

Nursing Students' Knowledge and Practice regarding Mantoux Skin Test Procedure



Gamila Eid Ahmed¹, Reham Mohamed ELghool², Samar ELhoseiny Abdelraoof³

¹ Demonstrator in Community Health Nursing, Faculty of Nursing, Mansoura University, Egypt

² Assistant Professor of Instructional Technology, Faculty of Education, Mansoura University, Egypt

³ Professor in Community Health Nursing, Faculty of Nursing, Mansoura University, Egypt

1. ABSTRACT

Tuberculosis (TB) is second leading cause of death from an infectious disease worldwide, as well cause disease among millions of people each year. Screening can lead to early diagnosis and treatment thereby reducing TB related morbidity and mortality, Mantoux tuberculin skin test (MTST) was the standard method for detecting latent TB infection, Therefore, the current study aimed to assess students' knowledge and practice regarding Mantoux skin test procedure, through a cross sectional study on a convenient sample composed of 200 undergraduate nursing students enrolled in the course of community health nursing^{2nd} semester, academic year 2021-2022, by three two structured self-administrated questionnaires and an observation checklist. Results of the present study revealed that 93% of nursing students had poor total level of knowledge with a mean 10.0500 (3.45357) and 71.5% had proficient total level of practice with a mean 43.5650(3.54522); concluding that most of nursing students had poor total level of knowledge and less than three quarters had proficient total level of practice regarding Mantoux skin test procedure, so it is recommended to design educational session to raise nursing students' knowledge regarding Mantoux skin test procedure.

Keywords: knowledge, practice, tuberculosis, nursing students, Mantoux skin test

2. Introduction:

Tuberculosis (TB) usually infects the lungs and is a slowly progressive, chronic, necrotizing or non-necrotizing, and granulomatous or non-granulomatous infection caused by Mycobacterium tuberculosis (MTB), TB is still a devastating infectious disease, as one third of the world population is infected with the causative agent MTB, more than 9 million develop active disease (Kowalewicz-Kulbat et al., 2018).

Worldwide, TB is the 13th leading cause of death and the second leading infectious killer after COVID-19 above HIV/AIDS, and a major contributor to antimicrobial resistance, since a total of 1.5 million people died from TB in 2020. Globally TB incidence is falling at about 2% per year, TB is curable and preventable (WHO, 2021).

The screening can lead to early diagnosis and treatment thereby reducing TB related morbidity and mortality, In the United States, the Mantoux tuberculin skin test (MTST) was the standard method for detecting latent TB infection since the 1930s, and is primarily used both to test close contacts of people who have active TB disease, and various groups of people who are at high risk for TB (Erol, 2018; Laghari et al., 2019; Naraghi 2018; Sellami, 2019).

MTST was performed by trained Health Care Worker using the Mantoux technique can be done in one-step or two steps. A dose of 0.1 mL of 2 tuberculin unit (TU) Purified Protein Derivative RT23/Tween 80, as the current standard recommended dose by the WHO is 2 TU (Durando et al 2016; Ghiasi, 2016).

MTST sensitivity has been estimated to be between 77% and specificity 97% in non-BCG vaccinated and 59% in BCG vaccinated populations BCG vaccination can confound the results of MTST by reducing specificity and increasing false positives for latent TB infection (Greenaway et al., 2018).

Aim of the Study

1. To evaluate nursing students' levels of knowledge regarding Mantoux skin test procedure
2. To evaluate nursing students' levels of practice regarding Mantoux skin test procedure.

3. METHODOLOGY

Design

A cross-sectional study design was utilized to accomplish this study.

Setting

The study was carried out at skill lab of community health nursing, Faculty of Nursing, Mansoura University.

Participants

Undergraduate nursing students were enrolled in the course of community health nursing 2nd semester, academic year 2021-2022.

Sampling

Accidental sample enrolled 220 undergraduate nursing students, from the above-mentioned settings.

Tools for Data Collection

The researcher developed two tools (I, II,) and adopted tool (III) from CDC, (2016) for data collection after reviewing the related literature as the following:

Tool (I): Nursing students' socio-demographic and academic characteristics self-administrated structured questionnaire. This questionnaire was used to assess socio-demographic and academic characteristics of nursing students such as: age, gender, residence, and academic achievement.

