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# NUTRITIONAL DEFICIENCIES VITAMIN D LEVELS AND OTHER RISK FACTORS IN PEDIATRIC TUBERCULOSIS PATIENTS

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**ABSTRACT**

**Background:** Tuberculosis (TB) is a major world health challenge affecting more than 9 million people every year, of which more than 1 million are children. It presents non-specific symptoms and, for this reason, has been described as a silent epidemic, especially in the diagnosis of childhood TB, especially in bacteriological confirmation. Understanding the risk factors of TB in children is, therefore, essential.

**Objectives**: To describe socioeconomic, environmental, and health-related characteristics of childhood TB patients in Nowshera, Pakistan, and their risk factors to propose public health interventions.

**Study Design:** A Cross-Sectional-Study

**Place and duration of study:** This study was conducted in Department pediatric and Biochemistry Department of QHAMC/NMC,Nowshera situated in Nowshera, Khyber Pakhtunkhwa province of Pakistan, over eight months starting from 1st January 2023 to 31st August 2023

**Materials and Methods:** A cross-sectional study was carried out at the Department pediatric and Biochemistry Department of QHAMC/NMC,Nowshera from 1st January 2023 to 31st August 2023, comprising 130 patients. In this study, Convenience sampling (Probability) was used. The data was collected by a structured questionnaire and analyzed by statistical package for the social sciences (SPSS version 24). Measures of central tendencies described quantitative data, mean, and frequencies and percentages described standard deviation, and qualitative data. The chi-square test was used to test the relationship between variables where the level of statistical significance was set at $P \leq 0.05$.

**Results:** Participants included mainly the study population of children aged 0-15 years, and the gender was equally split between boys 50% and girls 50%. A large percentage (69. 2%) were from low-income earners' homes, and 66. 9% of the respondents were from rural areas. Subjects' Body Mass Index (BMI) varied from less than 18 to more than 25. Of special interest, 43. 8% of the children with TB had not been administered BCG vaccination. The source of infection, contact with an adult TB patient, was reported in 43. 8%, while the rest were in the 56. 2 % who had no such history.

**Conclusion:** Childhood TB in the population under study is significantly related to some factors, namely, direct contact with TB patients, low economic status, crowded housing, poor ventilation and malnutrition.

**Keywords:** Tuberculosis, Nutritional status, Vitamin D, socioeconomic status

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## INTRODUCTION

Tuberculosis (TB) is still a global health concern, with an estimated 9 million new incidences every year, and at least 10% of these are children. This form of TB that occurs in children is often considered the 'silent killer' mainly because the more common adult TB overshadows it. This term speaks of the fact that TB in children is usually not easy to diagnose because the present symptoms do not fall within typical presentations, and getting bacteriological confirmation can be very difficult in children (Marais et al., 2014)(1). TB in children, on the other hand, presents with more general symptoms like cough, fever and weight loss, unlike in adults, and these symptoms can be easily confused with other childhood diseases (Jaganath & Mupere, 2012) (2). Tuberculosis also affects children in a very severe way and accounts for a lot of morbidity and mortality, more so in the developing world. Socioeconomic factors, which include poverty, malnutrition, crowded housing, and restricted access to health care, make the children in Pakistan vulnerable to TB since the country is one of the TB-endemic countries in the world (World Health Organization, 2016) (3).Nevertheless, with the application of the DOTS approach and other TB prevention measures, childhood TB still poses a significant concern in Pakistan (Mahmood et al., 2011) (4). Measures of control against TB include the BCG vaccination because they afford considerable protection against severe manifestations of TB in children. However, the coverage and effectiveness of BCG vaccination differ, and it has not been as conclusive in preventing pulmonary TB, the most widespread form of the disease (Trunz et al., 2006) (5). However, children who live with TB patients, especially those who share a house with the infected adults, are more prone to the infection (6 Marais et al., 2004). This highlights the need for contact tracing and management in TB control programmes (Dodd et al., 2016) (7). The purpose of this research is to determine and discuss the risk factors of childhood TB in Nowshera, PA, Pakistan. It is, therefore, essential to know these factors to direct interventions towards the right course.For the best results for the affected children. Descriptive in design, this study will look at the functions of socioeconomic status, nutritional status, household characteristics and BCG vaccination in the epidemiology of childhood TB. The study will add to the literature and help formulate public health interventions to tackle TB in children.

