# Original Research Article

## Study of Changes in Haematological Parameters in Alcoholism

**Dr. Anasuya. M[1], Dr. M. Vijay Kumar[2], Dr. Gopal Rao. S[3], Dr. C. Ramachandra Bhat[4], Dr. Ganesh Nayak[5], Dr. Chirag Gangadhar[6]**

[1,5,6]Post Graduate, General Medicine, K.V.G. Medical College, Sullia, Dakshina Kannada, Karnataka, India
[2]PostGraduate, D.M. Nephrology, Osmania Medical College, Hyderabad, Telangana, India
[3]Professor & HOD, General Medicine, K.V.G. Medical College, Sullia, Dakshina Kannada, Karnataka, India
[4]Professor, General Medicine, K.V.G. Medical College, Sullia, Dakshina Kannada, Karnataka, India

**\*Corresponding author**
Dr. Anasuya. M
Email: anasuyamaliyappa@gmail.com

**Abstract:** Alcoholism is a global public health problem with numerous health, social, legal, psychological and physical consequences. Excessive Alcohol consumption affects virtually every major organ system, and has significant serious consequences on the haematopoietic system affecting blood cells, their progenitors and clotting components. The study was conducted on 28 non alcoholics and 56 alcoholic subjects (28-moderate, 28- severe alcoholics). The results showed maximum alcoholics in the age group of 31-40 years. Mean duration of alcoholism was 11.8 years. In alcoholics Haemoglobin, PCV and platelet count was significantly decreased, MCV was increased. Leucocytosis and leukopenia were seen. Peripheral smear showed increase in macrocytic anaemia. Bone marrow examination showed predominant megaloblastic picture. In conclusion alcoholism has profound effects on haematological and haemostatic parameters in the blood. Duration of alcohol consumption correlated with changes in alcohol parameters. Some of the results in conjunction with the clinical history would also be useful in diagnosing and management of alcoholics. Abstinence can reverse many of alcohols' effect on haematopoiesis and blood cell function. These simple and affordable investigations help in early detection of complications of alcoholism.
**Keywords:** alcoholism, haematological parameters, mean corpuscular volume

## INTRODUCTION

Alcoholism is defined as a chronic and progressive disease characterised by loss of control over the use of alcohol with subsequent social, legal, psychological and physical consequences. Globally, there are 2 billion alcohol consumers with 2.3 million cases of alcoholism and 1.8 million deaths every year. The harmful use of alcohol ranks among the top five risk factors for disease, disability and death throughout the world [1].

While low doses of alcohol have some healthful benefits, the intake of more than three standard drinks per day on a regular basis enhances the risk of cancer and vascular diseases, and alcohol use disorder decrease the life span by about 10 years [2]. Alcohol consumption affects virtually every major organ system. Major causes of increased mortality in alcohol misuse are liver diseases, severe respiratory infections, cancers, cardiovascular diseases, suicide and violence [1].

Chronic alcoholism has significant serious consequences on the haematopoietic system involving the various blood cells, their progenitors in the bone marrow and clotting components. Alcohol's adverse effects on the hematopoietic, system are both direct and indirect. The direct effects of excessive alcohol consumption include toxic effects on the bone marrow, the blood cell precursors, and the mature red blood cells (RBC's), white blood cells (WBC's), and platelets. Alcohol's indirect effects include nutritional deficiencies that impair the production and function of various blood cells. These direct effects may be exacerbated by the presence of other alcohol-related disorders, such as liver disease and nutritional deficiencies [3].

The medical consequences of these adverse effects can be severe and include anaemia, increased risk of bacterial infections, impaired blood clotting and fibrinolysis, leading to excessive bleeding and strokes. Abstinence can reverse many of alcohols' effect on haematopoiesis and blood cell function [3]. Screening

and brief interventions for hazardous and harmful drinking have a good cost-effectiveness profile [1].

Many a time haematological changes are left undetected and untreated which could progress to serious complications. Early detection and treatment of haematological changes can prevent complications and reduce the mortality. These are the basis and the need for the study.

## AIMS AND OBJECTIVES
To study changes in haematological parameters in alcoholics with respect to quantity and duration of alcohol consumption-moderate drinkers and severe drinker.

## MATERIAL AND METHODS
28 (non-alcoholics) controls, 56 alcoholic subjects based on quantity and duration of alcohol intake were classified into 28 moderate and 28 severe alcoholic groups and satisfying the inclusion and exclusion criteria attending K.V.G. Medical College, Sullia were included in the study. Most of the subjects were from rural area. Their haematological parameters were included in the study. Ethical committee clearance taken.

