

Effects of Methamphetamine Abuse on Lymphocyte and Monocyte a Hematological Study

Doaa Qasim Abbas

College of Science, Wasit University, Agricultural, Kut, Iraq, 52000

Mutashar Jaddoa Jiheel

College of Science, Wasit University, Al_Zubaidiyah Kut, Iraq, 52000

Mahdi Abdul Karim

College of Medacine, Wasit University, Al_Hawrah, Kut, Iraq, 52000

Abstract: This study was conducted to investigate the effect of drugs on lymphocyte and monocyte. The study is based on a group of addicts who were detained on charges of using narcotic substances in Wasit Governorate, where the participants were divided into two groups: the addicts group and the healthy group (as a control group). Using laboratory methods and visual observation, blood and urine samples were collected, and analyzed using a Sysmex device to determine the number of immune cells.

The results of the study showed that the level of monocytes In the addicts group was insignificantly lower compared to the healthy group, while the lymphocyte level was significantly higher, indicating the effect of methamphetamine on cellular signaling pathways. The results of the statistical analysis also showed that there was a significant difference between the two groups in the levels of lymphocyte cells. These findings underscore the urgent need to understand the health effects of drug use, and highlight the importance of therapeutic interventions to reduce the risks associated with addiction. They also highlight the role of psychosocial support in helping addicted individuals recover and regain their health. Through this study, it is clear that more research is needed to understand the immune changes resulting from chronic drug use, and their potential impact on public health.

Keyword: Lymphocyte, monocyte, methamphetamine, addiction.

1. INTRODUCTION

Addiction to a drug means a strong and urgent desire that drives the addict to obtain the drug by any means and increase his dose from time to time, with difficulty or impossibility of quitting it, whether due to dependence (psychological addiction) or to the return of the body's tissues organically (Drug Dependency). The addict usually suffers from an internal compulsive driving force to abuse due to this psychological or organic dependence. Many political, economic and social factors have combined to make drugs a threat to the world.[1] The harms of drugs are many and varied. It is scientifically proven that drug abuse harms the safety of the user's body and mind and that the person who abuses drugs is a burden and a danger to himself, his family, his group, morals, production, security, the interests of the state, and society as a whole. Rather, it has serious dangers as well. Loss of appetite for food, which leads to thinness, emaciation and general weakness accompanied by yellowing or blackening of the face of the user. It also causes a lack of activity and vitality and weak resistance to disease, which leads to dizziness and chronic headache accompanied

by redness in the eyes. It also causes an imbalance and nervous coordination in the ears [2] Local irritation of the mucous membranes and bronchi as a result of the formation of carbon materials and their deposition In the bronchi, which results in chronic lung infections that may lead to pulmonary tuberculosis. Digestive system disorder which results in indigestion, excessive gas, bloating, fullness and overeating which usually ends in diarrhea. Liver damage and fibrosis, as opium, for example, breaks down liver cells and causes fibrosis and an increase in the sugar level, which causes the liver to be unable to rid the body of them. Erogenital inflammation and destruction and erosion of millions of nerve cells that make up the brain, which leads to memory loss, auditory, visual and intellectual hallucinations [1] Heart disorders, pericardial heart disease, angina, high blood pressure, and rupture of the arteries. It causes severe anemia, red blood cell breakdown, malnutrition, and bone marrow poisoning which lays down red blood cells. To know the effect of crystal meth on the immune system, this study was conducted. Methamphetamine is the largest drug threat across the globe, with health effects including neurotoxicity and cardiovascular disease)[3]

2. MATERIALS AND METHODS

2.1 SAMPLES COLLECTION

The present study was designed to study the effect of methamphetamine on physiological parameters in the body. Where the research took group of people detained in the department of drugs and psychological in waist provinase and accused of using and consuming narcotic substances. A total of fifty participants were taken, as the sample collection period extended from November, 2023 to March, 2024 in Wasit province. On the basis of laboratory examination and visual methods, are divided into two groups. The first group is people who abuse narcotic substances, precisely the methamphetamine drugs as abusers group. The second group is healthy and who do not use any kind of drug as a control group. The first group is methamphetamine addictions, and those who represent the focus of study and scientific research, and second group forty person as control groups.

