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Original Research Article

A clinico laboratorial study of effect of chronic alcoholism on hematological picture and changes in peripheral smear

Kedarisetty Sai Sandeep*, Kankipati Sri Meghana

Department of Internal Medicine, Andhra Medical College, Vizag, Andhra Pradesh, India

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***Correspondence:**
Dr. Kedarisetty Sai Sandeep,
E-mail: sandeepsai121@gmail.com

ABSTRACT

Background: Alcohol consumption is a widespread public health concern, significantly impacting immunological functions, increasing vulnerability to infections, and contributing to hematological disorders. Chronic alcoholics often experience notable changes in their blood profile, necessitating further investigation.
Methods: This observational cross-sectional study was conducted over two months at Andhra Medical College, Vishakhapatnam. A total of 45 male subjects, aged 26 to 76 years, consumed alcohol for more than five years and averaged over ten drinks per week. Exclusion criteria included congenital hematologic disorders and ongoing chemotherapy. Blood parameters were assessed against standard values.
Results: Key findings included decreased red blood cell (RBC) counts in 68.9% of subjects, with macrocytosis observed in 82.2%. Lymphocytopenia occurred in 60%, while thrombocytopenia was found in 35.6%. Neutrophil levels were elevated in 62.2% of the cohort. Notably, a significant decrease in mean corpuscular hemoglobin concentration (MCHC) and an increase in mean corpuscular volume (MCV) were documented, reflecting typical consequences of chronic alcohol exposure.
Conclusions: Chronic alcoholism significantly alters the hematological profile, characterized by decreased RBC counts, thrombocytopenia, increased neutrophils, lymphocytopenia, and macrocytosis. These findings underscore the urgent need for tailored interventions and preventive measures to address hematological impacts among chronic alcohol consumers.

Keywords: Alcohol, Chronic alcoholism, Hematological changes, Immunological dysfunction, Macrocytosis, RBC count

INTRODUCTION

Consumption of alcohol is a major public health hazard with strong associations between immunological dysfunctions, high vulnerability to infectious disease, anemia, and an increase in the risk of hematological malignancies.[1] It affects all organs in the body including the bone marrow, by increasing adiposity in tested rats.[2] The study aims to overview various changes in the hematological picture and peripheral smear of the blood due to alcohol in chronic alcoholics. A few observations include macrocytosis, increased INF-γ NK cells, thrombocytopenia, and increased susceptibility to bacterial infection. So, knowing the changes in a better way will help in providing better treatment and care.[3-5] As we see the usage of alcohol affects our body in many ways it affects the metabolism and therefore affects many organs in our body mainly the liver, spleen, kidney, bone marrow, and neurological system.

Mainly, coming to the hematological changes there are many significant changes observed like increased neutrophils, lymphocytopenia, decreased platelet count, decreased MCHC, and increased MCV, these all changes are due to consumption of alcohol in a large amount for a long time. This makes changes in different organs and

causes significant changes in blood production that result in changes in cell counts and abnormalities. In RBC changes like anisopoiklocytosis and macrocytosis are also seen according to some studies and hemolytic anemia is also seen in studies.

People who abuse alcohol are at risk for numerous alcohol-related medical complications, including those affecting the blood (i.e., the blood cells as well as proteins present in the blood plasma) and the bone marrow, where the blood cells are produced. Alcohol abuse is so common in India like-

According to an Organization for Economic Cooperation and Development (OECD) report released in May 2015, the average Indian consumes about 4.3 liters of alcohol per annum, says the report. The rural average is much higher at about 11.4 liters a year. Alcohol dependence is that severe in India. In this way, alcohol consumption affects a lot of people's health and it even significantly increases the morbidity of the person due to hospitalization in much chronic consumption it also causes mortality of the people who are consuming alcohol, this finally results in a burden on the government due to decrease In the per capita income and GDP, also to treat the patients the government has to spend so much money on them this as a whole has become a very big burden to the government as well. Hospitalization is sometimes due to anemia, hypoxia, and infections these all are due to defects in the production of the blood cells. This study can be useful in knowing the changes in the blood cell count and their relation with diseases like anemia, due to anemia and decreased MCHC the chance of hypoxia is prominent and that can be prevented by knowing the cause of the problem. As risk factor is already present on them, we can do the secondary prevention by supplementing the needed like B_{12}, folic acid to avoid the anemia and control its effects. This topic has been chosen out of curiosity to know if the changes are significant or not as it was studied from the other studies and this may help find the root cause of the changes being happened. And this topic is also not that well explored area in our region and there are very few studies in our region. Chronic alcoholic patients are quite good in number in my place of study, but many of them are associated with some other diseases that affect the blood cell values so they are not included as my samples. So finally 45 subjects satisfied the criteria and they were taken as the samples.

