

# Changes of Some Blood Count Variables in Correlation with the Time of Alcohol Abuse

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## Abstract

**Introduction:** The use of alcohol is already a phenomenon of many societies. It is estimated that the total number of the population classified as alcohol consumers in the world goes up to 2 billion, while 76.3 million people develop alcohol use disorder

**Aim:** The aim of this study is to find out the correlation between the time of alcohol abuse and changes of different variables in complete blood count.

**Methods:** This is a retrospective study, which included 328 patients, hospitalized at two centers for treatment of alcohol use disorders at UHC "Mother Teresa".

**Results:** 100 % of the patients of this study were male, due to the fact that AUD is mostly a male problem, but also because of the stigma that exists for women. The mean age of the patients was 42.9 ± 10.8 years old (22-81 years old). The results of the study showed that WBC, RBC, Hgb, HCT had a poor negative correlation, but were significantly important with the time of alcohol consumption (p < 0.01). Meanwhile, MCV, MCH, had a poor positive correlation with the time of alcohol consumption (respectively p = 0.02 and p = 0.03).

**Conclusion:** The time of problematic alcohol consumption is correlated with the changes of some variables of complete blood count.

**Keywords:** Alcohol abuse; Complete blood count (CBC); Time of alcohol abuse

## Introduction

The use of alcoholic beverages dates from the beginning of civilization in ancient Egypt. As far as we know the first alcoholic drink was used at least in 6000 BC and people have been drinking alcohol all over the world ever since [1].

The use of alcohol is already a phenomenon of many societies. It is estimated that the total number of the population classified as alcohol consumers in the world goes up to 2 billion, while 76.3 million people develop alcohol use disorder [2,3]. The effects of alcohol depend on the amount of ethanol consumed per kg body weight. Levels from 0:02 to 0:03 g / dl are achieved after consumption of one or two standard drinks [4]. Complete blood count is one of the most requested blood test from physicians. Alcohol is the most commonly used drug, whose consequences include changes of CBC [5]. Due to the fact, that alcohol use, especially in heavy drinkers, can cause different metabolic derangements, it is necessary, to investigate the changes of complete blood count [5]. Another reason that makes CBC necessary to use, is to reveal several damages that alcohol can cause, for example to reveal liver damage [5]. Alcohol consuming can cause different adverse effects on blood cells, therefore even in their functions. The main causes leading to changes of CBC (complete blood count) are: myelosuppression that is accompanying with slight reduction in all blood cells, blood loss from gastrointestinal tract, malnutrition etc [6].

## Methods

This is a retrospective cohort study with homogeneity, which was conducted during the period of January 2012- January 2013 in two clinics which treat alcohol use disorders: Center of Addictology and Clinical Toxicology and the Center of Alcohol Dependence at UHC "Mother Teresa". The data were collected from clinical records of patients admitted over this period in these clinics (Table 1).

Variables	Measurement techniques	Referent values
WBC	Cell-counter	4.0-10.0x10 <sup>3</sup>
RBC	Cell-counter	4.20-5.80x10 <sup>6</sup>
Hb	Cell-counter	12-16.5g/dl
HCT	Cell-counter	37-50%
MCV	Cell-counter	80-97µm <sup>3</sup>
MCH	Cell-counter	26.5-33.5pg
MCHC	Cell-counter	31.5-35.0g/dl
RDW	Cell-counter	10-15.0%
PLT	Cell-counter	150-400x10 <sup>3</sup>

Table 1: Variables of CBC.

The study included 328 patients admitted to these clinics with the diagnosis "alcohol withdrawal syndrome". Patients included in the study were > 22 years old and underwent treatment in these services for more than 24 hours. The category of patients excluded from the study were < 22 years old, hospitalized for less than 24 hours or the patients diagnosed with "alcoholic coma" who were initially hospitalized in the Intensive Care Service.

This study included several data:

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Variable	N	N*	Mean	SE Mean	St Dev	Minimum	Q1	Median	Q3	Maximum
WBC	327	1	7717	147	2658	1400	5900	7300	9100	21100
RBC	328	0	4.4719	0.0368	0.6661	2.5	4.0225	4.47	4.91	7
Hb	328	0	13.782	0.1	1.814	6.2	12.7	13.85	15	18
HCT	328	0	41.384	0.32	5.795	14.3	38.45	41.7	45.575	53.7
MCV	328	0	94.954	0.452	8.178	59	90	95	100.2	114
MCH	328	0	31.227	0.172	3.108	18.1	29.625	31.4	33.4	37.5
MCHC	328	0	33.265	0.129	2.337	22.3	32.3	33.4	34.4	43
RDW	327	1	14.161	0.0919	1.662	3.3	13.3	14	14.8	20.1

Table 2: Descriptive data of these variables.

