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Effect of Smoking Dry Cigarettes, Electronic Cigarettes, and Hookah on Vitamin D3 Levels and Blood Parameter in Samples of Youth from AL-Hawija City, Kirkuk governorate

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Abstract:- The study aimed to demonstrate the role of smoking on vitamin D3 levels and blood parameters represented by a group of young men who smoke cigarettes, electronic cigarettes and hookah in the city of Hawija, Kirkuk Governorate. The experiment was distributed into four groups, aged between 25 and 30 years, with 25 samples for each group. The first group was non-smokers, the second group was cigarette smokers, the third group was electronic cigarette smokers and the fourth group was hookah smokers. Blood samples were taken in the Hawija laboratories, where the results of the study showedThe results of the study showed a significant decrease (P≤0.05) in vitamin D3 levels in the dry cigarettes, electronic cigarettes and hookah groups compared to the control group, while the packed cell volume (PCV), red blood cells (RBC) and hemoglobin (Hb) tests showed a significant increase (P≤0.05) in the dry cigarettes, electronic cigarettes and hookah groups compared to the control group, while the platelets and white blood cells (WBC) tests showed a significant increase (P≤0.05) in the dry cigarettes and electronic cigarettes groups compared to the non-smoking control group, while the values of platelets and white blood cells (WBC) did not show any statistically significant differences in the hookah smokers group.

Keywords:- *Blood Parameters ,Vitamin D; Smoking, Cigarettes; Hookah ,Electrical Cigarettes.*

I. INTRODUCTION

Vitamin D deficiency is a high priority public health problem worldwide and affects people of all ages, Vitamin D deficiency (deficiency and insufficiency) was a problem even in sunny countries including Iraq, This problem was particularly high in the Middle East, among females and males in all age groups such as children, youth and the elderly [1], [2]. Vitamin D plays a critical role in maintaining optimal serum calcium and phosphate levels, which are essential for proper bone mineralization, prevention of hypocalcemia, and facilitation of nutrient absorption in the gastrointestinal tract. Inadequate vitamin D intake can lead to osteoporosis, brittleness, and deformities, as it is essential for bone growth and repair by osteocytes and osteoclasts. Adequate vitamin D intake prevents osteomalacia in adults, rickets in children, and helps prevent osteoporosis in the elderly [3]. A recent clinical study found a positive association between vitamin D and lung spirometry parameters in asthma patients. Asthmatic patients with deficient 25(OH)Vit.D levels had a 9.3–19.9% higher odds of current wheezing compared to those in the insufficient or optimal categories. However, the association between 25(OH)Vit.D and hospitalization for asthma was not statistically significant [4]. Despite the limitations of cross-sectional studies, it is plausible that vitamin D may be causally related to lung function.

Genetic studies have shown associations between polymorphisms in the vitamin D binding protein, lung function, and the diagnosis of chronic obstructive pulmonary disease (COPD) [5].. In addition to bronchiectasis [6]and lung function decline [7].suggesting that the vitamin D pathway is involved in lung function. In smoking-related lung disease, lung damage is mediated in part by inflammation [8], oxidative stress and increased proteases [9], [10]. Many of these processes are modulated by vitamin D [11] . Furthermore, laboratory studies and animal models suggest that cigarette smoke may interfere with the topical anti-inflammatory effects of vitamin D [12]. However, a recent longitudinal study in subjects with COPD showed no association between baseline vitamin D levels and rate of lung function decline over time [13]Smoking is known to be an important risk factor for cardiovascular and cerebrovascular diseases. Some studies have shown that smoking not only has significant harm to cardiovascular and cerebrovascular health, but is also a major cause of chronic obstructive pulmonary disease (COPD). Smoking is associated with accelerated deterioration of lung function, increased mortality, and worsening of symptoms in asthma and COPD [14]. There are also meta-analyses showing that smokers have an increased risk of fracture Several studies have shown an effect of smoking on 25-hydroxyvitamin D, although one considered it to be statistically insignificant on circulating vitamin D levels [15]. However, there is increasing evidence of negative effects of smoking on 25-hydroxyvitamin D and calcium metabolism [16].

