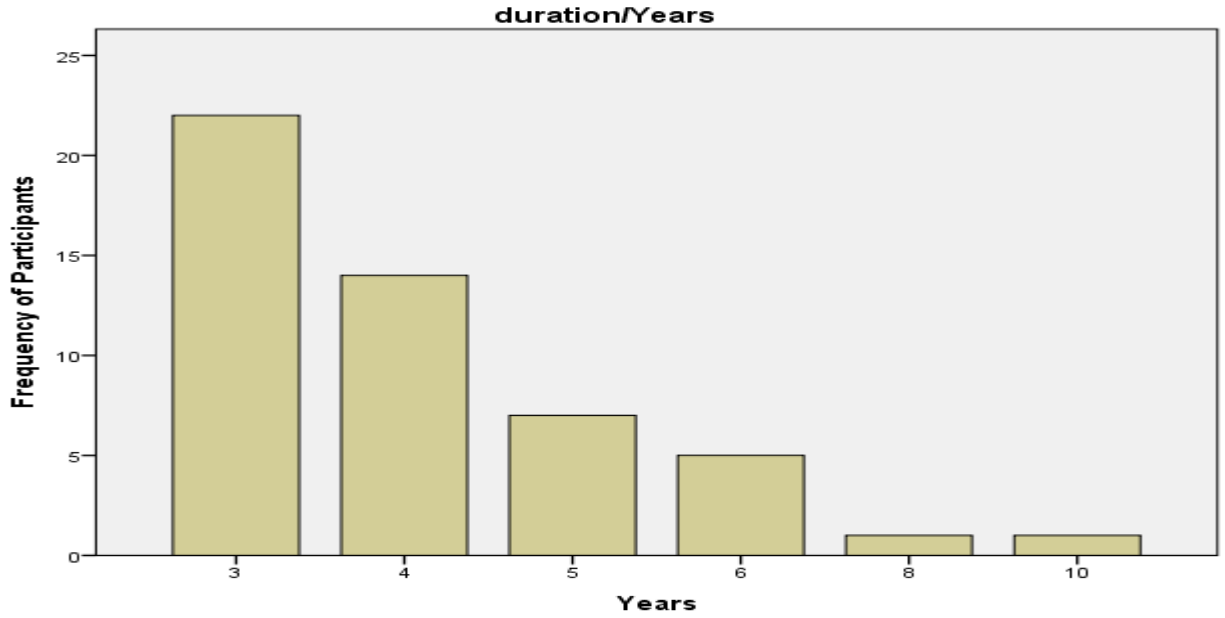

Figure 4.2: Duration of Participants Addicted to Smoking

Hemoglobin

The statistics describe the distributions of hemoglobin for a 100-person sample. The range of hemoglobin is 10.7 g/dL - 16.9 g/dL. The columns for frequency and percent represent the number and percentage of individuals within the sample. The valid percent column displays the percentage of individuals without missing data. The cumulative percent column shows the total percentage of individuals for each category of hemoglobin. The figure show the frequency and distribution of hemoglobin in a population of 100 individuals.

