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Original Research Article

A Study of Mantoux Test Reaction in Protein Energy Malnutrition

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ABSTRACT

Background and Objectives: Tuberculosis is a major public health problem throughout the world, especially in developing countries. It affects almost one-third of the world's population. It continues to be an important cause of morbidity and mortality in the children worldwide.
The objectives of the study are: 1) To study the tuberculin sensitivity among apparently healthy orphan children. 2) To study the nutritional status of orphan children. 3) To find out the relationship between nutritional status and tuberculin sensitivity. 4) To find out the relationship between previous BCG vaccine and tuberculin sensitivity.
Methods: Two hundred and twenty children aged 1-5 years visiting RCSM hospital pediatric department were included in the study. All the children included under the study were subjected for a thorough clinical examination (to detect the active disease) including nutritional anthropometry, previous BCG scars, history of contact with TB. Nutritional assessment was done by measuring weight for age, height for age, weight for height and expressed in standard deviation z scores based on WHO Child Growth Standards (2006). They were classified as normal, moderate acute malnutrition and severe acute malnutrition accordingly.
Mantoux test was performed by intradermal injection of 0.1 ml of PPD containing 5 TU PPD-S into volar (ventral) surface of long axis of left forearm. The induration at the injection site was measured after 48 hours using pen and ruler method. The transverse diameter of the induration was considered. An induration of ≥10 mm was taken as positive.
Results: Out of 220 children, 119 were males and 101 were females. 145 children (66%) had normal nutritional status, 48(22%) had moderate acute malnutrition and 27 (12%) had severe acute malnutrition. Out of 220 children, 73 (33.18%) were Mantoux positive.
Out of 145 normal children, 55 (37.9%) were Mantoux positive. Out of 75 PEM children, 18 (24%) were Mantoux positive.
BCG scar was present in 215 (97.7%) children with 72 (33.5%) were Mantoux positive and BCG scar was absent in 5 (2.3%) children with 1 child Mantoux positive. 17 children had history of contact with TB and 10 were Mantoux positive.
Interpretation and Conclusion: The number of Mantoux reactors and the mean induration size was affected by nutritional status and history of TB contact.

Key words: Mantoux sensitivity; Nutritional status; severe acute malnutrition; moderate acute malnutrition.

INTRODUCTION

Tuberculosis is a major public health problem throughout the world, especially in developing countries. It affects almost one third of the world's population. It continues to be important

cause of morbidity and mortality in the children worldwide. On the diagnostic front, with the significant advances at molecular level, there has not emerged a single test for diagnosis that too is not cost-effective requiring huge finances and high level of technical expertise. They are only supportive tests.

Severe malnutrition, younger age, and absence of BCG vaccination are significant risk factors for the transmission of infection. [1] The majority of infected children do not develop TB disease in childhood. The only evidence of infection may be a positive tuberculin skin test. Infants and young children under 5 years are at particular risk of developing disease. The majority of children will present with symptoms within one year of infection. The time-span between the infection and disease may be as little as 6 to 8 weeks. Various immunosuppressive illnesses facilitate the progression of infection to disease such as HIV-infection, measles, whooping cough and protein energy malnutrition. [2]

Test for an early diagnosis based on immunological and molecular methods, are not available for routine use in low-income countries like India. So the diagnosis of tuberculosis in childhood continues to be surrounded by considerable uncertainty. Recovery of tubercle bacilli which establishes the diagnosis with certainty is difficult in children, since it is very difficult to obtain sputum from children; even chest X-ray is not diagnostic. Hence tuberculin test, a good old method which has stood the test of time is still practised worldwide, especially in the under developed and developing countries. It continues to be used in the diagnosis of childhood tuberculosis as first screening test in clinically suspected children. But the test has its own disadvantages. It is influenced by many factors, like malnutrition, BCG vaccination and immuno-compromised children. Malnutrition and BCG vaccination are most common factors, which are known to affect the interpretation of tuberculin test. [3] Severe acute malnutrition (SAM) remains a major killer of children as mortality rates in children with severe wasting are nine times higher than those in well nourished children. [4] India's third National Family Health Survey (NFHS -3) indicates that the prevalence of severe wasting is 7.9% as per WHO growth standards. [5]

The high prevalence of malnutrition coupled with high prevalence of parasitic and infective illnesses, including HIV infection, in developing countries limit the use of the tuberculin test as a diagnostic tool of both tuberculosis infection and disease, as these conditions lead to immunosuppression. [6]

Aims and Objectives

1) To find the percentage of SAM and MAM children visiting OPD and IPD in CPR Hospital, Kolhapur.
2) To study the relation between nutritional status and tuberculin sensitivity in children 1 -5 years of age visiting at R.C.S.M. Government college and CPR Hospital on outdoor and indoor basis in pediatric department.