Tool II: Nursing students' knowledge self-administrated structured questionnaire. This questionnaire was used to assess nursing students' knowledge regarding Mantoux skin test such as: definition, site of skin test, needle length that must patient use, storage of tuberculin purified protein derivative before injection, and interpretation of the induration.

The tool composed of 26 questions and classified into 5 categories as the following:

1. Objectives of Mantoux skin test (It included 5 items = 5 marks)
2. Injection stage of Mantoux skin test (It included 5 items = 5 marks)
3. Reading stage of Mantoux skin test (It included 4 items = 4 marks)
4. Interpretation stage of Mantoux skin test (It included 9 items = 9 marks)
5. Two-step skin test (It included 3 items = 3 marks)

Scoring system of nursing students' knowledge. Total score of knowledge ranged from 0 to 26 marks. Each correct answer awarded one mark. According to the researcher's cut off point the knowledge levels was consisted of three categories, as the following:

Poor. Scores less than 60% of total scores (0 – 15.5)

Fair. Scores 60% to less than 80% of total scores (15.6 – 20.7)

Good. Scores 80% and more of total scores (20.8 - 26)

Tool III: Nursing students' practice observational checklist. The researcher utilized this checklist to evaluate nursing students' practice, while carrying out steps as: hand hygiene, wearing gloves, disinfect injection site till measuring induration. This tool composed of 50 questions and classified into four categories as the following:

1. Preparation of injection (It included 10 items = 10 marks)
2. Administration of Mantoux skin test (It included 24 items = 24 marks)
3. Reading of Mantoux skin test (It included 11 items = 11 marks)
4. Interpretation of Mantoux skin test (It included 5 items = 5 marks)

Scoring system of nursing students' practice. Total score of practice ranged from 0 to 50. Each proper step awarded one mark and zero for improper and not done step. According to the researcher's cut off point the practice levels were consisted of four categories, as the following:

Improper: less than 60% (0 – 29.9)

Master: 60% to less than 75% (30 – 37.4)

Expert: 75% to less than 85% (37.5 – 42.4)

Proficient: 85% or more; of the total score (42.5– 50)

Procedure

This study was accomplished throughout two main phases:

Phase I: Preparatory phase. It included the following:

Administrative stage. The researcher obtained approval to carried out the current study according to the following lines of permissions: council of Community Health Nursing Department submitted an official letter to the vice dean of postgraduate studies and research followed to vice dean of education and students' affairs, Faculty of Nursing, Mansoura University; to permit the researcher to conduct the study.

Ethical consideration. The researcher obtained approval from Research Ethics Committee, Faculty of Nursing, consequently obtained oral informed consent from nursing students, after explaining the aim of the study and assured them that their data be treated

anonymously and confidentially and used for research purpose only. In addition to each nursing student had the right to ask any question related to the study as well, withdraw at any time without given any reason.

Phase II: Operational Phase

Literature review. The researcher reviewed national and international literatures on the Mantoux skin test procedure and GBL proposed from scientific published articles, internet search and textbooks. The search was limited to the period from 2014 up to 2022.

Developing the study tools. The researcher developed tools I, II, after reviewing the related literature and adopted tool III from CDC, (2016).

Content validity. Five experts in the field of community health nursing tested the study tools for content validity and the required modifications were carried out.

Face validity. A pilot study was carried out on 10% of the study participants (20 students) were selected conveniently from the same settings and excluded from the study sample. The required modifications were done.

Data collection. The researcher had initiated data collection once she granted permission to conduct the study; from November 2021 to end of May 2022, at the end of clinical days, she introduced herself then explained the aim of the study and obtained oral consent from nursing students. The researcher was initially assessing nursing students' socio-demographic and economic characteristics, knowledge about Mantoux skin test procedure.

The researcher demonstrated Mantoux skin test procedure for each group (10 groups) and observed nursing students' re-demonstration by using tool (III) which take 25 minutes/ student, this conducted in ideal and equipped community health nursing skill lab, Faculty of Nursing, Mansoura University.

Data analysis. Statistical analysis was done according to the most currently reliable and valid statistical methods.

After data **collection** it was revised, coded, organized, categorized, analyzed using Statistical Package for Social Science (SPSS) version 20. Data were presented in the form of frequencies and percentage.

Mean and standard deviation for continuous variables and percentages for categorical variables.

Limitation of the study

The research schedule had to be conducted second semester, academic year 2020-2021; based on its documented proposal, but outbreak of Covid-19 pandemic and its consequence of converted face to face education to E- distance learning, resulted in postpone it to second semester, academic year 2021-2022.

