

ORIGINAL ARTICLE

HAEMATOLOGICAL AND IMMUNOLOGICAL PARAMETERS
AMONG DIACETYLMORPHINE ADDICTS

Syeda Huma Khizar, Syed Hamid Habib*, Muhammad Omar Malik*,
Sahar Farhat**, Safia Bibi, Qazi Muhammed Qasim**

Department of Physiology, Kohat Institute of Medical Sciences, Kohat, *Institute of Basic Medical Sciences,
Khyber Medical University, Peshawar, **Ayub Medical College, Abbottabad, Pakistan

Background: Chronic usage of diacetylmorphine has significant impact on different physiological processes of the body. Haematological parameters are reported to alter in diacetylmorphine addiction leading mainly to various signs and symptoms of anaemia and infection. This study was designed to investigate for haematological and immunological parameters in diacetylmorphine (heroin) addicts.

Methods: This was a case control study. We recruited forty-one male heroin addicts aged 25–46 years along with forty-one male healthy subjects as controls. The subjects were assessed clinically through history and physical examination. Complete blood count (CBC) was done by Celldyne Ruby, Multiparameter Automated Haematology Analyser. Data was presented as Mean±SD. Independent sample *t*-test was used to compare differences between the two groups on SPSS-22, and $p < 0.05$ was considered significant. **Results:** There were decreased haemoglobin levels, haematocrit, mean corpuscular volume, mean corpuscular haemoglobin concentration ($p < 0.01$) and marginal increase in WBC count in diacetylmorphine addicts. Rest of the haematological parameters were normal.

Conclusion: Diacetylmorphine addiction showed significant changes in haematological parameters compared to control group.

Keywords: Diacetylmorphine, addiction, haemoglobin, white blood cells, haematological parameters

Pak J Physiol 2020;16(2):6–8

INTRODUCTION

Worldwide, diacetylmorphine (DAM) addiction also known as ‘heroin’ addiction is a common social problem along with devastating effects on the economy as well.¹ It also seriously affects the mental and physical health of the abusers.² The world drug report of 2016 showed that there are 17 million diacetylmorphine addicts worldwide.³ In Pakistan 0.8% of the adult population are reported to be diacetylmorphine users.⁴ Khyber Pakhtunkhwa (KP) province has the highest prevalence of drug abuse in Pakistan. According to United Nations Office of Drugs and Crime (UNODC) 2013 report, there are 140,000 active heroin abusers in Khyber Pakhtunkhwa.⁴ This high burden of heroin addiction in KP has been because of easy supply through western border which is the main manufacturer of diacetylmorphine worldwide.⁵

Chronic use of opium derived drugs particularly diacetylmorphine addiction has significant impacts upon homeostasis of the body and haematological system is one of them. Diacetylmorphine addicts had significant changes (increase or decrease) in blood parameters including elevated neutrophil count, haematocrit, Mean Corpuscular Volume, decreased lymphocytes and red blood cell count, Mean Corpuscular Haemoglobin Concentration, and Mean Corpuscular Haemoglobin Content.⁶ Mean Platelet Volume was also observed to be affected.⁷

Diacetylmorphine induced macrocytosis (heroin macrocytic anaemia) is shown, related with increased red blood cell distribution width (RDW) in chronic diacetylmorphine users. Hematopoietic cells are affected directly or indirectly as a result of interaction with blood immune cells causing changes in their morphology and function.⁸ Low haemoglobin concentration in heroin addicts was also reported.⁹ This results in anaemia which is due to insufficient food consumption and poor nutrition in diacetylmorphine abusers.¹⁰ Another study shows significant increase in WBC count after diacetylmorphine administration in albino rats.¹¹

The objective of this study was to see the effects of diacetylmorphine on haematological and immunological parameters through complete blood count (CBC).

METHODOLOGY

This case control study included a total of 82 male subjects. Forty-one (41) male diacetylmorphine addicts were taken from Dost Foundation, Peshawar which works for the welfare and rehabilitation of the addicts. The subjects having history of active diacetylmorphine addiction for more than 6 months were included in the study. Another 41, age and BMI matched healthy subjects, without any addiction, infection or metabolic abnormality were taken as controls. The study was conducted from Sep 2016 to Mar 2018 after getting approval from Ethical Committee of Khyber Medical University, Peshawar, Pakistan.

Written informed consent was obtained from all participants. Detailed history was taken from all subjects along with complete physical examination. Non-probability random sampling technique was applied for subject recruitment. Blood samples for complete blood count (CBC) were taken after an overnight fast at early morning (7–8 AM) for biochemical profile analysis. Celldyne Ruby, Abbott Laboratories USA multi parameter automated haematology analyser was used for CBC. Thin layer chromatography of urine was used to confirm diacetylmorphine addiction.

The data was analysed on MS Excel and SPSS-22. Mean±SD was calculated for all subjects. Independent sample *t*-test was used to compare the two

groups (controls vs addicts), and $p < 0.05$ was considered significant.

RESULTS

This study included 82 male subjects having mean age of 35.24 ± 7.4 years in addicts and 36.46 ± 6.3 in controls. BMI was 20.5 ± 7.4 in drug addicts, and 20.6 ± 1.7 in controls.

There was decreased haemoglobin levels, HTC, MCH, and MCHC in addicts as compared to controls. The WBC count, Neutrophil count, and Percentage of Neutrophils and Eosinophils were less in addicts. However, the relation was not significant. Lymphocytes and monocytes percentage was a little high in addicts, but the differences were non-significant.

