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Renal Data from the Arab World

Prevalence and Presentation of Tuberculosis among Hemodialysis Patients in Khartoum, Sudan

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ABSTRACT. Tuberculosis (TB) is a major health problem in the developing countries. There are limited data about the prevalence of TB patients on maintenance hemodialysis (HD) in Sudan. The aim of this study is to identify the prevalence and presentation of TB among Sudanese maintenance HD patients. This is a hospital-based descriptive study. The participants of the study are all HD patients distributed in 13 HD centers in Khartoum and Khartoum North Provinces in Sudan. All patients attended the HD centers from November 1, 2014 to February 1, 2015, were interviewed by a questionnaire focused on personal and clinical data. Those who were diagnosed as having active TB were studied regarding their clinical presentation, presence of comorbidities, site of TB, and methods used on diagnosis. The total number of HD patients during the study period was 1328 patients. We found 19 patients who already diagnosed and treated for TB infection. The prevalence rate of TB among HD patients is 1.4%. The mean age of patient was 44.53 ±8.69 years, 89.5% of them were males. The majority of them have comorbidities: 31.6%% have hypertension and 21.1% have diabetes. Extrapulmonary TB was the major presentation (57.9%) mainly tuberculous lymphadenitis (26.3%). The pulmonary presentation was found to be 42.1%. The diagnosis of TB was supported by microbiological evidence of alcohol acid-fast *Bacilli* present in sputum smear (21%), histological diagnosis (31.6%), polymerase chain reaction (21%), and imaging in (26.3%). Patients on maintenance HD are at an increased risk of TB and diagnosis of TB among HD patients need a high index of suspicion. There is a great need for establishing a screening scheme for TB among HD patients and further epidemiological studies are needed to fully evaluate this problem.

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Introduction

The World Health Organization (WHO) 2014

Report estimated that the rate of tuberculosis (TB) in Africa was reached 263–341/100,000 population.[1] In the year 2013, the WHO reported that the notification rate of TB in Sudan was 108 cases per 100,000 population.[2]

Many studies pointed out the increase rate of TB among patients with end-stage renal failure (ESRF) in comparison with the general population. A study conducted among hemodialysis (HD) patients migrated to the United Kingdom from TB endemic countries reported a TB rate of 1187 cases per 100,000 per year.[3] In other study, the incidence rate of TB among HD patients was 3.1%.[4] Further studies found the rate of TB among dialysis patients was ranging from 12 to 26 times more than in the general population.[5,6] The reason behind the increase rate of TB among ESRF patients is related to the change in immune response which associated with uremic toxins and exacerbated by dialysis.[7]

There is limited data about the rate of TB cases among HD patients in Sudan. However, there was study reported that 5.4% of patients in peritoneal dialysis have active TB.[8] The aim of this study is to identify the prevalence and presentation of TB among HD patients in Khartoum, Sudan.

Materials and Methods

This study is a hospital-based descriptive study. The participants of the study are all HD patients distributed in 13 HD centers in Khartoum and Khartoum North Provinces in Sudan. All patients attended the HD centers from November 1, 2014, to February 1, 2015, were interviewed by questionnaire focused on personal and clinical data. Those who were diagnosed as having active TB were studied further. Their medical files were reviewed to identify the clinical presentation, presence of comorbidities, site of TB, and methods used on diagnosis.

The research was approved by Ethics and Research Comities in the Ministry of Health and local hospitals. An informed consent was obtained from each patient participated in the study.

Statistical Analysis

Data were analyzed using the Software Package for the Social Sciences (SPSS) version 21 (IBM Corp., 2012). IBM SPSS Statistics for Windows, Version 21.0. Armonk, NY, USA. Results were presented in number, percent, mean, and standard deviation.

Results

The characteristics of the study population are shown in Table 1. The total number of HD patients was 1328 patients. We found 19 patients

Table 1. Characteristics of the study population.

Age (mean±SD)	44.53±8.69 years
Sex	
Male	17 (89.5%)
Female	2 (10.5%)
Duration of dialysis (mean±SD)	39.84±25.5 months
History of TB	3 (16.7%)
Family history of TB	
Yes	4 (21.1%)
No	15 (78.9%)
History of contact to tuberculous patient	
Yes	9 (47.4%)
No	10 (52.6%)
Comorbidities	
Hypertension	6 (31.6%)
Diabetes	4 (21.1%)

SD: Standard deviation, TB: Tuberculosis.

Table 2. Clinical presentation of tuberculosis.

Clinical presentation	Percentage
Pulmonary TB	8 (42.1%)
Spinal tuberculosis (Potts disease of the spine)	1 (5.3%)
Abdominal TB	4 (21.1%)
Pleural TB	1 (5.3%)
Tuberculous lymphadenitis	5 (26.3%)

TB: Tuberculosis.

Table 3. Diagnosis of tuberculosis among hemodialysis patient.

