A study to find the correlation between ABO blood group and pulmonary tuberculosis

Dhanalakshmi M. N. K.[1], T. Jaya Chandra[2]

[1]Dr. M. N. K. Dhanalakshmi Assistant Professor, Department of Pathology, Tagore Medical College & Hospital, Rathinamangalam, Chennai, Tamil Nadu, [2]Dr. T Jaya Chandra, Associate Professor, Department of Microbiology, GSL Medical College, Rajahmundry, Andhra Pradesh, India.

Corresponding Author: Dr. T. Jaya Chandra, Associate Professor, Department of Microbiology, GSL Medical College, Rajahmundry, Andhra Pradesh, India. Email: chanduthegreat2014@gmail.com

Abstract

Introduction: Studies regarding pulmonary tuberculosis (PT) and blood group correlations were reported from different parts of globe. But there was huge disparity. Hence a study was conducted to find the relation between PT and ABO Rh blood group. **Materials and Methods:** Individuals with signs and symptoms suggestive of PT were included in the study. Two spot sputum samples were collected, sputum smears were stained by ZN staining. Simultaneously, ABO blood grouping and Rh typing was done for all the participants by slide agglutination test. *P* value of <0.05 was considered statistically significant. All the smear positive cases were included in test group. **Results:** During the study period, total 421 participants were included in the study the smear positivity was 64 (14.6%). In the test group, 2.2% were A+, 0.45% were A-; statistically there was no significant difference; 4.3% were B+, 0.9% were B- statistically there was no significant difference. Whereas 1.1% were AB+ and 0.45% were AB-; statistically there was no significant difference and 3.6% were O+, 1.4% were O-; statistically there was no significant difference. **Conclusion:** Present study showed that there was no significant association between blood groups and PT. Studies with large sample size for long time is recommended.

Keywords: Tuberculosis, Blood group, ZN staining, Sputum

Introduction

Mycobacterium tuberculosis (MTB) complex, an acid-fast bacillus is the causative agent of tuberculosis [1]. MTB can infect any organ in our body, lung infection, pulmonary tuberculosis (PT) is very common. TB is transmitted through the inhalation of the bacilli in the form of aerosols. Disease is 2 types, primary TB and secondary TB. The primary PT is usually asymptomatic or present with fever, productive cough, hemoptysis and chest pain. Symptoms are similar in post primary PT, but more pronounced and causes cavitary formation. Due to the large number of cases and deaths, WHO declared TB as global public health emergency. Nearly 90% of TB cases occur in low- and middle-income countries, India is one of the highest TB burden countries [1]. Various diagnostic methods such as smear microscopy, culture, molecular techniques, skin test, serodiagnostics are available [2].

Inspite of the availability of different diagnostic methods, sputum microscopy by Ziehl Neelsen (ZN) staining is commonly practiced method for the diagnosis of PT especially in high TB burden countries such as India [2].

Manuscript received: 20th November 2019
Reviewed: 30th November 2019
Author Corrected: 6th December 2019
Accepted for Publication: 11th December 2019

Factors such as quality, quantity of sputum, number of samples, staining technique used, gender and so on influence smear microscopy results [3]. Similarly, proteins present on the surface of the red blood cells (RBC) as well as the serum immunoglobulins influence the persons individuality [4].

The antigens of ABO blood groups are extracellular, present on the surface of RBC [5,6]. These antigens have a significant role not only in transfusion medicine but also in various other diseases. Studies regarding PT and blood group correlations were reported from different parts of globe. But there was huge disparity. With this a study was conducted to find the relation between PT and ABO Rh blood group.

Materials and Methods

Settings: Study was conducted in the department of Microbiology, GSL Medical College.
Duration of study: Study was conducted from January 2019 to September 2019.
Sampling method: Random sampling was considered in this study.

Inclusion criteria: The individuals aged 18 years and above with cough for > 2 weeks and the patients who gave informed consent were included in the study.

Exclusion criteria: Individuals aged below 18 years, Patients who are on Anti Tuberculosis Treatment (ATT), individuals with known HIV-positive status and those who didn't submitted informed consent were excluded in the study.

