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# PACKED CELL VOLUME AND HAEMOGLOBIN CONCENTRATION OF TUBERCULOSIS PATIENTS

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## ABSTRACT

Packed cell volume test for tuberculosis patients were carried out on a hundred and twenty (120) patients which were divided into four age groups; 20-30 years, 30-40 years, 40-50 years and 50-60 years. It was found that the packed cell volume and haemoglobin concentration decreases with age. Within the age bracket of 20-30 years, the PCV (%) of females was between the range of 35-39% and 38-45% in males, the Hb (g/dL) of females was between the range of 11.6-13.0g/dL and 12.6-15.0g/dL in males. Within the age bracket of 30-40 years, the PCV of females was between the range of 31-37% and 33-40% in males and the Hb of females was between the range of 10.3-12.3g/dL and 11.0-13.3g/dL in males. Then, within the bracket of 40-50 years, the PCV of females is 21-28% and 30-35% in males and the Hb of females was 7.0-9.3g/dL and 10.0-11.6g/dL in males. Lastly, within the age bracket of 50-60 years, the PCV of females was 18.0-21.0% and 11.0-33.0% in males and the Hb of females was 6.0-8.6g/dL and 3.6-11.0g/dL in males. The research aims at studying the volume of red cells and haemoglobin levels of tuberculosis patients within various age groups, compared to normal standard.

**KEYWORDS:** Tuberculosis, packed cell volume, haemoglobin.

**Abbreviations:** Hb- Haemoglobin, PCV- Packed Cell Volume, rpm- Revolution per minute, Tb- Tuberculosis.

## 1.0 INTRODUCTION

Tuberculosis has long been known in history under a variety of names such as *phthisis*, *scrofula*, bronchitis and inflammation of the lungs, lactic fever, gastric fever and lupus. The name "tuberculosis" was introduced in the nineteenth century and it refers to a disease condition caused by infectious agent known as tuberculosis bacteria or tubercle bacilli. The first breakthrough in understanding tuberculosis came when a German bacteriologist named Robert Koch isolated the infectious agent known as tuberculosis bacteria or tubercle bacilli in 1882. He was later awarded the Nobel Prize for physiology in 1905 (Ziganshinal, 2006). It has often been a difficult disease to diagnose and has been confused with many other diseases. However, its diagnosis is said to be done usually after a combination of skin, blood and imaging tests. Hence the aim of this work was to determine the packed cell volume (%) and haemoglobin (g/dL) concentration in tuberculosis patients as part of assessing their health status.

## 2.0 MATERIAL AND METHOD

Materials used were thus

1. Blood samples from individual patient,
2. Heparinized Capillary tubes and plasticin,
3. Microhaematocrit centrifuge and reader.

### 2.1 Packed Cell Volume (PCV) (Haematocrit method)

**Principle**

The packed cell volume is that proportion of whole blood occupied by red cells, expressed as a ratio (litre/litre).

Anticoagulated blood in a glass capillary of specified length, bore size and wall-thickness is centrifuged in a microhaematocrit centrifuge at a speed of 12000-15000 revolution per minute (rpm) for 5minutes to obtain constant packing of the red cells. The packed cell volume is read from the scale of a microhaematocrit reader or calculated by measuring the length of the red cell column and dividing it by the total lenght of the filled (blood) column.

**Method**

1. Fill the heparinized capillary tube to about three quarter of its total volume with anticoagulated blood.

2. Seal one end with a plasticin, and carefully locate the filled capillary tube into one the numbered slots of the micro-haematocrit rotor, with the sealed end against the rim gasket to prevent breakage.
3. Centrifuge for 5 minutes and read the volume of packed red cell with a micro-haematocrit reader or calculate as follows.

$$\text{PCV (\%)} = \frac{\text{Length of red cell column (mm)}}{\text{Length of total column (mm).}}$$

### 2.2 Haemoglobin (Hb) Determination

**Method**

The concentration of Haemoglobin is determined simply by dividing the value of packed cell volume by 3.

$$\text{Hb (g/dL)} = \frac{\text{Value of PCV}}{3}$$

## 3.0 RESULTS

From the test, a hundred and twenty (120) tuberculosis patients were tested for packed cell volume and haemoglobin concentration within the age bracket of 20-60 years, and compared with the normal range. The results of findings made are shown below.

