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Original Research Article

Study of Blood Indices in Alcoholic Subjects

R. Pavani[1], Kirtika Shrivastava[2], Sylvester Noeldoss Lazarus[3], Akhil Patil[4*]

[1]Associate Professor, Department of Physiology, Dr YSR Government Medical College Adoni , Kurnool District, Andhra Pradesh

[2]Assisstant Professor, Department of Physiology, Peoples College of Medical Sciences and Research Centre, Bhopal. (MP)

[3]Professor, Department of Pathology, American University of Barbados Brigdetown, Barbados (AUB)

[4]Associate Professor, Department of General Medicine, SMBT IMS RC, Dhamangaon,, Nashik, Maharashtra

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Corresponding Author: Dr. Akhil Patil

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Abstract

Alcoholism is a broad form for problems with alcohol and is generally used to mean compulsive and uncontrolled consumption of alcoholic beverages, usually to the determinant of drinker's health, personal relationships and social standing. It is medically considered a disease, specifically an addictive illness. Alcohol has numerous adverse effects on the various types of blood cells and their functions. The present study is designed to determine whether or not alcohol, in amounts commonly consumed by drinkers, could alter the complete blood count value like Hb, MCV, MCH, MCH. Total 30 male, moderate to severe alcoholics and 30 non-alcoholic normal subjects were included in study. RBC count, Hb, MCV, MCH, MCH was estimated. Study shows that hemoglobin and RBC counts, MCH, MCHC was less in alcholics which indicates anemia is common in alcoholics. MCV was high in alcoholics which indicates macrocytic anemia. Detection of hematological changes in alcoholics and giving psychiatric counseling and treatment for alcohol dependence will decrease the future complications.

Keywords: Blood Indices, MCV, MCH, MCHC, Alcoholics.

Introduction

Alcoholism has been defined as an individual's dependence on alcohol, alcohol misuse or uncontrolled drinking habit, which adversely affects biological, social and mental well-being. [1] It is characterized by tolerance and physical dependence or pathologic organ changes, or both- all of which are the direct or indirect effect of alcohol consumption. [2] It is estimated that 3.5% of the global burden of disease is attributable to alcohol, which accounts for as much death and disability as tobacco and hypertension. Alcohol is not only causally related to more than 60 medical conditions, [3,4,5] but is also linked to categories of disease whose relative impact on the global burden is predicted to increase. More than 2 billion people, or about three of ten individuals, are current drinkers globally. [6] There are multiple mechanisms through which alcohol use affects wellbeing: through cumulative intake, which causes damage to organs and tissues; by acute intoxication that may contribute to injuries or poisoning; and by dependent drinking leading to impairments and potentially self-harm or violence. These effects are also influenced by an individual's consumption volume and pattern of drinking. [7] Alcohol has various adverse effects on the blood cells and their functions. Heavy drinking can cause generalized suppression of blood cell formation and also result in the production of structurally abnormal blood cell precursors that cannot develop into functional cells. [8] People who abuse alcohols are at risk for numerous alcohols related medical complications, including those affecting the blood (blood cells as well as proteins present in the blood plasma) and bone marrow, where the blood cells are produced. Alcohol's advers effects on the blood building or hematopoietic systems are both direct and indirect. [9,10] The direct consequences of excessive alcohol consumption include toxic effects on the bone marrow, the blood cell precursors, the mature red blood cells (RBC), white blood cells and platelets. Alcohols indirect effects include nutritional deficiencies that impair the production and function of various blood cells. These direct and indirect effects of alcohol can result in serious medical problems for the drinkers. For example, anaemia resulting from diminished RBC

production and impaired RBC metabolism and function can cause fatigue, shortness of breath, light headedness, even reduced mental capacity and abnormal heart beats. Alcohol has numerous adverse effects on the various types of blood cells and their functions. Consumption of excessive amount of alcohol for prolong duration causes suppression of bone marrow so it lead to defective erythropoietin and production of functionally abnormal red blood cell. [11] The present study is designed to determine whether or not alcohol, in amounts commonly consumed by "moderate and severe drinkers," could alter the complete blood count value like Hb, MCV,MCH, MCHC, etc. Many bone marrow abnormalities occurring in severe alcoholics affect the RBC precursor cells. These abnormalities most prominently include precursors containing fluid-filled cavities (i.e., vacuoles) or characteristic iron deposits.