## RESULTS
In the present study alcoholic subjects there were 52 males and 4 females. Maximum numbers of cases were in the age group of 31-40 years. Youngest was 22 years and eldest was 65 years. The mean duration of alcoholism was 11.8 years. Majority of the symptoms included fatiguability, dyspepsia and jaundice.

Anaemia was present in 57% (16/28) in moderate alcoholics and 79 % (22/28) of severe alcoholics. The mean haemoglobin(Hb) was 12.4±2.3 g/dl in moderate alcoholics and it was 9.9±2.8 g/dl in severe alcoholics. There was decrease in the mean haemoglobin in alcoholics in comparison with non-alcoholics; decrease was more in severe alcoholics when compared to moderate alcoholics. The decrease in

the haemoglobin among the three groups was significant. As the duration of alcoholism increased mean haemoglobin decreased.

The mean Mean Corpuscular Volume (MCV) was 88.79±12.9fl in moderate alcoholics and 94.57±15.8 fl in severe alcoholics. MCV was increased in alcoholics in comparison to non-alcoholics; increase was more in severe alcoholics when compared to moderate alcoholics. The difference was not statistically significant. As the duration of alcoholism increased MCV was increased.

The total leucocyte count was within normal limits. There was decrease in total leucocyte count in severe alcoholics compared to non-alcoholics but was not significant. In alcoholics both leucopenia and leucocytosis were seen.

There was a significant decrease in RBC count, platelet count and PCV in alcoholics when compared to non-alcoholics. In severe alcoholics there was statistically significant decrease in RBC count, Packed Cell Volume (PCV) and platelet count compared to moderate alcoholics. As the duration of alcohol consumption increased RBC count, platelet count and PCV decreased (table -1, chart-1, chart-2)

Peripheral blood smear of alcoholic subjects showed all types of anaemias, predominant were microcytic hypochromic and macrocytic anaemia. Macrocytic anaemia was significantly increased. As the duration of alcohol consumption increased macrocytic anaemia was increased. The reason for increased microcytic anaemia is, majority of the subjects were from rural area which involves working in the fields barefooted, and malnutrition. (Table-2)

Bone marrow examination showed abnormal picture in alcoholics. There was a significant increase in megaloblastic picture in alcoholics. Abnormal cells like vacuolated RBC and sideroblasts were seen in alcoholics. (table – 3).

**Table 1: Comparison of complete blood count in moderate and severe alcoholics with non-alcoholics**

| Complete blood count | Moderate alcoholics N=28 | Severe alcoholics N=28 | Non alcoholics N=28 | Significance |
|---|---|---|---|---|
| Haemoglobin (gm) | 12.4±2.3 | 9.9±2.8 | 13.1±1.2 | <0.001 |
| Total count (cells/dl) | 7653.57±3641.17 | 6828.79±2873.43 | 6885.71±1383.156 | >0.05 |
| R B C (millions/dl) | 3.64±0.88 | 3.24±1 | 3.84±0.8 | <0.05 |
| M C V (fl) | 88.79±12.9 | 94.57±15.8 | 84.64±13.71 | >0.05 |
| P C V (%) | 35.14±6.2 | 30.84±7.2 | 35.29±5.9 | <0.05 |
| Platelet count (lakh) | 2.21±0.68 | 1.96±0.8 | 3.34±0.54 | <0.001 |

**Table 2: Comparison of peripheral blood smear in alcoholics and non-alcoholics**

| Peripheral blood smear | Moderate alcoholics N=28 | Severe alcoholics N=28 | Non alcoholics N =28 | Significance P value |
|---|---|---|---|---|
| Microcytic hypochromic anaemia | 10 (36%) | 8 (29%) | 9 (32%) | >0.05 |
| Macrocytic anaemia | 6 (21 %) | 8 (29%) | 2 (7%) | <0.05 |
| Dimorphic anaemia | 4 (14%) | 6 (21%) | 4 (14%) | >0.05 |
| Normocytic hypochromic anaemia | 3 (11%) | 3 (11%) | 3 (11%) | >0.05 |
| Normal | 5 (18%) | 3 (11%) | 10 (36%) | >0.05 |