**Table 3.1: Shows TB patients within the age bracket of 20-30 years.**

| Patients | Sex | PCV (%) | Hb (g/dL) |
|---|---|---|---|
| $P_{01}$ | F | 35 | 11.6 |
| $P_{02}$ | F | 38 | 12.0 |
| $P_{03}$ | M | 41 | 13.6 |
| $P_{04}$ | M | 43 | 14.3 |
| $P_{05}$ | M | 41 | 13.6 |
| $P_{06}$ | M | 45 | 15.0 |
| $P_{07}$ | M | 43 | 14.3 |
| $P_{08}$ | M | 40 | 13.3 |
| $P_{09}$ | M | 41 | 13.6 |
| $P_{10}$ | F | 35 | 11.6 |
| $P_{11}$ | M | 41 | 13.6 |
| $P_{12}$ | F | 36 | 12.0 |
| $P_{13}$ | F | 37 | 12.3 |
| $P_{14}$ | F | 39 | 13.0 |
| $P_{15}$ | F | 36 | 12.0 |
| $P_{16}$ | M | 41 | 13.6 |
| $P_{17}$ | M | 38 | 12.6 |

**Table 3.2: Shows TB patients within the age bracket of 30-40 years.**

| Patients | Sex | PCV (%) | Hb (g/dL) |
|---|---|---|---|
| $P_{01}$ | F | 37 | 12.3 |
| $P_{02}$ | F | 33 | 11.0 |
| $P_{03}$ | F | 34 | 11.3 |
| $P_{04}$ | F | 33 | 11.0 |
| $P_{05}$ | F | 31 | 10.3 |
| $P_{06}$ | F | 36 | 12.0 |
| $P_{07}$ | M | 40 | 13.3 |
| $P_{08}$ | F | 33 | 11.0 |
| $P_{09}$ | M | 38 | 12.6 |
| $P_{10}$ | F | 35 | 11.6 |
| $P_{11}$ | F | 34 | 11.3 |
| $P_{12}$ | M | 37 | 12.3 |
| $P_{13}$ | F | 33 | 11.0 |
| $P_{14}$ | M | 40 | 13.3 |
| $P_{15}$ | M | 37 | 12.3 |
| $P_{16}$ | F | 34 | 11.3 |
| $P_{17}$ | M | 38 | 12.6 |
| $P_{18}$ | M | 35 | 11.6 |
| $P_{19}$ | M | 35 | 11.6 |
| $P_{20}$ | M | 36 | 12.0 |
| $P_{21}$ | M | 35 | 11.6 |
| $P_{22}$ | M | 33 | 11.0 |
| $P_{23}$ | M | 35 | 11.6 |
| 24 | M | 34 | 11.3 |
| $P_{25}$ | M | 34 | 11.3 |
| $P_{26}$ | M | 33 | 11.0 |
| $P_{27}$ | M | 35 | 11.6 |

**Table 3.3: Shows TB patients within the age bracket of 40-50 years.**

| Patients | Sex | PCV (%) | Hb (g/dL) |
|---|---|---|---|
| $P_{01}$ | M | 33 | 11.0 |
| $P_{02}$ | M | 32 | 10.6 |
| $P_{03}$ | M | 30 | 10.0 |
| $P_{04}$ | M | 30 | 10.0 |
| $P_{05}$ | M | 34 | 11.3 |
| $P_{06}$ | F | 27 | 9.0 |
| $P_{07}$ | F | 25 | 8.3 |
| $P_{08}$ | M | 30 | 10.0 |
| $P_{09}$ | F | 26 | 8.6 |
| $P_{10}$ | M | 35 | 11.6 |
| $P_{11}$ | F | 28 | 9.3 |
| $P_{12}$ | M | 30 | 10.0 |
| $P_{13}$ | F | 27 | 9.0 |
| $P_{14}$ | M | 30 | 10.0 |
| $P_{15}$ | M | 35 | 11.6 |
| $P_{16}$ | M | 31 | 10.3 |
| $P_{17}$ | M | 30 | 10.0 |

| | | | |
|---|---|---|---|
| $P_{18}$ | M | 35 | 11.6 |
| $P_{19}$ | F | 26 | 8.6 |
| $P_{20}$ | F | 28 | 9.3 |
| $P_{21}$ | F | 21 | 7.0 |
| $P_{22}$ | M | 31 | 10.3 |
| $P_{23}$ | F | 25 | 8.3 |
| $P_{24}$ | M | 35 | 11.6 |
| $P_{25}$ | F | 27 | 9.0 |
| $P_{26}$ | M | 29 | 9.6 |
| $P_{27}$ | F | 32 | 10.6 |
| $P_{28}$ | M | 26 | 8.6 |
| $P_{29}$ | M | 34 | 11.3 |
| $P_{30}$ | M | 31 | 10.3 |
| $P_{31}$ | M | 34 | 11.3 |
| $P_{32}$ | M | 34 | 11.3 |
| $P_{33}$ | M | 31 | 10.3 |