Materials and Methods

A retrospective study was conducted for patients who sought treatment for alcohol use problems for a period of 1 year and healthy non-alcoholic subjects who visited laboratory for routine hematological investigations. A detail history was taken in alcoholics about quantity, type of alcohol, and number of years of alcohol consumed. Name, age, gender, occupation, and socioeconomic status were noted. General and systemic examination was done. All adult patients who are moderate alcoholics that is who consume alcohol less than 80 to 90 mg alcohol which is about 11 drinks per day. All adult patients who are severe alcoholics that is who consume more than 80 to 90 mg alcohol or more than 11 drinks per day. Total 30 male, moderate to severe alcoholics and 30 non alcoholic normal subjects were included in study. All patients who are less than 18 years. Patients with other hepatic disorders . Patients receiving hepato- toxic drugs were not included in this study. Blood indices which included Hemoglobin content , RBC count, PCV, MCV, MCH, MCHC were estimated by cell counter in complete blood count -CBC. Student t test was done to compare Blood indices values in alcoholics and normal subjects. Mean and SD was calculated. P value was considered. $P< 0.05$ will be taken as significant and $p< 0.001$ will be taken as highly significant.

Results

This study included 30 alcoholic and 30 normal non alcoholic subjects. Maximum alcoholics were in age group of 41-60 years . Most common sign in alcoholics was pallor which indicates anemia.

Table 1: Age wise distribution of Alcoholics

Age group in years	Non alcoholics n = 30	Percentage	Alcoholics n = 30	Percentage
20-30	3	10%	2	6.66%
31-40	5	16.66%	3	10%
41-50	12	40%	10	33.33%
51-60	8	26.66%	12	40%
>60	2	6.66%	3	10%

Table 2: Clinical Signs in Alcoholics

Signs	Alcoholics n = 30	Percentage
Pallor	20	66.66 %
Icterus	08	26.66 %
Ascites	06	20 %
Edema feet	05	16.66 %
Other Signs	07	23.33 %

Table 3: Blood Indices values in Non alcoholics and Alcoholics

Blood parameters and Blood Indices	Non alcoholics n = 30 Mean ± SD	Alcoholics n = 30 Mean ± SD	p value
Hb (gm%)	12.24±1.62	9.2±1.12	<0.001
RBC (millions/$mm^{3)}$	3.94±2.2	3.12±0.78	<0.001
PCV (%)	39.42±2.82	28.24±4.2	<0.001
MCV (fl)	88.72±2.6	94.42±3.4	<0.05
MCH (pg)	30.42±2.2	23.82±3.1	<0.05
MCHC (%)	36.24±1.84	30.14±1.6	<0.001

Table 3 shows that hemoglobin and RBC counts, MCH, MCHC was less in alcholics which indicates anemia is common in alcoholics. MCV was high in alcoholics which indicates macrocytic anemia. The difference Hb, RBC count PCV,MCV in alcoholics and normal subjects was highly significant $p< 0.001$. The difference in MCH,

MCHC values in alcoholics and normal subjects was significant $p< 0.05$.

