

Effect of cannabis smoking on some hematological parameters among smokers in Khartoum city

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Abstract :

Background: Cannabis extract (Bango) is the most contentious use of the cannabis sativa plant because of its psychoactive properties, namely delta-9-tetrahydrocannabinol (THC).

Aim : The current study focuses on whether cannabis abuse leads to alterations in hematological parameters.

Material and methods : This study includes 48 cannabis smokers and a control group of 47 apparently healthy individuals matched for age and sex. This is an analytical case-control study. The data were collected using a questionnaire and laboratory measurements. The study was conducted in Khartoum State during 2019. Venous blood of 2.5 mL was collected in K3EDTA containers, and C8BC parameter was determined using an automated hematological analyzer [Sysmex KX-21]. The data was analyzed by SPSS version 16.

Results : This study conducted a complete blood count (CBC) analysis on blood samples to investigate the effects of cannabis use. Hemoglobin concentrations and platelet counts showed no statistically significant differences between the cannabis and control groups in smokers. However, the absolute neutrophil count was significantly lower in the cannabis group compared to the control group. Other parameters, including WBCs, RBCs, HCT, and RDW-SD, also showed no significant differences. Subgroup comparisons between pure and mixed cannabis users, as well as between drug and non-drug, revealed no significant differences in hemoglobin, TWBCs, and platelets, though significant differences were noted in absolute lymphocyte count and PDW. Comparisons between alcoholic and non-alcoholic groups showed no significant differences across all measured parameters.

Conclusion : The results indicate that cannabis smoking has no direct effect on most hematological parameters. Furthermore, we observed no significant differences between pure cannabis users and those who smoke mixed cannabis. However, there were significant differences between drug and non-drug in absolute lymphocyte count and PDW. The alcoholic and non-alcoholic groups showed no significant differences.

Keywords: *Cannabis Sativa*, Complete Blood Cell Count (CBC)

تأثير تدخين الحشيش على بعض مؤشرات الدم لدى المدخنين بمدينة الخرطوم

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مستخلص

الخلفية: يعتبر مستخلص القنب (بانجو) هو الاستخدام الأكثر إثارة للجدل لنبات القنب بسبب خصائصه ذات التأثير النفسي، وهي دلتا-9-رباعي هيدروكانابينول (THC).

الهدف: تركز الدراسة الحالية على ما إذا كان تعاطي القنب يؤدي إلى تغييرات في معايير الدم.

المواد وطرق العمل: تشمل هذه الدراسة 48 مدخناً للقنب ومجموعة مراقبة مكونة من 47 شخصاً يتمتعون بصحة جيدة ومتطابقين من حيث العمر والجنس. هذه هي دراسة مراقبة الحالة التحليلية. تم جمع البيانات باستخدام الاستبيان والقياسات المختبرية. أجريت الدراسة في ولاية الخرطوم خلال عام 2019. تم جمع 2.5 مل من الدم الوريدي في أوعية K3EDTA، وتم تحديد معامل C8BC باستخدام محلل الدم الآلي [Sysmex KX-21]. وتم تحليل البيانات بواسطة برنامج SPSS الإصدار 16.

النتائج: أجريت هذه الدراسة تحليل تعداد الدم الكامل (CBC) على عينات الدم للتحقيق في آثار تعاطي القنب. لم تظهر تركيزات الهيموجلوبين وعدد الصفائح الدموية أي فروق ذات دلالة إحصائية بين مجموعة القنب ومجاميع التحكم لدى المدخنين. ومع ذلك، كان عدد كريات الدم البيضاء المطلق أقل بكثير في مجموعة القنب مقارنة بالمجموعة الضابطة. كما أظهرت المعلمات الأخرى، بما في ذلك كرات الدم البيضاء، وكرات الدم الحمراء، و HCT، و RDW-SD، عدم وجود فروق ذات دلالة إحصائية. كشفت مقارنات المجموعات الفرعية بين مستخدمي القنب النقي والمختلط، وكذلك بين المخدرات وغير المخدرات، عن عدم وجود فروق ذات دلالة إحصائية في الهيموغلوبين، و TWBCs، والصفائح الدموية، على الرغم من ملاحظة اختلافات كبيرة في عدد الخلايا الليمفاوية المطلقة و PDW. أظهرت المقارنات بين المجموعات الكحولية وغير الكحولية عدم وجود فروق ذات دلالة إحصائية في جميع المقاييس.

