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Original Research Article

A Comparative Study to Detect Tuberculosis in Pregnant Women with and Without Diabetes

M.N. K. Dhanalakshmi[1], Aparna Chowdary Chaliki[2], Gunta Raja Sekharam[3], Anusha T[4]

[1]Associate Professor, Department of Pathology, Bhaarath Medical College and Hospital, Agaram Main Road, Selaiyur, Chennai.

[2]Assistant Professor, Department of Obstetrics and Gynaecology, GSL Medical College, Rajahmundry.

[3]Assistant Professor, Department of Pulmonary Medicine, Government Medical College, Srikakulam.

[4]Assistant Professor, Department of Biochemistry, Osmania Medical College, Hyderabad

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Corresponding author: Dr. Anusha T

Conflict of interest: Nil

Abstract

Introduction: Diabetes mellitus (DM) was reported to be the major issue to control the spread of tuberculosis (TB). With these, a study was conducted to find the utility of FS in the diagnosis of pulmonary tuberculosis (PT) among the pregnant women.

Methods: It was a prospective study, conducted in GSL Medical College. In this research sputum samples which were submitted to institutional Microscopy centre were considered. In this research, pregnant women with DM, symptoms of cough for > 2 weeks were considered. Non cooperative members and non DM were not considered in this research. Then the participants were provided with sterile, plastic containers and they were asked to collect the sample. Collection of sputum sample, smear preparation as well ZN and fluorescent staining (FS) were carried as per the protocol. The data were analysed using SPSS version 21. Chi square test was used to find the statistical analysis. P <0.05 was considered to be statistically significant.

Results: Total 106 participants were included in this study. Maximum (32.8%; 34) in 21 – 25 years group; the mean age of the study members was 31.3 years. Total 8 (100%) PT cases were detected using FS. By using ZN staining 5 (4.5%) PT cases were detected; statically there was no significant difference. Maximum PT cases were detected in in 21 – 25 (5; 62.5%) years group.

Conclusion: FS technique has better diagnostic yield to detect pulmonary tuberculosis among the pregnant women with DM. But small sample and short duration of the study are the limitations of the research.

Keywords: Tuberculosis, Study, Staining, Diagnosis.

Introduction

Tuberculosis (TB) is a world pandemic, bacterial disease caused by *Mycobacterium tuberculosis* (MTB) complex. India is the highest TB burden country in the world, one-fifth of global burden with an annual incidence of > 2 million. [1] Smear microscopy (SM) was reported to be a simple and easy technique to identify the acid fast bacilli (AFB) with some limitations. Factors such as gender, intervention, number of sputum samples and quality of sample can influence the SM results. [2, 3] At this point, fluorescent staining (FS) was considered to be the one which can surely influence the SM results. The diagnostic utility of FS was reported to be better compared to the Ziehl Neelsen (ZN) staining.

Diabetes mellitus (DM) was reported to be the major issue to control the spread of TB along with the factors such as smoking, alcohol, malnutrition and so on. In India this is much more difficulty as we are the Diabetes Capital of the world. [4] In addition to this there is 8.99 times TB treatment failure risk among the DM. [4] This leads to spread of the infection as well as burden on program.

With these, a study was conducted to find the utility of FS in the diagnosis of PT among the pregnant women.

Methods

It was a prospective study, conducted in GSL Medical College. In this research sputum samples which were submitted to institutional Microscopy centre were considered. In this research, pregnant women with diabetes mellitus (DM) as well as non DM with symptoms of cough for > 2 weeks were considered. Non cooperative members were not considered in this research.

Initially the study was explained to the study members. All the individuals were explained in local language about the importance of submission of sputum sample. Difference between sputum and saliva was shown practically. After clarifying all the doubts, the participants were explained how to produce good quality sputum sample. Simultaneously it was demonstrated practically. Then the participants were provided with sterile, plastic containers and they were asked to collect the sample. Collection of sputum sample, smear preparation as well ZN staining were carried as per the protocol. [5] From the study members, blood sugar was estimated in the blood samples as per the guidelines. [6]

Fluorescent Staining:

The slides were placed on the staining rack without touching each other, flooded with freshly filtered auramine phenol, and left for 7–10 min. Then, the slides were washed well with running water, and care was taken to control the flow of water so as to prevent washing away the smear. They were decolorized by covering completely with acid alcohol for 2 min for two times and then washed well with running water as before to remove the acid alcohol. Following this, they were counterstained with 0.1% potassium permanganate ($KMnO_4$) for 30 s and washed as before with water. Then, the slides were air dried and observed under 40× objective. The reagents for FS technique were prepared as per guidelines. [5]

Statistical analysis:

The data were analysed using SPSS version 21. Chi square test was used to find the statistical analysis. $P < 0.05$ was considered to be statistically significant.