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 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 [12]. In a similar study conducted by Thoma E et al decrease in haemoglobin was noted as the duration of alcohol increased [13]. Alcohol as well as alcohol induced cirrhosis leads to decreased Red blood cell production. Hypersplenism can cause premature RBC destruction. Folic acid deficiency impairs RBC production and results from decreased ingestion, decreased absorption, and abnormal metabolisn of folic acid. Hypersplenism, blood loss, liver disease, folic acid deficiency, and reduced RBC production are causes of low haemoglobin levels in alcoholics. Alcoholism has effect on blood indices [14]. Most of these changes result, either directly or indirectly, in anemia and when extensive liver disease is present, the patient may develop an abnormally functioning fibrinogen or other coagulation disorders, which may initiate or exacerbate bleeding. Studies had shown that even before anemia appears, approximately 90% of alcoholics have a macrocytosis (mean corpuscular volume (MCV) between 100 and 110 femtoliter (fL) Alcohol-induced macrocytosis occurs even though patients are folate and cobalamin replete and do not have liver disease. The mechanism is unknown, but it takes 2–4 months for the macrocytosis to disappear after the patient becomes abstinent. Our study shows that hemoglobin and RBC counts , MCH, MCHC was less in alcholics which indicates anemia is common in alcoholics. MCV was high in alcoholics which indicates macrocytic anemia . The difference in Hb, RBC count PCV ,MCV in alcoholics and normal subjects was highly significant $p< 0.001$. The difference in MCH, MCHC values in alcoholics and normal subjects was significant $p< 0.05$. Alcohol as well as alcohol-induced cirrhosis lead to decreased RBC production. Hypersplenism can cause premature RBC destruction. Folic acid deficiency impairs RBC production and results from decreased ingestion, decreased absorption, and abnormal metabolism of folic acid. [15] Hypersplenism, blood loss, liver disease, folic acid deficiency, and reduced RBC production are causes of low hemoglobin levels in alcoholics. [16] Present study shows mean haemoglobin content and RBC count was less than normal values which tells that most of alcoholics are anemic . Mean values of MCV was more than normal range, which shows anemia seen in alcoholics was macrocytic. 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 . A progressive rise in MCV with alcohol intake 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 [17].

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. There is a significant decrease in RBC count, Hb, MCH, MCHC. The MCV is predominantly elevated which shows anemia seen in alcoholics was macrocytic.

References

1. R Reuben A. Alcohol and the liver. Curr Opin Gastroenterol. 2007;23(3):283-91.
2. Seixas FA, Blume S, Cloud LA, Lieber CS, Simpson RK. Definition of alcoholism. Ann Intern Med. 1976;85(6):764.
3. Parry CD, Patra J, Rehm J. Alcohol consumption and non-communicable diseases: epidemiology and policy implications. Addiction. 2011;106(10):1718-1724.
4. Rehm J, Room R, Graham K, Monteiro M, Gmel G, Sempos CT. The relationship of average volume of alcohol consumption and patterns of drinking to burden of disease: an overview. Addiction. 2003;98(9):1209-28.
5. Rehm J, Room R, Monteiro M, Gmel G, Graham K, Rehn N, et al. Alcohol as a risk factor for global burden of disease. Eur Addict Res. 2003;9(4):157-64.
6. Peacock A, Leung J, Larney S, Colledge S, Hickman M, Rehm J, et al. Global statistics on alcohol, tobacco and illicit drug use: 2017 status report. Addiction. 2018;113(10):1905-1926.

7. Ballard HS. The hematological complications of alcoholism. Alcohol Health Res World. 19 97;21(1):42-52.
8. Ballard HS. The hematological complications of alcoholism. Alcohol Health Res World. 1997;21(1):42-52.
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. Rubina MP, Basheer RKB, Safeer MTK, Soumya V, Ali MKT, Ramachandran CC. A comparative study on hematological parameters among the social and problem drinkers admitted in a tertiary care rehabilitation centre. Int J Res Med Sci 2019; 7:2981-4.
11. Harold S and ballard MD. Hematological complications of alcoholism. Alcohol Health Res World,1997:21(1);42 52.
12. Latvala J; Effect of alcohol consumption and acetaldehyde on blood cellsand molecules: Pathogenic and diagnostic implications. Tampere University press Universitaties Tamperensis, 2004; 39-52.
13. 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.
14. Chalmers D M, Rinsler M G, MacDermott S, Spicer C , Levi Biochemical AJ and haematological indicators of excessive alcohol consumption. Gut 1981; 22:992-996 doi:10.1136/gut.22.1.
15. Harold S, Ballard MD. Haematological complications of alcoholism. Alcohol Health Res World 1997; 21:42-52.
16. Thinnahanumaih M, Puranik N, Bidare C, Kammar KF, Venkatakrishniah OK, Maitri V. Moderate allcohol intake for even a short duration has deleterious effects on hematologic profile in Indian men. Int J Med Sci Public Health 2012; 1:105-8.
17. 17. Harold S. Ballard MD; Haematological Complications of Alcoholism. Alcohol Health & Research World. 1997; 21(1): 1-52.