

Awareness of use of Mantoux test for the diagnosis of tuberculosis in medical practitioners of PCMC area of Pune

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Abstract

Introduction: Although some studies have documented inadequate TB knowledge and poor compliance with TB treatment guidelines among practicing physicians, such data are lacking in India. The objective of this study is to assess and document the knowledge of TB diagnosis by Mantoux test and its management practices among medical practitioners. Study design: Survey analysis.

Materials and method: The survey was conducted among 300 medical practitioners in PCMC area of Pune. The authors were given a pre-tested questionnaire which was completed under supervision without allowance for discussions or cheatings. The anonymity and confidentiality of the respondents were being guaranteed. The questionnaire contains a set of multiple questions that assesses the knowledge of Mantoux test use, administration and its interpretation.

Result: 400 practitioners completed the study and data were analysed. Knowledge score was poor, attitude score and practice score were average but belief was towards positive.

Conclusion: This study concluded that there is less knowledge among medical practitioners about Mantoux test for the diagnosis of Tuberculosis.

Keywords: Mantoux test, Tuberculosis, Self Made Questionnaire

Introduction

Tuberculosis continues to be one of the most important global public health threats.¹ About one third of population is infected with Mycobacterium tuberculosis and at the risk of developing the disease.^{2,3} More than eight million people develops active TB annually with more than 90% of deaths occurring in the developing world.^{4,5} Early detection and adequate treatment are critical measures for disease control.^{6,7} Due to inadequate case detection and poor treatment continue to be some of the major

factors for the increasing burden of TB globally.^{8,9,10}

The Mantoux tuberculin skin test (TST) is the most accurate skin test for determining TB infection and is the only skin test recommended by TB Control.¹⁰

The tuberculin skin test is one of the few tests developed in the 19th century that is still in present use in clinical medicine. The first tuberculin test material was prepared by Robert Koch¹¹; its use for detection of tuberculosis (TB) infection was first described in 1907 by von Pirquet¹².

Particular problems have arisen with use of repeated tuberculin tests to detect new infection in high-risk populations such as initially tuberculin-negative contacts of active cases, and workers with occupational exposure. This has revealed that tuberculin reactions may decrease in size (reversion) or increase in size because of: (1) random variability from differences in administration, reading, or biologic response; (2) immunologic recall of preexisting delayed type hypersensitivity to mycobacterial antigens (boosting); or (3) new infection (conversion). This review has been undertaken to provide information regarding factors causing changes in the size of repeated tuberculin reactions¹³.

The Booster Phenomenon

The phenomenon of increased tuberculin reactions upon retesting in the absence of new infection, is believed to result from recall of waned cell-mediated immunity, akin to the anamnestic serologic response. Boosting is maximal if the interval between the first and second test is between 1 and 5 wk^{13,14} and is much less frequent if the interval is only 48 h or more than 60 days, although boosting can be detected one or more years after a first negative tuberculin test^{15,16}.

Conversion

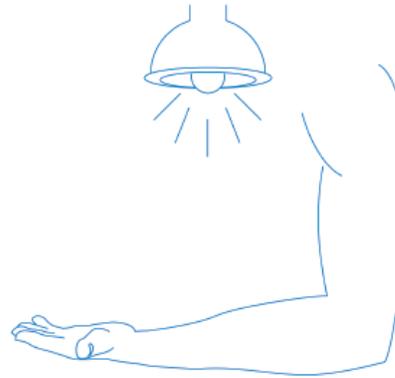
Conversion is defined as the development of new delayed type hypersensitivity to mycobacterial antigens following new infection with *M. tuberculosis*, nontuberculous mycobacteria, or BCG vaccination¹⁷.

❖ Administration of Mantoux test

Provide patient education and locate the injection site

- Collect necessary supplies and explain why the Mantoux test is given and what is involved in the procedure.

- Explain that 48 to 72 hours after the test is administered, the patient must return to have the induration measured and interpreted.
- Place the forearm palm side up on a firm, well-lit surface and select an area of healthy skin 5 to 10 centimetres below the elbow joint which is free of muscle margins, heavy hair, veins, sores, or scars.
- Only visibly dirty skin needs to be washed with soap and water.