Sample size: All the individuals who satisfy the inclusion criteria during the study period were included in the study.

Ethical approval: Study protocol was approved by the institutional ethical committee.

In this study, smear positive for AFB cases were included in the test and smear negative participants were included in the control group. The individuals were explained in local language about the importance of submission of sputum sample. Visual difference between sputum and saliva and how to produce good quality sputum sample were demonstrated practically. All the individuals were informed to provide two sputum samples, i.e., spot (S) sample at the time of first visit to the hospital, second (S_2) spot sample was collected 1 h after the S sample. Immediately after collection of sputum, smears were prepared and stained by ZN staining. Sputum collection, smear preparation and ZN staining were done as per RNTCP guidelines [7]. Simultaneously, ABO blood grouping and Rh typing was done for all the participants by slide agglutination test.

Sputum samples were collected in an open place by coughing. Initially, patient should inhale deeply two to three times with mouth open, cough out deeply from chest, and sputum sample was spitted out directly in the sterile, new, leak-proof sample container. Then, the container was closed tightly.

New unscratched slides were selected for smear preparation. Smear was prepared with sterile loop. A good smear is spread evenly, over a size of 2 × 3 cm and is neither too thick nor too thin (Figure 4.2).

This was allowed to air dry for 15-30 min and fixed by passing it over a blue flame 3-4 times.

Smears were flooded with filtered 1% carbol fuchsin and heated until they were steamed and left to steam for 5 min. After rinsing the slides with a gentle stream of water, 25% sulphuric acid was used to decolorize the smears for 2 to 4 min, and if necessary, the decolorization step was repeated for another 1-3 min.

The slides were rinsed as mentioned earlier and counterstained with 0.1% methylene blue for 30 s. The slides were then washed, air dried, and examined under oil immersion.

Statistical analysis: □2 test was used to find the association between the case and control groups in ABO-Rh and TB. *P* value of <0.05 was considered statistically significant.

Results

During the study period, total 421 participants were included in the study; in this 244 (55.7%) were male and 194 (44.2%) were female participants and the male female ratio was 1.27. the smear positivity was 39 (8.9%) and 25 (5.7%) respectively in male and female; statistically there was no significant difference (Table 1).

Among the smear positive cases, the male female ratio was 1.55 (Table 1).

Table-1: Gender wise smear results; n (%)

Gender	Positive	Negative	Total
Male	39 (8.9)	205 (46.8)	244 (55.7)
Female	25 (5.7)	169 (38.5)	194 (44.2)
Total	64 (14.6)	374 (85.4)	438 (100)
□^{2} value	0.8308		
P value	0.36208		
Statistical analysis	Not significant		

Table 2: Group wise blood group results; n (%)

Group	A		B		AB		O	
	Rh +	Rh -	Rh +	Rh -	Rh +	Rh -	Rh +	Rh -
Control	80 (18.2)	7 (1.6)	78 (17.8)	22 (5)	21 (4.8)	9 (2.05)	107 (24.5)	50 (11.4)
Test	10 (2.2)	2 (.45)	19 (4.3)	4 (0.9)	5 (1.1)	2 (0.45)	16 (3.6)	6 (1.4)
Total	90 (20.5)	9 (2.05)	97 (22.1)	26 (5.9)	26 (5.9)	11 (2.5)	123 (28)	56 (12.8)
χ^2 value	0.192		0.042		0.148		0.0353	
P value	0.661236		0.8376		0.700448		0.850961	
Statistical analysis	NS		NS		NS		NS	

In A blood group, 18.2% were Rh+, 1.6% were Rh – in control group; whereas in test group, it was 2.2% and 0.45%; statistically there was no significant difference. In B blood group, 17.8% were Rh+, 5% were Rh – in control group; whereas in test group, it was 4.3% and 0.9%; statistically there was no significant difference. In AB blood group, 4.8% were Rh+, 9% were Rh – in control group; whereas in test group, it was 1.1% and 0.45%; statistically there was no significant difference. In O blood group, 24.5% were Rh+, 11.4% were Rh – in control group; whereas in test group, it was 3.6% and 1.4%; statistically there was no significant difference (Table 2).