**Table 3.4: Shows TB patients within the age bracket of 50-60 years.**

| Patients | Sex | PCV (%) | Hb (g/dL) |
|---|---|---|---|
| $P_{01}$ | F | 24 | 8.0 |
| $P_{02}$ | M | 30 | 10.0 |
| $P_{03}$ | F | 25 | 8.3 |
| $P_{04}$ | F | 22 | 7.3 |
| $P_{05}$ | M | 29 | 9.6 |
| $P_{06}$ | M | 21 | 7.0 |
| $P_{07}$ | F | 18 | 6.0 |
| $P_{08}$ | M | 20 | 6.6 |
| $P_{09}$ | M | 29 | 9.6 |
| $P_{10}$ | M | 11 | 3.6 |
| $P_{11}$ | M | 25 | 8.3 |
| $P_{12}$ | M | 30 | 10.0 |
| $P_{13}$ | M | 23 | 7.6 |
| $P_{14}$ | M | 28 | 9.3 |
| $P_{15}$ | M | 21 | 7.0 |
| $P_{16}$ | M | 25 | 8.3 |
| $P_{17}$ | M | 24 | 8.0 |
| $P_{18}$ | M | 27 | 9.0 |
| $P_{19}$ | M | 31 | 10.3 |
| $P_{20}$ | M | 26 | 8.6 |
| $P_{21}$ | M | 25 | 8.3 |
| $P_{22}$ | M | 23 | 7.6 |
| $P_{23}$ | F | 24 | 8.0 |
| $P_{24}$ | F | 26 | 8.6 |
| $P_{25}$ | F | 25 | 8.3 |
| $P_{26}$ | F | 24 | 8.0 |
| $P_{27}$ | F | 20 | 6.6 |
| $P_{28}$ | M | 13 | 4.3 |
| $P_{29}$ | F | 24 | 8.0 |
| $P_{30}$ | M | 27 | 9.0 |

| | | | |
|---|---|---|---|
| $P_{31}$ | F | 23 | 7.6 |
| $P_{32}$ | F | 25 | 8.3 |
| $P_{33}$ | M | 33 | 11.0 |
| $P_{34}$ | F | 25 | 8.3 |
| $P_{35}$ | F | 23 | 8.3 |
| $P_{36}$ | M | 28 | 9.3 |
| $P_{37}$ | M | 33 | 11.0 |
| $P_{38}$ | M | 26 | 8.6 |
| $P_{39}$ | M | 29 | 9.6 |
| $P_{40}$ | M | 31 | 10.3 |
| $P_{41}$ | M | 33 | 11.0 |
| $P_{42}$ | F | 22 | 7.3 |
| $P_{43}$ | F | 23 | 7.6 |

## 4.0 DISCUSSION

Tuberculosis is a bacterial disease which affects the lungs and other organs in the body such as the lymph nodes, kidney, bones, joints etc.

The result obtained is better understood when compared with normal range (PCV range in normal females = 35-47%, males = 41-54%; and Hb concentration in normal females = 11.5-16.5g/dL, males = 13-18g/dL).

Tuberculosis patients within the age bracket of 20-30 years from the result obtained indicated a PCV range of 35-39% in females, 33-40% in males; and Hb range of 11.6-13.0g/dL in females, 12.6-15.0g/dL in males.

Those within the age bracket of 30-40 years indicated a PCV range of 31-37% in females, 33-40% in males; and Hb range of 10.3-12.3g/dL in females, 11.0-13.3 in males.

For those within the age bracket of 40-50 years, they indicated a PCV range of 21-28% in females, 30-35% in males; and Hb range of 7.0-9.3g/dL in females, 10.0-11.6g/dL in males.
The last group of tuberculosis patients studied is those within the age bracket of 50-60 years, showing a PCV range of 18-26% in females, 11-33% in males; and Hb range of 6.0-8.6g/dL in females, 3.6-11.0g/dL in males.

From the illustration above, it was generally observed that both the packed cell volume and haemoglobin concentration of tuberculosis patients were lower than those of normal. The reason supposedly was that as patients of tuberculosis lose blood which erythrocyte is a major component, the level of haemoglobin (responsible for oxygen mobilization) decreases.

In conclusion, it has been observed from the research result obtained above that tuberculosis patients losses some volume of blood with respect to age of the patients and stage of the disease (mild or chronic).

**REFERENCE**


1. Barry, C., Konstantinos, A. National tuberculosis advisory committee: Tuberculosis notification in Australia, 2007. Communicable diseases intelligence, 2009; 33(3): 1-12.
2. Brown, B.A. Haemoglobin principles and procedures, 3rd ed. Philadelphia, Lea Febizer, 1980; 241-244.
3. Campbell, A. and Bah-Sow, O. (2009). Pulmonary tuberculosis diagnosis and treatment. BMS, 2006; 332: 1194-1197.
4. Characle, S., Lubin, B., and Reid, C. (1989). Abnormal haemoglobin. Vol. 14, United States department of health and human services.
5. Lewis, P. Haemoglobin variants and haemoglobinopathies in Saudi Arabia. Saudi medical journal, 1990; 13: 488-499.
6. Luduigsson, J.F. Cardiac disease and risk of tuberculosis. A population based cohort study. Thorax, 2007; 62(1): 23-28.
7. Sharma, S.K., Mohan, A. Tuberculosis and other mycobacterial diseases. In Rakel. Current therapy, 2009; 282-290. Philadelphia.
8. Ziganshinal, Garner (2007). Tuberculosis search date October, 2006. Online version of (BM) clinical evidence.