Diagnostic Test	Percentage
Polymerase chain reaction	4 (21%)
Alcohol acid-fast *Bacilli*	4 (21%)
Imaging	5 (26.3%)
Histology	6 (31.6%)

who were already diagnosed and being treated for TB infection. The prevalence rate of TB among HD patients is 1.4%. The mean age of patient was 44.53 ± 8.69 years, 89.5% of them were males.

The majority of the study population had co-morbidities, 31.6% have primary hypertension and 21.1% have diabetes mellitus. Extra-pulmonary TB was the major presentation (57.9%) (Table 2). The pulmonary presentation was found to be 42.1%. The diagnosis of TB was supported by microbiological evidence of alcohol acid fast *Bacilli* (AAFB) in sputum smear (21%), histological diagnosis (31.6%), polymerase chain reaction (PCR) (21%), and imaging in (26.3%) (Table 3).

Discussion

In the current study, we found that the prevalence of TB among HD patients is 1.4%, this is considered to be 14 more times than TB in the general population in Sudan according to the WHO 2013 statistics.[2] Several studies reported the increased prevalence of TB among dialysis patients.[3,4,7] The prevalence of TB among dialysis patients range from 12 to 26 more times in the general population.[5,6]

In this study, we noticed that the mean age of our patients is younger than other studies where the mean age of patients is usually above 50-year-old.[4,5] However, a similar study conducted in Sudan among peritoneal dialysis patients found that the mean age of TB patients was 37-year-old.[8] This is most likely due to the fact that ESRF in Sudan is predominantly affecting the young population.[9]

In the current study, the mean duration of HD among TB patients was about 40 months. This agrees with other study conducted in the United Kingdom among HD patients migrated from TB endemic areas which reported that the mean duration of dialysis among them was 24 months.[3] Other studies reported that TB is associated with longer duration of dialysis.[10]

In this study, only 16% of TB HD patients have a history of TB. Several studies found that the rate of the previous history of TB among TB diagnosed HD patients is relatively low. In a study conducted in India among TB diagnosed HD patients, a history of TB was only 8%.[11] The same observation was noticed in another study conducted in Greece which found the percentage was only 2%.[12]

Fifty-eight percent of patient presented with extrapulmonary TB. TB lymphadenitis was the most common presentation of extrapulmonary TB in our HD patients. Several studies reported that extrapulmonary TB is the most common presentation among ESRF patients.[13-19] Other studies reported that TB lymphadenitis was the most common extrapulmonary TB among HD patients.[14,20]

Fifty percent of patients with pulmonary TB have been diagnosed by finding AAFB in the sputum. Some studies pointed out the diffi-

culty of diagnosing pulmonary TB among ESRF because the AAFB is difficult to be seen in the sputum of ESRF patients.[21] However, other studies found that 30% of ESRF patient diagnosed as TB by finding AAFB in the sputum.[6] In our study, 50% of AAFB smear negative pulmonary TB patients were diagnosed based on positive PCR. Several studies reported the increased rate of detection of TB by PCR, especially in smear-negative TB.[22-24] Other studies reported an increased rate of detection of TB among smear negative in immunocompromised patients.[25,26]

In the cases of abdominal and spinal TB, the diagnosis was made by imaging. Patients with abdominal TB usually present with peritonitis and mesenteric lymphadenitis.[27,28] The combination of clinical evidence of TB with characteristics findings in computed tomography of the abdomen can strengthen the diagnosis of abdominal TB.[29,30] For spinal TB, the diagnosis was made by magnetic resonant image (MRI). MRI is highly sensitive in detecting spinal TB.[31] Cases of pleural TB and TB lymphadenitis were diagnosed base on histology.

There were some limitations in our study. We believe that a number of TB patients among HD patients in Khartoum are underestimated because patients need to be screened properly for TB in HD setting, and one needs a high index of clinical suspicion because of the difficulty in making the diagnosis. A full investigation to detect TB in HD patients sometimes is difficult due to financial constraints.

Conclusion

Patients on maintenance HD are at an increased risk of TB, and further epidemiological studies are needed to evaluate this further. Diagnosis of TB among HD patients needs a high index of suspicion. There is increased need for establishing a screening scheme for TB among HD patients.

Conflict of Interest

The authors declare that the article is original, does not infringe upon any copyright, is not under consideration by another journal, and has not been published previously. All data collected during the study is presented in this manuscript. Each author believes that the manuscript represents honest work. Also, there is no conflict of interest.

