Screening of Diabetes Mellitus among the TB Clinic Attendees – A Short Survey

Purru Ravi Kumar[1], Sudha[1], V. Udhaya[*,1] and G. Durga Devi[2]

[1]Department of Physiology, Rajah Muthiah Medical College, Annamalai University, Chidambaram, Tamil Nadu, India.
[2]Department of Physiology, Government Medical College Ongole, Andrapradesh, India.

ABSTRACT

The noninfectious disease, diabetes increases the risk of the infectious disease TB. In developing countries TB remains a major cause of mortality and in these countries the prevalence rate of diabetes in increasing rapidly. In this study, totally 1200 number of TB clinic attendees were included and blindly screened for the diabetes. Random blood sugar was checked for the selected population. Blood samples were tested by glucometer. Out of 1200 TB clinic attendees, diabetes was diagnosed with 750 patients (63%). From our study, we conclude that the TB clinic attendees are at high risk and showing high percentage of DM. We also suggest that the danger of the co-existence of TB and DM should be explored and to be taught to the society especially to the TB clinic attendees to ensure the effective treatment.

© 2020 Elixir All rights reserved.

Introduction

The tuberculosis and its link with diabetes had been observed and studied for centuries together. The high prevalence rate of tuberculosis among the people with poor socio-economic status in the developing countries has been recorded. While prevalence of diabetes ascending globally (Kelly and Richard, 2009). The impact of diabetes on the evolution and seriousness of tuberculosis remain provocative matter in the public health and in the field of medicine (Stevenson et al., 2007; Harries et al., 2009 and Leung et al., 2008). The co-existence of tuberculosis and diabetes represents a global threat.

Numerous study information are available and says about the burden of tuberculosis and diabetes mellitus in the low-income and high income countries (Stevenson et al., 2007; Dooley et al., 2009; Lindoso et al., 2008 and Restrepo et al., 2007). Many research studies provided the data of the relative odds of developing tuberculosis among the diabetic patients range from 2.44 to 8.33 compared with non diabetic patients (Mboussa et al., 2003; Shetty et al., 2006; Coker et al., 2006 and Jabbar et al., 2006). Researchers from different nations such as Korea, UK, Hongkong performed large scale longitudinal studies in which thousands of participants provided convincing data, as the DM is a moderate to strong risk factor for the development of active tuberculosis (Stevenson et al., 2007; Kim et al., 1995; Shah and Hux 2003; Dyck et al., 2007 and Leung et al., 2008).

The Bidirectional screening of the infectious disease TB and the non infectious disease DM in the primary healthcare settings was implemented by the world health organisation and the international union against Tuberculosis and Lung diseases in collaboration with national Tuberculosis control program (WHO-2013). However while compare to the available research information about DM among the TB patients, less information is available and relatively research

in this field of specialisation seems to be still in the stage of infancy.

So it is suggested to perform research in the field of coexistence of TB and DM with different angles in view of bringing out the new information which may help the medical field to emphasize the single new directions in the management of the both TB and DM. The aim of present study was to screen the diabetes mellitus among the TB clinic attendees, in order to correlate the negative impacts of DM with tuberculosis and to explore the burden of non-communicable disease – DM on the communicable disease TB.

Materials and Methods

The study was conducted for twelve month period from June 2018 to May 2019.The study population sourced from Government medical college Ongole, Andrapradesh India. Totally 1200 individuals were included in this study. All were TB clinic attendees. Sputum and blood specimens were collected for screening Pulmonary Tuberculosis (PTB) and DM. Samples were collected at the time of their visit to the TB clinic / chest clinic. As well as age and sex matched patients attended health clinics for their health problems checkup were included as controls in this study. Residential address as well as their contact mobile numbers were collected from them for further contact. The Institutional ethical clearance was obtained to perform this study. The study plan and aim was explained to the study population prior to the specimen collection and their socio economic and personal habitual details were collected and recorded in the prescribed Proforma.