Aims and objectives of the study

To assess the changes in the complete blood picture with comparison to normal reference values. To assess the changes in the peripheral blood smear.

METHODS

Study design

It was an observational and cross-sectional study.

Study setting

Andhra medical college, Vishakhapatnam, Andhra Pradesh was chosen for the study.

Study population

Patients admitted in the medicine ward in KGH hospital, Vishakhapatnam.

Inclusion criteria

All subjects are in the age group >20 year, who have been taking alcohol since past 5 years. More than 10 drinks/week (1 drink =14 grams).

Exclusion criteria

Subjects who are having congenital hematological diseases. Patients undergoing chemotherapy. Patients of age <20. Patients who were not willing to undergo survey.

Study duration

The study took place for a period of 2 months (August 2022 to September 2022)

Sample size

45 persons were included for this study.

Study tools

All the case sheets of the patients were studied and the patients who had the history of alcohol consumption without any diseases that effect the blood cell count were noted. They were taken as subjects.

After taking prior consent from the subjects detailed history from the subjects about alcohol consumption like- since how many years alcohol being consumed, amount of alcohol consumes per day, form of alcohol being consumed are taken to find exact amount of alcohol being consumed and the subjects who fit into my inclusion criteria were listed. The information from their recent hemogram report was taken and all the required blood indices were noted in the Microsoft excel sheet. Information was analysed by comparing the values obtained with the standard values.

According to statements stated by people in the previous studies- significant chronic alcoholics had anemia, decrease in MCHC, decrease in platelet count, increase in MCV value.

Ethical consideration

Prior permission was be taken from institutional ethics committee of Andhra Medical College. Confidentiality of

the data was maintained. Informed consent was be taken from each participant. The study was initiated only after the approval from the committee.

Data collection and statistical analysis

Data was collected by directly interacting with every subject in medicine and required data was collected. This data was entered in the Excel sheet. Statistical analysis was done using SPSS version 26. An independent sample test was done by ranging the values in their reference values, greater than them, less than them.

RESULTS

A total of 45 subjects participated in the study, in all of them belonged to different ages ranging from 26 years least to 76 years highest.

Gender distribution

All the subjects were male subjects only.

Age distribution

Subjects were in the age group from 26 years to 76 years. They are represented in a bar diagram in Figure 1.

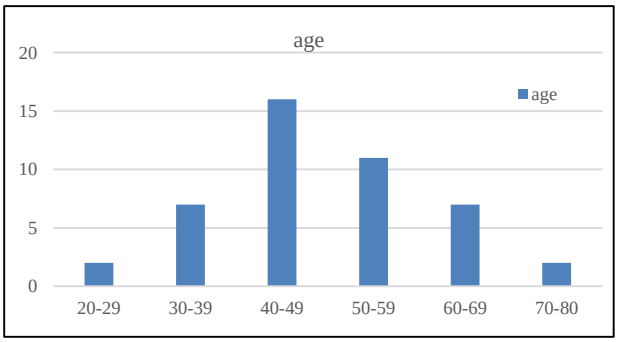

Figure 1: Age distribution.

Many people are in the age group of 40 -49 they are chronic alcoholics.

RBC count values (reference values being 4.7 million to 6.1 million are normal)

RBC count less than 4.69 million =68.9% (i.e. 31 subjects). RBC count between 4.7 to 6.1 million =31.1% (i.e. 14 subjects). RBC count more than 6.11 million =0 (Figure 2).

Neutrophil (N) percentage (reference normal value being 45-70%)

They are: N count less than 44% =0. N count between 45-70% =37.8% (i.e. 17 subjects). N count more than 71% =62.2% (i.e. 28 subjects) (Figure 3).

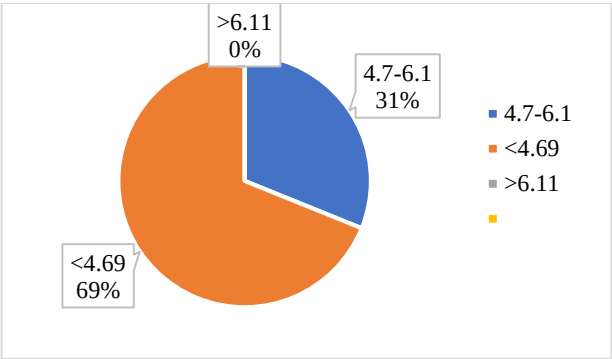

Figure 2: RBC count values.