Reference

1. WHO. Global Tuberculosis Report 2015. Geneva: World Health Organization; 2015.
2. WHO. Sudan: Country statistics summary. In: Regional Health Observatory Data Repository, ed. WHO Regional Office for the Eastern Mediterranean. Cairo, Egypt: World Health Organization; 2013.
3. Moore DA, Lightstone L, Javid B, Friedland JS. High rates of tuberculosis in end-stage renal failure: The impact of international migration. Emerg Infect Dis 2002;8:77-8.
4. Ates G, Yildiz T, Danis R, et al. Incidence of tuberculosis disease and latent tuberculosis infection in patients with end stage renal disease in an endemic region. Ren Fail 2010; 32:91-5.
5. Malik GH, Al-Harbi AS, Al-Mohaya S, et al. Eleven years of experience with dialysis associated tuberculosis. Clin Nephrol 2002;58:356-62.
6. Malik GH, Al-Mohaya SA, Al-Harbi AS, et al. Spectrum of tuberculosis in dialysis patients in Saudi Arabia. Saudi J Kidney Dis Transpl 2003;14:145-52.
7. Descamps-Latscha B. The immune system in end-stage renal disease. Curr Opin Nephrol Hypertens 1993;2:883-91.
8. Shigidi M, Farouk N, Abulikailik RI, Tag Alsir R, Abu-Aisha H. Active tuberculous infection among adult Sudanese patients on long term peritoneal dialysis. Arab J Nephrol Transplant 2012;5:135-40.
9. Banaga AS, Mohammed EB, Siddig RM, et al. Causes of end stage renal failure among haemodialysis patients in Khartoum State/ Sudan. BMC Res Notes 2015;8:502.
10. Shu CC, Wu VC, Yang FJ, et al. Predictors and prevalence of latent tuberculosis infection in patients receiving long-term hemodialysis and peritoneal dialysis. PLoS One 2012;7: e42592.
11. Rao TM, Ram R, Swarnalatha G, et al. Tuberculosis in haemodialysis patients: A single centre experience. Indian J Nephrol 2013;23: 340-5.

12. Christopoulos AI, Diamantopoulos AA, Dimopoulos PA, Goumenos DS, Barbalias GA. Risk factors for tuberculosis in dialysis patients: A prospective multi-center clinical trial. BMC Nephrol 2009;10:36.
13. Hussein MM, Mooij JM, Roujouleh H. Tuberculosis and chronic renal disease. Semin Dial 2003;16:38-44.
14. Lund RJ, Koch MJ, Oldemeyer JB, Meares AJ, Dunlay RW. Extrapulmonary tuberculosis in patients with end stage renal disease – Two case reports and a brief review. Int Urol Nephrol 2000;32:181-3.
15. Sasaki S, Akiba T, Suenaga M, et al. Ten years' survey of dialysis-associated tuberculosis. Nephron 1979;24:141-5.
16. Lundin AP, Adler AJ, Berlyne GM, Friedman EA. Tuberculosis in patients undergoing maintenance hemodialysis. Am J Med 1979; 67: 597-602.
17. Rutsky EA, Rostand SG. Mycobacteriosis in patients with chronic renal failure. Arch Intern Med 1980;140:57-61.
18. Andrew OT, Schoenfeld PY, Hopewell PC, Humphreys MH. Tuberculosis in patients with end-stage renal disease. Am J Med 1980; 68: 59-65.
19. Mitwalli A. Tuberculosis in patients on maintenance dialysis. Am J Kidney Dis 1991;18: 579-82.
20. Abdelrahman M, Sinha AK, Karkar A. Tuberculosis in end-stage renal disease patients on hemodialysis. Hemodial Int 2006;10:360-4.
21. Segall L, Covic A. Diagnosis of tuberculosis in dialysis patients: Current strategy. Clin J Am Soc Nephrol 2010;5:1114-22.
22. Kaul KL. Molecular detection of Mycobacterium tuberculosis: Impact on patient care. Clin Chem 2001;47:1553-8.
23. Soini H, Musser JM. Molecular diagnosis of mycobacteria. Clin Chem 2001;47:809-14.
24. Woods GL. Molecular techniques in mycobacterial detection. Arch Pathol Lab Med 2001;125:122-6.
25. Kivihya-Ndugga L, van Cleeff M, Juma E, et al. Comparison of PCR with the routine procedure for diagnosis of tuberculosis in a population with high prevalences of tuberculosis and human immunodeficiency virus. J Clin Microbiol 2004;42:1012-5.
26. Lyra JM, Maruza M, Verza M, et al. Evaluation of four molecular methods for the diagnosis of tuberculosis in pulmonary and blood samples from immunocompromised patients. Mem Inst Oswaldo Cruz 2014;109: 805-13.
27. Wells AD, Northover JM, Howard ER. Abdominal tuberculosis: Still a problem today. J R Soc Med 1986;79:149-53.
28. Uzunkoy A, Harma M, Harma M. Diagnosis of abdominal tuberculosis: Experience from 11 cases and review of the literature. World J Gastroenterol 2004;10:3647-9.
29. Gulati MS, Sarma D, Paul SB. CT appearances in abdominal tuberculosis. A pictorial essay. Clin Imaging 1999;23:51-9.
30. de Araujo AL. Relevance of imaging in the evaluation of abdominal tuberculosis. Radiol Bras 2015;48:VII.
31. Gehlot PS, Chaturvedi S, Kashyap R, Singh V. Pott's spine: Retrospective analysis of MRI scans of 70 cases. J Clin Diagn Res 2012;6: 1534-8.