الاستنتاج: تشير النتائج إلى أن تدخين الحشيش ليس له تأثير مباشر على معظم مؤشرات الدم. علاوة على ذلك، لم نلاحظ وجود فروق ذات دلالة إحصائية بين مستخدمي القنب النقي وأولئك الذين يدخنون القنب المختلط. ومع ذلك، كانت هناك اختلافات كبيرة بين المخدرات وغير المخدرات في عدد الخلايا الليمفاوية المطلقة و PDW. لم تظهر المجموعات الكحولية وغير الكحولية أي فروق ذات دلالة إحصائية.

الكلمات المفتاحية: *Cannabis Sativa*، العد الكامل لخلايا الدم (CBC).

Introduction

The hemp plant (*Cannabis sativa*) has been very popular all over the world. According to Ebuechi [1]. Between 1998 and 2011, an average of 7% of all cases reported were due to cannabinoid abuse, which equaled 110 deaths per year, and that percentage increased to 18% in 2020 [2]. Cannabis is a green or grey mixture of dried shredded flowers and leaves of the hemp plant. The female plant's resin-covered blossom top and the leaves that surround it are thought to contain the largest concentration of cannabinoids, which are still the most common component of cannabis and contain the active ingredient (THC), delta-9-tetrahydrocannabinol [3, 4]. However it is commonly abused and widely trafficked as illicit drugs in the world for its psychoactive substance (cannabinoid), a chemical Delta-9-tetrahydrocannabinol (THC) [1]. Cannabis smoke contains various Chemicals ,including THC ,carbon monoxide and carcinogens (substances that cause cancer) [5]. In the last few years in Khartoum State, using cannabis (Banko) is become very wide, especially among youth [5]. Many studies globally and regionally mentioned

that cannabis has direct effect to smoker health, whether is physically or psychologically [5]. High doses of cannabis can cause paranoid ideation, visual and auditory hallucinations, and possibly even cardiovascular effects such as arrhythmias, elevated heart rate, and blood pressure. Cannabis intoxication is dose-dependent and can impair memory, attention, and psychomotor performance when taken at low doses [6]. Thus, this study aimed to detect the effects of cannabis smoking on hematological parameters under different variables such as duration of smoking, daily doses, and association with other types of addictions.

Material and methods

We conducted an analytical case-control study in the year 2019. We recruited 48 cannabis smokers from Alshikh Hospital in Khartoum, Khartoum State, and included 47 apparently healthy individuals matching for age between 20 and 25 years old and sex (male) as a control group. We obtained the participants' consent to use the information solely for scientific purposes. We collected 2.5 ml of EDTA-anti-coagulated venous blood samples from each participant using the sterile venipuncture technique, followed by

an automatic complete blood cell count using Sysmex KX-21, an automated 3-part differential hematology analyzer (Sysmex Corporation Kobe, Japan), the tests were done as per the manufacturers' instructions [7]. We collected the primary data from two categories-48 cases and 47 controls—through telephone interviews using a closed-ended questionnaire, and we gathered all the data for this study from books, journals, preview studies, and the internet. We analyzed the study using the statistical package for social sciences (SPSS) version 16. We represented the qualitative data as a percentage. The presentation of quantitative data took the form of mean and SD, depending on the P value.