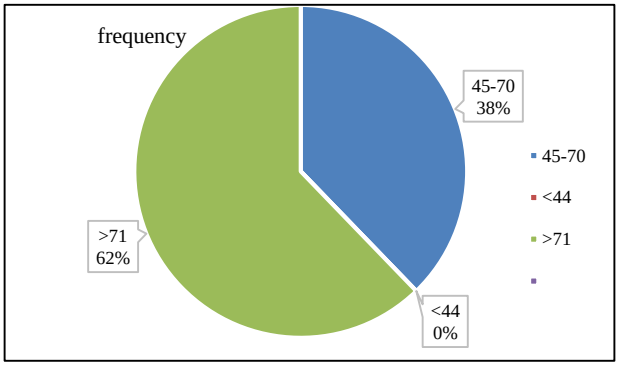

Figure 3: Neutrophil percentage.

Lymphocytes (L) percentage (reference normal values being 20%-44%)

They are: L count less than 19.99 =60% (i.e. 27 subjects). L count between 20-44% =40% (i.e. 18 subjects). L count more than 45 =0 (Figure 4).

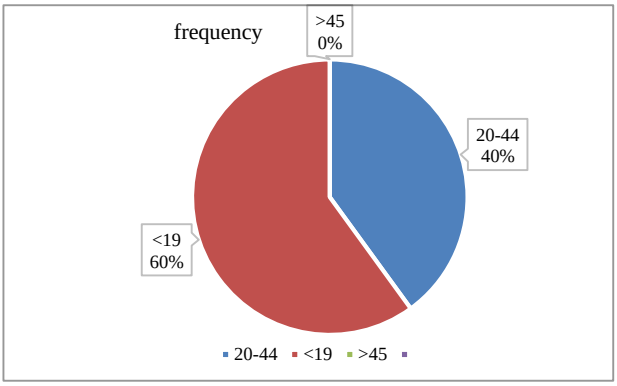

Figure 4: Lymphocytes percentage.

Hemoglobin (HB) (reference values being 14.0 to 17.5 gm/dl)

They are HB less than 13.99 gm/dl =77.8% (i.e. 35 subjects) HB between 14-17.5 gm/dl =20% (i.e. 9 subjects) HB more than 17.51 gm/dl =2.2% (i.e. 1 subject) (Figure 5).

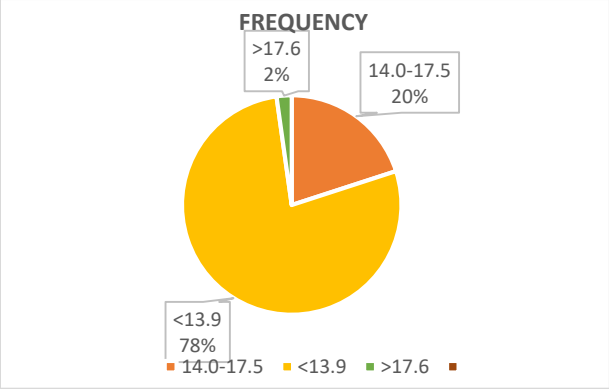

Figure 5: Hemoglobin (HB).

Platelet count (being the reference values 1.5 lakhs -4 lakhs)

They are: platelet count less than 1.499 lakhs =35.6% (16 subjects). Platelets count between 1.5 lakhs to 4 lakhs =64.4% (29 subjects). Platelet count more than 4.01 lakhs =0 (Figure 6).

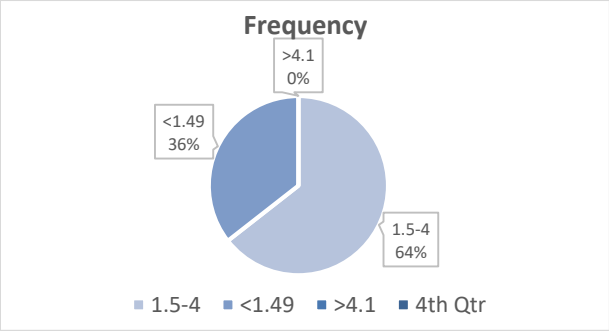

Figure 6: Platelet count.

MCV (reference value being 80-100 fl)

They are: MCV value less than 80fl =8.88% (4 members) MCV value between 80-100 fl =8.88% (4 members) MCV value more than 100 fl =82.22% (37 members). There was an increased mean corpuscular volume of 82.2% (Figure 7).