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II. METHODOLOGY

➢ *Study population:*

The participants in the study were young adults aged between 20 and 30 years from the residents of Al-Hawija district, Kirkuk Governorate, who joined the study after an initial health examination that proved that they were free of known chronic medical conditions. The study was divided into four groups, The first group was non-smoking people and the second group was cigarette smokers. The third group is people who smoke electronic cigarettes The fourth group was for people who smoke hookah .

➢ *Sample collection:*

A fasting blood sample was obtained in an evacuated container containing a gel activator for blood clotting from the median cubital vein with a tourniquet applied to the extremity and pressure on the fingers from 60 samples. The blood was centrifuged for 10 minutes at 10,000 rpm to precipitate all formed elements and separate the serum.

The samples were analyzed in the clinical chemistry laboratory of Al-Hawija Hospital. Aliquots of the samples were frozen at -80°C for subsequent assessment of vitamin D and blood parameters.

➢ *Biochemical Analysis*

Vitamin D status was assessed by ELISA. The French HORIBA ABX Micros 60 ES auto-blood analyzer was used to determine the concentration of red blood cells, white blood cells, hemoglobin value, and the percentage of packed red blood cells.

➢ *Statistical Analysis*

The statistical analysis was conducted using the SPSS software. Morale was assessed using the Anova-One Way test, and significant differences were determined using the Duncans Multiple Ranges test ($p \leq 0.05$) [17].

III. RESULTS AND DISCUSSION

➢ *Vitamin D3*

The results of the current study shown in Figure (1) and Appendix (1) showed a significant decrease ($P \leq 0.05$) in vitamin D3 levels in hookah(19.29±6.74 ηgm/ml), dry cigrate (10.38±3.40 ηgm/ml) and electronic cigarette (15.61±5.59 ηgm/ml) smokers when compared to non-smokers (26.091±6.70 ηgm/ml).

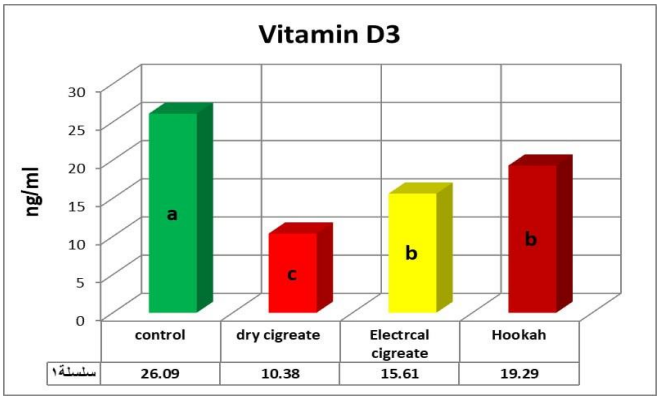

Fig 1 Shows the Level of Vitamin D3 among the Studied Groups (Control, Dry Cigarettes, Electronic Cigarettes, Shisha)

