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Original Research Article

# ABO and Rhesus Blood Group System in Tuberculosis Patients

Chukwurah Ejike Felix[1], Obeagu Emmanuel Ifeanyi[2*], Agom Daniel Dansy[3]
[1]Department of Haematology and Immunology, Faculty of Clinical Medicine, Ebonyi State University, Abakaliki, Nigeria
[2]Department of Medical Laboratory Science, Faculty of Health Sciences, Imo State University, Owerri, Nigeria
[3]Department of Medical Laboratory Science, Faculty of Health Sciences, Ebonyi State University, Abakaliki, Nigeria

***Corresponding author:** Obeagu Emmanuel Ifeanyi
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## Abstract

This study on ABO and Rhesus blood group system in tuberculosis patients aimed at the assessment on prevalence of tuberculosis on human ABO and Rhesus blood group system. ABO blood and Rhesus blood group system antigens are hereditary characters that are the most clinically significant in blood transfusion. Tuberculosis is an infectious disease cause by mycobacterium tuberculosis and treated with antibiotics. The samples were collected, diagnosed and analyzed for reliable results using laboratory standard procedures, the results are represented statistically showing no significant effect(s) of tuberculosis (TB) in ABO and Rhesus blood system. This research was carried out among Igbo tribe at location of Ohaozara in Ebonyi State using two hundred (200) Tuberculosis patients coming for treatment at Tuberculosis/ Leprosy Presbyterian Joint Hospital Uburu (Happy Home) and other patient from the same location while three hundred (300) controls (people free from TB). The ABO blood group and Rhesus systems' result present blood group 0 predominated others and with 48%, followed by A (22%), B (18%) and AB (12%) while the Rhesus blood group system is 90% positive and 10% negative in Juberculosis patients. In comparism, ABO blood groups are; 0 (44%), A (28%), and AB (4%), while the Rhesus blood group system is 94% positive and 6% negative in controls. From the statistics above, among the patients in control from the same geographical location interprets that blood group O has the highest frequency of about 46 percent (46%) followed by group A with 25%, B (21%) and AB (8%) while Rhesus blood group system is 92% Rhesus positive and 8% Rhesus (D) negative in average among population study of the same location (Ohaozara). With the test (blood grouping) conducted among the population, the results show that no particular blood group is susceptible to Tuberculosis and so, Tuberculosis does not have any phynotipic effect(s) on ABO blood group and Rhesus blood group system.

**Keywords:** ABO blood group system, Rhesus blood group system, Tuberculosis patients.



## INTRODUCTION

There are many kinds of blood group system existing in different individuals but among all, the ABO and Rh blood group system are the most clinically important blood systems especially the ABO blood system followed by Rh blood group system, and they are the most blood group credited wordwide [1].

The ABO determines the group of individuals and the Rh determines whether the individuals group is positive or negative due to presence or absence of red blood cell D antigens [2].

The ABO blood system was discovered in 1900 at the University of Vein by Karl Landsteiner who found three different blood types (A B and O). The Rh blood system was discovered in 1940 by Karl Landsteiner and Weiner and the same great scientist and his student Weiner discovered the Rh blood system in 1940.

Karl Landsteiner during the discovery of ABO system recognized the presence of two separate erythrocyte antigens the A, B and B antigens. Expression of A and B genes in erythrocytes or body fluids results from the independently inheritance of A and B genes. The ABO locus resides on chromosome 9 in human, the H allele produces an enzyme that at the cellular level to construct the H antigen. This contribution to medical sciences was the most significant event in blood group systems research since the discovery of the ABO system. The associated and anti-B antibodies are usually IgM antibodies present in the serum, which are usually produce in the first year of life by sensitization to environmental substances such as bacteria, food, viruses [3].

The Rhesus blood system is probably the most complex of all erythrocytes blood group system with more than 40 different Rh antigens. Five major antigen

have been observed in the Rh system D, C, c, E, and e. C and c as well as E and e are antithetical refers to two antigens controlled by a pair of allelic genes. The presence of the Rh-antigen on an individual red blood cells means that the person is said to be Rhesus positive, while it absence is designated Rhesus negative [2].

