INVESTIGATION OF FACTORS INFLUENCING TUBERCULOSIS DEVELOPMENT IN CHILDREN ACCORDING TO TUBERCULOSIS CONTACT HISTORY

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Background: Tuberculosis (TB) remains a significant global health concern, especially among children. Understanding the risk factors associated with TB development in pediatric populations is crucial for effective prevention and management.

Objective: This study aims to compare risk factors between children who have direct contact with TB patients and those who do not, with the goal of identifying key determinants of TB susceptibility.

Methods: We conducted a analysis of pediatric TB cases from medical records. Participants were divided into two groups: Group A (children with direct TB exposure) and Group B (children without direct TB exposure). Demographic, clinical, and environmental variables were assessed.

Results: Preliminary findings indicate that children with direct contact with TB patients are at higher risk of developing TB. Key risk factors include: Household Exposure - Children living in close proximity to active TB cases face increased transmission risk; Malnutrition - Poor nutritional status weakens the immune system, making children more susceptible to TB infection; Crowded Living Conditions - Overcrowded households facilitate TB transmission.

Conclusion: Our study underscores the importance of targeted interventions for high-risk pediatric populations. Early case detection, nutritional support, and infection control measures are essential in reducing TB incidence among children.

Key terms: Tuberculosis, intrathoracic tuberculosis, TB exposure, pediatrics, early detection

Abstract: In this study, an in-depth analysis was conducted to explore the distinct characteristics of medical, biological, and social risk factors that play a significant role in the progression of tuberculosis among children. A key aspect of the investigation involved examining the potential influence of contact with tuberculosis patients on the development of the disease. The tuberculosis remains one of the most significant public health problems [1]. The severity of tuberculosis development in children is primarily influenced by factors such as the number of infection sources, presence of bacterial excretion (including drug-resistant strains), and the location of the infection site. The absence of proper anti-epidemic measures at the infection source, including preventive therapy for contacts, also plays a role. The main conditions that contribute to the transmission of tuberculosis from a sick person to those in contact are social issues within the family, including a low level of sanitation awareness and failure to follow proper sanitary-epidemiological practices in the infected person's household. In children without established contact, the primary risk factors for tuberculosis development are social problems, which appear to be indicative of exposure to non-first-line sources of infection, such as children in migrant families or large, socially marginalized families with low health literacy.

Key words: intrathoracic tuberculosis, risk factors, tuberculosis infection, children.

Introduction: Identification, prevention and treatment of tuberculosis in children and adolescents is an important component of the national program of the fight against TB in our Republic [2,4,11]. Children are especially susceptible to tuberculosis [5]. Traditionally the leading factors associated with the development of tuberculosis in children and adolescents encompass a combination of epidemic, medical-biological, and social factors. These risk factors play a crucial role in influencing the susceptibility and progression of tuberculosis in this population. It is important to understand the multifaceted nature of these factors and their interplay in order to effectively combat tuberculosis in children and adolescents. Contact with a tuberculosis patient is the primary epidemic risk factor contributing to the development of the disease in children. Incidence rates among children with such exposure are many times higher compared to those in a healthy environment. Concomitant pathology (medical risk factor) determines the high probability of tuberculosis in children infected with Mycobacterium tuberculosis (MBT) due to a decrease in nonspecific body defense factors.

Research purpose: To establish the primary risk factors associated with the manifestation of tuberculosis in children, this study aimed to consider the influence of contact with tuberculosis patients. The overarching goal was to determine an

individualized approach to organizing preventive measures specifically focused on high-risk groups.

Materials and methods. A total of **137 children** (comprising **69 boys** and **68 girls**), ranging in age from **3 to 17 years old**, were closely monitored in the children's department of the **4-city anti-tuberculosis dispensary** in the city of **Tashkent** from **2020 to 2024.** Among these children, **32.7%** fell into the preschool age group, while **67.3%** were of school-going age. Notably, **10.6%** of the preschoolers were unorganized in terms of their social status. The study aimed to comparatively assess the **medical and social status** of tuberculosis patients and healthy children infected with **Mycobacterium tuberculosis (MTB)**. This assessment took into consideration whether the children had been in contact with a known source of infection. The study population was divided into **two observation groups**.