MATERIALS AND METHODS

Two hundred and twenty children 1 to 5 years age visiting CPR hospital on IPD and OPD basis were included in the study. All the children included under the study were subjected for a thorough clinical examination (to detect the active disease) including nutritional anthropometry, previous BCG scars, history of contact with TB. Nutritional assessment was done by measuring weight for age, height for age and weight for height and expressed in z scores based on WHO Child Growth Standards (2006).

Mantoux test was performed by intradermal injection of 0.1 ml of PPD containing 5 TU PPD-S into volar (ventral) surface of long axis of left forearm. The induration at the injection site was measured after 48 -72 hours using

pen and ruler method. The transverse diameter of the induration was considered. An induration of ≥10 mm was taken as Tuberculin positivity. Statistical methods were used to interpret the results.

Patients who were found moderate acute malnourished or severely acute malnourished were further investigated for chest radiograph and ESR. Similarly all children who were found Mantoux positive were thoroughly investigated by chest radiography, and ESR. Chest radiograph findings were categorised as consistent or not consistent with tuberculosis. Children with chest radiographs consistent with tuberculosis were admitted and underwent gastric lavage after an overnight fasting of eight hours. This was done by aspirating the stomach contents. Children found to be having Chest X Ray consistent with TB were sent to DOTS centre for further management. Patients with SAM and complications were admitted and stabilised in nutritional rehabilitation centres.

Inclusion Criteria: Children of age 1 to 5 years with absence of clinical evidence of tuberculosis on general examination.

These children were further categorised as

1) normal- weight/height > -2 SD (WHO growth chart)
2) moderate acute malnutrition- weight/height -2 to -3 SD (WHO growth chart)
3) severe acute malnutrition – weight/height less than -3SD (WHO growth chart)

Exclusion Criteria

- Children more than 5years of age
- Children less than 1 year of age
- Known case of tuberculosis.
- History of having taken anti tubercular drugs in past or present
- Evidence of tuberculosis on detailed clinical examination.

Recent vaccination with live attenuated vaccine e.g. measles, oral polio vaccine within 6 weeks

Statistical analysis: Collected data of 220 children was analysed and Pearson Chi square test was applied and p value was calculated. Results were drawn according to significant p value.

RESULTS

Table 1: MantouxTest results in different age groups

Age	Mantoux test		Total
	Positive	Negative	
1 to <2 years	20(27.3%)	34(23.3%)	54 (24.5%)
2 to <3 years	20(27.4%)	33(22.4%)	53 (24.1%)
3 to <4 years	14(19.2%)	33(22.4%)	47 (21.4%)
4 to 5 years	19(26.1%)	47(31.9%)	66 (30.0%)
Total	73(100.0%)	147(100.0%)	220 (100.0%)

220 children of age 1 to 5 years were given Mantoux test.

Out of 220 children, 73 (33.2%) were Mantoux positive.

Out of 220 children, 75(34%) were PEM and 145 (66%) were having normal nutritional status. Out of 75 PEM, 48 (22%) were MAM and 27(12%) were SAM. Out of 145 normal children, 55 (37.9%) children were Mantoux positive. Out of 75, PEM children 18 (24%) were tuberculin positive which means more tuberculin positivity was observed in normal nourished children compared to PEM children.

Mean induration size of Mantoux positive children in PEM is 12.78 mm and normal children is 12.85 mm, and Mantoux negative children in PEM is 1.68 mm and normal children is 2.4 mm.