**General data:**

- age (age of the patient at admission) (Figure 1)
- time of alcohol consumption (defined in years by reference to the patient himself or family)
- employment status (current situation at the time of admission, the patient’s employment status, divided in: employed, unemployed, students, the disabled and pensioners) (Figure 2)

**Specific data obtained in the study included:**

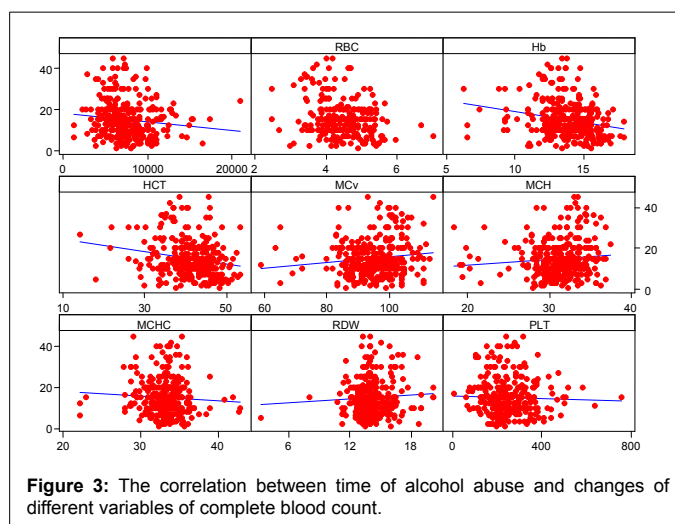
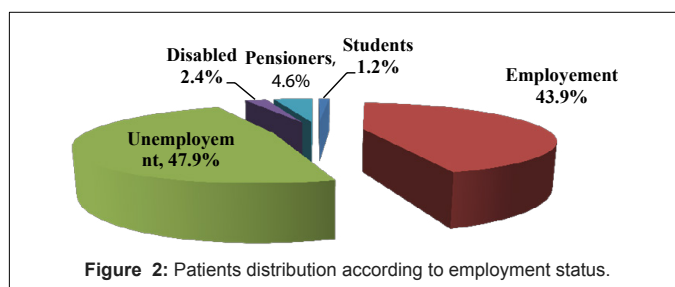
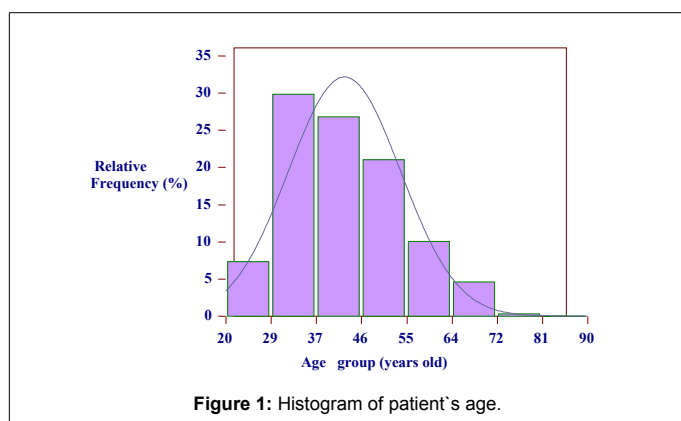
- WBC-number of leucocytes
- RBC-number of erythrocytes
- Hb - hemoglobin
- HCT-hematocrit
- MCV -mean corpuscular volume
- MCH- mean cell hemoglobin-average amount of Hb in the cell
- MCHC - mean corpuscular hemoglobin-concentration
- RDW-red blood cell distribution width
- PLT-number of thrombocytes

All the tests were carried out at the Laboratory Service of University Hospital Center “Mother Teresa”, as well as at the private Laboratory “Elite” (Figure 3).

**Results**

This study included 328 patients, whose mean age was 42.9 ± 10.8 years old. The youngest was 22 years old and the oldest was 81, median results 42. The data’s are shown in (Table 1).