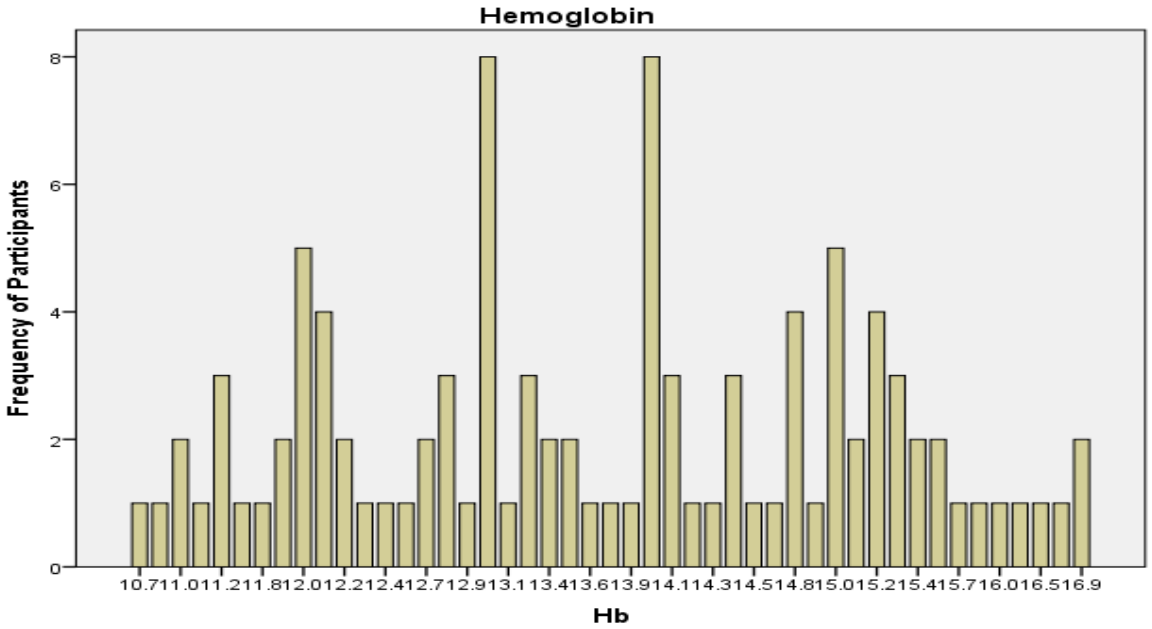

Figure 4.3: Hb Level among Participants Addicted to Smoking

T-Test

Group Statistics

	smoker non smoker	N	Mean	Std. Deviation	Std. Error Mean
Haemglobin	smoker	50	14.576	1.2823	.1813
	nonsmoker	50	12.774	1.1382	.1610
Total WBC	smoker	50	8333.94	1512.048	213.836
	nonsmoker	50	5924.64	1291.637	182.665
Total RBC	smoker	50	5.1304	.49738	.07034
	nonsmoker	50	4.3852	.59364	.08395
Platelet Count	smoker	50	216800.00	54729.017	7739.852
	nonsmoker	50	222520.00	49861.948	7051.544
HCT	smoker	50	44.396	3.8284	.5414
	nonsmoker	50	39.078	5.6117	.7936
MCV	smoker	50	85.174	7.9155	1.1194
	nonsmoker	50	87.256	8.3671	1.1833
MCH	smoker	50	28.232	2.3145	.3273
	nonsmoker	50	28.000	3.2070	.4535
MCHC	smoker	50	32.320	1.2817	.1813
	nonsmoker	50	31.672	1.6295	.2304
RDW-CV	smoker	50	15.170	.8869	.1254

	nonsmoker	50	14.872	1.9691	.2785
Neutrophils	smoker	50	47.16	7.919	1.120
	nonsmoker	50	57.90	10.088	1.427
Lymphocytes	smoker	50	45.76	7.297	1.032
	nonsmoker	50	34.68	9.696	1.371
Monocytes	smoker	50	4.74	1.440	.204
	nonsmoker	50	4.50	1.594	.225
Eosinophils	smoker	50	2.62	.635	.090
	nonsmoker	50	2.78	1.130	.160

The statistics above provide information about various health parameters, categorized according to smokers and nonsmokers. Each parameter contains the mean, standard error, and standard deviation for both smokers and nonsmokers.

These are the parameters and groups that they correspond to:

- *Hemoglobin: The average hemoglobin level for smokers is 14.576g/dL and for nonsmokers, it's 12.774g/dL.
- Smokers have a mean WBC count of 8,333.94 and non-smokers 5,924.64 cells/mm3.
- *Total Red Blood Cell Count: The average total RBC count for smokers is 5.1304 million cells/uL and for non-smokers, it's 4.3852 million cells/uL.
- Smokers have a mean platelet count of 216,800.00 and non-smokers 222,520.00.
- *HCT: Hematocrit values are 44.396% in smokers and 39.078% in non-smokers.
- *MCV: the mean MCV for smokers is 85.174 fL and 87.256 for non-smokers.
- *MCH: Mean Corpuscular Hemoglobin (28.232 pg) for smokers, and 28.000 pg in non-smokers.
- *MCHC (Mean Corporation Hemoglobin concentration): The MCHC for smokers is 32.320g/dL and for non-smokers, it is 31.672g/dL.
- *RDW (Red Cell Distribution Wideness): The average RDW-CV for smokers is 15,170% and for non-smokers, it's 14,872%.
- *Neutrophils - The average neutrophil count for smokers is 47.16 % and for non-smokers, it's 57.90%.
- *Lymphocytes - The average lymphocyte count for smokers is 45,76% and for non-smokers it's 34,68%
- *Monocytes: the mean monocyte count for smokers is 4.74% and 4.50% for non-smokers.
- *Eosinophils - The average eosinophil number is 2.62% in smokers, and 2.78% in nonsmokers.