Tobacco is a leading cause of preventable disease, disability and death. Worldwide, more than 7 million deaths annually are attributable to tobacco use. Annually, an estimated half a million Americans die prematurely, and another 8.6 million suffer from chronic diseases related to tobacco smoking, resulting in increased resource use. Despite the known risks of tobacco, 50 million (20.8%) of adults in the United States continue to use tobacco products. This chapter will provide an overview of the pathophysiology of negative health effects of various tobacco products including cigarettes, hookahs, electronic nicotine delivery systems (ENDS), and smokeless tobacco [18].Smoking has a negative effect on the creation of steroid hormones, including vitamin D, according to the death of Soldin and its colleagues [19]. The microscopic mechanisms that have smoking an effect on vitamin D metabolism is unknown, One of the explanations is that the current smokers had less vitamin D diet than ever than smokers, which may explain the negative relationship between smoking and vitamin D in our study partially, if not complete. Chemicals in tobacco smoke can have a direct effect on vitamin D metabolism [20]. Skin synthesis is the main source of vitamin D in the human body, and vitamin D synthesis is affected by skin aging [21]. Precalciferol is unstable and requires isomerization to form cholecalciferol. Once formed, cholecalciferol travels from the skin into the bloodstream, where it binds to vitamin D-binding proteins [22]. On the other hand, Several studies detect have investigated parathyroid hormone levels in smokers and we found that parathyroid hormone levels were lower in smokers than in nonsmokers. Parathyroid hormone levels are mainly regulated by calcium ions [23]. Previous studies have shown that smokers have higher serum ionized calcium levels, and small changes in ionized calcium levels cause rapid changes in PTH secretion and synthesis. Several other putative regulators, such as chromogranin peptides and interleukin-8, may also be involved in the regulation of PTH secretion [24]. Previous studies have indicated that when people are exposed to e-cigarettes, their lungs secrete proinflammatory cytokines such as interleukin IL-6, IL-8, and tumor-causing agents, Necrosis factor-α (TNF-α), as indicated by a number of studies [25]. Inflammatory disorders, including severe respiratory distress, have been linked to the use of electronic devices Cigarettes [26].

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Vitamin D appears to affect a variety of inflammatory and structural cells within the lung including macrophages, lymphocytes, and epithelial cells [27].

➢ *White Blood Cells (WBC)*

The results of the current study in Figure (2) and Appendix (1) showed a significant increase of (P≤0.05) in the level of white blood cells (WBC) in the group of smokers of dry cigarettes as it reached (9.85±0.9 mm3/cell) and the group of smokers of electronic cigarettes (vape) as it reached (7.01±0.62 mm3/cell) compared to the control group or non-smockers group (8.65±1.01 mm3/cell), while there were no significant differences between the group of hookah smokers (8.52±0.37 mm3/cell) compared to the control group of non-smokers.

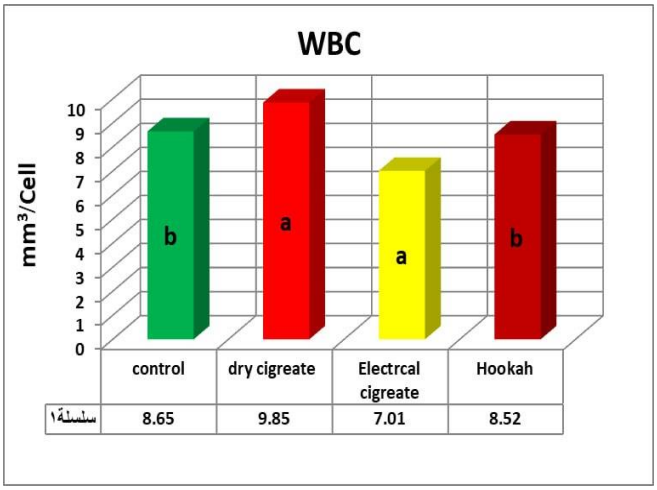

Fig 2 Shows the Level of WBC among the Studied Groups (Control, Dry Cigarettes, Electronic Cigarettes, Shisha)

Several studies have also indicated that dry and electronic curtains are linked to changes in the levels of vital indicators of infections, such as the number of white blood cells, and this may be because they contain many toxic and carcinogenic compounds harmful to health [28]. Premium studies have shown that the number of white blood cells in smokers and electronic curtains increased significantly compared to non -smokers [29]. A study conducted by [30] also explained that the high number of white blood cells (WBC) may be caused by the destructive launch of the nicotine, which can raise the numbers of lymphocytes in the blood, and that the negative effects of cigarette smoke and electronic curtains on the respiratory system and the resulting inflammation On this, it may also be contributing factors in the high number of white blood cells. Where the consumption of all types of tobacco (dry, electronic and hookah) increases the number of egg blood cells ;Because this also applies to e-cigarettes with a nicotine-free liquid, the change here is also independent of nicotine. This confirms that even nicotine-free products cause a cellular immune response and therefore it is difficult to ignore the importance of damage, even if its severity cannot be estimated in real quantity based on the cellular response [31].

