

## Hematology and Blood Chemistry Results of Recovering Drug Abusers in Indonesia

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### Abstract

The objective of the study was systemic disorders can be found in most drug abusers as a result of both drug abuse and multiple unhealthy lifestyle habits, including tobacco use, alcohol consumption, and poor dietary habits. Such conditions may affect not only the quality but also the quantity of the hematology and blood chemistry levels of these individuals. The aim of this study was to evaluate the hematology and blood chemistry results of recovering drug abusers. Methods: This was a cross-sectional study based on the secondary data from the medical records of 179 residents of the Rehabilitation Center of the National Narcotics Bureau in Lido, West Java, Indonesia. As the results, the study subjects had low red blood cell counts (38.55%), low hemoglobin counts (24.58%), low hematocrit levels (20.11%), high erythrocyte sedimentation rate levels (28.49%), high white blood cell counts (20.67%), low neutrophil counts (7.26%), high lymphocyte counts (16.20%), low eosinophil counts (18.45%), high aspartate aminotransferase levels (6.4%), high alanine aminotransferase levels (12.30%), and high creatinine levels (11.17%). As a conclusions, a number of the drug abusers evaluated in this research showed abnormalities in their hematology and blood chemistry data.

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### Introduction

Drug abuse is a serious issue in Indonesia, as well as in many other countries around the world. According to the *American Psychiatric Association: Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition*, the diagnosis of drug abuse involves the repeated use of such materials for more than 12 months with adverse consequences or use that places the affected person in a physically dangerous and/or high risk situation.<sup>1</sup> Based on the 2007–2016 drug abuse data published by the Rehabilitation Center of the National Narcotics Bureau of the Republic of Indonesia, the number of cases of drug abuse each year has continued to increase. In 2014, there were more than 4

million cases recorded in Indonesia<sup>2</sup> with various types of narcotics easily available and circulating widely in the community. Based on the data from the Directorate of Drug Crime, in March of 2014 the most widely used narcotics were marijuana (460,039 cases), amphetamine (189,799), ecstasy (140,614 cases), and heroin (33,358 cases).<sup>2</sup> This data is not much different from that obtained in other countries, such as the United States of America (USA), where the drugs most commonly abused are methamphetamines, heroin, cocaine, and marijuana.<sup>3</sup>

Drug abuse has been known to have many negative effects on one's health, including depression, mental problems, systemic disease, and even death.<sup>4</sup> The use of different types of addictive substances, via oral, intranasal, intravenous (IV), inhalation, or topical use, has been shown to cause systemic diseases in the user (both infectious and non infectious), including human immune deficiency

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virus/acquired immunodeficiency syndrome (HIV/AIDS), hepatitis, tuberculosis, endocarditis, hypertension, heart disease, and many other systemic diseases.<sup>1</sup>

In addition, drug abusers also tend to smoke, have poor dietary habits, and excessively consume alcohol, which are known to have health impacts. One study in the USA found that 71% of the subjects who used narcotics also smoked.<sup>5</sup> In addition, the National Survey on Drug Use and Health reported that in 2002 and 2003, 52.7% of those individuals aged 21 years or older who consumed alcohol also used narcotic<sup>6</sup>.

Drug abuse, systemic disease, smoking, poor diet, and excessive alcohol consumption are all known to affect both the quantity and quality of the blood cells and blood chemistry levels. For example, a decrease in the number of neutrophils has been found in nearly 50% of all untreated HIV patients. In addition, 10% of all untreated HIV patients also suffer from anemia caused by a decrease in the number of erythrocytes.<sup>7</sup>

Similar levels can occur in cases of excess alcohol consumption, which can result in decreased blood cell production and cause abnormalities in the blood's cellular structures.<sup>8</sup> Another study about the effects of smoking on red blood cells showed that changes in hematological parameters of smokers and non-smokers, the red blood cell count was higher in smokers than in nonsmokers.<sup>9</sup>

Based on the background information above, the authors conducted a study to determine the hematological and blood chemistry conditions of drug abusers.

## Methods

This research was conducted in September of 2013 using secondary data involving 179 male residents at the Rehabilitation Center of the National Narcotics Bureau in Lido, West Java, Indonesia. The data were obtained from the laboratory results found in the medical records of these residents.

This study was approved by the Faculty of Dentistry, University of Indonesia Ethics Commission. The data obtained were processed as descriptive data using Microsoft Office Excel, and the results were presented in a tabular format.

## Results

The data showed that the majority of the subjects exhibited normal hematology and normal blood chemistry test results. However, some of the subjects' hematological test values were below or above the normal ranges. Approximately 5.03% of the subjects had unknown data in certain components of the hematological examination because it was not recorded in the medical record (Table 1).

**Table 1.** Hematology results of the residents of the Rehabilitation Center of the National Narcotics Bureau in Lido, West Java, Indonesia.