## MATERIALS AND METHODS

This study was a cross-sectional descriptive survey conducted at Paeds ward and Biochemistry Department of Nowshera Medical College / Qazi Hussain Ahmed Medical Complex Nowshera from 1st January 2023 to 31st August 2023. In total, 130 patients diagnosed with pediatric diseases were enrolled, and convenience sampling was applied. The study's objective study's objective was to review the antecedent research to determine the socioeconomic, and environmental risk factors linked with childhood TB. The data collection was done with the help of structured questionnaires that the guardians of the children filled in.

### ETHICAL APPROVAL STATEMENT

Principal Author Mussawar Aman obtained Ethics Review Board approval No ERB-611/04/2022 for this study at the Department of pediatric of QHAMC/NMC,Nowshera. Ethics board approval served as the prerequisite for beginning the study while upholding all institutional requirements for human ethics research.

### DATA COLLECTION

The information was obtained during a structured interview based on the questionnaire that included questions related to demographic characteristics, socioeconomic status, nutritional status, household conditions, and medical history, including BCG vaccination and contact with TB patients.

### STATISTICAL ANALYSIS

The gathered data were analyzed by using the SPSS version 24. 0. Regarding the descriptive analysis, continuous data were shown in Mean±SD, and categorical data were presented in number and percentage. The Chi-square test was used to determine the relationship between variables; the level of significance applied was $P \leq 0.05$.

## RESULTS

The study was conducted on 130 children aged 0-15 years, 65 male and 65 female. As for social background, 69. 2% of the patients came from lower-class families, and 66. 9% of the patients were from rural areas. The participants' BMI scores fell between <18 and >25, indicating that the nutritional status of the participants was diverse. However, it is worth mentioning that BCG vaccination was given to 56. 2% of the children with TB, but 43. 8% had not been vaccinated. Also, 43. 8% reported previous contact with an adult TB patient, while 56. 2% of the respondents had no such contact. Therefore, these findings point towards the fact that socioeconomic factors and incidences of direct contact with TB patients are major drivers of childhood TB in this region. The patients were of various SES, classified into lower, middle and upper, as depicted in Figure 1. The patients were of various SES, classified into lower, middle and upper, as depicted in Figure 1.

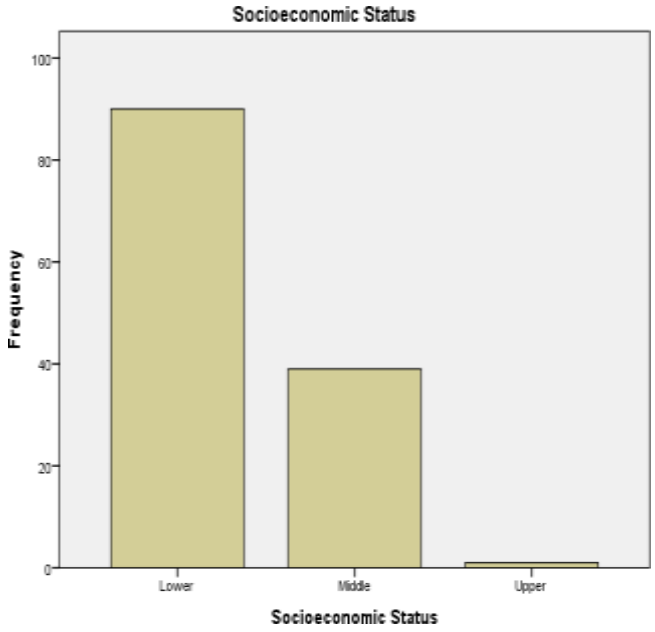


**Figure 1: Socioeconomic status**

As shown in Figure 1, 69.2% of the sample belonged to a lower socioeconomic status, 20% to the middle, and only 0.8% to the upper class.