**The age of the patients**



Size of a sample	N=328
Youngest	22.0
Oldest	81.0
Average	42.9
95% CI for the average	41.7-44.1
Median	42
95% CI for median	40.0-44.0
Variance	117.7
Standard deviation	10.8

Table 3: Statistical summary of the patients.

Size of sample	N=328
The smallest period of time	1.0
The longest period of time	45.0
Average	14.9
95% CI for average	13.9-15.9
Median	13.0
95% for median	12.0-15.0
Variance	76.6
Standard deviation	8.7

Table 4: Statistical summary of time abusing with alcohol.

As it is shown in Graphic 1 age is presented in the category of 10 years. A total of 39 patients or 11.9 % of the cases were ≤ 30 years old, a total of 110 cases or 33.5 % of them were 31-40 years old, 93 cases or 28.4 % of them were 41-50 years old, a total of 64 cases or 19.5 % of them were 51 -60 years old, 22 patients or 6.7 % of them were ≥61 years old. The results show predominance of the cases in age groups 31-40 years and 41-50 years old, with a statistically significant difference with other age groups ( $\chi^2$  Goodness of fit = 81.2  $p < 0:01$ ).

Age is not subject of normal distribution  $KS=0.009$

**Employment status of these patients:** As of the employment status shown here, a considerable number of patients in the study were unemployed -157 patients or 47.9 %, 144 or 43.9 % were employed , 15 or 4.6 % of the cases were pensioners, 8 or 2.4 % of cases were disabled and 4 or 1.2 % of the cases were students. The difference is statistically significant ( $\chi^2$  Goodness of fit = 368  $p < 0:01$ ) (Graph 2).

**Time of alcohol abuse:** The average time of alcohol abuse was  $14.9 \pm 8.7$  years. The shorter time was 1 year and the longest was 45 years. Median was 13 years (Table 3).

As we can see from the Graph 3 the obvious results are as follows:

- There is a weak negative correlation, which is statistically significant between WBC and the time of alcohol consumption. As the time of alcohol consumption increases WBC are lowered. (Rho = -0.17,95% CI = -0.2-0.06,  $p < 0:01$ )
- There is a weak negative correlation, which is statistically significant between RBC and the time of alcohol consumption. As the time of alcohol consumption increases RBC are lowered. (Rho = -0.24,95% CI = -0.34-0.13,  $p < 0:01$ )
- There is a weak negative correlation, which is statistically significant between Hgb and the time of alcohol consumption. As the time of alcohol consumption increases Hgb is lowered. (Rho = -0.21,95% CI = -0.31-0.10,  $p < 0:01$ )
- There is a weak negative correlation, which is statistically significant between HCT and the time of alcohol consumption. As the time of alcohol consumption increases HCT is lowered. (Rho = -0.20,95% CI = -0.30-0.09,  $p < 0:01$ )
- There is a weak positive correlation, which is statistically significant between MCV, MCH and the time of alcohol consumption. As the time of alcohol consumption increases the level of MCV and MCH increases (Rho = 0.12,95% CI = 0:01 to 0:23,  $p = 0:02$ ; Rho = 0.11,95% CI = 0.007-0.2,  $p = 0:03$ )
- There is a weak negative correlation, which is statistically insignificant between MCHC, RDW and PLT and the time of alcohol consumption (respectively Rho = -0.05,95% CI = -0.15-

0.05,  $p = 0.4$ ; Rho = 0.008,95% CI = -0.10-0.11,  $p = 0.88$ ; Rho = -0.02,95% CI = -0.13-0.08,  $p = 0.6$ ).

## Discussions

Alcohol abuse is a common phenomenon in Albania, especially among men. Till the '00, alcohol abuse among female was very uncommon, but nowadays it is becoming a problem even for female, especially young.

In Albania it was never performed such a study, so till now we didn't know how alcohol abuse affected blood cells in alcohol abusers.

Since, complete blood count is readily available laboratory test, and alcohol affects blood cells, it is very helpful to use this test to better determine and to evaluate problems caused from alcohol abuse. Another reason, why is very useful to use this test to determine problems that comes from alcohol abuse, is the fact that here in Albania we do not have the equipment and techniques to evaluate modern biomarkes of chronic alcohol abuse like EtG, CDT, EtS,FAEE, acetaldehyd,salsolinol etc, we should use every "small" trace to detect in time the problems that comes from alcohol.