The Rh gene reside on chromosome 1 with the D gene acting as an antosomal as discrete units (Wemer) or as haplotypes (Fisher and Race), (i.e is HLA system; human leukocyte antigen system; four gene codes A,B,C and D for polymorphic proteins). The ABO and Rh system contain antibodies that can be stimulated as a result of presence of foreign body called antigen and this lead to haemolytic disease of the newborn (HDN). i.e the human antibody in the subsequently react with the fetal antigens. This fetal antigen can induce maternal immunization by the formation IgG antibodies, which will pass from the meternal circulation into fetal circulation through the placenta, in the fetal reaction with the fetal red blood cell lead to their destruction by the fetal reticuloendothelial system.

Since the discovery of ABO and Rh blood group system blood transfusion has been an easy and successful practice in medicine. And the rate of death as a result of transfusion reaction and rate of HDN occurrence had reduced [4].

Infecious diseases have played a significant role in altering the course of human populations in addition to bringing about change in their genetic constitutions. In Nigeria, tuberculosis remains the single major communicable disease affecting adults of great population suffering, a quarter being openly infectious; some percentage persons die each year with a far fewer number effectively detected and treated. While BCG (bacilli calmette-Guerin) immunization protects from the most devastating forms of infantile tuberculosis (meningitis and disseminated tuberculosis), it does not appear to offer long term protection against the adult form of disease, which occurs from adult to child in millions of households throughout the country today.

Earlier studies have shown associations between some genetic markers viz; ABO blood group, HLA (human leukocyte antigen), serum proteins and tuberculosis both in India and abroad [5, 6]. However, information on various other red cell markers and disease is negligible in India populations. Therefore this pilot study is planned to fill this void by providing phenotype and allele frequency and allele frequency distributions of as many as different red blood cell genetic markers including two blood group systems (Al, A2 BO, Rh D), 4 red cell enzyme polymorphisms (ADA, AKL, ESD, PGM1) and haemoglobin (Hb) variants in pulmonary tuberculosis patients and controls.

**Pulmonary Tuberculosis**

Tuberculosis (TB) is an infection disease caused by bacteria whose scientific name is mycobacteria tuberculosis. It was first isolated in 1882 by a German physician named Robert Koch who received noble award on the discovery.

Pulmonary tuberculosis commonly affects the lungs but also can involve almost any organ of the body. Many years ago, this disease was referred to as "consumption "because, without effective treatment, these patients often would waste away (die). Today of cause, tuberculosis usually can be treated successfully with antibiotics.

There also the group of organisms referred to as a typical tuberculosis there involve other types of bacteria that are in mycbacteria family. These organisms do not cause diseases and are referred to as "colonizers" because they simply live along side with other bacteria in our bodies without causing damage. At times, these bacteria can cause infections.

**Aims and Objectives**

- This project study is clone to assess the prevalence of tuberculosis patients in ABO and Rhesus blood group system among the Igbo tribe.
- It was conducted to correlate/com pare the results to the existing results of other scientists on the similar studies.
- This work was carried out in order to evaluate the causes, multiple risks, preventions and possible treatments for tuberculosis and its effects on ABO and Rhesus blood group system.

**Materials and Samples**

Data of sample collected from a total of 500 (five hundred) unrelated patients and controls (people free from TB) at random attending PJH (Presbyterian Joint Hospital) Uburu, PJH* Tuberculosis/Leprosy Uburu (Happy Home) and PJH Diagnostic Laboratory. All the subjects for the samples were between 20 and 65 years of age.

- Blood samples were collected at random from 200 (two hundred) patients of pulmonary tuberculosis and 300 (three hundred) persons free from TB (controls). From each subject, about l-2mls of blood was drawn using 3mls sterilized syringe and collected into E.D.T.A.K2 anticoagulant container then to the hospital laboratory (PJH diagnostic Laboratory).

**Procedures**

- I sterilized all the containers and materials before used for all the practical.

- Following all the procedures from the labeled containers and detailed data, I made the materials ready before collecting the blood samples from the subjects (patients and controls).
- I carefully collected the blood samples from each of the subjects from a total of 500 (five hundred) unrelated TB patients and controls (free from TB) at age bracket of 20-65 years.
- By method of syringe, I collected blood samples randomly of about 2-3 mis with 3mis syringe and via heparinzed tube containing EDTA K2 (Ethylene Diamine Tetra Acetic Acid potassium).
- I transported the samples immediately to the Haematology unit in Laboratory.
- I processed the sample for the preparation of haemolyses by freezing and thawing method.
- I confirmed ABO blood groups and Rhesus system of the samples by tube method using antisera. 8.1 worked out mathematically their percentages and frequencies in patients' and controls' samples. 9. I than interpreted my results in tabular form, pie chart and bar chart for understanding.

