

The Relation between (Number of cigarettes and duration) with 2nd polycythemia in Baghdad

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Abstract

The study includes effect of smoking and relation between the number of cigarettes smoking and duration on 2nd polycythemia.

And the main causes of increasing the Hb and PCV result on the smokers

By measured the Hb & PCV for 30 patients those have a 2nd polycythemia due to heavy long duration of cigarettes smoking.

These reading show there are relation between the No. of cigarettes and duration on the increase Hb & PCV result .

Key Words : Cigarettes , polycythemia , Hb (hemoglobin) , PCV (packed red cell volume).

Introduction

Polycythemia:

Polycythemia is divided into two main types :-

1- primary polycythemia (Polycythemia vera):

Primary polycythemia, often called polycythemia Vera . polycythemia rubra Vera (PRV), or erythremia, occurs when excess red blood cells are produced as a result of an abnormality of the bone marrow.

2- Secondary polycythemia:-

Secondary polycythemia is caused by either natural or artificial increases in the production of erythropoietin, hence an increased production of erythrocytes. In secondary polycythemia, there may be 6 to 8 million and occasionally 9 million erythrocytes per cubic millimeter (micro liter) of blood. Secondary polycythemia resolves when the underlying cause is treated. Secondary polycythemia in which the production of erythropoietin increases appropriately is called (physiologic polycythemia) [1, 2].

The signs and symptoms of polycythemia :-

1- Headaches, dizziness, and weakness.

The Relation between (Number of cigarettes and duration) with 2nd polycythemia in Baghdad Ali N. abdalhassnawy , Enaam S. Abdulla

- 2- Shortness of breath and problems breathing while lying down.
- 3- Double or blurred vision and blind spots.
- 4- Itching all over (especially after a warm bath), reddened face, and a burning feeling on your skin (especially. your hands and feet).
- 5- Bleeding from gums and heavy bleeding from small cuts
- 6- Unexplained weight loss..
- 7- Fatigue & tiredness.
- 8- Excessive sweating
- 9- Very painful swelling in a single joint, usually the big toe (called gouty arthritis) [2].

Tobacco:-

is the main ingredient incigaettes . A manufactured cigarette is made up of two main types:-

- Cured types - flue cured, light and dark air cured, sun cured.
- Reconstituted (stems, ribs etc.) and expanded tobacco.

Cigarette manufacturers have spent many years manipulating what goes into cigarettes by using Additives. Additive types include:-

- Humectants - up to 5% of the weight of a cigarette. These preserve moisture, as dry tobacco has harsh taste. Glycerol and propylene glycol are most commonly used.
- Flavors - added to counteract reductions in flavor due to filters and the use of reconstituted tobacco. Natural and synthetic flavor enhancers are used to give woody, spicy, minty, fruity, sweet and flowery flavors. Flavors also mask the 'harshness' of smoking, and may help young smokers begin and continue smoking.

Others, such as menthol, numb a smoker's throat. Ammonia raises smoke pH, enabling more nicotine to be absorbed [3].

The content of tobacco:-

The tobacco contain more than 200 different chemicals material some of these have a harmful effect on human body, causes multiple diseases in many organs, some of these material have a carcinogenic effect and the other have direct effect on organ tissues, the main organs that affected brain, lungs, heart, blood and vessels, liver, kidneys, immune system, stomach, reproductive organs, skin and bones[4].

Some of these chemicals material are (carbon monoxide, tar, nicotine, styrene, Aldehydes, acrylonitrile, nitric oxide, quinoline, isoprene, resorcinol, acetone, Toluene, cadmium, formaldehyde, 1, 2- amino naphthalene, Phenol, lead, acrolein, nickel, benzene, 3, 4- amino biphenyl, Pyridine, catechol, 1, 3-butadiene, chromium, Hydroquinone, methyl ethyl ketone, cresols, hydrogen cyanide)[4,5].

The Relation between (Number of cigarettes and duration) with 2nd polycythemia in Baghdad Ali N. abdalhassnawy , Enaam S. Abdulla

Carbon monoxide (CO):- Carbon monoxide is a colorless, tasteless, odorless, nonirritating, flammable and poisonous gas that is emitted from incomplete combustion of carbonaceous material used as fuels for transportation.