Group 1 included 78 children who had contact with a tuberculosis patient. In this group, 58 children received treatment for intrathoracic tuberculosis and 20 children were infected with MTB with the local form of tuberculosis excluded;

Group 2 included 59 children who had not contact with a tuberculosis patient, in this group, 22 children received treatment for intrathoracic tuberculosis and 37 children were infected with MTB with the local form of tuberculosis excluded;

Results: The predominant forms of tuberculosis observed in children include: Tuberculosis of the Intrathoracic Lymph Nodes: This form accounts for 66.2% (53 individuals) of cases. Focal Tuberculosis: Approximately 15.0% (12 individuals) of cases fall into this category. Primary Tuberculosis Complex: Seen in 11.2% (9 individuals) of affected children. Less common forms, such as tuberculous pleura, infiltrative tuberculosis, and disseminated tuberculosis, occur sporadically. Among the cases, 82.5% (59 individuals) exhibit limited disease processes. Notably, 32.5% of patients with minor forms of tuberculosis were identified through digital radiography. When assessing the epidemic risk factors, several key factors were considered: Type, duration, and severity of contact with the source of infection. Implementation of preventive and diagnostic measures at the source of infection. Courses of preventive therapy. Timeliness of radiological examinations for individuals in contact with tuberculosis patients.

The status of the child's family was assessed using handout forms. The evaluation covered several dimensions, including the child's parental education levels, living conditions, the family's financial security, the parents' employment status, occupational affiliations, the health literacy and any harmful habits.

In addition to social factors, we considered medical and biological risk factors for disease development. These factors included the child's age, physical development,

and the presence of any concurrent pathologies, as identified during hospital assessments.

Analyzing the epidemic risk factor in the first observation group (comprising 78 children with contact history with a tuberculosis patient), we observed that family and/or close contacts were predominant. Often, these contacts involved a single source of infection. Interestingly, this pattern did not significantly differ between children who developed tuberculosis and those infected with Mycobacterium tuberculosis (MTB) without a localized form of the disease. Further investigation revealed a correlation between the severity of contact and social challenges in the patient's life.

Thus, among patients diagnosed with tuberculosis, double contact with another tuberculosis patient was more prevalent compared to patients who did not develop the disease after exposure (47.0% vs. 8.2%, respectively). Although the sample size was limited, a discernible trend emerged: children who contracted tuberculosis were twice as likely to have been in contact with a deceased source (32.6% - 15 individuals) compared to those who remained uninfected (14.3% - 4 individuals). Additionally, the source of infection was 3.1 times more likely to be a bacterial excretor (36.0% - 7 individuals) in the tuberculosis cases, compared to the uninfected group (17.27% - 4 individuals).

Recognizing that tuberculosis is a socially influenced disease, we conducted a social assessment of tuberculosis foci to identify significant factors contributing to disease development in children. Specifically: Parents of children with tuberculosis were significantly less likely to have higher education (9.9%) compared to MTB-infected parents (32.1%). This disparity also correlated with lower health literacy in families of sick children compared to MTB-infected families.

Furthermore, among mothers who traditionally serve as homemakers and caregivers, higher education was three times more common in mothers from tuberculosis foci where children remained uninfected (27.0%) compared to those with tuberculosis cases (6.7%). These findings aligned with indicators of sanitary literacy in the infection hotspots. Notably, a low level of health literacy was twice as prevalent among parents of children with tuberculosis (66.1%) compared to MTB-infected parents (33.9%).

Furthermore, no notable differences were observed between children who fell ill with tuberculosis and those infected with *Mycobacterium tuberculosis* (MTB) in terms of gender, age, physical development, or the presence of somatic pathology. However, a thorough examination of children with tuberculosis revealed that **58.6%** of patients had various somatic pathologies, including functional changes in organs and systems that often went undetected before hospital admission. It is well-established that the risk of developing tuberculosis increased by the presence of concomitant diseases [10].

This observation is coupled with the low social status of families in which children contract tuberculosis, highlighting the insufficient attention parents pay to their child's health. Addressing this issue necessitates the involvement of various therapeutic specialists to enhance overall patient well-being, improve adherence to anti-tuberculosis therapy, shorten treatment duration, and minimize its consequences [3].

Of particular interest is the second group of patients, comprising 59 individuals who had no established contact with a tuberculosis patient. **Given the results** from analyzing the first group (with established contact) and acknowledging the **significant influence of social issues** on the implementation of the epidemic risk factor, our initial focus was on **investigating the social difficulties** encountered by patients in this second group.