Discussion

MTB complex comprising MTB, M.*bovis*, M. *bovis* BCG, M. *africanum,* M. *caprae,* M. *canettii,* M. *microti*, and M. *Pinnipedii*, is the causative agent of the world pandemic, TB. It was reported in the literature that worldwide, TB ranks to be the second leading cause of death due infectious disease next to HIV [8,9,10]. Due to the large number of infected cases as well as deaths, TB was reported to be the world pandemic by the WHO [1]. Inspite of the availability of various techniques such as culture, molecular techniques, serodiagnostic methods, in this study, ZN staining was used to stain the sputum smears. LED fluorescent staining is a rapid, sensitive technique compared to ZN technique [1,2,11]. But by considering the advantages such as rapidity, ease in the technique, ZN staining was used in the current study to stain the sputum smears.

In this research, gender wise, the smear positivity was 39 (8.9%) and 25 (5.7%) respectively in male and female; statistically there was no significant difference (Table 1). In addition to sputum quality and staining technique, gender difference also one of the influencing factors of sputum microscopy results. Kivihya-Ndugga et al. conducted a study to find what extent the performance of sputum microscopy itself is responsible for gender difference in notification rates for diagnosis of PT [12]. Sputum smears were stained by ZN staining and fluorescent staining techniques. The authors found that 7% of men and 11% of women were undetected and women were less likely to be diagnosed as SP. In this study also, smear positivity was less in female. In this study, statistically there was no significant difference between the blood groups and PT individuals (Table 2). In the available literature, the association between blood group and various infectious diseases such as plague, anthrax, cholera, smallpox was reported [13-16]. Similarly, blood groups and PT correlation studies are also available [4,17,18]. In a study by Rao et al., the authors reported significant association between A blood group and PT; the authors reported that among PT cases 18% PT patients were A+ and non of the participants were A- [17]. Whereas in this study, 2.2% participants were A+ and 0.45% were A-; statistically there was no significant difference (Table 2).

Viskum K., reported a significant increase in persons with blood groups O and AB [19]. Whereas Rao et al. found significant association between PT and persons of blood groups O and A [17]. In this report, in the test group, 3.6% patients were O + and 1.4% were O -; statistically there was no significant difference (Table 2), and 1.1% patients were AB + and 0.45% were AB -; statistically there was no significant difference.

Limitations of the study: Small sample size, short study period are the limitations of the study.

Conclusion

Mixed results were reported in different studies in PT and blood groups correlation. Hence studies with large sample size for long time is recommended.

What the study adds to the existing knowledge?

The present study was conducted to find the relation between PT and ABO Rh blood group, which resulted in mixed results. Hence, the present study provide a recommendation that larger sample size are required to derive the relation between PT and ABO.

Authors contributions

Dr. M N K Dhanalakshmi: Literature survey, Paper writing, data analysis

Dr. T. Jaya Chandra: Sample collection, Bench work, statistical analysis, paper writing

References

1. Chandra TJ, Raj RS, Sharma YV. Same day sputum smear microscopy for the diagnosis of pulmonary tuberculosis: Direct versus concentrated sputum smear. Int J Tuberc Lung Dis 2016; 20(2):247-251. doi: 10.5588/ ijtld. 15.0566.

2. Chandra TJ. Same day sputum smear microscopy approach for the diagnosis of pulmonary tuberculosis in a microscopy centre at Rajahmundry. Indian J Tuberc. 2012; 59 (3): 141-144.

3. Chandra TJ. One-sample two-smear versus two-sample two-smear approach for the diagnosis of pulmonary tuberculosis. J Lab Physicians. 2018;10(2):135-139. doi: 10. 4103/JLP.JLP_145_17.

4. Tiwari VK, Kumar A, Mohan N, Kumar A, Agarwal R, Khurana A. Distribution of ABO and Rh blood groups in patients with tuberculosis in Rohilkhand region of Uttar Pradesh. Int J Med Sci Public Health. 2015;4(6):760-762. doi: 10.5455/ijmsph.2015.27112014153.