Transportation sources include emissions from all mobile sources such as cars, truck, buses, motorcycles,

Aircraft, locomotives, vessels, farm equipment, industrial and construction machinery, cigarette smoking [6].

Materials and methods:

Specimen :-

Samples of whole blood anticoagulated with EDTA taken from 30 patients a known case of 2nd polycythemia due to history of heavy smoking for many years from different age, and the patient have follow up programs to check up the (Hb , PCV) in iben alnafees hospital.

Cyanmethaemoglobin method (Hb):-

Principle : -

Whole blood is diluted in cyanmethemoglobin reagent .this reagent hmolysis the erythrocytes which releases hemoglobin the solution . the ferrous ions (Fe+2)of the hemoglobin molecules are oxidized by potassium ferricyanide to ferric ions (Fe+3). this oxidation results in the formation of met hemoglobin actable compound . all Hb derivatives excepts sulf hemoglobin are converted to cyanmethemoglobin.

When measured sepectrometrically at 540nm. the absorbance of cyanmethemoglobin follows Lambert-Beer's law and is directly Proportional to the concentration of (Hb)in the blood .a reference (standard)curve is prepared using cyanmethemoglobin standard solutions of known (Hb)concentrations –an unknown (Hb)concentration may be calculated the measured absorbance read from a standard calibration curve directly from the instrument scale of specialized instrument.

Reagent and Equipment:-

- 1- Cyanmethemoglobin standard ,80 mg/dl-available commercially.
- 2- Cyanmethemoglobin reagent available commercially as a dry powder or liquid reagent containing potassium ferric cyanide[K₃Fe(CN)₆] potassium cyanide (KCN) , and sodium bicarbonate. Cyanmethemoglobin reagent should be in brown bottle to prevent deterioration.
- 3- Test tubes 13 * 100mm.
- 4- Micropipette 20 µL (0.020 ml)
- 5- Micropipette tips.
- 6- Volumetric pipette 1ml , 2ml, 3ml , 4ml
- 7- Serologic pipette 5 ml

The Relation between (Number of cigarettes and duration) with 2nd polycythemia in Baghdad Ali N. abdalhassnawy , Enaam S. Abdulla

8- Matched cuvet (kū-vet') A small container or cup in which solutions are placed for photometric analysis.

9- Spectrophotometer

10- Graph

Procedure :-

Preparation of a standard hemoglobin curve : prepare duplicate dilutions of the cyanmethemoglobin standard representing 4 g /dl , 8 g/dl , 12 g /dl , 16 g /dl and 20 g /dl (as mention in the table 1-1).

A – label 13*100mm test tubes .

B - using the appropriate volumetric pipette the Cyanmethemoglobin standard into the lower 3rd of each test tube

C – using a 5 ml serologic pipette , add the proper amount of Cyanmethemoglobin reagent to each tube

D – mix contents of each tube thoroughly

E – transfer the standard solutions into matched cuvetts

F – read the absorbance of each solution at 540 nm using a reagent blank record the results

G – prepare a standard hemoglobin curve using graph paper . plot the absorbance on the y – axis and the hemoglobin concentration in g/dl on x – axis.

Hemoglobin procedure:

A – Pipette 5 ml of Cyanmethemoglobin reagent into appropriately labeled 13*100 mm test tube

B – Draw 0.02 ml of well – mixed whole blood into the micropipette carefully wipe the excess blood from the outside of pipette

C – Expel the blood from the micropipette into the Cyanmethemoglobin reagent

D – Rinse the micropipette several times to remove all remaining blood from the pipette

E – mix the contents of test tube thoroughly by inversion

F – allow the diluted hemoglobin solution to sit at room temperature for 10 minutes

g- mix the test tube thoroughly and transfer the content to a matched cuvet

H – record the absorbance of the diluted hemoglobin solution using a reagent blank at 540 nm

I – determine the hemoglobin concentration (g/dl) of the diluted solution using the standard calibration curve (figure 1) established for that particular spectrophotometer and set of reagent. [7]

Packed red cell volume (PCV):

Laboratory instrument:

Wintrobe haematocrit tubes, Pasteur pipettes, and a centrifuge with a speed of 3000 recycle per minute(r.p.m).

The Relation between (Number of cigarettes and duration) with 2nd polycythemia in Baghdad Ali N. abdalhassnawy , Enaam S. Abdulla

Principle:

An oxalated sample of the blood is centrifuged to pack red cells to the maximum. The volume of packed red cells is determined. The procedure is reliable because of its reproducibility.