## PROTOCOL

(1) Red Blood cells Grouping and Rhesus systems by Tube method.

**Step-1:** In three (3) small test tubes labeled A-C was pipetted into I each tube as follows;
Tube A: 1 drop of anti-A serum
1 drop of 2-3% patient's or controls red cells.
Tube B: 1 drop of anti-B serum
1 drop of 2-3% patient's or controls red cells.
Tube C: 1 drop of ant- D serum
1 drop of 2-3% patient's or controls red cells.

**Step 2:** The contents in the above test tubes were gently and thoroughly mixed.

**Step 3:** The tests with the mixture were stood in test tube rack at room temperature for 3-5 minutes then, observed for agglutination or haemolysis under light.

**Step 4:** I confirmed the reactions on microscope by making a drop of the mixture on a grease free clean slide and view under microscope with xlO objective lens.

**Step-5: Results**

| Group | Anti- A | Anti-B | Anti AB |
|---|---|---|---|
| A | + | - | + |
| B | - | + | + |
| AB | + | + | + |
| 0 | — | - | ! |

| | | |
|---|---|---|
| Rh (D) +Ve → | Anti- A Plus Red Cells | + |
| Rh (D) - Ve → | Anti- D Plus Red Cell | - |

## RESULTS

From the course of my study, I have observed that phenotypically, the distribution of blood groups, (ABO and Rhesus system) in the red cells of tuberculosis patients and controls (persons free from TB) are;

In the ABO blood group system, blood group O predominated in patients and controls with the highest frequency (48%) and (44%)respectively, followed by blood groups A (22% and A (28%), B (18%) and B (24%), and AB (12%) and AB (4%) in patients and controls respectively as presented in Table l and 5 below .

In the rhesus blood group system, the frequency of Rh (D) negative was highest in patients having tuberculosis (10%) and (6%) in controls while their frequencies of Rh (D) positives were 90% and 94% in patients and controls respectively as presented in the Table 2 and 6 below.

**Table-1: TB Patients' Result Data of Abo Blood Group and Rhesus System, In Tabular Form**

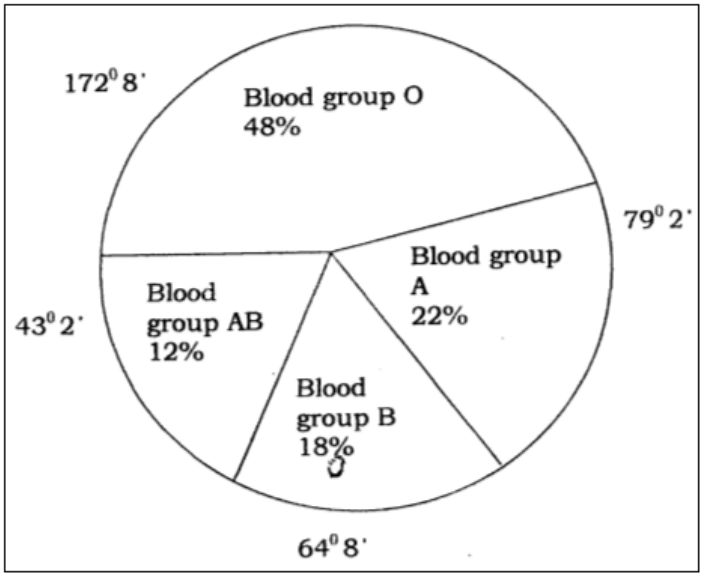
| Blood Group | Rhesus (D) Factor | Frequency of TB Patients | Percentage |
|---|---|---|---|
| A | Positive | 40 | 20% |
| A | Negative | 4 | 2% |
| B | Positive | 32 | 16% |
| B | Negative | 4 | 2% |
| AB | Positive | 20 | 10% |
| AB | Negative | 4 | 2% |
| O | Positive | 88 | 44% |
| O | Negative | 8 | 4% |
| TOTAL | | 200 | 100% |