Samples of urine and blood were collected from people suspected of Taking methamphetamine drug from held in the department of narcotic drugs and psychotropic substances, blood samples 1 ml were drawn The urine samples were placed in Blain Tubes. Began to conduct the test on urine samples. Where put the cassette for detecting the presence of drugs in the urine. If the result is positive, put the blood samples of the k3 EDTA tube where the blood in the device Sysmex. if the results is negative, meaning that the person does not use type of drug, the sample ignored.

2.2 HEMATOLOGICAL PARAMETERS

Complete Lymphocyte cells and monocyte using a device Sysmex

1. Drawing: A sample of venous blood is drawn into a sterile EDTA tube.
2. Initial analysis: The drawn sample is entered into the Sysmex device, which analyze the blood and gives the results
3. Differentiation: After the total count, the device separates the white blood cells into their different types (lymphocytes, monocyte) and shows the percentage of each type.
4. Diagnosis: The results of the differential white blood cell counts are interpreted to identify any disorders or infections in the body.
5. Accuracy and reliability: The Sysmex device is characterized by accuracy and reliability in performing these tests, ensuring accurate and reliable results.
6. Speed: The device is characterized by the speed of completing tests, which helps in obtaining results in a short time.

The Sysmex device is a powerful and reliable tool for performing total and differential white blood cell counts, and its results aid in the correct diagnosis and treatment of many medical conditions.

2.3 ETHICS APPROVAL

This study was approved by the Ethics Committee of the Department of Biology, College of Science, University of Wasit as did the Iraqi Ministry of Health. Before they were included in the study tests.

2.6 EXCLUSION CRITERIA

People who use methamphetamine and other substances were excluded. People who suffer from psychological and mental illnesses were also excluded. People who did not show a positive result in the drug test were also excluded. People who abstained from using drugs were also excluded.

Following the section that involves the study and calculation of the spectrum dispersion, thermo optic coefficient in addition to the group velocity. The age and sex 2-No addicted to alcohol drug or cigarettes.

2.4 HEALTHY CONTROL GROUP

Healthy control group consists of (40) apparently healthy of different ages (15-55 years), but all of them are chosen dependent on the next criteria:

1. The age and sex
2. No addicted to alcohol drug or cigarettes.

2.5 PATIENTS GROUP

This study has included (50) Iraqi abusers . Patients were selected from the Al—Zahraa Hospital(psychiatry unit forensic medicine unit) .This study extended from November, 2023 to June, 2024. The data were collected together with the subject's medical history. Criteria used for the diagnosis methamphetamine addiction

1. Diagnosis through drug screening kit
2. Diagnosis by specialist doctor

2.7 STATISTICAL ANALYSIS

The statistical packages of social sciences –SPSS (2019)program was used to detect the effect of difference groups (abusers and control) ,In study parameters T-test was used to significant compare between means. (0.01) probability in this study[4]

3. RESULTS AND DISCUSSION

3.1 Effect Methamphetamine Addiction on Concentration of Monocyte

The results of the study indicated that there is a non-significant difference between Abusers and Control. The Monocyte level for the "Abusers" group is 0.904, compared to the "Control" group at 1.193.

Table (1) Shows the monocyte count (10^3 UI).

Group	Means +_ SE		
	monocyte (10^3 ul)		
Abusers	0.904 +_ 0.15		
Control	1.193+ 0.17		
T-test	0.454		
P-value		0.208	
**p(0.01),Non significant			

This recent study found that cellular concentrations return to normal levels after a period of cessation of crystal anesthetic use. This suggests that the negative effects on monocytes can be reversed if use is discontinued.It does agree with our study [5].

This study found a significant decrease in the concentration of monocytes in crystal drug addicts compared to the control group. This change is thought to be related to the toxic effects of the drug. It does agree with our study [6]. This study found an increase in the concentration of monocytes in crystal drug addicts. This increase is believed to be related to immune and regulatory disorders caused by drug addiction. It does not agree with our study [7] This recent study showed that changes in monocyte concentration continued for long periods even after stopping the use of crystal anesthetics. This suggests the possibility of permanent changes in cellular function as a result of addiction. It is possible that consistent with our study [8]. It is clear from these studies that there are mixed results about the effect of crystal drug addiction on monocyte concentration.

3.2 The Effect Methamphetamine Addaction on Concentration of Lymphocyte

The results of the study indicated that there is a significant difference between addicts (Abusers) and healthy people (Control). The lymphocytes level for the "Abusers" group is 16.05, compared to the "Control" group at 3.93.