Results

Total 106 participants were included in this study. Maximum (32.8%; 34) was in 21 – 25 years group followed by 26 – 30 years (29.2%), the mean age of the study members was 31.3 years (Table 1)

Table 1: Age wise distribution of the study participants; n (%)

Age	PT	Non PT	Total
≤ 20	0	11 (10.4)	11 (10.4)
21 – 25	5 (4.5)	29 (27.3)	34 (32.8)
26 – 30	1 (0.9)	30 (28.3)	31 (29.2)
31 – 35	1 (0.9)	24 (22.7)	25 (23.6)
≥ 36	0	5 (8.9)	5 (8.9)
Total	8 (7.5)	98 (92.5)	106 (100)

Total 8 (100%) PT cases were detected using FS. By using ZN staining 5 (4.5%) PT cases were detected; statically there was no significant difference (Table 2).

Table 2: Utility of different staining techniques in the diagnosis of PT; n (%)

Technique	PT	Non PT	Total
ZN	5 (4.5)	101 (95.3)	106 (100)
FS	8 (7.5)	98 (92.5)	106 (100)
Statistical analysis	Chi square = 0.56692; statistically not significant		

Maximum PT cases were detected in in 21 – 25 (5; 62.5%) years group. When FS was compared among the DM and non DM women, more PT cases were diagnosed in DM but there was no statistical significant (Table 3).

Table 3: Utility of FS technique in DM and non DM pregnant women in the diagnosis of PT; n (%)

Parameter	PT	Non PT	Total
DM	8 (7.5)	98 (92.5)	106 (100)
Non DM	7 (6.6)	7 (6.6)	105 (100)
Statistical analysis	Chi square = 0.788816; statistically not significant		

Discussion

Being high populated country, India has dual burden with high DM as well as TB.[1] In India, 8% of TB individuals were diagnosed to be DM. in this research also total 8 TB cases were diagnosed among the individuals with DM. the mean age of the study members was 31.3 years. As per the available data, the TB DM comorbid condition was high in > 50 years. [7, 8] In this research DM individuals with signs and symptoms of PT were included; hence there is some difference in the age.

Among the 8 (100%) PT cases, 75% (6) were low and middle income group. In the literature also, highest PT were reported to be low followed by middle income group. [9, 10] This is because of close family living. Hence chances of spreading of the infection is very high. In addition to this, due to loss of working days, usually these don't go for diagnosis as well as treatment immediately. This also favours the spread of the infection.

Fluorochroming is a direct chemical interaction that occurs between the fluorescent dyes and component of bacterial cell. [11] This interaction is same as that occurs with the stains used in Light Microscope (LM). But, the difference is that the use of fluorescent dyes enhances contrast and amplifies the observer's ability to detect the stained cells 10-fold greater than would be observed by LM. Hence always there is better sensitivity with FS. In this research also the smear positivity was more with FS (Table 2);

statistically there was no significant difference. Though there was statistical significance, we should not neglect FS technique. Because we should look at the detection of more number of smear positive cases. In a report it was mentioned that each individual with active PT can spread disease 10 – 12 per annum which can increase significant financial burden on the program. [12]

More number of PT cases were diagnosed with FS technique among the women with DM (Table 3); it was not statistically significant. With this it is clear that FS diagnostic utility is better in DM. Continuous power supply and high cost mercury lamps are the major limitations of fluorescent microscope (FM). [13] When we consider the disease spread issue as well as financials burden on the program, cost of the FM lamp is minimum. Moreover LED FMs were available and installed almost all the designated microscopy centers. [5, 14] Hence FS is a better alternative in the diagnosis of PT even in the pregnant women with DM. But the limited specificity is another limitation of FS. By repeating ZN staining to the FS stained smears, the specificity issue can be resolved. [15]

Conclusion:

FS technique has better diagnostic yield to detect pulmonary tuberculosis among the pregnant women with DM. But small sample and short duration of the study are the limitations of the research.

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