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Haemglobin	Equal variances assumed	.354	.553	7.432	98	.000	1.8020	.2425	1.3208	2.2832
	Equal variances not assumed			7.432	96.639	.000	1.8020	.2425	1.3207	2.2833
Total WBC	Equal variances assumed	.047	.830	-.676	98	.501	-269.980	399.470	-1062.715	522.755
	Equal variances not assumed			-.676	97.994	.501	-269.980	399.470	-1062.715	522.755
Total RBC	Equal variances assumed	.994	.321	6.804	98	.000	.74520	.10953	.52785	.96255
	Equal variances not assumed			6.804	95.085	.000	.74520	.10953	.52777	.96263
Platelet Count	Equal variances assumed	.000	.999	-.546	98	.586	-5720.000	10470.415	-26498.197	15058.197
	Equal variances not assumed			-.546	97.162	.586	-5720.000	10470.415	-26500.437	15060.437
HCT	Equal variances assumed	8.044	.006	5.536	98	.000	5.3180	.9607	3.4115	7.2245
	Equal variances not assumed			5.536	86.490	.000	5.3180	.9607	3.4083	7.2277
MCV	Equal variances assumed	.227	.635	-1.278	98	.204	-2.0820	1.6289	-5.3145	1.1505
	Equal variances not assumed			-1.278	97.700	.204	-2.0820	1.6289	-5.3146	1.1506
MCH	Equal variances assumed	5.454	.022	.415	98	.679	.2320	.5593	-.8779	1.3419
	Equal variances not assumed			.415	89.151	.679	.2320	.5593	-.8793	1.3433
MCHC	Equal variances assumed	4.978	.028	2.210	98	.029	.6480	.2932	.0662	1.2298
	Equal variances not assumed			2.210	92.850	.030	.6480	.2932	.0658	1.2302
RDW-CV	Equal variances assumed	4.475	.037	.976	98	.332	.2980	.3054	-.3081	.9041
	Equal variances not assumed			.976	68.097	.333	.2980	.3054	-.3114	.9074
Neutrophils	Equal variances assumed	1.988	.162	-5.922	98	.000	-10.740	1.814	-14.339	-7.141
	Equal variances not assumed			-5.922	92.769	.000	-10.740	1.814	-14.342	-7.138
Lymphocytes	Equal variances assumed	4.005	.048	6.456	98	.000	11.080	1.716	7.674	14.486
	Equal variances not assumed			6.456	91.023	.000	11.080	1.716	7.671	14.489
Monocytes	Equal variances assumed	1.124	.292	.790	98	.431	.240	.304	-.363	.843
	Equal variances not assumed			.790	97.007	.431	.240	.304	-.363	.843
Eosinophils	Equal variances assumed	12.890	.001	-.873	98	.385	-.160	.183	-.524	.204
	Equal variances not assumed			-.873	77.162	.386	-.160	.183	-.525	.205

The statistics above provide the results from an independent sample comparison of various health parameters among smokers and nonsmokers. The statistics provide information about the equality between variances (Levane test) and equality of means. The results show whether or not there are significant differences between smokers and nonsmokers in terms of means for each parameter. The standard error, mean difference, and confidence interval give additional information about the magnitude and precision.

Inhaling this toxic chemical while smoking is one of the main causes of lung function decrease that results in chronic obstructive pulmonary disease (COPD) and its associated morbidities and fatalities (Qasim et al., 2019). In Pakistan, smoking cigarettes and shish kabob pose serious health risks. It is concerning how common it is in young people. Given that it is a primary cause of cerebrovascular accidents and chronic illnesses including hypertension and atherosclerosis, this is an extremely important public health issue. Additionally, smoking increases the chance of lung, pharyngeal, laryngeal, and oral cancer, among other cancers (Shah & Siddiqui, 2015). Lung function parameters FVC FEV1, FEV1/FVC, were reduced in cigarette and shisha smokers as compared to non-smokers. Shisha and cigarette both adversely affect lung functions, however shisha is less harmful than cigarette smoking (Mumtaz et al., 2020).

In a study on the impact of smoking on hematological parameters, WBC, red blood cells, Hb, and HTC levels were found to be markedly increased. These changes have been associated with atherosclerosis, polycythemia vera, chronic obstructive pulmonary disease, and cardiovascular diseases, and also higher risk of atherosclerosis, polycythemia, chronic obstructive pulmonary disease, and cardiovascular disease in smokers has been revealed (Asif et al., 2013). From the data which recorded in this study we can say there is different between the hematological parameters between the smokers and nonsmokers blood samples, where high counts of WBC, HCT, RBC and Hb were clearly recorded in the samples of smoker's ones.