Result

The case and control study aimed to estimate the effect of cannabis on blood cells count. case group 48 control group 47. The distribution of the cannabis according to the age 23 with (47.9%) were less than 20 years old, 22 with (46.8%) were between 20 – 25 years old, while as 3 (6.2%) were more than 25 years up to 35 . all of them were males. Education qualification 11(23%) were university grad-

uates , 26 (54.16%) had secondary school education , 10 (20.8%) primary school education while 1 (2.0%) was illiterate .The frequency of smoking cannabis per day 4 (8.3%) were smoking 1 cigarettes /day, up to maximum 26 (54.16%) smoking 3 cigarettes / day. Again 3 (6.2%) were smoking 2 times / day, while fewer13 (27%) of them were taking 4 to 5 times per/ day. 2 (4.1%) were smoking 6 per/day. The distribution of other substances addicted to cannabis is shown in Table (1).

Table 1. The distribution of other substances among cannabis addicts

Substances	%
Pure 15	31.25
Mixed 33	68.7
Tabaco snuffing 41	85.4
No Tabaco snuffing 7	14.5
Cigarettes smoker 44	91.7
No cigarettes smoker 4	8.3
Drinking alcohol 25	52
No drinking alcohol 23	48
Using medical drug for disease10	20.8
No medical drug 38	79.1

The study population's CBC results

Hemoglobin concentration were no statistically significant difference in cannabis compared with control group, control (14.93 ± 1.29) case (14.97 ± 1.26)

respectively with P value (0.774). A normal platelet count in smokers was not statistically significant difference in cannabis group compared with control group, control (269.29 ± 64.15) case (256.56 ± 67.78) respectively with P value (0.95). Absolut neutrophil was a normal count was significant difference in cannabis compared with control group, control (3.51 ± 1.74) ,case (2.78 ± 1.23) respectively with P value (0.01). WBCs, RBCs ,HCT and RDW-SD values were no statistically significant compared with control group. When we compare between subgroup of the case pure and mixed group we found that was no significant differences in all parameter of Hb , TWBCs and Platelets with P value (0.838) (0.136) (0.914) respectively. we compare between Drug and non Drug we found that there was no significant difference in some parameter of Hb, TWBCs and Platelets with P value (0.457) (0.763) (0.838) respectively. With significant difference in Absolute Lymphocyte P value (0.023). and PDW P value (0.021) less than P value (0.05). we compare between Alcoholic and non Alcoholic we found that was no significant differences in all parameter of Hb , TWBCs and Platelets with P value

(0.956) (0.775) (0.886) respectively.

From the probability Value of independents samples test it higher than significance level (0.05). CBC was carried out on all the collected EDTA blood samples and the obtained results were compared with those of the control (Table 2,3,4 and 5).

The study population's CBC results between variables (control and case)

The findings show a not-significant relationship between variables (control and case), and the probability value of the Independent Samples Test is higher than the significance level (0.05) (Table 2).

Table 2. The mean, standard deviation, and P-value of the study population's CBC results compared to those of the control group

	Control n = 47		Case n = 48		
	Mean	Std. Deviation	Mean	Std. Deviation	p. value
Hb	14.932	1.2977	14.975	1.2610	774 0.
Hct%	44.119	3.3438	43.973	3.1067	0.586
RBCs	5.091	4010.	4.954	3626.	590.0
MCV	84.321	11.7845	88.044	3.5314	2930.
MCH	29.236	1.7343	30.015	1.7343	7570.
MCHC	34.094	1.5664	34.125	1.5269	8690.
RDW	42.962	2.8011	52.490	54.9738	0.087
TWBCs	6.926	2.1314	6.340	2.1023	0.589
Absolute Lymphocyte	2.438	6936.	2.658	7710.	0.913
Absolute Neutrophil	3.511	1.7484	2.781	1.2328	0.017
Mixed	736.	3179.	669.	3915.	0.266
Platelets	269.298	64.1547	256.563	67.7881	0.954
PDW	12.691	2.1053	13.385	2.1593	6780.

The study population's CBC results between variables (pure and mixed)

We found that the variables (pure, mixed) do not have a significant relationship with each other. The probability value of the Independent Samples Test is higher than the significance level (0.05) (Table 3).