Table-1: Comparison of haematological and immunological parameters between diacetylmorphine addicts and normal subjects (Mean±SD)

Variables	Normal	Addicts	<i>p</i>	Normal Lab ranges
WBC (10^3 cells/ μ l)	7.23±2.32	6.63±8.5	0.120	4–11
RBC (million cells/ μ l)	4.81±0.55	4.20±0.32	<0.001*	3.8–4.8
Haemoglobin (gm/dl)	14.73±0.91	13.44±0.78	<0.001*	12–16
Haematocrit (%)	45.27±2.76	41.0±2.41	<0.001*	36–46
MCV (fl)	93.69±6.76	90.94±6.61	0.067	80–95
MCH (pg)	31.04±2.17	30.00±1.91	0.024*	27–31
MCHC (gm/dl)	32.35±0.65	31.52±1.03	<0.001*	32–36
Platelets (10^5 cells/ μ l)	3.38±6.61	2.27±6.61	0.125	1.4–4.25
Neutrophils (cells/ μ l)	4,615.29±1,960.7	4,138.01±801.1	0.155	2,500–7,000
Neutrophils (%)	62.95±8.40	62.32±7.91	0.726	50–70
Lymphocytes (%)	31.66±7.85	32.15±7.83	0.779	25–40
Monocytes (%)	2.12±0.842	2.46±1.027	0.104	2–10
Eosinophils (%)	3.07±1.60	2.73±1.34	0.299	0–4

*Significant

DISCUSSION

The results of this study reported decreased haemoglobin concentration, MCH, haematocrit and MCHC in diacetylmorphine addicts ($p < 0.01$). Studies previously done also reported decreased haemoglobin concentration in diacetylmorphine abusers in human beings.⁹ Decreased MCH and MCHC is also reported by previous studies.⁶ The resultant anaemia may be because of insufficient food intake and diet poor in both macro- and micronutrients in diacetylmorphine users.¹⁰ In contrast to our study another study reports no alteration in haemoglobin levels after diacetylmorphine injection in albino rats.¹¹ This difference might be because of the fact that our subjects were humans addicted to diacetylmorphine for at least 6 months and Bhoir *et al*¹¹ gave injections to albino rats for one month.

The immune system of human beings maybe effected by diacetylmorphine in two ways. It may directly act on opioid receptors, macrophages and lymphocytes or indirectly through the nervous system.¹² The immune system is important for opioid users because diacetylmorphine abusers are at high-risk for infectious diseases such as Hepatitis B and C and HIV.¹³ Needle sharing and immune dysfunction results in

increase in infections which results in increased leukocyte count in diacetylmorphine addicts.¹⁴

Diacetylmorphine inhibits numerous functions of leukocytes like chemotactic response, phagocytosis and cytokine production.¹⁵ The total number of leukocytes (TLC) in the blood are reported to decrease with a single injection of diacetylmorphine.¹⁶ The chances of infection are increased in diacetylmorphine abusers due to decreased efficiency of the immune system.¹⁵ Long term use of opioids immensely suppresses the immune system which enhances the risk of infections such as tuberculosis, cold and pneumonia in diacetylmorphine abusers.¹⁷ Repeated infections also lead to secondary immune dysfunction.¹⁷

Our study also reports slight decrease in white blood cells (WBC) count. Gizel *et al*¹⁸ also reported marked decrease in WBC count in diacetylmorphine users. In contrast, increase in WBC count can be due to infections resulting from needle sharing and dysfunction of immune system resulting from diacetylmorphine addictions.¹⁴ This increase in white blood cells maybe be due to activation of inflammatory cascade in the bronchial tree. The increase in WBC count is also a valuable marker of damage done to the tissues by these drugs leading to atherosclerosis and cardiovascular diseases.^{19,20}

There was no significant difference in neutrophil count ($p=0.155$) and neutrophil percentage ($p=0.726$) between diacetylmorphine abusers and healthy participants of our study; same is reported in the world drug report 2013.²¹ Yet another study reports increase in neutrophil significantly ($p=0.005$) in diacetylmorphine abusers.⁶

CONCLUSION

Diacetylmorphine addiction showed significant decrease in some haematological parameters as compared to control group.

LIMITATIONS OF THE STUDY

Female subjects could not be included in the study due to cultural restrictions. This is a single center study which needs future studies with large sample size and results taken multicentres for varification of the present results. The follow-up of the subjects could not be done in our study because of financial constraints and time limitation. We recommend prospective studies on the same subjects during their treatment and after complete recovery to see if the haematological parameters return to normal.

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Address for Corrspondence:

Dr. Muhammad Omar Malik, Department of Physiology, Institute of Basic Medical Sciences, Khyber Medical University, Peshawar, Pakistan. **Cell:** +92-333-5196243
Email: Marmalik786@gmail.com

Received: 2 Jun 2020

Reviewed: 17 Jun 2020

Accepted: 18 Jun 2020

Contribution of Authors:

SHK: Concept, data acquisition and analysis, manuscript writing

SHH: Concept, data acquisition and analysis, manuscript writing

MOM: Design, methodology, analysis, manuscript writing

SF: Manuscript writing, critical review

SB: Manuscript writing, critical review

QMQ: Manuscript writing, critical review

Funding source: None

Conflict of interest: None