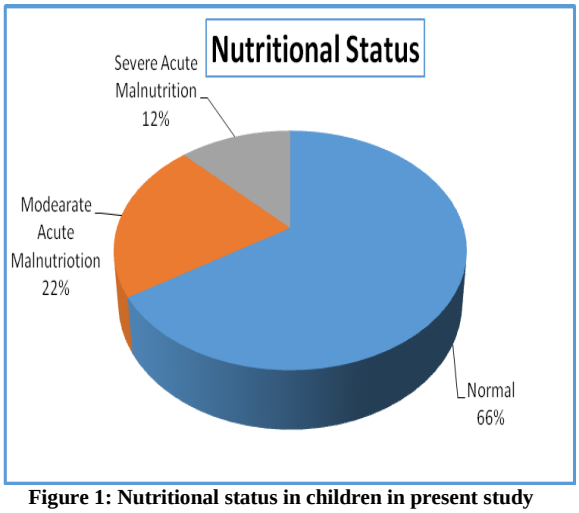

Figure 1: Nutritional status in children in present study

Out of 220 children history of contact with tuberculosis was noted in 17 children and 10(58.8%) were Mantoux positive. 203 had no history of contact with tuberculosis, 63 (31%) were positive.

There was significant association between history of contact with TB and tuberculin positivity, where more number of children with history of contact had tuberculin positivity.

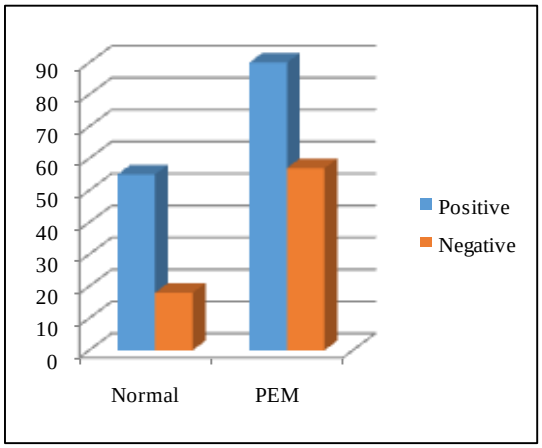

Figure 2: Mantoux Test Vs Nutritional Status

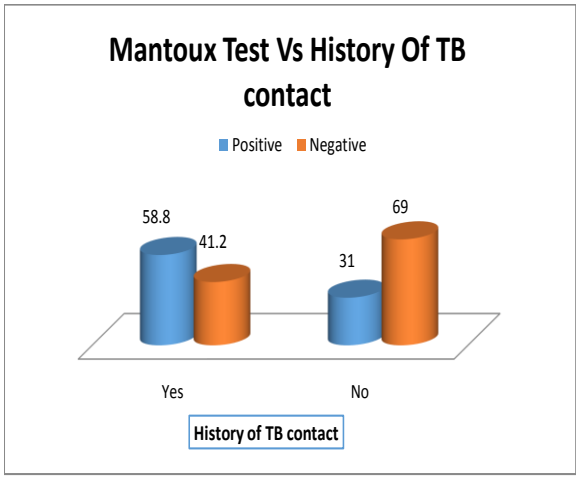

Figure 3: Mantoux test Vs History of TB contact

DISCUSSION

Malnutrition is one of the causes for false negative reactions. In developing countries like India, the effect of malnutrition on tuberculin sensitivity is very relevant. The present study result has showed that 55 (37.9%) children were tuberculin positive out of 145 normal children and 18(24.0%) children were tuberculin positive out of 75 PEM children. So there is more number of tuberculin positive in normal children as compared to PEM children. This difference was significant ($p<0.05$).

The mean induration size among tuberculin positive was observed to be lesser in PEM children (12.78 mm) as compared to normal children (12.85mm). Similarly the mean induration size among tuberculin negative children was observed to be lesser in malnourished (1.68 mm) and as compared to normal (2.40 mm) children.

Out of 220 children in the present study, history of TB contact was present in 17. Out of them 10 (58.8 %) had a positive Mantoux test. Out of 17 contacts 1 was SAM and had negative Mantoux test. Association between TB contact and Mantoux positivity was statistically significant.

Similar results were found in a study by M Singh, M L Mynak, 281 contacts were studied. Out of which 33.8 % showed positive Mantoux test. Out of the contacts 26.3% had normal nutrition, 25.4% had mild and 57.3% had severe malnutrition. 1 TU strength Tuberculin was used for the study. [1]

CONCLUSION

- The Mantoux tuberculin test using 5 tuberculin units of purified protein derivative is the “gold standard” skin test.
- It is affected by protein energy malnutrition and history of TB contact.
- Mean induration size of Mantoux reaction is more in normal children than in PEM children.

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