**Table-2: ABO Blood Group of TB Patients**

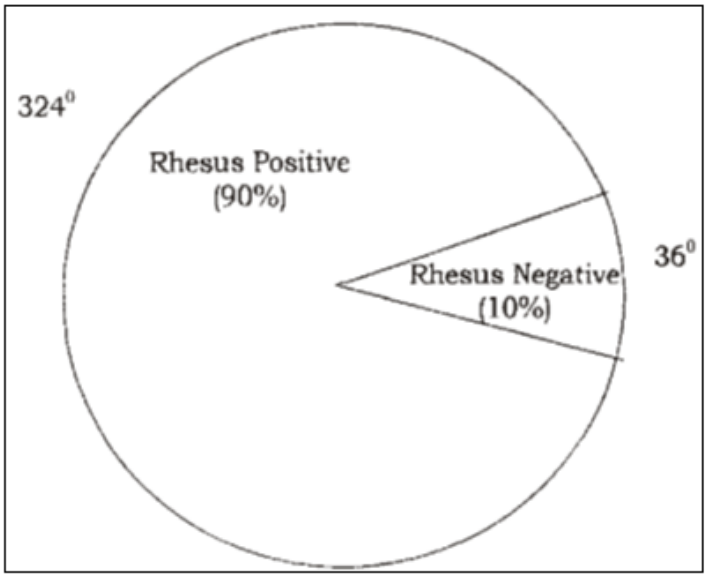
| Blood Group | Frequency of TB Patients | Percentage Values |
|---|---|---|
| A | 44 | 22% |
| B | 36 | 18%. |
| AB | 24 | 12% |
| O | 96 | 48% |
| TOTAL | 200 | 10O% |

**Table-3: Rhesus (D) Blood System of TB Patients**

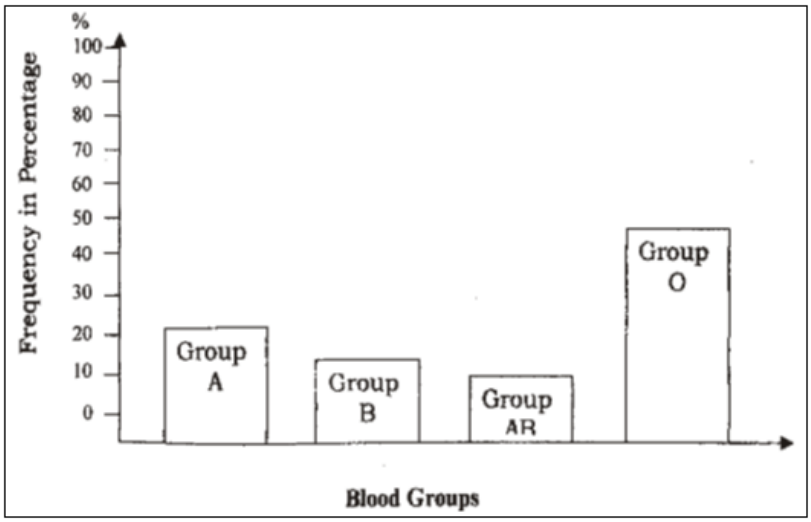
| **Rhesus (D) Blood System** | **Frequency of TB Patients** | **Percentage Value** |
|---|---|---|
| Positive | 180 | 90% |
| Negative | 20 | 10% |
| **TOTAL** | **200** | **100%** |