➢ *Red Blood Cells (RBC)*

The results of the current study shown in Figure (3) and Appendix (1) indicate a significant increase (P ≤ 0.05) in the concentration of red blood cells in the group of smokers of dry cigarettes, as it reached (5.41±0.39) cells / mm³, the group of smokers of electronic cigarettes (vap) reached (5.67±0.29) cells / mm³ and the group of smokers of hookah (hocca) as it reached (5.39±0.37) cells / mm³ compared with control group (4.70±0.22) cells/mm³ .

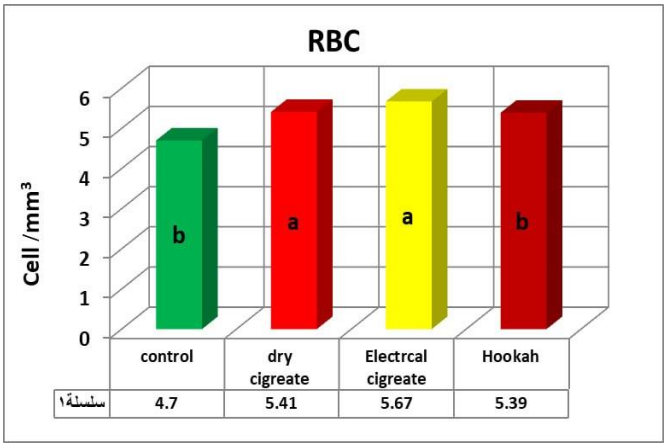

Fig 3 Shows the Level of RBC among the Studied Groups (Control, Dry Cigarettes, Electronic Cigarettes, Shisha)

The results of our current study are consistent with those of [32]which indicated that the lack of oxygen prepared for tissues stimulates the body to increase the production of red blood cells from stem cells and by stimulating the hormone Erythropoietin secreted from the kidneys.

➢ *Hemoglobin (Hb)*

The results of the current study shown in Figure (4) and Appendix (1) showed a significant increase (P ≤ 0.05) in the concentration of hemoglobin Hb in the group of dry cigarette smokers as it reached (15.42±0.55) grams / 100 ml and the group of smokers of electronic cigarettes (vape) as it reached (15.82±0.50) grams / 100 ml and the group of hookah smokers (shisha) as it reached (15.70±0.70) grams / 100 ml compared to the control group (14.58±0.37) grams / 100 ml.

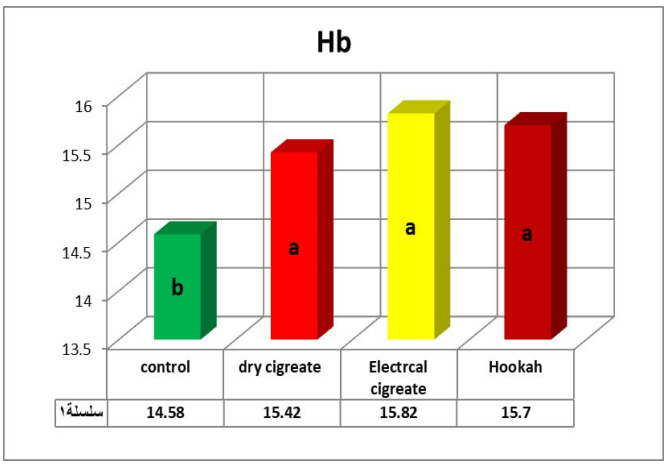

Fig 4 Shows the Level of Hb among the Studied Groups (Control, Dry Cigarettes, Electronic Cigarettes, Shisha)

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The results of our current study are consistent with the findings [33] where they found that smoking changes blood parameters, increases the number of red blood cells, which may lead to increased viscosity and high hemoglobin levels, which is an excessive clotting condition that harms health and increases the risk of cardiovascular and brain diseases.