Table (2) Shows the lymphocyte count (10^3 UI)

Group	Means +SE		
	Lymphocyte (10^3 UI)		
Abusers	16.05+ 1.76		
Control	3.93+ 0.53		
T-test	4.039		
p-value		00001	
** (p 0.01), Significant			

Researchers have found that methamphetamine affects the cellular signalling pathways of lymphocytes, leading to their proliferation and increased number. Another study showed that inflammation and infections associated with drug abuse lead to excessive immune activity, including increased lymphocyte counts [9]

A study found that drug abuse causes great stress and tension on the body, which leads to increased production of stress hormones such as cortisol and thus an increase in the number of lymphocyte [9]

(Pérez-Mana et al., 2018) this study showed that methamphetamine prevents programmed lymphocyte death by inhibiting the signalling processes leading to cell death. This increases the lifespan of lymphocytes and thus increases their number.[9]

The study by (Tsai et al., 2020) this study found that methamphetamine use increases the risk of inflammation and infection, which stimulates the body to increase the production of lymphocytes to deal with these infections [10]

This study by (Sinha and Jastreboff, 2013) this study showed that methamphetamine causes great stress and tension on the body, which raises levels of stress hormones such as cortisol. These hormones promote an increase in the number of lymphocytes [11]

Methamphetamine causes great stress and tension on the body, which raises levels of stress hormones such as cortisol (Sinha and Jastreboff, 2013). These hormones promote an increase in the number of lymphocytes, including basal cells [11]

(Islam, S et al., 2004) The aim of this study was to investigate the serum immunoglobulins and white blood cells status of drug addicts. And to assess the extent of influence of drug habit and sexual practice on the immune components. The study was Conducted among 253 male drug addicts and 100 non-addict controls of aged 18 – 45 years. An enzyme-linked Immunosorbent assay (ELISA) was employed to analyse the serum immunoglobulin concentrations.

Results showed a significant ($p = 0.00$) decrease of peripheral lymphocytes ($51.8 + 15.2$ vs. $71.9 + 11.5$) was Noted in the drug addicts. It does not agree with our study [12].

Multiple drug abuse for longer period had resulted in a significant (p 50.05) decrease of serum immunoglobulins and lymphocytes. Consistent with our study [12] The study results show clear effects of methamphetamine on lymphocytes and monocytes. Lymphocytes, which are considered a subset of white blood cells (leukocytes), are known as "agranulocytes" due to the lack of cytoplasmic granules and the presence of spherical nuclei. T and B cells are essential in the adaptive immune response, while LGL and NK cells play a role in the early innate immune response

Monocytes, on the other hand, are part of the innate immune response and contribute to maintaining cellular balance, especially during infections and inflammation. In normal human blood, monocytes represent about 5% of circulating nucleated cells. The results indicate that methamphetamine may affect these cells, warranting further research to understand these effects more deeply.

Lymphocytes are a subset of leukocytes, or white blood cells, classified as "agranulocytes" because they usually lack cytoplasmic granules and have spherical nuclei, which gives them the name "mononuclear cells." The primary lymphocytes that regulate the adaptive immune response, which arises in response to previous antigenic challenges, are T cells and B cells. Additionally, large granular lymphocytes (LGL) and natural killer (NK) cells are involved in the early innate immune response, functioning independently of antigens [13]

As part of the innate immune response, monocytes play a crucial role in maintaining cellular homeostasis, particularly during infection and inflammation [13] In normal adult blood, they account for approximately 5% of circulating nucleated cells [13] Monocytes in circulation have a half-life of one to three days [14] Atypical findings in myelodysplastic syndromes include monocytopenia, which is a reduction in circulating monocytes[15] Conversely, peripheral blood often shows monocytosis, or an increase in circulating monocytes, particularly in response to infections, trauma, drugs, autoimmune diseases, and certain cancers [6]

Investigating the diagnosis of chronic myelomonocytic leukemia is warranted when monocytosis is persistent and unexplained [16]

4. CONCLUSIONS

The results of this study demonstrate the negative effects of methamphetamine use on white blood cells, with significant differences observed in the levels of lymphocytes and monocytes between the abuser group and the control group. These findings suggest that ongoing use of this drug can lead to immune system disturbances, increasing the risk of infections and diseases. Furthermore, the decrease in certain types of white blood cells may contribute to a diminished ability to combat infections. It is crucial for future research to continue exploring the long-term health impacts of methamphetamine use, including its psychological and social effect

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