

# ACCURACY OF BCG TEST WITH TUBERCULIN TEST IN THE DIAGNOSIS OF EXTRA PULMONARY TUBERCULOSIS

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## Abstract;

**Objective:** To determine the accuracy of BCG test with Tuberculin test in the diagnosis of extra pulmonary tuberculosis. **Material and Methods;** A total of 369 patients aged less than 18 years were taken. All the patients presenting in the pediatric medicine department Nishtar hospital Multan, Pakistan fulfilling the inclusion and exclusion criteria were taken for this cross-sectional study. Modified Kenneth Jones scoring criteria (MKJSC) /Pakistan Pediatric Association (PPA) scoring chart was applied to all the patients. The investigations including CBC, ESR, chest X-ray, X-ray spine/joints, CT scan were obtained from central laboratory Nishtar hospital, Multan. Tuberculin test and BCG test were performed simultaneously on the same patient and interpreted according to predefined criteria. **Results;** Of these 369 study cases, 192 (52%) were boys and 177 (48%) were girls. Mean age of our study cases was  $6.24 \pm 2.52$  years (with minimum age was 2 years and maximum age was 12 years). Majority of our study cases i.e. 205 (55.6%) presented within 45 days of the symptoms of the disease. Mean disease duration was  $47.89 \pm 17.78$  days (with minimum disease duration was 25 days and 90 days was maximum disease duration). Mean modified Kenneth Jones Scoring Criteria (MKJSC)  $7.56 \pm 0.754$  in our study cases. Tuberculin test was positive in 219 (59.3 %) of our study cases, while BCG test positive in 272 (73.7%) of our study cases and accuracy of BCG test with tuberculin test was seen in 191 (51.8%) of our study cases. Stratification was done with regards to age, gender and disease duration and p-values were found to be  $p=0.000$ ,  $p = 0.000$  and  $p = 0.038$ . **Conclusion;** Our study results have indicated that BCG test is robust and safe test for the diagnosis of extrapulmonary tuberculosis in children of any age group. If applied simultaneously, they are useful diagnostic tool for the diagnosis of extra pulmonary TB.

**Keywords;** BCG Test, Tuberculin test, Extra pulmonary TB

## Introduction;

Tuberculosis (TB) is a major public health problem in Pakistan. Pakistan ranks 8<sup>th</sup> amongst the countries with highest burden of TB in the world. Pakistan contributes about 44% of TB burden in the Eastern Mediterranean region. TB is responsible for 5.1% of the total national disease burden in Pakistan<sup>1</sup>. The estimated proportion of children with TB is 3-13% of all TB cases<sup>2</sup>. Extra pulmonary tuberculosis (EPTB) accounts for 15-20% of all TB cases<sup>3</sup>. Tuberculous meningitis (TBM) accounts for about 7-12% of all cases<sup>4</sup>. The term EPTB is used to describe the isolated occurrence of TB at body sites other than the lungs including lymph nodes, kidney, meninges, spine, growing areas of bones, pleura, pericardium, peritoneum, liver, gastrointestinal tract (GIT), genitourinary tract and skin. Patients with EPTB may manifest constitutional symptoms such as fever, fatigue, malaise, anorexia and weight loss. In addition, patients may manifest signs and symptoms of organ system involved<sup>3</sup>. TBM is the most dangerous manifestation of TB because it is often difficult to diagnose, requires a long course of therapy and is associated with significant morbidity and mortality.

The major challenge in the diagnosis of EPTB is frequently atypical clinical presentation simulating other inflammatory and neoplastic conditions which frequently results in a delay or deprivation of treatment. Therefore, a high index of suspicion is required to make an early diagnosis. Traditionally in children, the diagnosis of TB is based upon clinical signs and symptoms, h/o close contact with adult TB case, chest X-ray and tuberculin skin test.

Tuberculin skin test is an accepted intradermal test for epidemiological survey but it has certain limitations<sup>5</sup>. Host related factors such as age, nutrition, immunosuppression, viral infection and immunization with live viral vaccines may alter the tuberculin reactivity of a patient<sup>6</sup>. It can be negative in the presence of severe form of disease like meningitis, disseminated/miliary tuberculosis<sup>7-12</sup>. Also, recent exposure to environmental non tuberculous mycobacteria (NTM) can result in cross sensitization and false positive reaction to tuberculin test<sup>6</sup>.

In view of the poor sensitivity of the tuberculin test, the clinicians have looked for BCG as a diagnostic test. In 1969, Egmore stated the following “the vaccination induration when measured could be used as a screening test for tuberculosis controls”.<sup>6</sup>

In a study conducted by CevikA et al. (2007), total 78 patients of both pulmonary and extra pulmonary tuberculosis of age between 90 days and 14 years were enrolled. Sensitivity and specificity of tuberculin test were 44% and 80% at confirmed tuberculosis and 46% and 100% at probable tuberculosis. Sensitivity and specificity of BCG test were 77% and 39% at confirmed tuberculosis and 79% and 53% at probable tuberculosis<sup>8</sup>. In another study conducted by Anis Ur Rehman et al. (2005), 100 patients of pulmonary tuberculosis were enrolled and subjected to both Tuberculin and BCG test. Both tests were found negative in about 26% of cases and positive in about 40% of cases. BCG was positive in 74% patients (BCG & TST positive in 40 %, TST alone positive in 34 %) <sup>9</sup>.