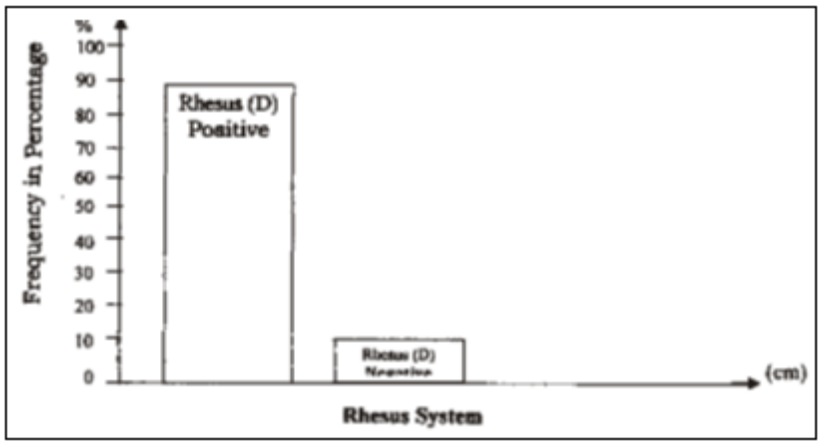

**TB Patients' Result Data of ABO Blood Group Presented In Pie Chart**




**TB Patients' Result Data of Rhesus (D) System Presented In Pie Chart**




**TB Patients' Result Data of ABO Blood Group Presentred in Bar Chart**




**TB Patients' Result Data of Rhesus System Presented In Bar Chart**

**Table-4: Controls' Result Data of ABO Blood Group and Rhesus System in Tablar Form**

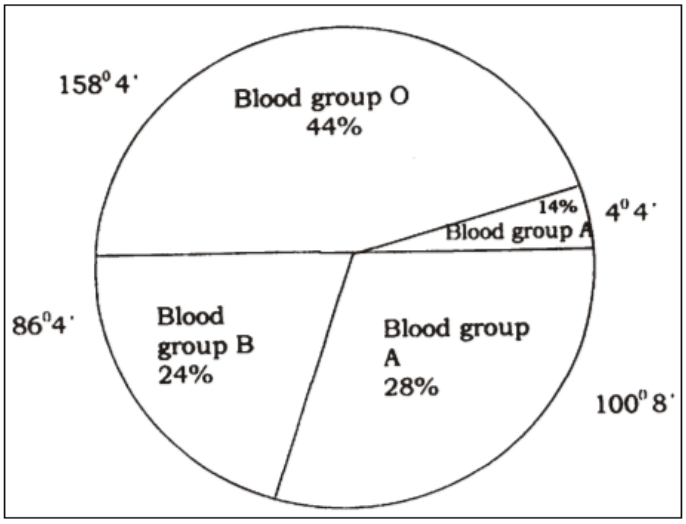
| Blood Group | Rhesus (D) Factor | Frequency of TB Patients | Percentage |
|---|---|---|---|
| A | Positive | 70 | 24% |
| A | Negative | 0 | 0% |
| B | Positive | 84 | 28% |
| B | Negative | 0 | 0% |
| AB | Positive | 12 | 4% |
| AB | Negative | 0 | 0% |
| O | Positive | 114 | 38% |
| 0 | Negative | 18 | 6% |
| TOTAL | | 300 | 100% |

**Table-5: ABO Blood Droup of Controls**

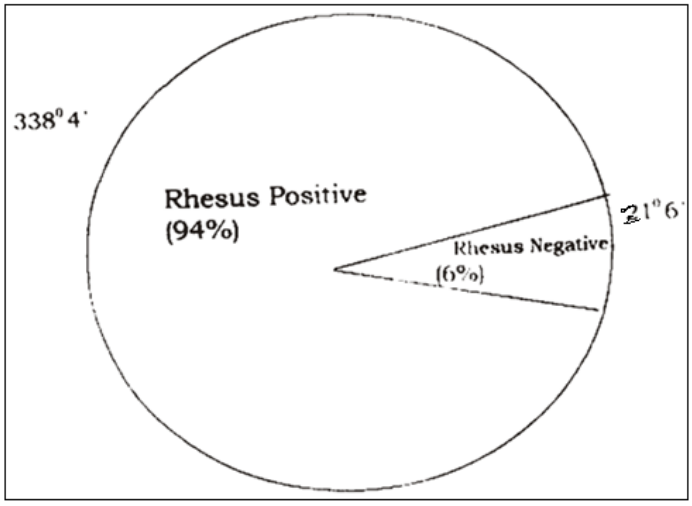
| ABO Blood Group | Frequency of control | Percentage value |
|---|---|---|
| A | 84 | 28% |
| B | 72 | 24% |
| AB | 12 | 4% |
| O | 132 | 44% |
| TOTAL | 300 | 10O% |

**Table-6: Rhesus (D) Blood System of Controls**

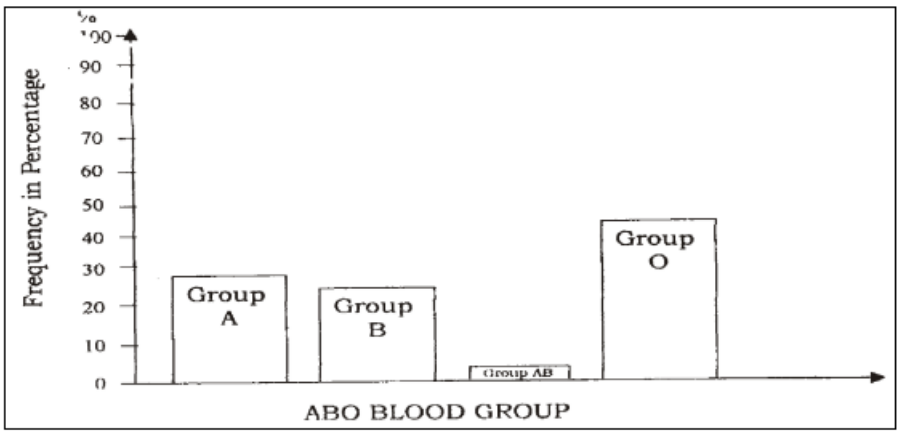
| Rhesus (D) Blood System | Frequency of control | Percentage Value |
|---|---|---|
| Positive | 282 | 94% |
| Negative | 18 | 6% |
| TOTAL | 3OO | 1OO% |