Procedure:

The haematocrit tube must be clean and dry. Mix the oxalated sample of blood thoroughly by gently shaking for 3 minutes. With the Pasteur pipette fill the haematocrit tube to the 10 mark. This is done by passing the pipette to the bottom of the haematocrit. There must be no air bubbles.

Fill a second haematocrit with either another sample of blood or water. This tube is to counter balance the first one during centrifugation. Put the tube in the centrifuge at 3000 r.p.m. for 30 minutes. Take the reading of packed red cells.

At the uppermost portion of packed red cells is seen a narrow dark band (due to reduced hemoglobin). The reading is made at the uppermost level of the band. Above the band will be seen a reddish grey layer of white cells. The volume of packed red cells read is for 10 ml. multiply by 10 to get the value for 100. This value is the PCV.[7]

Result and discussion:

Studies discuss the relation between smokings as a cause of 2nd polycythemia. By take a random sample of male patients in different age with known cases of 2nd polycythemia and they have a follow up program to the hospital after reassurance to decrease the no. of cigarette/day and take some treatment.

The normal range of Hb (in male 12.5 – 14, in female 11.5 - 14) g/dl.

The normal range of PCV (in male 40-45%, in female 35-40%)

We read the Hb and PCV to these patients as a rule of follow up the result as below in table (1-2).

From the result when compare with the normal range of Hb and PCV we can see the relation between the no. of cigarette smoking/day, duration and increase of Hb & PCV level.

CO is formed when a cigarette is lit. It has a number of toxic effects on the body, the most important of which is that it reduces the amount Of oxygen that is carried in the bloodstream of smokers. CO binds with the hemoglobin in the blood instead of oxygen, meaning that lessOxygen is available to body organs and tissue. The heart has to pump harder to make sure that enough oxygen can get to all organs [9, 10].

The affinity of hemoglobin for CO is 200 times higher than its affinity for oxygen, which restricts the oxygen-carrying capacity of blood and leads to reduced O₂ supply for the tissues CO can also cause direct cellular injury by

The Relation between (Number of cigarettes and duration) with 2nd polycythemia in Baghdad Ali N. abdalhassnawy , Enaam S. Abdulla

forming bonds with enzymes and respiratory pigments, such as myoglobin, cytochrome P450 and cytochrome aa3[10,11].

That leads to increasing the red cell formation and lead to 2nd polycythemia [14].

Tube	Cynmethemoglobin standard	Cynmethemoglobin reagent	Dilution
4 g/dl	1 ml	4 ml	1/5
8 g/dl	2 ml	3 ml	3/5
12 g/dl	3 ml	2 ml	3/5
16 g/dl	4 ml	1 ml	4/5
20 g/dl	5 ml	0 ml	----

Table (1-1) :- the preparation of cynmethemoglobin according to the dilution.

Patients	Age/years	Cigarettes/day	Duration/years	Hb gm./dL	PCV %
No.1	65	≥ 40	25	16	53
No.2	53	50	30	16.7	55
No.3	35	□ 60	15	16.3	54
No.4	49	30	10	14.8	49
No.5	57	≤ 35	30	17.2	57
No.6	30	40	12	15.7	52
No.7	38	≥ 40	18	16	53
No.8	50	40	30	17.5	58
No.9	42	30	17	14.5	48
No.10	37	≥ 20	10	14.2	47
No.11	43	40	20	15.4	51
No.12	54	30	25	16.6	55
No.13	46	40	20	16.4	54
No.14	32	30	10	14.3	47
No.15	67	≥ 50	30	16.9	56
No.16	28	40	9	14.7	49
No.17	55	50	27	15.6	52
No.18	52	≈ 50	30	16.7	55
No.19	24	≤ 20	5	13.9	46
No.20	30	20	12	13.6	45
No.21	59	≥ 50	27	17.3	57
No.22	44	40	20	15.2	50
No.23	39	30	22	14.8	49
No.24	41	15	10	13	43
No.25	37	20	17	14.7	49
No.26	27	20	5	12.4	41
No.27	28	20	9	14.6	48
No.28	56	≈ 40	30	15.6	52
No.29	36	40	10	15.5	51
No.30	41	20	20	13.3	44