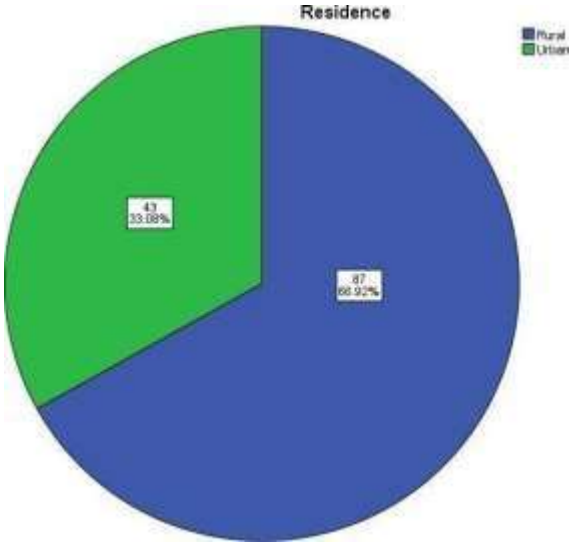


**Figure 2: Residence**

Figure 2 shows the residence distribution of the included population. 66.9% resided in the rural areas, while 33.1% lived in the urban areas.

**Table 1: Number of people sharing a room**

| Persons Living per Room | Frequency | Percent |
|---|---|---|
| **>2** | 42 | **32.3** |
| **3-5** | 72 | **55.4** |
| **>5** | 16 | **12.3** |
| **Total** | **130** | **100.0** |

Table 1 represents the living conditions of the patients included in this study. As for their living conditions, 32.3% had less than two people living in each room, 55.4% from 3 to 5 and 12.3% had more than five people in one room.

**Table 2: Cross-ventilation of house**

| Cross Ventilation | Frequency | Per cent |
|---|---|---|
| **Yes** | 78 | **60.0** |
| **No** | 52 | **40.0** |
| **Total** | **130** | **100.0** |

Table 2 shows the cross-ventilation of the houses of the patients. This table shows that cross-ventilation was present in 60% of houses and absent in 40%.

**Table 3: History of contact with adult TB Patient**

| History of Contact with Tuberculosis Case | Frequency | Per cent |
|---|---|---|
| **Yes** | 57 | **43.8** |
| **No** | 73 | **56.2** |
| **Total** | **130** | **100.0** |

Table 3 shows the history of contact with adult TB patients. 43.8% of patients had a prior history of exposure to TB patients, while 56.2% had no such prior exposure.

**Table 4: Relationship with the adult TB**

| Relation with Case | Frequency | Per cent |
|---|---|---|
| **No exposure** | 73 | **56.2** |
| **Parent** | 21 | **16.2** |
| **Sibling** | 19 | **14.6** |
| **Others** | 17 | **13.1** |
| **Total** | **130** | **100.0** |

Table 4 shows the relationship of the patient with adult TB patients. It says that 43.8% of patients had a history of contact with another adult patient of Tuberculosis; among these, 16.2% were either of the parent, 14.6% were a sibling and 13.1% were others. Conversely, 56.2 per cent had had no previous history of contact with another case of Tuberculosis.

**Table 5: Body Mass Index**

| BMI | Frequency | Per cent |
|---|---|---|
| **<18** | 58 | **44.6** |
| **18-25** | 62 | **47.7** |
| **>25** | 10 | **7.7** |
| **Total** | **130** | **100.0** |

Table 5 shows the body mass index range of the patients. As evident from this table, 44.6% of patients had a BMI <18, while only 7.7% of patients had a BMI >25. Most patients (47.7%) had a BMI in the normal range.