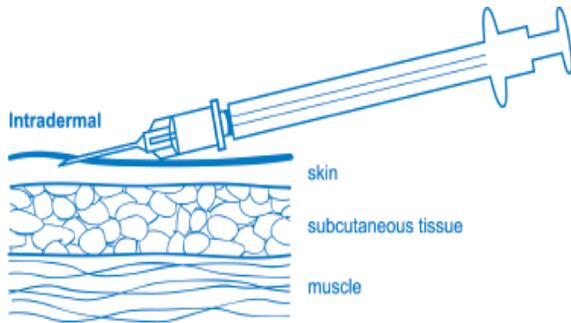


Prepare the syringe

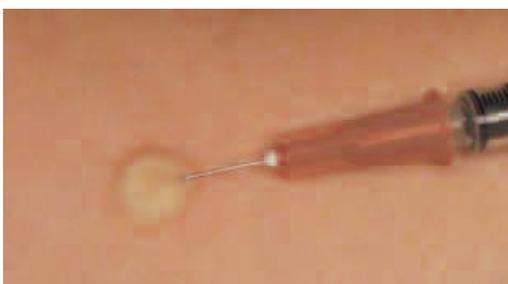
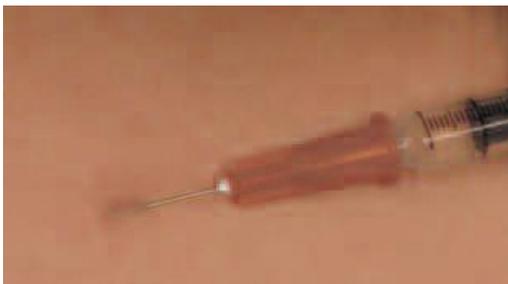
- Check expiry date and ensure that the vial contains SSI tuberculin 2TU in 0.1ml.
- Securely fasten an appropriately sized (21G green) needle to a 1ml graduated syringe and draw up just over 0.1ml of tuberculin.
- Safely dispose of the needle used to draw up the tuberculin and securely fasten a 25G or 26G short bevel needle.
- Expel air and excess tuberculin to leave exactly 0.1ml of tuberculin.



Inject 0.1ml of tuberculin



- Stretch taut the selected area of skin between the thumb and forefinger, 5-10cm below the elbow joint.
- Insert the needle slowly, bevel upwards, at an angle of 5 to 15 degrees.



- Advance the needle through the epidermis approximately 3mm so that the entire bevel is covered and visible just under the skin.

- Release the stretched skin and, holding the syringe in place on the forearm, slowly inject the tuberculin solution.
- If the needle is inserted correctly you should feel quite firm resistance as the tuberculin enters the skin to form a tense, pale wheal 6 to 10 mm in diameter.

Check the skin test, record information and confirm return appointment

- If the wheal is less than 6mm in diameter the test should be repeated at a site at least 5cm (50mm) from the original site.
- Explain that mild itching, swelling, or irritation may occur and that these are normal reactions that do not require any treatment.
- Tell the patient to avoid scratching the site, keep the site clean and avoid putting creams, lotions, or adhesive dressings on it.
- Record all required information and provide an appointment card for the patient to return and have the test read.

Reading

- The Mantoux skin test should be read between 48 and 72 hours after administration. The basis of reading the skin test is to measure and record the presence or absence of induration. Reliable reading of the Mantoux skin test requires standardisation of procedures, training, supervision, and practice. This may also include periodic standardised reliability testing.



- Visually inspect the site on a firm, well-lit surface.
- Only the induration, which is a hard, dense, raised formation, is measured, even if there is soft swelling or redness (erythema).

Palpate induration

- Induration is not always visible or present and can only be determined by palpation with the fingertips.
- Using a light, gentle motion, sweep the fingertips over the surface of the forearm in all four directions to locate the margins or edges of induration.



Mark induration

- The diameter of the induration is measured across the forearm, from the thumb side of the arm to the little finger side.
- Use fingertip as a guide to mark lightly with a fine dot at the widest edges of induration across the forearm.
- If the margins of induration are irregular, mark and measure the longest diameter across the forearm.



Measure induration

- Measure the diameter of the induration using a plastic flexible millimetre (mm) ruler.
- Place the zero ruler line inside the left dot edge and read the ruler line inside the right dot edge.
- If the measurement falls between two divisions on the millimetre scale, record the lower mark.

Record measurement of induration in mm

- Record the exact measurement in millimetres (mm) of induration.
- If there is no induration, record as 0mm.
- Do not record results as 'positive' or 'negative'.
- Record the date and time the test was read, the name and signature of the person who read the skin test, and the presence or absence of adverse effects.



Reading

1. Read TST in 48-72 hours, preferably at 72 hours:
 - a. Instruct individuals to return to the health department if induration occurs after the TST is read;
 - b. Positive TST reactions occurring after 72 hours are considered valid; and
 - c. Negative TST reactions should be repeated when individuals fail to return within 72 hours.

2. Locate induration (not redness) by palpating in a crosswise motion.
3. Measure transversely (crosswise or “east to west”) to the long axis of the forearm and record this as a single measurement.
4. Record reaction in mm (example: 0mm, 16mm) and document date of reading and signature of person reading the test.
5. Cold packs or over the counter topical steroid preparations may be used for the relief of pruritus and local discomfort.
6. Evidence of severe scarring at an old TST site denotes a prior positive reaction and a repeat TST may not be indicated.

