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TO DETERMINE THE PREVALENCE OF HIV IN CHILDREN WITH TUBERCULOSIS IN ORDER TO INFLUENCE FUTURE PREVENTIVE AND TREATMENT INITIATIVES

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ABSTRACT

Background: Pakistan has the fifth highest tuberculosis (TB) burden in the world, accounting for 61% of TB infections in the WHO's Eastern Mediterranean Region. With an estimated 510,000 new cases each year, including 15,000 multidrug-resistant tuberculosis (MDR TB) cases, the country has the world's fourth-highest MDR TB rate, affecting 12.6% of youngsters. HIV raises the risk of tuberculosis, particularly among children who are malnourished, however data on TB/HIV co-infection in Pakistan is scarce, particularly among youngsters.

Objective: To determine the prevalence of HIV in children with tuberculosis in order to influence future preventive and treatment initiatives

Duration : This study was conducted in Civil Hospital Karachi, Pakistan from year 2022 to year 2023.

Methodology: This cross-sectional study, covered children aged 3 months to 12 years with active or extra-pulmonary tuberculosis. Following Ethical Review Committee permission, complete clinical and lab tests including blood, sputum/gastric aspirate AFB, CSF analysis, imaging, and HIV screening were done, with fundamental investigators covering the costs. Data was securely captured, analyzed in SPSS version 24, and presented as descriptive statistics to provide a brief summary of findings.

Results: There was a total of 100 children who were a part of this study. Majority of the children were male. The mean age for the study was 2 years. The average weight was 15.57 kg. The average height was 102.3 cm. Gene Xpert testing of gastric aspirate revealed a 20% positivity rate, with Mantoux tests positive in 5% of cases, rifampicin resistance detected in 3%, gastric aspirate for AFB positive in 14%, and HIV positivity discovered in 5%.

Conclusion: HIV is not uncommon in children with tuberculosis, as both pulmonary and extra-pulmonary TB can coexist with HIV infection.

Keywords: Tuberculosis, Extra pulmonary TB, HIV co infection

INTRODUCTION

The World Health Organization (WHO) reported 10.4 million new cases of tuberculosis (TB) worldwide in 2015, with 1 million impacting the pediatric population [1]. Pakistan ranks fifth in the world for tuberculosis burden, accounting for 61% of cases in the WHO's Eastern Mediterranean Region [2]. Pakistan has one of the world's largest TB burdens, with an estimated 510,000 new cases per year, 15,000 of which advance to multidrug-resistant tuberculosis (MDR TB) [3]. Furthermore, Pakistan has the world's fourth highest rate of MDR TB, with 12.6% of cases involving children [4].

Young children, underweight people, and those with Human Immunodeficiency Virus (HIV) are more likely to get tuberculosis (TB) [5]. The World Health Organization's (WHO) major approach to addressing the worldwide tuberculosis epidemic in children is to reduce its incidence and spread [6]. TB mortality and morbidity remain high in the pediatric population due to their age-related sensitivity, although it frequently goes unreported due to unusual symptoms and under-reporting. In Pakistan, HIV incidences are primarily seen in intravenous drug users, whereas infections in children are frequently connected to repeated use of same disposable non sterile injections delivered by inexperienced staff [7].

A study, which was performed in April 2019, detected an HIV outbreak in Larkana, a district in Sindh Province, Pakistan. By June 2019, 251 people had been tested, yielding 9 HIV-positive results [8]. Since the outbreak began, thousands of people have been checked, with hundreds of testing positive for HIV. Untrained medical professionals in rural Pakistan frequently provide hazardous intramuscular and intravenous injections, which may have contributed to the HIV outbreak.