**Table 6: Physical signs of Anaemia**

| Physical Signs of Anemia | Yes | No |
|---|---|---|
| **Pallor** | 77 (59.2%) | **53 (40.8%)** |
| **Koilonychia** | 30 (23.1%) | **100 (76.9%)** |
| **Shortness of Breath** | **97 (74.6%)** | **33 (25.4%)** |

Table 6 shows the physical signs of AnaemiaIncluding Pallor, Koilonychia and Shortness of breath. Pallor was reported in 59.2% of cases, koilonychias in 23.1% and shortness of breath in 74.6%.

**Table 7: Treatment status**

| Time Treatment Taken for | Frequency | Per cent |
|---|---|---|
| Complete course | 5 | 3.8 |
| Incomplete course | 5 | 3.8 |
| Treatment in progress | 117 | 90.0 |
| Treatment has not started yet | 3 | 2.3 |
| Total | 130 | 100.0 |

## DISCUSSION

Tuberculosis in children is still a significant concern in the world esp, especially in developing nations of the world, including Pakistan. The results of this study also point to several important risk factors for childhood TB, as has been identified in other studies. Socioeconomic status, household conditions, and contact with TB patients were highlighted significantly, which shows that these factors are interrelated and play an important role in transmission and infection in children with TB. Among the discovered trends in the research study, a considerable discovery was that children from lower socioeconomic classes stand a higher chance of developing TB and assuming the entire population of the affected children, 69. 2% of them were determined to come from a low-class background. This is in concordance with other research that shows that poverty is a key predictor of Tuberculosis because of such factors as malnutrition, population density and inadequate medical facilities (8). Constipation, as highlighted in the study by the different BMI classifications, is a key issue as it weakens the immune system, thus exposing children to TB (9). This concurs with Jaganath and Mupere (2012), who pointed out that malnutrition and TB were significantly related in children (10). The survey also showed that the majority of the children,66. 9 per cent lived in rural areas with scarce health facilities. This finding supports the claim that rural people are more vulnerable to TB because most of them cannot afford to access quality health facilities, their socioeconomic status is lower, and most of them are malnourished (11). Further, the living standards that involved congested houses and lack of proper ventilation were the significant causes of TB spread. These environmental factors foster Mycobacterium tuberculosis infection Mycobacterium tuberculosis infection, particularly in a home with an infected person (12). In particular, it was established that
43. 8% of the children with TB reported a history of contact with an adult smear-positive pulmonary TB patient at home, which supports the concept of contact tracing and management in TB control. This finding agrees with other workers who have also established that household contact is the primary determinant of childhood TB (6). Marais et al. (2004) noted that children in homes with TB-infected adults are likely to develop the disease because they are exposed for long (13). The study also focused on the effects of BCG vaccination, where 43. 8% of the infected children had no record of BCG vaccination. The BCG vaccine is also understood to offer substantial protection against the severe types of TB in children; however, it provides a less s p e c i f i c protection against pulmonary TB(14). Trunz et al. (2006) also endorse BCG vaccination in the prevention of severe TB manifestations (15). In addition, the study's findings also show that childhood TB is a complex disease that depends on socioeconomic factors, environmental conditions, nutritional status, and immunization history. Tuberculosis control measures must, therefore, encompass all these factors as a way of management. It is necessary to improve socioeconomic status, better nutrition, and living conditions and provide a wide range of vaccinations.

## CONCLUSION

The results of this study can be discussed in the current literature on risk factors of childhood TB. From the socioeconomic

Status, contact with TB patients, and BCG vaccination factors indicate that TB control requires a multi-faceted approach to tackling the disease. Further research should be done to study these relationships longitudinally and to assess the effectiveness of specific interventions in children in decreasing the TB rate.

## Authors Contribution

**Concept & Design of Study**: Mussawar Aman

**Drafting:** Irfan Khan

**Data Analysis:** Alamzeb Jadoon

**Critical Review:** Shah Nawaz

**Final Approval of version:All Mantion Above**

**Disclaimer: Nil**

**Conflict of Interest: There is no conflict of interest.**

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