Recommendations

- The tuberculin skin test is preferred for routine targeted testing for latent TB infection in immunocompetent adults and children 5 years and older in the public health setting.

Materials and method

The survey is being conducted among 400 medical practitioners in PCMC area of Pune. The authors are being given a pre-tested questionnaire which will be completed

under supervision without allowance for discussions or cheatings. The anonymity and confidentiality of the respondents are being guaranteed. The questionnaire contains a set of multiple questions that assesses the knowledge of Mantoux test use, administration and its interpretation.

- Type of study: Survey analysis.
- Place of study: PCMC Area - Pune.
- Duration of study: 3 months
- Sample size:400
- Gender: both male and female.

Materials used

- Subject explanation form, data collection form – Questionnaire

Inclusion criteria

- Group of population: Medical practitioners recognised under MCI

Exclusion criteria

- Medical practitioners who are not recognised under MCI
- Medical students, PG students, Interns

Statistical analysis

Table 1: Knowledge

Knowledge	No of cases	Percentage (n=399)
Q3 What type of hypersensitivity reaction is Montoux	337	84.46
Q6 What is administered for testing the Montoux reaction	323	80.95
Q7What does is injected	258	64.66
Q8When is Montoux test read	187	46.87
Q14What is the size to conform positively in immunocompetent patients	307	76.94
Q15 What is the size to conform positively in immunocompetent patients	255	63.91

Table 2: Knowledge score wise distribution of cases in study group

Knowledge score	No of cases	Percentage
Good (5 – 6)	197	49.37
Average (2 – 4)	182	45.61
Poor (0 – 1)	20	5.01
Total	399	100

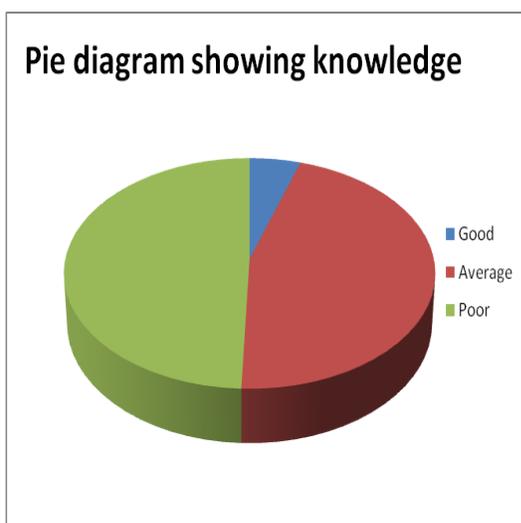
Table 3: Attitude

Attitude	No of cases	Percentage (n=399)
Q13 Is <u>Mantoux</u> a diagnostic or screening test for active Tuberculosis	162	40.60
Q17What is the size to confirm positivity in immunocompromised patients?	157	39.35
Q18For how long can BCG vaccination be attributed to <u>Mantoux</u> positivity?	163	40.85
Q21 <u>Mantoux</u> positive in a contact child of a case. What will you do next?	312	78.20

Table 4: Attitude score wise distribution of cases in study group

Attitude score	No of cases	Percentage
Positive (2 – 4)	278	69.67
Negative (0 – 1)	121	30.33
Total	399	100

Pie diagram showing knowledge



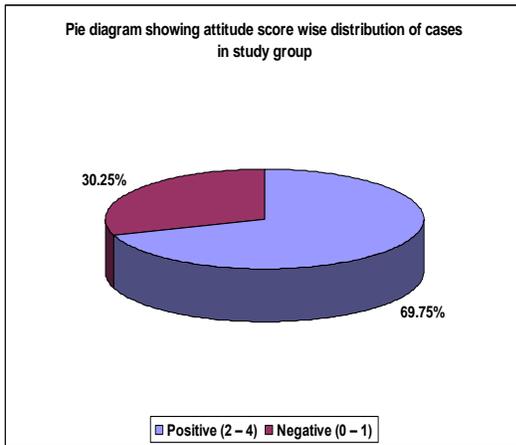


Table 5: Practice

Practice	No of cases	Percentage (n=399)
Q4 Where is the injection given for Montoux	291	72.93
Q5 What is the method of injection in Montoux testing	250	62.66
Q9 What is looked for in the reaction	249	62.41
Q19 When is Mantoux to be prepared if initial test was negative and clinical suspicion of infection is high?	94	23.56

Table 6: Practice score wise distribution of cases in study group

Practice score	No of cases	Percentage
Good (4-5)	27	6.77
Average (2-3)	287	71.93
Poor (0-1)	85	21.30
Total	399	100