In our study, we found that smoking shisha, dry cigarettes and e-cigarettes together is a potential risk factor for raising hemoglobin levels and increasing the severity of erythrocytosis, a serious problem as shisha smoking is gaining increasing popularity among members of society. Increased exposure to smoking among individuals is a public health concern that requires serious measures and policies to prevent increased exposure to smoking.

Smoking leads to a decrease in the supply of oxygen to tissues, which leads to an increase in the production of the hormone erythropoietin from the kidneys to the blood, stimulating stem cells to differentiate into new red cells and as a result high levels of hemoglobin [34].

➢ *Packed Cell Volume (PCV)*

Smoking of its various types is one of the largest health threats today, which has been documented many of its effects, except that a few of them are still a subject of discussion, such as its effect on blood indicators, especially its effect on the percentage of red blood cells. The previous study in this field has indicated the results of the current study shown in figure (5) and appendix (1) to the occurrence of a moral increase (P≤0.05) in the number of red blood cells for the hookah smokers group (46.63 ± 1.63%) and the electronic cigarette group (47.36 ± 1.36%), the conventional cigarette collection (46.18 ± 1.77%) when compared to a group of non -smokers (43.81 ± 1.18%).

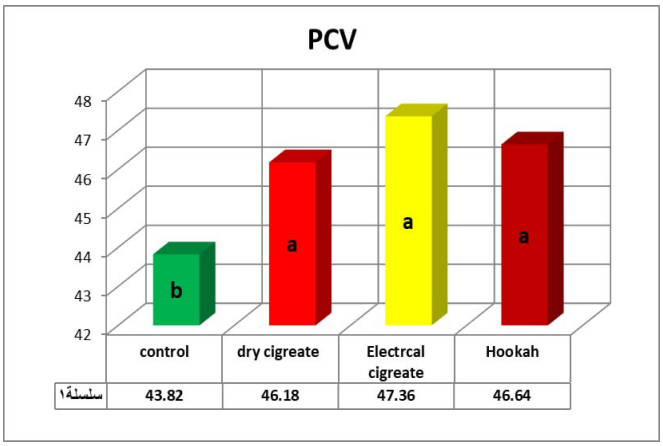

Fig 5 Shows the Level of PCV among the Studied Groups (Control, Dry Cigarettes, Electronic Cigarettes, Shisha)

Our results are consistent with the results of the studies of [35] and this may be due to the presence of nicotine, which increases the oxidation of red blood cell membranes by more than 13.8% of the normal limit and this percentage increases with increasing dose [35] and the combination of carbon monoxide in tobacco and the effects of nicotine disrupts the delivery of oxygen to tissues and stimulates the bone marrow to produce more red blood cells, increasing their number [36].

The carbon monooxide is one of the most important chemical components of cigarettes and contributes effectively to changing the number of red blood cells and related standards in smokers, through its association with hemoglobin to be together to be a hemoglobin carboxy compound, and this reduces the ability of red blood cells to carry oxygen, and this motivates the body to increase the production of erythropoietin. From the kidneys to carry through the blood to pure bone where stem cells settle for the purpose of motivating them to divide and differentiate into new red blood cells to compensate for low oxygen levels [37].

➢ *Platelet*

The results of the current study shown in figure (6) and appendix (1) indicated a significant increase (p≤0.05) in the number of platelets for the group of shisha smokers (269.55±10.82/µL), the group of e-cigarette smokers (369.91±14.02/µL) and the group of smokers of traditional cigarettes (331.91±16.97/µL) when compared to the group of non-smokers (221.18 ± 8.29/µL).