Table 3. The mean, standard deviation, and P-value of the CBC results for those smoking pure cannabis compared to those who smoke mixed cannabis

	Pure n = 15		Mixed n = 33		
	Mean	Std. Deviation	Mean	Std. Deviation	p. value
Hb	14.547	1.3346	15.170	1.1962	0.838
Hct	43.980	2.9615	43.970	3.2153	0.839
RBCs	4.947	.3441	4.958	.3759	0.559
MCV	88.153	3.9507	87.994	3.3881	0.120
MCH	29.180	1.1942	30.394	1.8217	0.218
MCHC	33.233	1.4936	34.530	1.3806	0.462
RDW	44.473	2.4847	56.133	6.2739	0.218
TWBCs	7.267	2.6811	5.918	1.6614	0.136
Absolute Lymphocyte	2.767	.7566	2.609	.7840	0.963
Absolute Neutrophil	3.213	1.2357	2.585	1.987	0.783
Mixed	.413	.2875	.785	.3831	0.372
Platelets	250.333	74.7889	259.394	65.3887	0.914
PDW	14.880	1.8888	12.706	1.9402	0.650

The study population's CBC results between variables (drug and no-drug)

We found that the variables (drug, no-drug) do not have a significant rela-

tionship with each other. The probability value of the Independent Samples Test is higher than the significance level (0.05) (Table 4).

Table 4. The mean, standard deviation, and P-value of the CBC results of those drug and non-drug

	Drug n = 10		Non drug n = 38		
	Mean	Std. Deviation	Mean	Std. Deviation	p. value
Hb	15.570	1.0012	14.819	1.2693	0.457
%Hct	44.600	2.9458	43.797	3.2200	0.591
RBCs	5.000	.3399	4.935	.3788	0.563
MCV	88.490	3.1572	88.003	3.6932	0.495
MCH	30.910	1.6855	29.835	1.8236	0.770
MCHC	34.920	1.2200	33.884	1.5143	0.435
RDW	44.690	2.3388	44.546	2.7209	0.174
TWBCs	6.430	1.8068	6.359	2.2061	0.763
Absolute Lymphocyte	2.600	.3018	2.562	.5866	0.023
Absolute Neutrophil	2.670	1.1509	2.862	1.3344	0.324
Mixed	.860	.4526	.956	.3651	0.466
Platelets	266.600	85.8981	255.486	63.4322	0.838
PDW	12.130	1.2979	13.735	2.2530	0.021

The study population's CBC results between variables (alcoholic and non-alcoholic)

The findings show a not-significant relationship between variables (alco-

holic, non-alcoholic), and the probability value of the Independent Samples Test is higher than the significance level (0.05) (Table 5).

Table 5. The mean, standard deviation, and P-value of the CBC results of alcoholic and non-alcoholic cannabis smokers

	Alcoholic n = 23		non-alcoholic n = 25		
	Mean	Std. Deviation	Mean	Std. Deviation	p. value
Hb	15.487	1.2952	15.460	1.2734	.0956
Hct	44.865	3.3681	44.784	3.3073	.0975
RBCs	5.078	.4285	5.056	.4174	0.929
MCV	87.643	3.1772	87.816	3.4074	.0712
MCH	30.257	1.4832	30.3016	1.5467	0.815
MCHC	34.548	1.1369	34.544	1.0920	0.843
RDW	43.878	2.4132	44.228	2.6084	0.536
TWBCs	6.430	1.7821	6.528	1.8669	0.775
Absolute Lymphocyte	2.665	.6541	2.664	.6277	.0806
Absolute Neutrophil	3.126	1.4508	3.05	1.4160	.0852
Mixed	.774	.2472	.812	.3140	0.508
Platelets	254.130	68.9284	248.280	73.7578	0.886
PDW	13.357	2.0939	13.168	2.1209	0.926