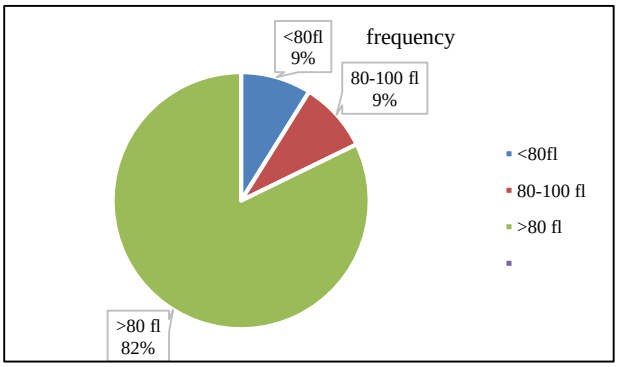

Figure 7: MCV percentage.

DISCUSSION

A total of 45 subjects participated in the study, in which all of them belong to different ages ranging from 26 years being the least to 76 years being the highest. Only the subjects who fit under the inclusion criteria were studied, patients with the diseases that cause change in the blood cell indices were excluded. A hemogram report was taken from the patient and the values were noted and analysed after the analysis, the results were as such there was a decrease in the RBC count significantly i.e. 68.9% of subjects have a decreased RBC count. This may be due to the defect in protein production or bone marrow increased adiposity and we can see a significant rise in the neutrophils by 62.2 percent this indicates ongoing acute inflammation in the body by how ever in a study tells it have no role in causing the acute inflammation, we can see a decrease in the lymphocyte count. i.e. in 60% of people, we can see decreased lymphocytes the same conclusion was with the study done earlier by Ballard, that alcohol also effect the WBC count.[22,23] The impairment of leukotrienes generation in the presence of alcohol might be the cause of the low polymorphonuclear lymphocytes production.[24] In the same way we can also observe a significant decrease in the HB in the subjects i.e. 77.8 members have decreased HB similarly in the study done by Savage et al 62% of the chronic alcoholics are anemic.[24] This is due to the defect in either bone marrow or globin production and we can also see a decrease in platelet count in some individuals i.e. 35.5 percent of subjects, may be due to the defect in the proteins production, destruction, oxidation of the proteins and even effect the clotting system.[25]

In 82% of the subjects macrocytosis is observed similarly megaloblastic marrow change was found in 34% of the sample in study done by Savage et al.[24] This may be due to the B_{12} deficiency caused due to chronic alcoholism, as alcohol consumption causes B_{12} deficiency. As told by Seppä et al, they have done the study on the population with the alcohol consumption, without folate and B_{12} deficiency they have noticed the macrocytosis in the patients.[20] Macrocytosis may be also due the effect of the alcohol exposure due the developmental abnormality of the blood cells due to the chronic alcohol exposure even the B_{12} and folate levels are good in blood.[26,27]

According to the study done by Ballard, alcohol has numerous adverse effects on the various types of blood cells and their functions. For example, heavy alcohol consumption can cause generalized suppression of blood cell production and the production of structurally abnormal blood cell precursors that cannot mature into functional cells. Alcoholics frequently have defective red blood cells that are destroyed prematurely, possibly resulting in anemia. Alcohol also interferes with the production and function of white blood cells, especially those that defend the body against invading bacteria. Consequently, alcoholics frequently suffer from bacterial infections. Finally, alcohol adversely affects the platelets

and other components of the blood-clotting system.[27] So, the change in the study correlates with the changes observed by Ballard.[6,9]

Due to the time constriction sample size is limited to 45 if the time is sufficient then it would've been a large sample size.

CONCLUSION

The effect of chronic alcoholism on the hematological picture was observed and comparing these findings with similar studies conducted in the past the results were similar. Similar findings were decreased RBC, decreased WBC, decreased platelets, increased neutrophils, decreased MCHC, and increased MCV in this way there are many changes in the hematological picture. The changes were RBC decreased in 68.9% of subjects, platelets decreased in 35.6% of subjects, neutrophils increased in 62.2% of subjects, lymphocytes decreased in 60% of subjects, and increased MCV in 82% of subjects. Based on the above findings we can conclude that chronic alcoholism influences the hematological picture.