Here are some key observations: Parents of children with tuberculosis were significantly less likely to have higher education compared to those infected with Mycobacterium tuberculosis (MTB) (22.6% vs. 77.4%, respectively). In families characterized by large household size (22.2%) or where parents led an asocial lifestyle (2.1%), only children with tuberculosis were affected. Half of the children who fell ill with tuberculosis lived in unsatisfactory housing conditions (52.1%), whereas among MTB-infected children, this situation occurred four times less frequently (13.0%). These findings underscore the importance of addressing social determinants and promoting better health practices within families to combat tuberculosis effectively.

Families of children with tuberculosis, when compared to those infected with tuberculosis, exhibit distinct characteristics: **Sanitary Literacy**: The family members' level of sanitary literacy is significantly different. Among families of children with tuberculosis, **27.0%** demonstrate low sanitary literacy, whereas in MTB-infected families, this figure is much lower at **6.7%**. **Bad Habits (Smoking)**: Parents in families with tuberculosis-affected children are more likely to have bad habits, particularly smoking. **47.7%** of parents in these families smoke, whereas in MTB-infected families, the prevalence is **20.4%**. **Material Well-Being**: Families of tuberculosis patients face greater material challenges. **22.2%** of them experience low material well-being, compared to **13.3%** in MTB-infected families.

Notably, **60%** of children infected with **Mycobacterium tuberculosis (MTB)**, even without an established localized form of the disease, reside in socially prosperous families.

These findings **underscore the importance of social factors** in contact with the infection source, even when the source is not conclusively identified. Social challenges such as migration, residing in rented apartments, and parental behavior can act as

indicators for a **heightened risk of an unidentified infection source**. Intriguingly, in instances where the infection source remains elusive, the **average occurrence of social issues** among children with tuberculosis is **substantially higher (3.2%)** compared to children infected with *Mycobacterium tuberculosis* (MTB) without a localized form of tuberculosis (*0.7%*).

Assessing the significance of medical and biological factors in disease development among cases with unknown contact with a tuberculosis patient revealed their lower impact, even within the first group. In contrast, social problems within the family played a more significant role. Interestingly, the lack of knowledge about the infection source appears to prolong the impact of infection on the child's body.

This extended impact may explain the higher occurrence of bronchopulmonary pathology in children with tuberculosis compared to those infected with Mycobacterium tuberculosis (MTB) (16.3% vs. 2.6%, respectively). Additionally, 19% of children with tuberculosis exhibited body weight deficiency, a sign of a general disorder syndrome during active tuberculosis infection. Notably, such cases were absent in MTB-infected children.

The primary determinant of tuberculosis development in children is the presence of an epidemic factor, namely the exposure to a tuberculosis-infected individual. It is crucial to consider the extent of the epidemic threat associated with an outbreak, which encompasses factors such as the number of infection sources, bacterial excretion, assessment of drug sensitivity, and identification of the focal point of contagion. The likelihood of disease transmission to individuals in contact with the patient is substantially influenced by social challenges within their families.

In children with tuberculosis where an established source of infection is absent, social issues within the family serve as indicators of potential infection sources. These sources primarily include individuals who are not immediate family members but have close ties to the family. This observation is particularly evident among children living in migrant families or families with parents exhibiting antisocial behavior. In such cases, an uncontrolled infection source may be in close proximity to the child intermittently but over an extended period. Unfortunately, some parents neglect their children's health. Additionally, repeated instances of bronchopulmonary pathology and physical development delays, particularly inadequate body weight, contribute to the overall syndrome of disorders during active tuberculosis infection. Research aimed at increasing the effectiveness of treatment of such patients in the severe group is extremely important [8,9].

Conclusion

The study of medical and social characteristics made it possible to establish that patients in most cases belong to a socially maladjusted contingent.

The prevention of tuberculosis infection in children should involve addressing the social issues faced by their families. This includes isolating the child from the source of infection and administering a controlled preventive course of anti-tuberculosis chemotherapy, considering the potential epidemic risk involved. To enhance the accuracy of tuberculosis diagnosis and decrease the chances of misdiagnosis, comprehensive approaches are necessary [6]. Special attention should be given to families of migrants, homeless individuals, and families with parents who exhibit antisocial behavior, as it may be challenging to identify the source of infection and implement timely preventive measures. When a child faces three or more social problems, it is crucial to observe them in a high-risk group for tuberculosis.

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