Pulmonary Tuberculosis (PTB) Screening

The PTB was diagnosed by clinical examination and X-ray, further confirmed by the additional supportive laboratory tests. The sputum samples (three samples) were collected and screened for Mycobacterium tuberculosis by

Tele:
E-mail address: udaviarokya3@gmail.com

microscopic examination (AFB sptum smear) and further by CBNAAT test.

Diabetes Mellitus (DM) screening

Diabetes mellitus was screened for the study population by glucometer. Initially all the patients were checked for their random blood sugar. Further, the patients / volunteers were requested to give their Fasting Blood Samples (FBS). The results were recorded. Pilot study was conducted prior to this study during which difficulty was faced with most of the patients in collecting blood for fasting sugar check. Hence fasting blood glucose level was performed with limited population and the related data was not included in this paper publication that will be discussed in the PhD thesis and published in future.

Results and Discussion

TB patients and DM Patients are susceptible to get affected by each other (TB and DM). The adverse effect of DM on TB treatment outcomes has been recorded. It has been estimated by the author Jeon an Murray 2008 that diabetes mellitus increases the risk of TB by three fold. The incidence of diabetes mellitus increased world wide and according to the International Database Federation (IDF), it has been estimated that about 415 million individuals shown to have diabetes mellitus and by the year 2040 it is expected to increase to 642 million (IDF,2011). Likewise Tuberculosis is another major public health issue involving a dominant cause of morbidity and mortality. It was recorded in the year of 2015 about 9.6 million TB cases at global level among which India constitutes 2.2 million TB cases.

The prevalence of TB in India was recorded as 195 per lakh and the TB incidence rate was noted as 167 per lakh (Ministry of health and family welfare-2016). As per the data published by whiting et al 2011 almost 62.4 million type 2 diabetes (T2DM) individuals and 77million individuals with pre diabetic conditions. The estimated numbers are predicted and rise in 101 million by the year 2030 (Whiting et al 2011).The possibility of finding the undiagnosed case of DM with in the TB clinic settings is highly help us to identify both DM and pre-diabetic cases among the TB positive as well as TB negative patients. The present study was aimed to find out the prevalence of Diabetes and pre-diabetes among the TB clinic attendees. Due to the non cooperation of the patients fasting blood sugar was not checked with all study population. All the data presented in this paper is a part of the PhD research study, hence limited points with restriction has been discussed in this paper.

In this study results , out of 1200 TB clinic attendees about 1185 patients were referred to the chest clinic (TB clinic) by the medicine OPD and inpatient wards of the Government medical college Ongole, Andrapradesh, India, and 15 patients were identified as review cases those who were undergone anti tuberculosis drug treatment. Overall the age group of the study population was ranged between 30–70 years. The gender details of the study population was recorded as 665 males and 520 females . Among 1185 patients subjected to the sputum Acid Fast Bacilli (AFB) , 63% of them had been shown to have AFB in their sputum (new cases) . All the patients found to shown AFB in their sputum falls in the age group ranged between 30 and 70 years while the patients attended TB clinic for the review after taking the anti tuberculosis drug falls in the age group range 65 to 70 years.

The information collected from the patients clearly shows that the patients undergoing anti tuberculosis treatment and came for the review might not have been strictly followed the treatment regimen and /or having the habit of consuming alcohol almost daily. Compared to the newly diagnosed cases of AFB, the patients already diagnosed and had anti tuberculosis treatment had recorded with the increased percentage of blood sugar level (ranged betweeni150-300) , and it was recorded as 55% and 80% respectively (Table.1) . The same time, 20% (age range- 30 to 70 years) of the newly diagnosed AFB cases and 30% of the patients already had anti tuberculosis treatment (age range- 65 to 70 years) shown to have higher blood sugar level (range 301-400). So TB with DM as comorbid conditions can worsen the health condition of the aged TB patients. From this it came to know that the DM not only facilitate the TB infection but it also affect the TB treatment . Similar study reports had been published by few authors. The study performed by Indian authors on TB and DM reported that the Diabetes was recorded with pulmonary TB (14.8%) cases and sputum smear positive (20.2%) cases. Different research authors from multiple settings performed systemic reviews studies on TB and DM screening showed increased prevalence of DM among TB cases that was ranging from 1.9% to 35% (Stevenson et al 2007, Workneh et al 2017, Balakrishnan et al 2012, Visvanathan et al 2012 and Gupta et al 2011). Retrospective research studies conducted by three different authors suggest that the baseline mycobacterial burdens seems to higher in diabetic patients than controls (Mboussa et al., 2003; Wang et al., 2009).