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Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Kaastrup K, Grønbæk K. The Impact of sedentary lifestyle, high-fat diet, tobacco smoke, and alcohol intake on the hematopoietic stem cell niches. Hemasphere. 2021;5(8):e615.
2. Maddalozzo GF, Turner RT, Edwards CHT, Howe KS, Widrick JJ, Rosen CJ, et al. Alcohol alters whole body composition, inhibits bone formation, and increases bone marrow adiposity in rats. Osteoporos Int. 2009;20:1529-38.
3. Green R, Dwyre DM. Evaluation of Macrocytic Anemias. Semin Hematol. 2015;52(4):279-86.
4. Xu H, Wang H. Immune cells in alcohol-related liver disease. Liver Res. 2022;6(1):1-9.
5. COWAN DH, HINES JD. Thrombocytopenia of severe alcoholism. Ann Intern Med. 1971;74(1):37-43.
6. Ballard HS. Hematological complications of alcoholism. Alcoholism: Clin Exp Res. 1989;13(5):706-20.
7. Torres Duarte AP, Dong QS, Young J, Abi-Younes S, Myers AK. Inhibition of platelet aggregation in whole blood by alcohol. Thromb Res. 1995;78(2):107-15.
8. Homaidan FR, Kricka LJ, Bailey AR, Whitehead TP. Red cell morphology in alcoholics: a new test for alcohol abuse. Blood Cells. 1986;11(3):375-92.
9. Marotta F, Safran P, Tajiri H, Princess G, Anzulovic H, Idéo GM, et al. Improvement of hemorheological abnormalities in alcoholics by an oral antioxidant. Hepatogastroenterology. 2001;48(38):511-7.
10. Tyulina OV, Prokopieva VD, Boldyrev AA, Johnson P. Erythrocyte and plasma protein modification in alcoholism: a possible role of acetaldehyde. Biochim Biophys Acta. 2006;1762(5):558-63.
11. Paraf A, Coste T, Gouffier E. Hematopoiesis disorders in acute alcoholism. Ann Med Intern. 1971;122(6):689-700.
12. Mcfarland W, Libre EP. Abnormal leukocyte response in alcoholism. Ann Intern Med. 1963;59:865-77.
13. Tai HB. Quantitative changes in hematopoiesis in chronic hepatitis, fatty cirrhosis and atrophic liver cirrhosis. Blut. 1964;10:67-81.
14. Coste T, Gouffier E, Paraf A. Study of 27 chronic alcoholic patients hospitalized in a state of intoxication. Sem Hop. 1972;48(37):2427-32.
15. Gervais P, Efthymiou ML, Loygue A, Housset E, Giaccalone. The role of alcoholism and hepatic insufficiency in certain hematologic disorders. Consequences in industrial medicine. Arch Mal Prof. 1972;23(3):118-22.
16. Grattagliano I, Vendemiale G, Didonna D, Errico F, Bolognino A, Pistone A, et al. Oxidative modification of proteins in chronic alcoholics. Boll Soc Ital Biol Sper. 1995;71(7-8):189-95.
17. Homaidan FR, Kricka LJ, Whitehead TP. Morphology of red blood cells in alcoholics. Lancet. 1984;1(8382):913-4.
18. Duarte APT, Dong QS, Young J, Abi-Younes J, Myers AK. Inhibition of platelet aggregation in whole blood by alcohol. Thrombos Res. 1995;78(2):107-15.
19. Seppa L, Heinila K, Sillanaukee P, Saarni M. Evaluation of macrocytosis by general practitioners. J Stud Alcohol. 1996;57(1):97-108.
20. Seppä K, Laippala P, Saarni M. Macrocytosis as a consequence of alcohol abuse among patients in general practice. Alcohol Clin Exp Res. 1991;15(5):871-6.
21. Douglas CC, Twomey JJ. Transient stomatocytosis with hemolysis: A previously unrecognized complication of alcoholism. Ann Intern Med. 1970;72:159-64.
22. Ballard HS. Alcohol, bone marrow, and blood. Alcohol Health Res World. 1993;17(4):310-5.
23. Lindenbaum J, Hargrove RI. Thrombocytopenia in alcoholics. Ann Intern Med. 1968;68:526-32.
24. Savage DS, Lindenbaum J. Anemia in alcoholics. Medicine. 1986;65:322-38.
25. McFarland E, Libre EP. Abnormal leukocyte response in alcoholism. Ann Intern Med. 1963;59:865-77.

26. Baldari S, Manni I, Di Rocco G, Paolini F, Palermo B, Piaggio G, et al. Reduction of cell proliferation by acute C2H6O exposure. Cancers. 2021;13(19):4999.
27. Zuluaga P, Teniente-Serra A, Fuster D, Quirant-Sánchez B, Hernandez-Rubio A, Martínez-Cáceres E, et al. Increased natural killer cells are associated with alcohol liver fibrosis and with T cell and cytotoxic subpopulations change. J Clin Med. 2022;11(2):305.

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