5. Storry JR, Olsson ML. The ABO blood group system revisited: a review and update. Immunohematol. 2009; 25 (2) : 48-59.

6. Eastlund T. The histo-blood group ABO system and tissue transplantation. Transfus. 1998;38(10):975-988. doi: https://doi.org/10.1046/j.1537-2995.1998.381098440863.x.

7. Central TB Division, Directorate General of Health Services Ministry of Health and Family Welfare. Manual for Sputum Smear Fluorescence Microscopy. New Delhi, India: Ministry of Health and Family Welfare. Available from: http://www.tbcindia.nic.in/showfile.php?lid=2988. [Last accessed on 2017 Nov 26].

8. Boum Y, Atwine D, Orikiriza P, Assimwe J, Page AL, Mwanga-Amumpaire J, et al. Male gender is independently associated with pulmonary tuberculosis among sputum and non-sputum producers people with presumptive tuberculosis in Southwestern Uganda. BMC Infect Dis 2014; 14: 638. doi: 10.1186/s12879-014-0638-5.

9. Neyrolles O, Quintana-Murci L. Sexual inequality in tuberculosis. PLoS Med 2009;6(12):e1000199. doi: https:// doi. org/10.1371/journal.pmed.1000199.

10. Khan MS, Dar O, Sismanidis C, Shah K, Godfrey-Faussett P. Improvement of tuberculosis case detection and reduction of discrepancies between men and women by simple sputum-submission instructions: A pragmatic randomized controlled trial. Lancet. 2007;369(9577):1955-1960. doi: https://doi.org/10.1016/S0140-6736(07)60916-7

11. Chandra TJ, Raj RS, Sharma YV. Same day sputum smear microscopy approach with modified ZN staining for the diagnosis of pulmonary tuberculosis in a microscopy centre at Rajahmundry. Indian J Med Microbiol. 2014;32 (2): 153-156. doi: 10.4103/0255-0857.129801.

12. Kivihya-Ndugga LE, van Cleeff MR, Nganga LW, Meme H, Odhiambo JA, Klatser PR. Sex-specific performance of routine TB diagnostic tests. Int J Tuberc Lung Dis. 2005;9(3):294-300.

13. Rios M, Bianco C. The role of the blood group antigens in infectious diseases. Semin Haematol. 2000;37(2):177-185. doi: https://doi.org/10.1016/S0037-1963(00)90042-8.

14. Berger SA, Young NA, Edberg SC. The relationship between infectious diseases and the human blood types. Eur J Clin Microbiol Infect Dis. 1989;8(8):681-689.

15. Lindesmith L, Moe C, Marionneau S, Ruvoen N, Jiang X, Lindblad L, et al. Human susceptibility and resistance to the Norwalk virus infection. Nat Med. 2003;9(5):548-553.

16. Guseva EV, Tashpulatov RIU. The blood antigens in the AB0 system and the susceptibility of humans to diphtheria. Zh Mikrobiol Epidemiol Immunobiol. 2004;(4):79-81.

17. Rao BN, Reddy VD, Sahu PS, Kumar VA, David MA, Yugandhar P, et al. J. The ABO blood group distribution and Pulmonary Tuberculosis. J Clin Diag Res. 2012;6 (6): 943-946. doi: 10.7860/JCDR.2012.4370.2298.

18. Gondaliya ST, Makwana HH, Lakum NR, Agnihotri AS. Pulmonary Tuberculosis and Blood Groups: Any Association? Gujarat Med J. 2012;67(2):39-41.

19. Viskum K. The ABO and Rh blood groups in patients with pulmonary tuberculosis. Tubercle.1975;56(4):329-334

How to cite this article?

Dhanalakshmi M. N. K, T. Jaya Chandra. A study to find the correlation between ABO blood group and pulmonary tuberculosis. Trop J Path Micro 2019;5(12):1046-1049.doi:10.17511/ jopm.2019.i12.13