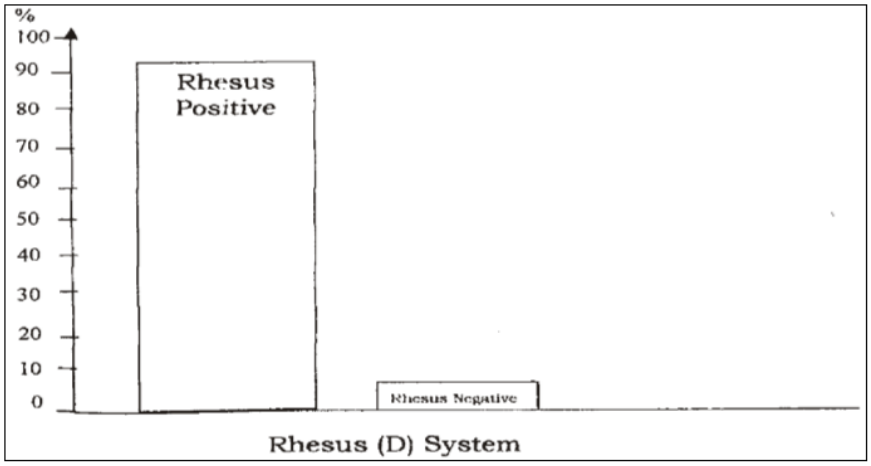



**Controls' Result Data of ABO Blood Group Presented In Pie Chart**




**Controls' Result Data of Rhesus (D) System Presented In Pie Chart**






**Controls' Result Data of Rhesus (D) System Presented in Pie Chart**

## DISCUSSION

The research on ABO blood group and Rhesus system in TB (tuberculosis) patients at Eastern region of Nigeria and to be (individuals free of TB) was carried out in Tuberculosis/ Leprosy Presbyterian Joint Hospital (Happy Home, Uburu in Ohaozara L.G.A Ebonyi State of Nigeria. We observed that in the ABO blood group system, blood group O predominated in the Tb patients with the highest frequency (48%), followed by A (22%) B(18%) and AB (12%), while in controls (people free from TB) from the same Igbo tribe and location follow the same pattern of results from that of Tb patients. Blood group O was highest in frequency (44%), while A (28%, B (24%) and AB (4%).

The rhesus blood group system, the frequency of Rh (D) negative in patients was 10% and 6% in controls, while the frequencies of Rh (D) positive were 90% and 94% in patients and controls respectively.

This study was carried out with two hundred (200) Tb patients and three hundred (300) controls and there was no significant difference between the Tb patient and controls in the ABO and Rhesus blood groups.

Chessbrough reported his finding on the same study that blood group O (49%); A (26%), region are the average occurrence which is similar to the controls I obtained in my study outcome. Cheesbrough also discovered that rhesus (D) positive is of 94-95% [7].

Laha and Duta [8] found a very high frequency of blood group 0 in pulmonary tuberculosis patients while Bhosale and kulkani [9] observed that group A showed the highest frequency (36%) in the case of TB patients of Bombay.

Reddy *et al.*, [10] considering the proportions of ascariasis, cataract, coneal ulcer and tuberculosis occurring in Badaga patients found that 47.65% of them belonged to the 0 blood group as compared to 31.25% of controls.

Kshatriya and Kapoor [11], observed appreciably high frequency of blood group B and Rhesus factor D negative in tuberculosis patients.

Maror and Bhanwer [12] observed higher incidence of pulmonary tuberculosis among blood group AB and B individuals.

Jain [13] found a significantly higher incidence of group AB among pulmonary tuberculosis patients.

In other hands several studies reported in literature [14-18] observed no significant difference between the blood groups of TB patients and person free from TB (Controls).

## CONCLUSION

The haematological, Serological and biochemical studies on the effects tuberculosis in ABO blood groups and rhesus system of the patients have apparently not given a much significant evidence for phenotypic association with tuberculosis.

Tuberculosis (TB) to adopt the preventing measures of drug abuse and individuals free from Tuberculosis to adopt the preventive measures from contacting mycobacterium organisms that causes Tuberculosis and still maintain good body immunity from balance die.

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