Children with HIV are at a much higher risk of developing tuberculosis (TB) and other opportunistic infections, with a sixfold increase in mortality from TB and HIV co-infection [9]. The prevalence of active tuberculosis in HIV patients is increasing due to either reactivation of latent tuberculosis or increased susceptibility to Mycobacterium tuberculosis. Understanding the prevalence of TB/HIV co-infection is critical for developing preventative strategies. WHO recommends testing TB patients for HIV and screening HIV-positive people for tuberculosis [10]. Addressing HIV in tuberculosis patients not only reduces TB incidence among HIV-infected individuals, but also contributes to worldwide TB reduction [11].

There is a scarcity of data on HIV and tuberculosis co-infection in Pakistan, and no research has been undertaken to date on co-infection rates in both children and adults. As a result, the purpose of this study is to identify the prevalence of HIV among diagnosed tuberculosis patients in the hopes of providing significant insights for future preventive and treatment methods.

METHODOLOGY

This research is a cross-sectional analysis which was performed at the outpatient tuberculosis clinic. All the participants of this research were children who were aged between 3 months to 12 years. All the children were diagnosed with extra-pulmonary TB or active TB. The Ethical Review Committee approved this research. There was a detailed examination of the children’s history and findings were recorded.

Laboratory results were documented and included a wide range of tests such as blood panels, sputum analysis, gastric aspirate, cerebrospinal fluid (CSF) examination including chest X-ray, drug resistance and culture sensitivity (DR&CS), abdominal ultrasound, brain MRI, and CT scans of chest and abdomen. HIV testing was undertaken on all patients diagnosed with active tuberculosis, and samples were forwarded to laboratory. Results were meticulously documented, securely archived to ensure confidentiality, and reports were sent to each patient personally.

The obtained data was carefully input into SPSS software version 24 and analyzed using descriptive statistics, which were displayed as percentages, means, frequencies, and standard deviations to provide a complete summary of the findings.

RESULTS

There was a total of 100 children who were a part of this study. Majority of the children were male. The mean age of the study was 2 years. The average weight was 15.57 kg. The average height was 102.3 cm. Table number 1 shows the demographics of the children involved in this study.

Table No. 1:

Characteristics	N	%
Sex		
Male	60	60
Female	40	40
Age (yrs)		
0 to 4	33	33
5 to 9	32	32
10 to 12	35	35
HIV Status		
Positive	5	5
Negative	95	95
Disease location		
Extrapulmonary	72	72
Pulmonary	28	28

Table number 2 summarizes the constitutional symptoms of the patients which shows that majority of the children had history of fever:

Table No. 2:

Symptoms	N	%
Hemoptysis	6	6
Cough	37	37
History of Fever	90	90
Weight loss	62	62
Diarrhea	21	21

Abdominal pain	30	30
Fits	28	28
Difficulty in walking	1	1
Back pain	1	1
Decreased appetite	36	36

Gene Xpert testing of gastric aspirate revealed a 20% positivity rate, with Mantoux tests positive in 5% of cases, rifampicin resistance detected in 3%, gastric aspirate for AFB positive in 14%, and HIV positivity discovered in 5%. All of the HIV-infected youngsters in our study tested negative for Mantoux. The brain, lungs, and abdomen were the most commonly affected locations of tuberculosis, as seen in Table 3.

Table No. 3:

Site	**N**	**%**
Abdomen	28	28
Brain	29	29
Lungs	28	28
Spine	5	5
Disseminated	7	7
Lymph node	2	2

DISCUSSION

The World Health Organization (WHO) estimates that approximately 38 million individuals worldwide are living with HIV/AIDS, including 1.7 million children under the age of fifteen [12]. While HIV positivity rates in Pakistan have increased dramatically, the incidence among youngsters is still relatively low. In contrast, a 2019 study in Ratodero, Sindh, revealed 930 HIV-positive individuals, 80% of whom were youngsters under the age of five [13].

In our study, 60% of the pediatric population was male and 40% was female. Ali et al. observed similar findings, identifying 54.9% boys and 45.1% females with tuberculosis in children [14]. Brooke et al. found that 56% of pediatric tuberculosis patients were male [15].

