ORIGINAL ARTICLE

AWARENESS OF THE MANTOUX TUBERCULIN SKIN TEST AMONG HEALTHCARE WORKERS

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ABSTRACT

Background: The bacterium Mycobacterium tuberculosis (MTB) causes the infectious disease tuberculosis(TB). Mantoux tuberculin skin test (MTST) dates back to the 19th century, and remains widely used as the primary test for TB screening and diagnosis; however, its interpretation continues to be challenging.

Objectives: To determine the knowledge level of the Healthcare Workers (HCWs) about MTST and the knowledge difference among different groups of HCWs.

Study Design: Cross-sectional study.

Place and duration of study: Pakistan Ordinance Factory (POF) Hospital, Wah Cantt, 03 months (January to April 2024).

Methodology: This study involved 200 HCWs comprising medical officers and nurses. The data on knowledge, interpretation, and application of MTST from participants were gathered using a self-administered questionnaire. The understanding level of different groups was determined with the chi-square test.

Results: Healthcare workers had scarce knowledge about MTST, its interpretation, and application. Out of 200 participants, 24(12%) had awareness about MTST, total procedural awareness was seen in 24(12%), while 28(14%) exhibited total interpretation awareness.

Conclusion: The knowledge and interpretation level of HCWs regarding MTST was inadequate. Concrete steps must be taken to enhance its awareness. Regular awareness sessions should be scheduled for healthcare workers to update their knowledge in this area.

Key Words: *Awareness, Healthcare workers, Mantoux Tuberculin Skin Test, Tuberculosis screening*

How to cite this article: *Tehseen T, Anwar S, Ghazal L, Shoukat A, Asim F, Malik TM. Awareness of the Mantoux Tuberculin Skin Test among Healthcare Workers. HMDJ. 2025 June; 05(01): 10-14. https://doi.org/10.69884/hmdj.5.1.0294*

INTRODUCTION

Mycobacterium tuberculosis (MTB) causes Tuberculosis (TB), a contagious disease, spread by airborne particles. Being a major cause of global mortality, TB is a significant public health concern [1]. World Health Organisation (WHO) reports 10.6 million fresh TB cases and 1.3 million deaths due to TB in 2022 [2]. In the same year, WHO published the updated guide," Implementing the End TB Strategy: The Essentials, 2022 Update", offering revised resources to support global TB control efforts [3]. The initial steps for decreasing the rate of TB-related ill effects are screening, early diagnosis, and management. All the high-risk Healthcare Workers (HCWs), at risk of contracting TB, even in the low-endemic regions, are required to undergo primary TB screening by using the Mantoux tuberculin skin test (MTST) [4,5]. Additionally, it can pinpoint the high-risk areas within healthcare facilities by analysing the proportion of HCWs diagnosed with TB over several years [6]. The expensive TB confirmatory tests, their low sensitivity, and microscopy being not feasible in low-income endemic areas, make MTST a key screening test in such setups [7]. Latent tuberculosis Infection (LTBI) can be identified through meticulous screening by MTST, and it is recommended for the diagnosis & management of TB in low-income rural populations, where TB is prevalent[8]. This test has its foundation in a delayed hypersensitivity (DTH) response towards the I/D injection of purified protein derivative (PPD), comprising the antigens from MTB, Mycobacterium bovis, Bacillus Calmette-Guerin (BCG) and non-tuberculous mycobacteria (NTM). It shows low sensitivity in immunocompromised patients. Variability in results may be attributed to the requirement for two visits within a 72-hour window following the initial intradermal injection of PPD, as well as potential reader bias during the

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Received: 02-06-2025
Revision: 25-06-2025
Accepted: 30-06-2025

doi.org/10.69884/hmdj.5.1.0294

interpretation of the PPD-DTH response [9,10]. Improvement of the PPD skin test can be achieved by conducting a standard procedure, preceded by proper training and supervision of the staff. While the PPD skin test is widely utilized globally, interpreting the results can be difficult[11]. The high-risk groups of TB infection comprise persons directly exposed to the infectious agent, contacts of active pulmonary TB patients, persons suffering from latent tuberculous infection, people living in crowded shelters, and healthcare workers, especially those handling and treating TB patients [12]. Among healthcare workers, pulmonologists and respiratory therapists are particularly at risk and require regular testing due to their high likelihood of exposure [13]. Formal training of HCWs to administer, read, and interpret the results of MTST is a vital requirement for TB screening. Careful measurement of the size of the induration at the site of the injection is mandatory. This can be influenced by elements such as injection technique and the patient's skin condition. Technical difficulties in administering, reading and interpreting the response can lead to false results because of insufficient skills or personal bias [9,14]. Standard, CDC guidelines say that PPD test interpretation encompasses the size of induration as well as individual risk factors. A < 5 mm induration may still be taken as +ve in HIV+ve individuals or those with a recent contact with an active TB patient. An induration of ≥ 5 mm is taken as +ve in the immunocompromised, inclusive of patients on corticosteroid therapy, undergoing chemotherapy, or those who have received an organ transplant. Whereas in the recently immigrated people from countries where TB is common, an induration of ≥ 10 mm is considered +ve. Moreover, workers / residents in risky places like jails, homeless shelters, laboratories and healthcare facilities and, the injection drug users, children under 04 years, individuals with chronic ailments that augment TB reactivation risk, an induration of ≥ 15 mm is considered +ve in disease free adults with low chance of acquiring TB[15,16].