Laboratory test	Normal n(%)	Below normal range n(%)	Above normal range n(%)	Unknown n(%)
Erythrocytes	98 (54.75)	69 (38.55)	3 (1.67)	9 (5.03)
Hemoglobin	126 (70.39)	44 (24.58)	0 (0)	9 (5.03)
Hematocrit	134 (74.86)	36 (20.11)	0 (0)	9 (5.03)
ESR	114 (63.69)	0 (0)	51 (28.49)	14 (7.82)
Thrombocytes	164 (91.62)	1 (0.56)	5 (2.79)	9 (5.03)
Leukocytes	132 (73.74)	1 (0.56)	37 (20.67)	9 (5.03)
Segments	134 (74.86)	13 (7.26)	22 (12.29)	10 (5.59)
Lymphocytes	134 (74.86)	6 (3.35)	29 (16.20)	10 (5.59)
Monocytes	166 (92.74)	1 (0.56)	2 (1.11)	10 (5.59)
Eosinophils	135 (75.41)	33 (18.45)	1 (0.56)	10 (5.59)
Basophils	169 (94.41)	0 (0)	0 (0)	10 (5.59)

ESR: erythrocyte sedimentation rate

In addition to the hematological data, the blood chemistry test data was also obtained from the medical records and analyzed with regard to the alanine amino transferase (ALT) level and

renal condition of the subjects. The majority of subjects had normal blood chemistry results; however, 12.29% of the subjects had high ALT levels and 11.17% of the subjects had high

creatinine levels (Table 2).

**Table 2.** Blood chemistry results of the residents of the Rehabilitation Center of the National Narcotics Bureau in Lido, West Java, Indonesia.

Laboratory results	Normal n(%)	Below normal range n(%)	Above normal range n(%)	Unknown n(%)
AST	159 (88.83%)	2 (1.12%)	11 (6.14%)	7 (3.91%)
ALT	150 (83.80%)	0 (0%)	22 (12.29%)	7 (3.91%)
Urea	170 (94.97%)	0 (0%)	2 (1.12%)	7 (3.91%)
Creatinine	150 (83.80%)	2 (1.12%)	20 (11.17%)	7 (3.91%)

AST: aspartate aminotransferase, ALT: alanine aminotransferase

### Discussion

In this study of 179 male drug abusers, the hematological data that was analyzed consisted of the hemoglobin, leukocytes, erythrocytes, erythrocyte sedimentation rate (ESR), hematocrit, thrombocytes, and leukocytes (segmented neutrophils, lymphocytes, monocytes, eosinophils, and basophils). The blood chemistry was also analyzed, including the aspartate amino transferase (AST), ALT, urea, and creatinine. It was found that 44 (24.58%) of the residents had below normal hemoglobin levels. In addition, 69 (38.55%) of the residents had below normal erythrocyte values and 36 (20.11%) of the residents had below normal hematocrit values. These low level results are indicators of anemia.

Anemia is a disorder in which there is a reduction in the oxygen-carrying capacity of the blood. It is generally associated with a decrease in the amount of circulating erythrocytes or the presence of abnormalities in the hemoglobin present in those erythrocytes. This condition can be caused by several factors, such as decreased erythrocyte production due to iron, vitamin B12, or folic acid deficiencies, blood loss, or increased circulating erythrocyte destruction (e.g. autoimmune destruction).

Based on a hematological examination, anemia is expressed when the hemoglobin values fall below 13 g/dL in a male patient. The most common symptoms seen in individuals suffering from anemia are fatigue, lethargy, increased heart rate, breathing difficulty, abdominal pain, bone pain, buzzing in the ears, dizziness, numbness of the fingers and toes, and reduced muscle strength.<sup>1</sup>

It has been shown previously that IV drug users (IDUs) are more susceptible to hepatitis C and HIV. Ten million active IDUs have been

exposed to hepatitis C virus (HCV) and 8 million have chronic infection.<sup>10</sup> In this current study, 16 of the 179 residents (8.94%) were suffering from hepatitis C. Moreover, various studies have shown that individuals with hepatitis C and HIV are more susceptible to anemia. Research conducted by Alem et al., in 384 patients suffering from HIV showed that 269 (70.1%) of those patients were anemic.<sup>11</sup> Other study stated that chronic liver disease of any cause is frequently associated with hematological abnormalities, and iron deficiency anemia is a frequent complication of advanced liver disease.<sup>12</sup>

Excessive alcohol consumption can contribute to reductions in the erythrocyte, hemoglobin, and hematocrit values. In this study, based on the data obtained from the residents data, it was found that most of the residents who used narcotics also consumed excessive amounts of alcohol. The other factors that can contribute to reductions in the erythrocyte, hemoglobin, and hematocrit values are malnutrition and vitamin B6, vitamin B12, and folic acid deficiencies.