In this study data collected from tuberculosis-positive children to explore HIV co-infection in the pediatric population. Because HIV infection is uncommon in Pakistan, no equivalent research has been undertaken on children in the nation. 5% of the 100 youngsters diagnosed with active tuberculosis tested positive for HIV.

Marieke et al. discovered that 4.9% of Europeans were co-infected with HIV and tuberculosis [16]. The CDC in the United States observed similar findings, with a 6% rate of co-infection. According to WHO, global HIV and tuberculosis co-infection rates vary greatly, ranging from 2.3% to 39% across regions [17]. In our investigation, HIV was found in 5 children, with 3 (60%) of these cases presenting with extra-pulmonary tuberculosis—a larger proportion than has been reported in prior studies. Two of the cases of extrapulmonary tuberculosis involved abdominal tuberculosis.

In terms of weight and height, three of four HIV-positive individuals had WHZ scores less than -3, showing that malnutrition is a common risk factor for co-infection. Overall, 35% of patients were classified as malnourished according to CDC growth chart standards, with WHZ scores less than -3, while the remainder had scores greater than -3. This is consistent with findings from a similar study conducted in Sindh, Pakistan, which found that 13% of children had low levels of malnutrition [18].

Unlike previous research that reported a higher prevalence of medication-resistant tuberculosis in HIV-positive individuals, our investigation revealed no drug resistance in this group. This lack of resistance may be attributed to the small number of HIV-positive patients in our study. In general, TB co-infection with HIV leads to a higher risk of treatment failure.

Our study found a greater incidence of extra-pulmonary tuberculosis (TB), including abdominal TB and tuberculous meningitis (TBM), which is likely related to the focus on opd based children, whereas pulmonary tuberculosis is routinely addressed in outpatient settings. In contrast, TBM, abdominal TB, and disseminated TB frequently necessitate hospitalization. According to other studies, extra-pulmonary tuberculosis accounts for 20-30% of TB cases in the pediatric population [19,20].

In our study, GeneXpert tests were positive in 20% of the children, which is consistent with prior studies that found microbiological confirmation in less than 30% of children with pulmonary tuberculosis. We found common symptoms such as fever, cough, and weight loss, which are consistent with previous research.

CONCLUSION

HIV is not uncommon in children with tuberculosis, as both pulmonary and extra-pulmonary TB can coexist with HIV infection.

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This study was conducted without receiving financial support from any external source.

Conflict in the interest

The authors had no conflict related to the interest in the execution of this study.

Permission

Prior to initiating the study, approval from the ethical committee was obtained to ensure adherence to ethical standards and guidelines.

REFERENCES

1. Bashir N, Haider N, Farooq A, Hussain M. Epidemiology and clinical spectrum of pediatric patients with human immunodeficiency virus (HIV) infection: A 15 years' experience. Pakistan Journal of Medical Sciences. 2023 May;39(3):820.
2. Brooks MB, Malik A, Khan S, Ahmed JF, Siddiqui S, Jaswal M, Saleem S, Amanullah F, Becerra MC, Hussain H. Predictors of unsuccessful tuberculosis treatment outcomes in children from a prospective cohort study in Pakistan. Journal of global health. 2021;11.
3. Wali A, Khan D, Safdar N, Shawani Z, Fatima R, Yaqoob A, Qadir A, Ahmed S, Rashid H, Ahmed B, Khan S. Prevalence of tuberculosis, HIV/AIDS, and hepatitis; in a prison of Balochistan: a cross-sectional survey. BMC public health. 2019 Dec;19:1-8.
4. Sheikh AS, Aziz M, Ayaz M. Rising trends of multidrug resistant (MDR) tuberculosis in Pakistan. Biomedical Journal. 2018;1:4.
5. Earley M, Chirenda J, Highet A, Mujuru HA, Yang Z. Characterizing Pediatric Tuberculosis with and without Human Immunodeficiency Virus Coinfection in Harare, Zimbabwe. The American journal of tropical medicine and hygiene. 2018 Sep 5;99(3):601-7
6. Abbas U, Masood KI, Khan A, Irfan M, Saifullah N, Jamil B, Hasan Z. Tuberculosis and diabetes mellitus: Relating immune impact of co-morbidity with challenges in disease management in high