Diabetes mellitus acting as a predisposing factor among the TB patients and leads to treatment failure or death. In TB patients with DM, those who were receiving short-course therapy, shown to have 3.9 times increased risk of TB

Table 1. Diabetes mellitus and TB associated details of the TB clinic Attendees with specific gender and age group.

Sl. No	Data studied	TB clinic Attendees (n=1200)			
		PTB- sus. Refd- cases	PTB- on-Trt	PTB .pos.new cases	Neg-PTB
1	PTB	1185 99%	015 !.2%	750 63%	435 37%
2	Age groups range	30 -70 yrs	65-70yrs	30-70 yrs	30 - 70 yrs
3	Males	665 56 %	09 60%	480 41%	185 16%
4	Females	520 44%	06 40%	270 22%	250 21%
5	DM-Random Above 150-300 mg/dL	965 81%	12 80%	415 55%	264 61%
6	DM-Random Above 301- 400 mg/dL	220 19%	03 20%	335 45%	171 39%

PTB – Pulmonary Tuberculosis, TB – Tuberculosis, DM – Diabetes mellitus, Tr – Treatment
Note Number of the study population presented here is a portion of the regular patient flow of the TB clinic /chest clinic during the year June 2018 to May 2019

treatment failure (Morsy et al., 2003). It is suggested that these types of patients should be identified and isolated from the society and strict medical care should be provided to them by which the spread of TB in the society can be avoided. Moreover both TB as well as DM can be easily managed among these type of patients.

However increased number of the TB clinic attendees who had been recorded as pulmonary TB negative individuals found have high blood sugar level. About 63% of them had shown blood sugar level 150-300 mg / dL while 40% of them found to shown blood sugar level range 301-400 mg / dL respectively. This point requires attention of the medical authorities and policy makers to give equal attention to the TB negative individuals also in view of treating them for DM. Many research authors performed study on the association of TB and DM and also discussed about the negative impact of DM on TB patients especially the active TB progress and the DM impact on the TB treatment outcomes (Restnepo BI et al., 2011 and Ali Nasir et al 2016). The information about the DM among the TB negative individuals those attended TB clinics, and the related research profile seems to be inadequate or less when compare to the importance so far given to the TB positive patients. Hence it is felt essential to focus on the TB clinic attendees both TB positive and TB negative individuals in response to the DM management and treatment. It is also suggested to have future extensive researches on this field of specialization to bring out the full profile which will be highly useful for the future management of DM and TB in the society.

From our study we suggest that to co-ordinate the long term care for DM in theTB control. The negative impacts of DM on TB which includes consumption of longer time to bring down the results of smear negative from sputum smear positivity and drug resistant TB (Cleopas Martin Rumende, 2018). In this point , research should be performed in different angle, in this connection if the infections type of TB-DM patients and the patients with TB positive and DM negative should be studied and that will help in the control of both TB and DM. So it is suggested to perform research in the field of coexistence of TB and DM with different angles in view of bringing out the new information which may help the medical field to emphasize the single new directions in the management of the both TB and DM. Hence screening of DM among the TB clinic attendees can help the early diagnosis of the DM among the TB positive patients those who are going to start their anti tuberculosis drug treatment and also help for the TB patients already under anti tuberculosis treatment outcome.