A study by Strike et al. showed that 54.5% of the narcotics users that they screened did not reach a sufficient food intake.<sup>13</sup> In addition, other research reported that drug abusers have significantly lower body mass indexes (BMIs) than non drug abusers.<sup>14</sup> A clinical nutritional deficiency has been seen by drug users, while some of these nutritional deficiencies are caused by the physical and biochemical changes that occur from drug and alcohol use, and others happen because of poor dietary choices.<sup>15</sup> Moreover, the abuse of amphetamines can decrease both the quantity and quality of the erythrocytes.<sup>16</sup>

In the leukocyte examination, it was found that 37 (20.67%) of the residents had above

normal values, which generally indicates the presence of an infection, tissue inflammation, or tissue necrosis related to a disease. The increase in the leukocytes in drug abusers can be triggered by the inflammatory response that occurs related to the systemic conditions and also the type of drug used.

Richards JR et al. (2014) reported that amphetamine used had a higher leukocytes level compared with cocaine used.<sup>17</sup> More specifically, when examining the segmented neutrophil levels, 22 (12.29%) of the residents had above normal values and 13 (7.26%) had below normal values. An increase in the number of segmented neutrophils usually indicates an acute bacterial infection. In addition, smoking can also increase the number of segmented neutrophils. A below normal segmented neutrophil level can occur in cases of a prolonged severe infection, as well as the use of certain medications, such as antimicrobials, non steroidal anti-inflammatory drugs (NSAIDs), and certain analgesics.

Number of previous studies indicates that total lymphocyte count may be useful as a surrogate marker of immune status. With regard to the lymphocyte counts, 29 (16.20%) of the residents had above normal and 6 (3.35%) had below normal values. High lymphocyte values can occur in acute viral infection cases, as well as in individuals with chronic infections and in the early stages of HIV. However, a reduction in the lymphocyte value is significantly related to HIV/AIDS. Most studies concluded a decrease of lymphocyte count was strongly related to decline in CD4 count.<sup>18</sup>

Monocytes play a pivotal role as cellular component of the innate immune response and initiation of adaptive immunity. Two (1.11%) of the residents had above normal monocyte values and 1 (0.56%) had a below normal value. Above normal monocyte values can occur in chronic infections (such as tuberculosis),<sup>19</sup> while below normal values, although rare, can be found in individuals with aplastic anemia.<sup>20</sup> All types of illicit drugs increase CNS dopamine, while in HIV infected drug abusers may increase HIV infection and/or dysregulate several functions of monocytes, macrophages, and T cells, impacting CNS damage associated with HIV infection.<sup>21</sup> In addition, 33 (18.45%) of the residents had lower than normal eosinophil values and 1 (0.55%) had a higher than normal value. Increased eosinophil values are found in patients with parasitic

infections, as well as in individuals with histories of asthma or allergic rhinitis or drug reaction.<sup>22</sup> A decrease in the eosinophil value is generally associated with excessive alcohol consumption.<sup>23</sup>

The ESR results showed that among the 179 residents evaluated, 51 (28.49%) had ESR values above normal, which could be an indicator of anemia, tuberculosis, acute hepatitis, or a bacterial infection. With regard to the thrombocyte values, 5 (2.79%) of the residents had above normal values. This may indicate iron deficiency anemia or the presence of an infectious disease like tuberculosis. As mentioned previously, drug abusers with histories of hepatitis C and HIV are more susceptible to anemia. In addition, the study by Deiss et al. mentioned that drug abusers are also susceptible to tuberculosis.<sup>24</sup>

The results of the blood chemistry evaluation showed that 11 (6.14%) of the residents had above normal AST values. In addition, the ALT values were above normal in 22 (12.30%) of the residents. Increased AST and ALT values are often caused by excessive alcohol consumption, chronic hepatitis B and C, certain medications, and acute hepatitis.<sup>25</sup>

The evaluation of the urea showed that 2 (1.12%) of the residents had above normal values, while the creatinine evaluation showed that 20 (11.17%) of the residents had above normal values. Increased urea and creatinine values may indicate a disturbance in the kidneys. The kidneys can be injured in diverse ways by many drugs, both legal and illegal.<sup>26</sup> Conversely, it was also found that 2 (1.12%) of the residents had below normal creatinine values, which may indicate that they were malnourished.<sup>27</sup>

One limitation of this study was that there was not enough data about the systemic disease histories or results of the clinical and subjective examinations of the residents. Therefore, it was not possible to compare the results of hematological examinations and blood chemistry with the clinical states of the residents.

## Conclusions

The results of the hematological and blood chemistry examinations of the 179 study participants were mostly normal; however, a number of the residents showed results beyond the normal limits with regard to the erythrocytes,

hemoglobin, hematocrit, leucocytes, segmented neutrophils, lymphocytes, monocytes, eosinophils, ESR, AST, ALT, urea, and creatinine. Further studies are suggested, including a comprehensive examination of the subjects that can be compared with the laboratory test results. In addition, a similar study is needed with female subjects to determine if there are any laboratory results differing from those of the male subjects.

### Conflict of Interest

All authors report no conflict of interest.

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