burden countries. Journal of clinical tuberculosis and other mycobacterial diseases. 2022 Dec 1;29:100343.
7. Ch MK, Syed ZA, Younus M. Prevalence of human immunodeficiency virus (HIV) infection in patients with pulmonary tuberculosis. Pakistan Journal of Chest Medicine. 2009;15(3):18-21.
8. Saeed M, Hussain S, Riaz S, Rasheed F, Ahmad M, Iram S, Arif M, Rahmani TH, Anwar AI. GeneXpert Technology for the diagnosis of HIV-associated tuberculosis: Is scale-up worth it?. Open Life Sciences. 2020 Jun 30;15(1):458-65.
9. Acosta CD, Rusovich V, Harries AD, Ahmedov S, van den Boom M, Dara M. A new roadmap for childhood tuberculosis. The Lancet Global Health. 2014 Jan 1;2(1):e15-7.
10. Starke JR, Cruz AT. The global nature of childhood tuberculosis. Pediatrics. 2014 Mar 1;133(3):e725-7.
11. World Health Organization. Guidelines for intensified tuberculosis case-finding and isoniazid preventive therapy for people living with HIV in resource-constrained settings. Geneva: World Health Organization; 2011
12. Reid A, Grant AD, White RG, Dye C, Vynnycky E, Fielding K, Churchyard G, Pillay Y. Accelerating progress towards tuberculosis elimination: the need for combination treatment and prevention. The international journal of tuberculosis and lung disease. 2015 Jan 1;19(1):5-9.
13. Khuawar SM, Laghari AH, Shaikh GS. Tuberculosis as a Predicator of Childhood Malnutrition in Sindh, Pakistan. National Editorial Advisory Board. 2019 Oct;30(10):32.
14. Ali Z, Rehman A, Bakht S, Niazi S, Oneeb A, Maqbool T, Choudhary AK. Spectrum of Clinical Presentation of Tuberculosis Meningitis in Children at a Tertiary Care Hospital. Pakistan Journal of Medic
15. Brooks MB, Dubois MM, Malik AA, Ahmed JF, Siddiqui S, Khan S, Brohi M, Das Valecha T, Amanullah F, Becerra MC, Hussain H. Agespecific effectiveness of a tuberculosis screening intervention in children. Plos one. 2022 Feb 18;17(2):e0264216.
16. United States Department of Health and Human Services, CDC. Reported tuberculosis in the United States, 2014. Atlanta: CDC; 2015.
17. World Health Organization. Global tuberculosis report 2015. Geneva: World Health Organization; 2015
18. Khalife S, Jenkins HE, Dolynska M, Terleieva I, Varchenko I, Liu T, Carter EJ, Horsburgh CR, Rybak NR, Petrenko V, Chiang SS. Incidence and mortality of extrapulmonary tuberculosis in Ukraine: Analysis of national surveillance data. Clinical Infectious Diseases. 2022 Aug 15;75(4):604-12.
19. Rabold EM, Ali H, Fernandez D, Knuth M, Schenkel K, Asghar RJ, Baig MA, Shaikh S, Morgan O. Systematic review of reported HIV outbreaks, Pakistan, 2000–2019. Emerging infectious diseases. 2021 Apr;27(4):1039.
20. Byamungu LN, du Preez K, Walters E, Nachega JB, Schaaf HS. Timing of HIV diagnosis in children with tuberculosis managed at a referral hospital in Cape Town, South Africa. The International Journal of Tuberculosis and Lung Disease. 2018 May 1;22(5):488-95.