CAPSULE SUMMARY

The knowledge level of the healthcare workers about the Mantoux Tuberculin Skin Test, and the differences in the knowledge of HCWs were assessed. Healthcare workers had insufficient knowledge about MTST, its interpretation and application. Tangible steps, along with regular awareness sessions, must be taken for healthcare workers to update their knowledge in this area.

Our study aimed to evaluate the extent of understanding of MTST by HCWs at POF Hospital, Wah Cantt. The purpose was to check the understanding level of different steps of MTST, including performance and interpretation.

The specific objectives were to determine and compare the knowledge about MTST among different groups of HCWs.

METHODOLOGY

After the approval by the Ethical Review Committee/ Institutional Review Board (ERC/ IRB) of Wah Medical College, a cross-sectional study was undertaken at the same college and POF Hospital, Wah, in 03 months after the approval of synopsis. Sample size calculation was done by the Knowledge, Attitude and Practice (KAP) survey sample size calculator, taking a sample population of 400, keeping 95% confidence level & 5% margin of error. Sample size was 197 (rounded off to 200)[17]. A convenient sampling technique was used.

The House officers (HO), Medical Officers (MO), Post-Graduate Trainees (PGT), Post-Resident Nurses (Post RN), Generic Nursing students (BScN) participated in the study. Questionnaires were distributed to the participants after obtaining their informed consent and were collected within a week. After an extensive literature search, a questionnaire with two sections was constructed. Section 1 was about the demographic aspects like age, gender, work status, academic qualification, etc. Section 2 consisted of 20 questions; 8 were related to the procedure of MTST, and 12 were about the method of reading and interpretation of the result. Close-ended items were used for data collection. It was mandatory to answer all questions to eliminate incomplete forms.

In the study questionnaire, each answer carried a value of "1" if correct and "0" if incorrect. In this way, knowledge of the test procedure carried 8 marks, and knowledge of test result reading and its interpretation carried 12 marks. Each participant's knowledge regarding the test procedure and its interpretation was categorised according to the modified Bloom's cut-off point, where any score from 80%- 100%" was Good", 50% - 79% was "Moderate", and less than 50% score was "Poor".

The software SPSS 23 was used for data analysis. Frequency and percentages of the knowledge score were calculated. To assess the difference in the levels of understanding between various groups, a chi-square test was used. The significance (p-value) was 0.05.

RESULTS

Overall awareness for MTST was good among 24(12%), moderate among 40(20%), and poor in 136(68%) HCWs. The total procedural awareness was good among 24(12%), moderate among 45(22.5%) while 131(65.5%) participants showed poor awareness. The interpretation awareness was good among 28(14%), moderate among 111(55.5%) and 61(30.5%) participants had poor interpretation awareness. Regarding the level of awareness according to designations, the detailed results are given in Tables 1 and 2.

The highest awareness and interpretation awareness levels were observed among MOs(54%), whereas the level of procedural awareness was maximum among HOs (23%)(Table3).

DISCUSSION

The MTST is a dependable and standard method extensively

Table 1: Awareness level according to Designation / Qualification

Designation	Total number of participants	Qualification	Poor n(%)	Moderate n(%)	Good n(%)	p-value
PGT	10	MBBS	4(40)	6(60)	0	
MO	30	FCPS	4(13)	10(33)	16(54)	0.001
HO	44	MBBS	20(46)	16(36)	8(18)	
Post RN	80	Post RN	74(92)	6(8)	0	
Generic BSN	36	Generic BSN	34(94)	2(6)	0	

Table 2: Total level of Procedure awareness according to Designation / Qualification