It has been estimated that about 50% of the DM patients living in developing countries are unaware of their DM diagnosis. Few studies pointing the low level HbA_1Cs among the newly DM diagnosed patients with TB (versus previously – diagnosed DM) (Restnepo BI et al., 2011 and Kirui et al 2012). control. The negative impacts of DM on TB which includes consumption of longer time to bring down the results The present study was aimed to find out the prevalence of Diabetes and pre diabetes among the TB clinic attendees. Hence screening of DM among the TB clinic attenders can help the early diagnosis of the DM among the TB positive patients those who are going to start their anti tuberculosis drug treatment and also help for the successful treatment outcome of TB patients already undergoing anti tuberculosis drug treatment.

Conclusion

The screening of the DM among the TB clinic attendees shown to have considerable percentage of DM positivity. The study population had shown the positive correlation which favours the co-existence of both DM and TB. The possibility of finding the undiagnosed case of DM within the TB clinic settings is highly help us to identify both DM and pre-diabetic cases among the TB positive as well as TB negative patients. Hence it is felt essential to focus on the TB clinic attendees both TB positive and TB negative individuals in response to the DM management and treatment. It is also suggested to have future extensive researches on this field of specialisation to bring out the full profile which will be highly useful for the future management of DM and TB in the society.

References

1. Ali Nasir Siddiqui 1, Khalid Umer Khayyam 2, Manju Sharma 3, Effect of Diabetes Mellitus on Tuberculosis Treatment Outcome and Adverse Reactions in Patients Receiving Directly Observed Treatment Strategy in India: A Prospective Study, Biomed Res Int. 2016; 2016: 7273935. doi: 10.1155/2016/7273935. Epub 2016 Aug 24.

2. Balakrishnan S, Vijayan S, Nair S, Subramoniapillai J, Mrithyunjayan S, Wilson N, et al. High diabetes prevalence among tuberculosis cases in Kerala, India. PLoS One. 2012;7:e46502.

3. Coker R, McKee M, Atun R, Dimitrova B, Dodonova E, Kuznetsov S, et al. Risk factors for pulmonary tuberculosis in Russia: case-control study. British Medical Journal. 2006;332(7533):85–7. doi: 10.1136/bmj.38684.687940.80 []

4. Cleopas Martin Rumende, 2018. Risk Factors for Multidrug-resistant Tuberculosis Acta Med Indones, Jan; 50(1):1-2.

5. Dooley KE, Tang T, Golub JE, Dorman SE, Cronin W. Impact of diabetes mellitus on treatment outcomes of patients with active tuberculosis. *Am J Trop Med Hyg.* 2009; 80:634–39.

6. Dyck MD, Helena Klomp RN, MSc, Darcy D. Marciniuk MD, Leonard Tan MB, PhD, Mary Rose Stang PhD, Heather A. Ward MD & Vernon H. oeppner MD The Relationship Between Diabetes and Tuberculosis in Saskatchewan *Canadian Journal of Public Health* volume 98, pages55–59 (2007)

Gupta S, Shenoy VP, Bairy I, Srinivasa H, Makhapadhyay C.Diabetes mellitus and HIV a co- morbidities in tuberculosis patients of rural south India. *J Infect Public Health.* 2011; 4: 140–4.

7. Harries AD, Billo N, Kapur A. Links between diabetes mellitus and tuberculosis: should we integrate screening and care? *Trans R Soc Trop Med Hyg.* 2009;103:1–2.

8. International Diabetes Federation. *IDF Diabetes Atlas [Internet].* 5th edn: 2011. http://www.diabetesatlas. org/F. (accessed 5 Feb 2012).

9. Jabbar, A., Hussain, S.F. & Khan, A.A. (2006). Clinical characteristics of pulmonary tuberculosis in adult Pakistani patients with co- existing diabetes mellitus. *EMHJ - Eastern Mediterranean Health Journal, 12 (5), 522-527, 2006.*

10. Jeon CY, Murray MB. Diabetes mellitus increases the risk of active tuberculosis: A systematic review of 13 observational studies (vol 5, pg e152, 2008). Plos Medicine. 2008;5(8):1298.