**Table 3: Comparison of Bone marrow picture in alcoholics and non-alcoholics**

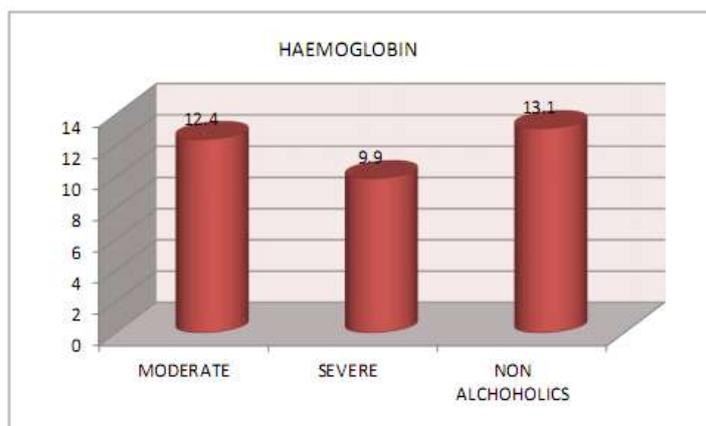| Bone marrow picture | Moderate alcoholics N=28 | Severe alcoholics N=28 | Non alcoholics N=28 | Significance P value |
|---|---|---|---|---|
| Erythroid hyperplasia | 5 (18%) | 7 (25%) | 6 (21%) | =>0.05 |
| Megaloblastic picture | 5 (18%) | 9 (32%) | 3 (11%) | <0.05 |
| Sideroblastic picture | 2 (7%) | 4 (14%) | 0 | |
| Vacuolated RBC | 1 (3%) | 3 (11%) | 0 | |



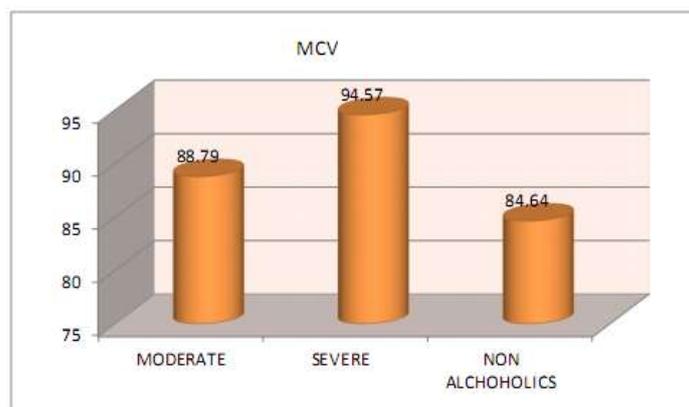**Fig. 1: Mean haemoglobin in alcoholics and non-alcoholics**

**Fig. 2: Mean values of MCV in alcoholics and non-alcoholics**

## DISCUSSION

The findings of this study have shown the effects of drinking patterns on haematological parameters in alcohol consumers. This study observed and highlighted several correlations between changes of some variables of complete blood count and the time of problematic alcohol consumption, which were as follows; MCV is increased in alcoholics, more in severe alcoholics; whereas RBC, Hb, PCV, platelets are decreased , suggesting the role of quantity and duration, in the variation of the parameters.

In a study conducted by Latvaala J *et al* anaemia was seen in 50% in alcoholics [4]. In a similar study conducted by Thoma E *et al* decrease in haemoglobin was noted as the duration of alcohol increased [5].

In a similar by E.O. Akkani *et al* the mean haemoglobin was 12.5g/dl [8], and in a study by Thoma E. *et al* mean haemoglobin was 13.7g/dl in alcoholics [5].

In a study conducted by Latvaala J. *et al* the alcoholic group had significantly higher MCV [4, 7].In a similar study conducted by T. Odula *et al* the mean MCV in moderate alcoholics was 84.9 9.1fl, and in severe alcoholics was 89.7 9.7fl [7], in a similar study by Thoma E. *et al* mean MCV was 94.954fl [5].

In a similar study conducted by Thoma E. *et al* WBC was significantly low in alcoholics [5].

In a similar study conducted by O.harbor *et al* the mean platelet count in moderate alcoholics was 2.53 lakh, heavy alcoholics was 1.30 lakh and in non-alcoholics was 2.60 lakhs [7].In a similar study by Akkani *et al* mean platelet count in alcoholics was 1.88lakh [6].

In a study conducted by Thoma et al the mean PCV among alcoholics was 41.384%.26 [5].

Peripheral smear showed all types of anaemia predominantly macrocytic anaemia, and bone marrow picture showed predominant megaloblastic picture and abnormal cells like vacuolated RBC and sideroblasts suggesting the role of increased consumption of alcohol in the causation of abnormal blood and bone marrow pictures. Their appearance generally is considered an indicator of excessive alcohol consumption [9].

In a study conducted by T.Odula *et al* alcoholics showed predominantly macrocytic blood picture in peripheral blood smear [6]. In a study conducted by Latvala Jaana *et al* anaemia was found in approximately 50% of the alcohol abusers and was characteristically normocytic or macrocytic [4].