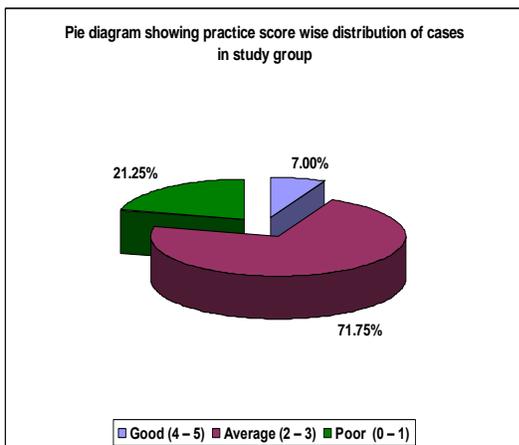
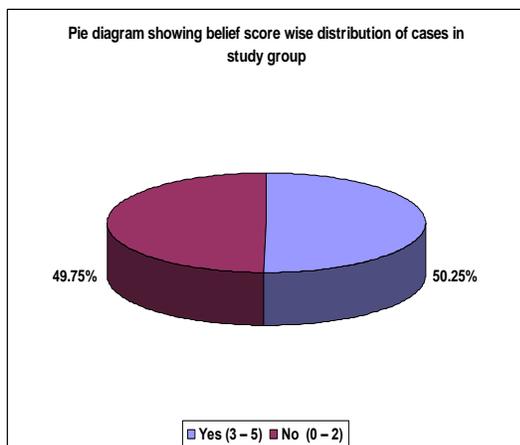


Table 7: Belief

Belief	No of cases	Percentage (n=399)
Q10 What is the Montoux test used to detect	180	45.11
Q11 What is the meaning of positive Montoux test	204	51.13
Q12 What can be the reasons for negative Montoux test	295	73.93
Q16 For how long can BCG vaccination be attributed to Montoux positively	154	38.60
Q20	143	35.84

Table 8: Belief score wise distribution of cases in study group

Belief score	No of cases	Percentage
Yes (3 – 5)	200	50.13
No (0 – 2)	199	49.87
Total	399	100



Discussion

Tuberculosis in humans is mainly caused by *Mycobacterium tuberculosis*. The infection is transmitted by respirable droplets generated during forceful expiratory manoeuvres such as coughing.

Diagnostic tests for tuberculosis

Various investigations can be used to diagnose tuberculosis. These include medical imaging, microbiology tests, tests of a patient's immune response (tuberculin skin

testing and interferon gamma release assays) and histopathology.

Early diagnosis and effective management of active tuberculosis remain the most effective strategies for public health control of tuberculosis. As pulmonary tuberculosis is infectious, it is particularly important to consider the possibility of tuberculosis in patients with subacute and chronic infectious conditions and with a cough for longer than two to three weeks. If such a patient has an abnormal chest X-ray, analysis of three morning sputum specimens

will rapidly detect those with active transmissible infection. Tuberculin skin tests and interferon gamma release assays have no role in the initial investigation for active pulmonary tuberculosis. They are mainly used for detecting latent tuberculosis in people when active tuberculosis has been excluded, and for whom preventive treatment would be considered.

Mantoux Test Interpretation

The Mantoux test does not measure immunity to TB but the degree of hypersensitivity to tuberculin. There is no correlation between the size of induration and likelihood of current active TB disease but the reaction size is correlated with the future risk of developing TB disease.

The interpretation of the test result will depend on all relevant clinical circumstances. In the absence of specific risk factors for TB, an induration of between 6 and 15mm is more likely to be due to previous BCG vaccination or infection with environmental mycobacteria than to TB infection. Where there is a higher probability of TB infection, such as recent contact with an infectious case, a high occupational risk or residence in a high prevalence country, then an induration of 6mm or greater, without a history of previous BCG vaccination, is more likely to be due to TB.

A reaction of 6mm or greater, indicates a response of the immune system due to either TB infection, infection with environmental mycobacteria or previous BCG vaccination (BCG vaccinated persons normally become tuberculin positive after 4-8 weeks). There is no correlation between the size of postvaccination Mantoux reactions and protection against TB disease and routine post-BCG Mantoux testing serves no purpose.

Reactions larger than 15mm are unlikely to be due to previous BCG vaccination or exposure to environmental mycobacteria.

Viral infections, especially HIV, can cause false negative reactions. Other factors that can weaken the Mantoux reaction include severe TB disease, renal failure and diabetes, treatment with immunosuppressive drugs, old age or newborn infants and improper storage, insufficient dose and inadvertent subcutaneous injection.

Most of practitioners don't aware that when to read Mantoux test so mostly they will get false result and that's why patients are having inadequate treatment of tuberculosis. So by this study, we can come to know that only 46.87% medical practitioners are aware of when to read Mantoux test.

Result

- 400 practitioners completed the study and data were analysed. Knowledge score was poor, attitude score and practice score were average but belief was towards positive.

Conclusion

- This study concluded that there is less awareness among medical practitioners about Mantoux test for the diagnosis of Tuberculosis.

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