Discussion

The current study shows normal in value of hemoglobin concentration and hematocrits in cannabis, which reached 15.570 with P value (0.٤٥٧) and 44.600% with P value (0.٥٩١) respectively. Previous studies revealed that smoking had no impact on the quantity of erythrocytes but considerably raised hemoglobin levels and hematocrit when compared to nonsmokers. It was concluded that increased hemoglobin and red cell mass indicate adaptation to carbon monoxide inhaled from cigarette smoke [8]. According

to [9], smoking cigarettes, as opposed to pipes led to increases the levels of hemoglobin (Hb) in female smokers and the packed cell volume (PCV) in male smokers. HCT value was not influenced significantly by cannabis addiction [10]. Cannabis abusers had a substantially higher hemoglobin concentration (14.0 ± 2.8) than the control group (12.6 ± 2.6) (P value < 0.04), and the group that abused cannabis had a substantially lower number of neutrophils than the control group (35.09 ± 9.3 vs. 40.3 ± 12.6), with a P value of 0.02. Addiction to cannabis did not signifi-

cantly affect WBCs, RBCs, HCT, or RDW-SD values. Cannabis increases the amount of carboxy-hemoglobin, which raises the oxygen demand in the heart and decreases the oxygen supply while also inducing platelets [7]. Some previous study have reported effects on the blood including increases in hemoglobin concentration, packed cell volume and red blood cell counts, and these have been attributed to chronic exposure to smoke and carbon monoxide similar to that tobacco smokers, Gabbay, et al., [11], but some studies record no significant effect for cannabis on hemoglobin concentration in marijuana smokers, Oseni, et al., [10]. On other hand, Karimi, et al., [12], reported that chronic consumption of cannabis lead to increase hemoglobin concentration of cannabis abusers in khashmiri youth. When we compare mean of hemoglobin between case (cannabis) and control group, we found that was no significant difference, (14.93 ± 1.2) case (14.97 ± 1.2) respectively with P value (0.774). This disagree with study of, Oseni, *et al.*, [10], effects of marijuana smoke on some hematological parameters of smokers. red blood cell count obtained in this study in significantly in case group compare with control group,

and this line disagree with study by ,El-shahat, [13], who obtained a higher red blood cell count in the test group.

The total white cell count obtained in this study was marginally normal. Control (6.926 ± 2.1) , case (6.340 ± 2.1) respectively with P value (0.589). but not statistically significant. The variations observed were all in line with the reports of Klein, et al., Oseni, et al., El-shahat [14,10,13]. Absolut neutrophil a normal count was significant difference in cannabis compared with control group, control (3.51 ± 1.74) case (2.78 ± 1.23) respectively with P value (0.01).

This disagree with previous studies by Murikinati, et al ., [15]. There was reduction of the number of the neutrophils. and agree with studies by El-shahat, et al., [13], that cannabis smoking results in a normal neutrophil count. Also the findings of this study which showed a normal platelet count in smokers was not statistically significant difference with P value(0.95), in line with the study result of Erikssen , et al., [16]. When we compare between subgroup of the case pure and mixed group we found that was no significant differences in all parameter of Hb, TWBCs and Platelets with P value (0.838) (0.136) (0.914) respectively.

we compare between Drug and non Drug we found that there was no significant difference in some parameter of Hb, TWBCs and Platelets with P value (0.457) (0.763) (0.838) respectively. With significant difference in Absolute Lymphocyte P value (0.023). and PDW P value (0.021) less than P value (0.05).we compare between Alcoholic and non- Alcoholic we found that was no significant differences in all parameter of Hb, TWBCs and Platelets with P value (0.956) (0.775) (0.886) respectively. From the probability Value of independents samples test it higher than significance level (0.05).

Conclusion

The current study's findings demonstrated that smoking cannabis had no direct impact on a number of hematological parameters, with the cannabis group's platelet, neutrophil, and hemoglobin counts being normal when compared to the control group. discovered that there was no statistically significant difference between the case group's hematological parameters and those of the control group. Absolute lymphocyte and PDW showed a significant difference between the drug and non-drug groups, with p values of 0.023 and 0.021, respectively.

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