4. RESULTS

Table (1) shows that, age of the studied nursing students ranged from less than 20 to less than 24 years with a mean age of 2.5150± (.67977). It was observed that 83.5% and 72% of the studied students were female and resident in rural areas respectively

Figure (1) illustrates that, 53.5%, and 3.5% of the nursing studied students had A, and C+ academic achievement, respectively.

Table (2) reveals that, 95.5%, 67.5%, 81%, 83.5%, and 72.5% of the studied nursing students had poor knowledge about objectives, injection stages, reading stages, and interpretation stages of Mantoux skin test and two-step skin test with a mean 1.4550 (.74211), 2.1000 (.97713), 1.6650(1.03835), 3.7450 (1.71015), and 1.0850 (.90102) respectively. Finally, 93% of the studied nursing students had poor total knowledge score with a mean 10.0500 (3.45357).

Figure (2) illustrates that, 64% of the studied nursing students mentioned that, intradermal was the route of injecting Mantoux skin Test.

Table (3) presents that, that 90%, 54%, 76%, and 43% of the studied nursing students were proficient in preparation, administration, reading, and interpretation of Mantoux skin test procedure respectively. nursing 71.5% of the studied nursing students had proficient total practice score with a mean 43.5650 (3.54522).

Table 1 Students' socio-demographic characteristics

Items	n=200	%
Age groups		
20 to < 22 years	106	53
22 to < 24 years	94	47
Mean (SD)	2.5150 (.67977)	
Gender		
Female	167	83.5

Male	33	16.5
Residence		
Rural	144	72
Urban	56	28

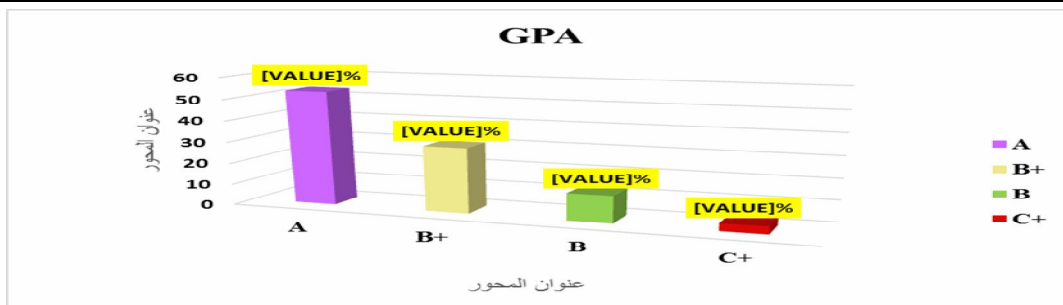


Figure 1 Students' academic achievement (GPA)

Table 2 Students' score level of knowledge regarding safe injection and needlestick injury

Items	n=200	%	Mean (SD)
Objectives of Mantoux skin test (5 items)			
Poor	191	95.5	1.4550 (.74211)
Fair	9	4.5	
Injection stage of Mantoux skin test (5 items)			
Poor	135	67.5	2.1000 (.97713)
Fair	53	26.5	
Good	12	6	
Reading stage of Mantoux skin test (4 items)			
Poor	162	81	1.6650(1.03835)
Fair	30	15	
Good	8	4	
Interpretation stage of Mantoux skin test (9 item)			
Poor	167	83.5	3.7450 (1.71015)
Fair	32	16	
Good	1	0.5	
Two-step skin test (3items)			
Poor	145	72.5	1.0850 (.90102)
Fair	47	23.5	
Good	8	4	
Total knowledge score (26 items)			
Poor	186	93	10.0500 (3.45357)
Fair	14	7	

Note. Poor = scores less than 60% of total scores

Fair = scores 60% to less than 80% of total scores

Good = scores 80% to 100%

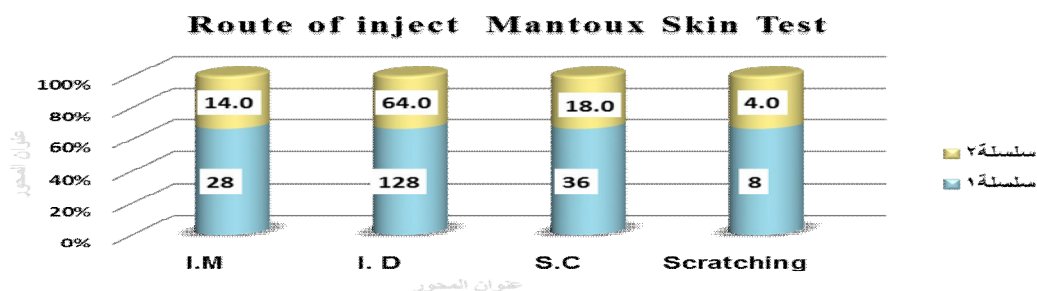


Figure 2 Students' knowledge regarding route of injecting Mantoux skin test

Table 3: Students' score levels of practice related to Mantoux skin test procedure