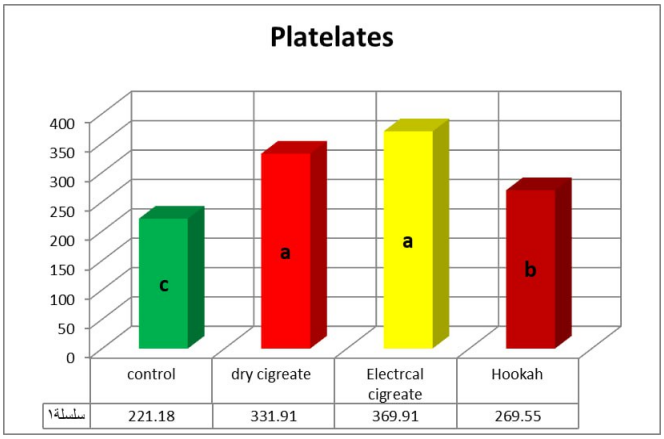

Fig 6 Shows the Level of Platelet among the Studied Groups (Control, Dry Cigarettes, Electronic Cigarettes, Shisha)

This clearly indicates that platelets are affected by smoking and this may be due to several reasons, including:

- *Systemic Inflammation:*

Smoking is known to trigger a state of systemic inflammation. This inflammation can lead to increased platelet production as part of the body's response to injury or stress. A higher platelet count is often observed in smokers compared to non-smokers, indicating a hypercoagulant condition that can increase the risk of cardiovascular disease [38].

- *Carbon Monoxide Exposure:*

Cigarette smoke contains carbon monoxide (CO), which can bind to hemoglobin and reduce oxygen delivery to tissues. This hypoxia may stimulate the bone marrow to produce more platelets as a compensatory mechanism, similar to the response we see in red blood cell production [39].

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- *Platelet Activation:*

Chemicals in cigarette smoke, such as nicotine and other toxic substances, can activate platelets, leading to increased platelet aggregation. This activation can contribute to an increase in the number of circulating platelets and may increase the risk of thrombotic events [38], [39].

- *Metabolic Syndrome Association:*

Smoking is often associated with components of metabolic syndrome, which is associated with high platelet counts. Studies have shown that individuals with multiple components of metabolic syndrome tend to increase platelet counts significantly, suggesting that smoking may exacerbate this condition and its effects on platelet levels [40].

IV. CONCLUSION

Our results indicate that smoking hookah, electronic cigarettes, and traditional cigarettes is associated with elevated levels of red blood cells, platelets, hemoglobin, and PCV (Packed Cell Volume). This increase may indicate higher blood viscosity and an elevated risk of cardiovascular diseases. Additionally, the results showed a significant decrease in Vitamin D3 levels, which could increase the risk of other health issues such as osteoporosis and weakened immunity.

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APPENDIX (1)

Appendix (1) The level of studied variables in blood serum for the four study groups (control, dry cigarette smokers, e-cigarette smokers, Shisha)

GROUPS / Parameters	Control	Dry Cigrate	Electrical Cigrate	Shisha
Vitamin D3	26.091±6.70 a	10.38±3.40 C	15.61±5.59 b	19.29±6.74 b
P.C.V	43.82 ±1.07 b	46.18 ± 1.78 A	47.36±1.36 a	46.64±1.63 a
Platelates	221.18 ± 8.29 c	331.91±16.97 A	369.91±14.02 a	269.55±10.82 b
WBC	8.65±1.01 b	9.85±0.9 A	7.01±0.62 a	8.52±0.37 b
RBC	4.70±0.22 b	5.41±0.39 A	5.67±0.29 a	5.39±0.37 a
Hb	14.58±0.37 b	15.42±0.55 A	15.82±0.50 a	15.70±0.70 a