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(respectively): MCV and MCH are correlated positively with the time of alcohol misuse, whereas WBC, RBC, Hgb, HCT are correlated negatively. Different authors have carried out studies based on changes of these variables, as well as their correlation with the time of problematic alcohol use. In this study, we find out that RBC has negativ significant correlation with the time of alcohol abuse .

Changes of RBC from chronic and heavy drinking have been studied in many respects, not only regarding to changes of the size of RBC(macrocytosis), but even the presence of defectuose RBC in the blood and their production from the bone marrow [5]. As a result of these changes, anemia is a common finding in alcoholics [5].

Anemia was found in approximately 50% of the alcohol abusers in a study performed in Finland [7]. The same study revealed that elevated MCV and MCH was a common finding among alcohol abusers both in absence, or in presence of anemia [7]. Consuming of beer, which contains folate, reduces the risk of anemia, but consuming the alcoholic beverages that lack folate, increasis the risk [8]. In this study, there is weak negativ, but insignificant correlation between the duration of alcohol abuse and red cell distribution width(RDW), (Figure 3) but increased RDW and other dismorphisms are common findings after long time of alcohol abuse and can be used as a marker of alcohol misuese [9].

As the time of alcohol consumption increases, so the amount of

Author, Year published:	Mancinelli et al. 2009 (14)	HAROLD S. BALLARD, 1997 (15)	Das et al. 2011 (16)	Akira Yokoyama et al. 2014 (17)	Latvala et al. 2004 (18)	This study
Studied parameters:						
WBC	n/d	↓	↓	n/d	↓	↓
RBC	n/d	↓	↓	↓	↓	↓
Hb	n/d	↓	↓	↓	↓	↓
Hct	n/d	↓	↓	↓	n/d	↓
PLT	n/d	↓	↓	n/d	↓	↓
MCV	↑	↑	↑	↑	↑	↑
MCH	n/d	n/d	↑	n/d	n/d	↑
RDW	↑	n/d	n/d	n/d	n/d	↑

Table 5: Studies of some authors concerning changes of variables of complete blood count and time of alcohol consumption.

alcohol that a person consumes is increased, WBC is decreased, and this correlation is significant ( $p,0.01$ ). This means that alcohol abusers are at high risk to develop various diseases, including infections, [10] or cancer [11-14]. Even though the exact mechanism how alcohol is related to cancer it is not yet well established [11-14]. In this study it was not observed any statistically significant relation between time of alcohol consumption, although they have negative correlation. The reduction of PLT, or exactly the negative correlation between platelet count and duration of alcoholism it was observed too in a prospective case-control study performed in Kebbi State in Nigeria [15].

In another case-control study performed too in Nigeria, which included one hundred and twenty adults ( $\geq 18$  years old), they are observed many haematological complication from the duration of alcohol abuse. They observed significant reduction of WBC, RBC, haemoglobin, haematocrit and platelet count, while MCV values are significantly elevated [6,16].

In a study performed in India, it was found out a significant reduction of haemoglobin, RBC, WBC, haematocrit and PLT, while MCV and MCH were significantly elevated [17]. Anemia, leucopenia and thrombocytopenia are common abnormalities that are associated with alcohol abuse with respect to time of alcohol abuse and the quantity of alcohol consumed. [6,7,15-17] These findings suggest that alcohol abuse can cause bone marrow suppression, or ethanol has cytotoxic effects. Liver damage secondary to alcohol abuse also impacts red blood cells and the haemostatic mechanisms [18]. Some of other studies that deal with haematological changes from alcohol abuse are shown in the table 5.

## Conclusions

The time of problematic alcohol use affects changes in some variables of complete blood count, thus leading to problems that may follow these changes [19-21]. Since here in Albania, we lack the modern techniques to detect biomarkers of alcohol abuse, which are more sensitive and specific, it is necessary for us to focus even on these changes to detect in time problems caused from alcohol abuse. In this study hundred percent of the patient are male, mostly due to stigma that exist for female to present for medical help for such problems, but even for the fact that alcohol is become a female problem recently [22-25]. So, we didn't have the chance to study the differences that may be seen between male and female, which remains to be studied later.

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