Items	n=200	%	Mean (SD)
Preparation (10 items)			
Proficient	180	90	9.4400 (.90582)
Master	11	5.5	
Expert	8	4	
Improper	1	0.5	
Administration (24 items)			
Proficient	108	54	20.3700 (2.13680)
Expert	75	37.5	
Master	13	6.5	
Improper	4	2	
Reading (11 items)			
Proficient	152	76	9.6900 (2.02842)
Expert	25	12.5	
Improper	14	7	
Master	9	4.5	
Interpretation (5 items)			
Proficient	86	43	4.0650 (1.002900)
Expert	59	29.5	
Master	40	20	
Improper	15	7.5	
Total practice score (50 items)			
Proficient	143	71.5	43.5650 (3.54522)
Expert	39	19.9	
Master	17	8.5	
Improper	1	0.5	

Improper = scores less than 60% of total score

Master = scores 60 to less than 75% of total score

Expert = scores 75 to less than 85% of total score

Proficient = scores 85 to 100% of total score

5. DISCUSSION

Detecting tuberculosis is one way by using MTST, which is an immunological test for tuberculosis and is being used globally by health institutions for many years now. MTST determine whether the patient has a prior exposure or not to Mycobacterium tuberculosis (Hoeltke, 2013; Mastroli, 2019; San Pedro, 2018).

Very few studies have addressed the issue of health care students involved in clinical training may run risks of being exposed to Mycobacterium tuberculosis similar to health care workers within the hospital settings (Durando et al, 2013).

Study results revealed that more than half of studied students their age ranged from 20 to less than 22 years, the majority of studied students were female and less than three quarter of them live in rural areas . Results of the current study covered two main parts as following: first part illustrated that, most of nursing students had poor total level of knowledge regarding Mantoux skin test procedure. This finding was in agreement with an Italian study by; Montagna et al. (2014) revealed

that most of nursing students had poor knowledge regarding TB.

Moreover, a Chinese studies was conducted by Ou et al. (2018); Zhao, Ehiri, Li, Luo, and Li, (2013) revealed that under graduated medical students had generally poor knowledge about TB.

Furthermore, Irani, Shahraki, Ghaderi, Nasehi, and Mostafavi, (2015) conducted a study about lack of optimum knowledge, attitude, and practice among health care workers regarding tuberculosis in Iran, reported that less than three quarters of participants had poor knowledge.

As well, Morocco and Russian studies carried by Woith, Volchenkov, and Larson, (2012); Kizub et al. (2012) illustrated that two thirds of the participants had poor knowledge regarding TB.

Contrary to this result, an Italian cross section study conducted by Montagna et al. (2018) titled "Knowledge, experiences, and attitudes toward Mantoux test among medical and health professional students", indicated that most of nursing students had good knowledge on tuberculosis.

Second part. Regarding nursing students' total level of practice related to Mantoux skin test procedure, less than three quarters of nursing students had proficient total level of practice, this could be attributed to; researcher observed nursing students' practice immediately after demonstration of Mantoux skin test procedure in community health nursing skill lab. To the best of researcher's knowledge, there were no published articles on Mantoux skin test procedure; this could be inferred to, the attention emphasizing on the issue of TB, rather than Mantoux skin test procedure.

6. CONCLUSION

It can be concluded that; most of the nursing students had a poor total level of knowledge and less than three quarters of nursing students had proficient total level of practice; regarding Mantoux skin test procedure.

7. RECOMMENDATIONS

1. Design educational session to raise nursing students' knowledge regarding Mantoux skin test procedure.
2. Expand and keep members of medical education institutions abreast of developments in pedagogical technology.
3. Replicate the study on a large sample acquired from different universities in Egypt to figure out the main aspects of Mantoux skin test procedure among nursing students.

8. Acknowledgement

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