Bone marrow abnormalities were related to the duration of alcohol intake. Megaloblastic picture was the predominant feature in alcoholics. Giant metamyelocytes and vacuolated RBC were seen in alcoholics. In a study conducted by J. Latvala, *et al* 49% of severe alcoholics and 20% of moderate alcoholics showed macrocytosis. Bone marrow aspirates of 12 alcoholic patients showed vacuolization of pronormoblasts and 8 cases showed presence of ringedsideroblasts [10].

In a study by Thoma E *et al*, conducted on alcoholics, there was anaemia seen in alcoholics. There was significant decrease in haemoglobin, total count, haematocrit and significant increase in MCV and MCH. There was also decrease in platelet count inthem [5].

Das SK et al, in their study on comparison of haematological parameters in alcoholic patients' anaemia was seen in alcoholics. There was significant decrease in haemoglobin, RBC, haematocrit [11].

Excessive alcohol consumption can interfere with various physiological, biochemical, and metabolic processes involving the blood cells. In alcoholics' presence of abnormal RBC and decreased RBC count causes increased anaemia, variations in leucocyte count and platelet count cause increased risk of infections and excessive bleeding and strokes. A progressive rise in MCV with alcohol intake with thrombocytopenia is attributed to marrow suppression, with alcoholic abuse. The change in MCV values often predict serious alcohol- related pathology and may be a useful indicator of alcohol abuse. Alcohol adversely affects the production and function of virtually all types of blood cells. Thus, alcohol is directly toxic to the bone marrow, which contains the precursors of all blood cells, as well as to the mature cells circulating in the bloodstream. Abstinence can reverse many of alcohol's effects on haematopoiesis and blood cell functioning [3].

## CONCLUSION

Excessive chronic consumption of alcohol results in profound alterations in the blood cells and their functions. All these parameters in combinations may be useful indicator for identification and determination of severity of alcohol abuse adverse effects. In conclusion, heavy drinking have been shown to affect some haematological parameters while moderate drinking had less effects, hence some of the parameters that had association with heavy drinking could be used in conjunction with clinical history for the diagnosis and management of alcoholism. Screening and brief interventions for hazardous and harmful

alcoholism can prevent complications and reduce the mortality.

**REFERENCES**
1. Global status report on alcohol and health; World Health Organisation, 2014; 1-57.
2. Schukit MA; Chapter 392. Alcohol & Alcoholism. In: Longo DL, Fauci AS, Kasper DL, Hauser SL, Jameson JL, Loscalzo J, editors. Harrison's Principles of internal medicine. 18th Ed. New York: McGraw Hill, Health Professions Division;2012; 2:3546-52.
3. Harold S. Ballard MD; Haematological Complications of Alcoholism. Alcohol Health & Research World. 1997; 21(1): 1-52.
4. Latvala J; Effect of alcohol consumption and acetaldehyde on blood cellsand molecules: Pathogenic and diagnostic implications. Tampere University press Universitaties Tamperensis, 2004; 39-52.
5. Thoma E, Bitri S, Mucaj K, Tahiri A, Pano I; Changes of Some Blood Count Variables in Correlation with the Time of Alcohol Abuse. J Addict Res., 2015; 6: 221.
6. Oduola T, Adeosun OG, Oduola TA, Agbaje NR, Raheem ZA; Drinking patterns: biochemical and haematological findings in alcohol consumers in Ile- Ife, Nigeria. African Journal of Biotechnology, 2005; 4(11): 1304-1308.
7. Erhabor O, Yakubu1 O, Isaac IZ, Sule1 AL, Wase A, Ezimah1 AC; Effect of Alcohol Consumption on Platelet, Prothrombin Time and Activated Partial Thromboplastin Time of Alcoholics in Birnin Kebbi, Kebbi State, Nigeria. International Journal of Tropical Disease & Health, 2014; 4(2): 224-232.
8. Akani EO, Mabayoje VO, Zakariyahu TO, Oparinde DP; Haematological Characterization among Heavy Alcohol Consumers in Osogbo Metropolis. Res. J. Med. Sci., 2010; 4(2):48-52.
9. Kumar V; Chapter 9. Effects of Alcohol. In: Kumar, Abbas, Fausto, Aster, editors. Robbins and cotron pathologic basis of diseases. 8 th ed. Philadelphia;Saunders Elsevier, 2010.
10. Latvala J, Parkkila S, Melkko J, Niemela O; Acetaldehyde adducts in blood and bone marrow of patients with ethanol-induced erythrocyte abnormalities. Mol Med., 2001; 7(6):401-405.
11. Das SK, Vasudevan DM; Biochemical Diagnosis of Alcoholism. Indian Journal of Clinical Biochemistry, 2015; 20(1) 35-42.