CONCLUSION

This study shows that there is a significant difference between the hematological parameters between the smokers and non-smokers blood samples where high counts of WBC, HCT, RBC and Hb were clearly recorded. The finding of this study showed that hematological alterations in smokers lead to respiratory and cardiac problems.

Conflict of interest: The authors declare that there is no conflict of interest regarding this study

Funding: No funding received for this publication

Bibliography:

1. Adamson, J. W., & Finch, C. A. (1975). Hemoglobin function, oxygen affinity, and erythropoietin. *Annual Review of Physiology, 37*(1), 351-369.
2. Asif, M., Karim, S., Umar, Z., Malik, A., Ismail, T., Chaudhary, A., Hussain Alqahtani, M., & Rasool, M. (2013). Effect of cigarette smoking based on hematological parameters: comparison between male smokers and non-smokers. *Turkish Journal of Biochemistry/Turk Biyokimya Dergisi, 38*(1).
3. Buist, A., Vollmer, W., & McBurnie, M. (2008). Worldwide burden of COPD in high-and low-income countries. Part I. The Burden of Obstructive Lung Disease (BOLD) Initiative [State of the Art Series. Chronic obstructive pulmonary disease in high-and low-income countries. Edited by G. Marks and M. Chan-Yeung. Number 6 in the series]. *The international journal of tuberculosis and lung disease, 12*(7), 703-708.
4. Deutsch, V., Lerner-Geva, L., Reches, A., Boyko, V., Limor, R., & Grisaru, D. (2007). Sustained leukocyte count during rising cortisol level. *Acta haematologica, 118*(2), 73-76.

5. Francesco, F., Satheeshkumar, P., Senthil Kumar, D., Caterina, F., & Giuseppe, P. (2012). Comparative study of hematological and blood chemistry of Indian and Italian Grey Mullet (Mugil cephalus Linneaus 1758). *HOAJ Biology*, 1-5.
6. Granger, D. N., & Harris, N. R. (2012). Vascular Responses to Intestinal Inflammation in Inflammatory Bowel Disease. *Crohn's Disease and Ulcerative Colitis: From Epidemiology and Immunobiology to a Rational Diagnostic and Therapeutic Approach*, 133-139.
7. Grčević, D., Sanjay, A., & Lorenzo, J. (2023). Interactions of B-lymphocytes and bone cells in health and disease. *Bone, 168*, 116296.
8. Lukács, K., & Valkó, O. (2021). Human-vectored seed dispersal as a threat to protected areas: Prevention, mitigation and policy. *Global Ecology and Conservation, 31*, e01851.
9. Mumtaz, M. S., Pansota, Q. J., Majeed, M. M., Mujeeb, M., Rehman, U. A., & Rana, M. (2020). Impact of Shisha and Cigarette Smoking on Lung Functions in Young Adults: Shisha smoking & lung function tests. *Journal of Aziz Fatimah Medical & Dental College, 2*(1), 22-27.
10. Öztuna, F. (2004). Sigaranın hücresel etkileri. *Akciğer Arşivi, 2*, 111-116.
11. Qasim, H., Alarabi, A. B., Alzoubi, K. H., Karim, Z. A., Alshbool, F. Z., & Khasawneh, F. T. (2019). The effects of hookah/waterpipe smoking on general health and the cardiovascular system. *Environmental health and preventive medicine, 24*, 1-17.
12. Salim, Y., Kalanjati, V. P., Prajitno, J. H., & Melbiarta, R. R. (2022). HEMOGLOBIN A1C (HBA1C) IS STRONGLY CORRELATED WITH MEAN CORPUSCULAR VOLUME AMONG TYPE 2 DIABETES MELLITUS (T2DM) PATIENTS ADMITTED TO A TERTIARY HOSPITAL IN EAST JAVA, INDONESIA. *Folia Medica Indonesiana, 58*(1), 46-49.
13. Shah, N., & Siddiqui, S. (2015). An overview of smoking practices in Pakistan. *Pakistan journal of medical sciences, 31*(2), 467.
14. Sun, Y., Wu, Y., Tang, S., Liu, H., & Jiang, Y. (2020). Sestrin proteins in cardiovascular disease. *Clinica Chimica Acta, 508*, 43-46.