11. Kim SJ, Hong YP, Lew WJ, Yang SC, Lee EG. Incidence of pulmonary tuberculosis among diabetics. Tubercle and Lung Disease. 1995;76(6):529–33. doi: 10.1016/0962-8479(95)90529-4

12. Kirui NK, Pastakia SD, Kamano JH, Cheng S, Manuthu E, Chege P, et.al. Important co-morbidity in patients with diabetes mellitus in three clinics in Western Kenya. Public Health Action. 2012; 2(4):148–151. pmid:26392975

13. View ArticlePubMed/NCBIGoogle Scholar

14. Leung CC, Lam TH, Chan WM, Yew WW, Ho KS, Leung GM, et al. Diabetic control and risk of tuberculosis: A cohort study. American Journal of Epidemiology. 2008;167(12):1486–94. doi: 10.1093/aje/kwn075

15. Lindoso AA, Waldman EA, Komatsu NK, Figueiredo SM, Taniguchi M, Rodrigues LC. Profile of tuberculosis patients progressing to death, city of Sao Paulo, Brazil, 2002. *Rev Saude Publica.* 2008;42:805–12.

16. Mboussa J, Monabeka H, Kombo M, Yokolo D, Yoka-Mbio A, Yala F. Course of pulmonary tuberculosis in diabetics. *Rev Pneumol Clin.* 2003;59:39–44.

17. Ministry of health and family welfare-2016.

18. . Morsy AM, Zaher HH, Hassan MH and Shouman A. Predictors of treatment failure among tuberculosis. Patients under DOTS strategy in Egypt. East Mediterr Health J. 2003; 9:689-701

19. Restrepo BI (2007) Convergence of the tuberculosis and diabetes epidemics: Renewal of old acquaintances. Clin Inf Dis 45: 436–438.

20. Restrepo BI, Camerlin AJ, Rahbar MH, Wang W, Restrepo MA, Zarate I,et.al. Cross-sectional assessment reveals high diabetes prevalence among newly-diagnosed tuberculosis cases. Bull World Health Organ. 2011; 89(5):352–359. pmid:21556

21. Shah BR, Hux JE. Quantifying the risk of infectious diseases for people with diabetes. *Diabetes Care.* 2003;26:510–13.

22. Shetty N, Shemko M, Vaz M, D'souza G. An epidemiological evaluation of risk factors for tuberculosis in South India: a matched case control study. *Int J Tuberc Lung Dis.* 2006;10:80–86.

23. Stevenson CR, Forouhi NG, Roglic G, Williams BG, Lauer JA, Dye C, et al. Diabetes and tuberculosis: The impact of the diabetes epidemic on tuberculosis incidence. BMC Public Health. 2007;7:234.

24. Viswanathan V, Kumpatla S, Aravindalochanan V, Rajan R, Chinnasamy C, Srinivasan R, et al. Prevalence of diabetes and pre-diabetes and associated risk factors among tuberculosis patients in India. PLoS One. 2012;7:e41367.

25. Wang QZ, Ma AG, Han XX, Zhao SL, Cai J, Ma YB, et al. Prevalence of Type 2 Diabetes among Newly Detected Pulmonary Tuberculosis Patients in China: A Community Based Cohort Study. Plos One. 2013;8(12).

26. Whiting Leonor Guariguata Clara Weil Jonathan Shaw IDF Diabetes Atlas: Global estimates of the the prevalence of diabetes for 2011 and 2030-Diabetes Research and Clinical Practice Volume 94, Issue 3, December 2011, Pages 311-321

27. Wang CS, Yang CJ, Chen HC, Chuang SH, Chong IW, Hwang JJ, Huang MS: Impact of type 2 diabetes on manifestations and treatment outcome of pulmonary tuberculosis. Epidemiol Infect. 2009, 137: 203-210. 10.1017/S0950268808000782.

28. World Health Organization. TUBERCULOSIS & DIABETES www.who.int/tb

29. Workneh MH, Bjune GA, Yimer SA. Prevalence and associated factors of diabetes mellitus among tuberculosis patients in South- Eastern Amhara Region, Ethiopia: A cross-sectional study. PLoS ONE. 2016; 11(1):e0147621. pmid:26808967.