## Material and Methods:

Patients aged less than 18 years of either gender presenting with fever ( $T \geq 39 C^0$ ) lasting more than 2 weeks with any of the following conditions were taken;

- i. Altered sensorium with/ without fits (assessed clinically)
  - ii. Focal neurological signs (assessed clinically)
  - iii. Hepatosplenomegaly/ascites (assessed clinically)
  - iv. Matted lymphadenopathy (assessed clinically)
  - v. Gibbous formation (assessed via X-ray)
- Mono arthritis (assessed clinically).
  - Scoring at Modified Kenneth Jones scoring Criteria (MKJSC) 7 or more.

Suspected case of pulmonary tuberculosis and clinical plus CSF findings suggestive of alternative CNS pathology were excluded. All the patients presenting in the pediatric medicine department Nishtar hospital Multan, Pakistan fulfilling the inclusion and exclusion criteria were taken for the study. Modified Kenneth Jones scoring criteria (MKJSC) /Pakistan Pediatric Association (PPA) scoring chart was applied to all the patients. The investigations including CBC, ESR, chest X-ray, X-ray spine/joints, CT scan were obtained from central

laboratory Nishtar hospital, Multan. Tuberculin test and BCG test were performed simultaneously on the same patient and interpreted according to predefined criteria<sup>9</sup>.

### Results;

A total of 369 children meeting inclusion and exclusion criteria were taken in this study. Of these 369 study cases, 192 (52%) were boys and 177 (48%) were girls. Mean age of our study cases was  $6.24 \pm 2.52$  years (with minimum age was 2 years and maximum age was 12 years). Mean age of the boys was  $5.85 \pm 2.38$  years and that of girls was  $6.67 \pm 2.60$  years ( $p=0.002$ ). Majority of our study cases i.e. 340 (92.1%) were aged less than 10 years. Majority of our study cases i.e. 205 (55.6%) presented within 45 days of the symptoms of the disease. Mean disease duration was  $47.89 \pm 17.78$  days (with minimum disease duration was 25 days and 90 days was maximum disease duration). Mean modified Kenneth Jones Scoring Criteria (MKJSC)  $7.56 \pm 0.754$  in our study cases. Tuberculin test was positive in 219 (59.3 %) of our study cases, while BCG test positive in 272 (73.7%) of our study cases and accuracy of BCG test with tuberculin test was seen in 191 (51.8%) of our study cases. Stratification was done with regards to age, gender and disease duration and p-values were found to be  $p=0.000$ ,  $p = 0.000$  and  $p = 0.038$ .

### Discussion;

Tuberculosis (TB) is a major global health problem and may appear as a multisystem disease and Childhood tuberculosis remains a major public health problem in Pakistan. A total of 369 children meeting inclusion and exclusion criteria were taken in this study. Of these 369 study cases, 192 (52%) were boys and 177 (48%) were girls. Rehman et al<sup>9</sup> reported 49% boys and 51 % girls which is close to our study results. Clavik et al<sup>8</sup> reported slightly higher proportion of female gender predominance over male gender as girls were 56 % compared with 44 % boys in their study.

Mean age of our study cases was  $6.24 \pm 2.52$  years (with minimum age was 2 years and maximum age was 12 years). Mean age of the boys was  $5.85 \pm 2.38$  years and that of girls was  $6.67 \pm 2.60$  years ( $p=0.002$ ). Majority of our study cases i.e. 340 (92.1%) were aged less than 10 years. A study conducted in Turkish children reported mean age of the children with EPTB was  $6.2 \pm 4.3$  years, which is similar to our study results<sup>8</sup>. Similar results were reported by Rahman et al<sup>8</sup> which reported 72 %. Narain et al<sup>13</sup> reported 39 % children under 4 years of age, Chakraborty et al<sup>14</sup> reported 54 % children under four years of age. Gupta et al<sup>15</sup> reported 79% children with TB were under 8 years of age.

Tuberculin test was positive in 250 (67.8%) of our study cases, while BCG test positive in 192 (52%) of our study cases and accuracy of BCG test with tuberculin test was seen in 191 (51.8%) of our study cases. In a study conducted by CevikA et al<sup>8</sup>, total 78 patients of both pulmonary and extra pulmonary tuberculosis of age between 90 days and 14 years were enrolled. Sensitivity and specificity of tuberculin test were 44% and 80% at confirmed tuberculosis and 46% and 100% at probable tuberculosis. Sensitivity and specificity of BCG test were 77% and 39% at confirmed tuberculosis and 79% and 53% at probable tuberculosis<sup>8</sup>.

Another study from Turkey reported accuracy of the BCG test was 44.5 % with tuberculin test, these findings are close to our study results.<sup>16</sup>

Yildirim et al reported accuracy being as high as 83.5% from Turkey.<sup>17</sup> In another study conducted by Anis Ur Rehman et al<sup>9</sup>, accuracy of BCG test was reported to be 40 % in such patients, these findings are in compliance to that of our study results. BCG test was positive in 74% of the patients (BCG & TST positive in 40 %, TST alone positive in 34 %) <sup>9</sup>.

### Conclusion;

Our study results have indicated that BCG test is robust and safe test for the diagnosis of extrapulmonary tuberculosis in children of any age group. If applied simultaneously, they are useful diagnostic tool for the diagnosis of extrapulmonary TB. BCG test can be applied on the children at risk without prior tuberculin test.

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