Table (1-2) : sample of blood from 30 patients have 2nd polycythemia

The Relation between (Number of cigarettes and duration) with 2nd polycythemia in Baghdad Ali N. abdalhassnawy , Enaam S. Abdulla

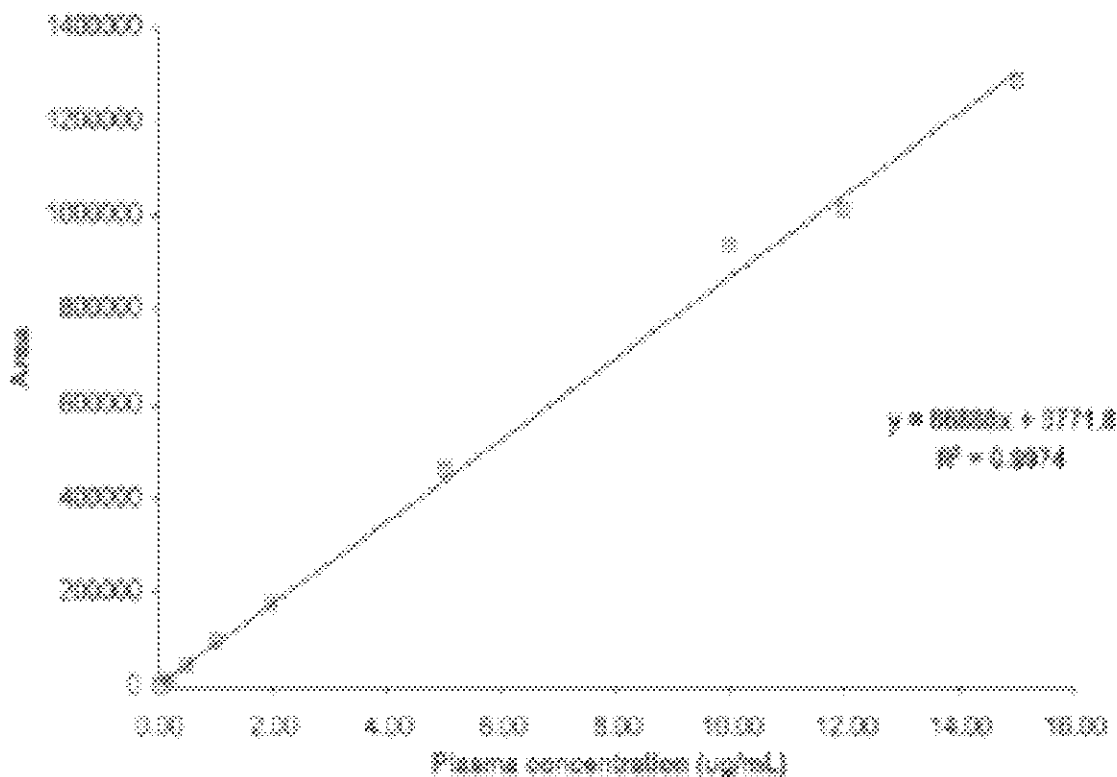


Figure 1 [The standard calibration curve]

Y axis = absorption.

X axis = concentration .

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The Relation between (Number of cigarettes and duration) with 2nd polycythemia in Baghdad Ali N. abdalhassnawy , Enaam S. Abdulla

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العلاقة بين عدد السكائر وفترة التدخين مع زيادة نسبة الدم الثانوي (فرط كريات الدم الحمراء) في بغداد

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قسم العلوم

الخلاصة

الدراسة تتضمن تأثير التدخين من حيث عدد ومدة تعاطي السكائر على مرض فرط كريات الدم الحمراء الثانوي .

وأهم اسباب زيادة لزوجة الدم و الهيموغلوبين عند المدخنين ، وذلك عن طريق اخذ عينات للدم من 30 مريض يعاني من فرط كريات الدم الحمراء الثانوي .

حيث اظهرت القراءات هنالك علاقة بين عدد ومدة تعاطي السكائر في زيادة لزوجة الدم و الهيموغلوبين عند المدخنين عن طريق اجراء فحص نسبة اللزوجة (PCV) و الهيموغلوبين (Hb) .

الكلمات المفتاحية : التدخين ، فرط كريات الدم الحمراء ، هيموغلوبين ، خلايا الدم المضغوطة .