Designation	Total number of participants	Qualification	Poor n(%)	Moderate n(%)	Good n(%)	p-value
PGT	10	MBBS	2(20)	8(80)	0	
MO	30	FCPS	18(60)	12(40)	0	
HO	44	MBBS	12(27)	22(50)	10(23)	0.001
Post RN	80	Post RN	31(39)	49(61)	0	
Generic BSN	36	Generic BSN	16(44)	20(56)	0	

Table 3: Total level of Interpretation awareness according to Designation / Qualification

Designation	Total number of participants	Qualification	Poor n(%)	Moderate n(%)	Good n(%)	p-value
PGT	10	MBBS	8(80)	2(20)	0	
MO	30	FCPS	4(13)	8(27)	18(60)	
HO	44	MBBS	8(18)	30(68)	6(14)	0.001
Post RN	80	Post RN	76(95)	4(5)	0/0/0	
Generic BSN	36	Generic BSN	35(97)	1(3)	0/0/0	

used for the diagnosis of LTBI. It also has a utility in the estimation of uncertain cases of TB with negative MTB culture. A cross-sectional study conducted in Palestine evaluated the knowledge, awareness, and experiences related to tuberculosis among 383 clinical & pre-clinical medical students. The study found that only 6.5% of all students had ever undergone a Mantoux test, and 29.5% knew that it is administered intradermally. Moreover, only 43.6% correctly understood that a positive Mantoux test does not confirm active TB infection. Clinical students demonstrated significantly better understanding than the pre-clinical students across all TB-related domains, including Mantoux testing. These findings underscore a substantial gap in practical TB knowledge among future healthcare professionals and highlight the importance of targeted educational interventions to reinforce diagnostic concepts such as MTST[18].

From January 2018 to 2020, a study was done in Solan, India. Patients presenting in the OPD for the Mantoux test were included. A related physician referred 789 TB-suspected patients, on whom TSTs were performed. Out of 789 patients, 709 (90%) belonged to the rural population, and 401 (51%) of the rural population were from a low socio-educational status. Patients positive for the MTST were 198 (25%), negative cases were 459 (58%), and 135 (17%) cases did not show up for interpretation[8]. Several surveys were conducted in Pakistan to estimate the knowledge, diagnosis, and management of TB by different methods, including MTST. However, none so far has concentrated on the understanding of the procedure and interpretation of the MTST by HCWs. Considering this void, our study focused on assessing HCWs' knowledge of the MTST, its interpretation and application in detail. Our outcomes will guide the development and implementation of interventions

that assist HCWs regarding the MTST in the diagnosis of TB. Our findings revealed a concerning lack of awareness regarding the MTST. While only 12% of participants demonstrated good awareness and 20% had moderate awareness, a significant majority (68%) exhibited poor awareness. This highlights the urgent need for focused educational interventions and training programs to boost MTST-related knowledge among HCWs, which is critical for timely TB detection and control.

RECOMMENDATIONS

- There is an urgent need for structured training programs to address practical gaps in MTST knowledge.
- Standard operating procedures, hands-on workshops, and routine assessments of MTST knowledge and practices should be integrated into continuing medical education (CME) and infection control programs to ensure updated knowledge and skills among healthcare workers.
- Incorporating qualitative research (interviews/focus groups) could identify the reasons behind poor awareness and perceived barriers to MTST implementation.

LIMITATIONS

This was a single-centre study with a convenience sample, which may have limited generalizability. Self-reporting might have introduced response bias.

CONCLUSION

This study reveals a significant knowledge gap among healthcare workers regarding the MTST. Tuberculosis control relies heavily on accurate screening and early detection. Structured training programs for MTST administration and interpretation must be incorporated into the ongoing professional development initiatives for all HCWs.

ETHICAL APPROVAL: *Reference number: (Letter No =WMC/ERC/IRB/041, Date: 12-01-2024*

CONSENT FOR PUBLICATION: *Written, informed consent was obtained from the study participants.*

AVAILABILITY OF DATA: *Data is available from the corresponding author on a justified request.*

FINANCIAL DISCLOSURE/ FUNDING: *None*

ARTIFICIAL INTELLIGENCE TOOLS DISCLOSURE: *None*

CONFLICT OF INTEREST: *None*

ACKNOWLEDGEMENT: *None*

AUTHORS' CONTRIBUTION

- ***Tahira Tehseen:*** *Conception and design, Acquisition of data*
- ***Saba Anwar:*** *Acquisition of data*
- ***Lubna Ghazal:*** *Aanalysis and interpretation of data*
- ***Aniqa Shoukat:*** *Aanalysis and interpretation of data*
- ***Fareena Asim:*** *Drafting the article*
- ***Tariq Masood Malik:*** *Critical revision*

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