

Nurses' Performance for Patients with Tuberculosis Disease at Chest Dispensaries in El-Gharbia Governorate

Rania Mohamed helmy*, Hemat Abd El Moneem El-Sayied ** & Safinaze Mohamed Sayied ***

* Nursing instructor at el-mahalla chest hospital.

** Professor of Community Health Nursing, Faculty of Nursing, Ain Shams University.

*** Lecturer of Community Health Nursing, Faculty of Nursing, Ain Shams University.

Abstract

Background: TB still a major public health problem. Understanding the knowledge practice and attitude of nurses which may influence TB control is very important for ending TB epidemic. **The aim:** The present study aims to assess nurses' performance for patients with tuberculosis disease at chest dispensaries in El-Gharbia governorate. **Design:** A descriptive study design was utilized. **Setting:** The study was conducted at 7 chest dispensaries in El-Gharbia governorate, Egypt. **Sample:** A convenient sample was used composed of 150 nurses working in the previously mentioned setting. **Tool:** Data were collected using one tool; A structured Interviewing questionnaire consists of 5 parts; (1) Socio-demographic characteristics of nurses, (2) past and current medical history of nurses, (3) nurses' knowledge regarding TB, (4) practices of nurses related to TB infection control, and (5) nurses' attitude regarding TB patient. **Results:** The study revealed that 78% of studied nurses had satisfactory knowledge about tuberculosis and 90% of the studied nurses had satisfactory level of practices regarding prevention of TB, also 85% of the studied nurses had positive level of attitude regarding TB. **Conclusion:** More than three quarters of studied nurses had satisfactory knowledge and practices and positive attitude regarding TB. There was a statistically significant relation between nurses' knowledge about TB disease and their practice. Also, there was a statistically significant relation between the positive attitude and satisfactory knowledge. **Recommendation:** Develop training team that works to identify training needs and put plans to increase nurse's awareness and improve their practice. For further research, investigate threats and opportunities for implementing TB- ending by 2030 program.

Keywords: nurses' performance, TB patients, chest dispensaries.

Introduction

Tuberculosis is a contagious disease which caused by infection with Mycobacterium tuberculosis complex, particularly Mycobacterium africanum and Mycobacterium tuberculosis. The high incidence rate of tuberculosis infection, as well as the high morbidity and mortality rates, has had a significant influence on the economic and health status of the people in the affected countries. Workplace productivity has decreased, and the cost of living has increased (Kanabalan et al., 2021).

TB is still one of the worldwide major ten causes of death, as well as the leading cause result of a single infectious agent. TB claimed the lives of an estimated 1.3 million HIV-negative people and an additional 300,000 HIV-positive people. Globally, an estimated 10.0

million persons (range, 9.0–11.1 million) contracted tuberculosis (TB), with only 6.4 million cases reported. Drug-resistant tuberculosis is indeed a national health crisis (Kanchar & Swaminathan., 2019).

Knowledge, attitude and practice of nurses are essential during the treatment and follow-up of TB patients as well. Lack of knowledge, poor interpersonal relationship and communication skills were found to be having negative effects on tuberculosis patients on long term therapy with anti-tuberculosis drugs. Improving the level of awareness on knowledge in preventive and curative care of TB was found to be enhanced by expanding the scope of nursing professionals. This was expected to be achieved through continuing professional education and clinical experience (Krithika, Jayanthi & Subramanian., 2018).

However, it is estimated that with current TB control strategies, the goals of reducing the number of deaths by 95 percent, reducing the incidence rate by 90 percent, and increasing the cure rate of patients receiving first-line treatment to 90 percent in 2030 will not be met unless research and development efforts are intensified. It is also vital to increase the nurses' performance to detect illnesses early and to improve the quality of care, diagnosis, and treatment (Chaves et al., 2019).

The role of community health nurse is very important in preventing transmission of pulmonary TB infection in the hospital because the one who provides care for 24 hours consistently to the patient is the nurse, which also means accountability for the relationship between the nurse and the patient, where the nurse helps the patient participation, helps gain knowledge and improves health, in this case, the prevention of TB transmission through the use of compliance control in pulmonary TB patients. The nurse's relationship with the patient is a mutual learning experience and emotional experience for the patients. (Trisnawati & Ulama 2020).

Significance of the Study

TB is one of the world's worst infectious illnesses, killing up to three people every minute (1–3). (Srinivasan et al., 2019).

In Egypt the documented incidence reported in WHO Egypt TB profile was 11/100 000 populations in the total population. while the MDR/RR-TB incidence was 83 and the TB treatment coverage estimated incidence in Egypt reach 61% (WHO., 2020). Nearly 916 new smear-positive and retreatment cases of tuberculosis were registered in Gharbia governorate over a five-year period. (El Emeiry et al., 2019). Based on the above, the study aims to assess nurses' knowledge, practice and attitude regarding TB diseases to set the necessary recommendations for improving nursing performance.

Aim of the study

This study aims to assess nurses' performance for patients with tuberculosis disease through;

- Assessing nurses' knowledge regarding tuberculosis.
- Assessing nurses' practice regarding tuberculosis
- Assessing nurses' attitude regarding tuberculosis.

Research Questions:

1. What is the knowledge extent of nurses about tuberculosis?
2. What are the practices of the nurses regarding tuberculosis control?
3. What is the attitude of nurses regarding patient with tuberculosis disease?

Subjects and methods

I. Technical design

The technical design used for the study includes; Research design, setting, sampling of the study and tools of data collection.

Research design

A descriptive design was used to conduct this study.

Study Setting

The study was conducted at all chest dispensaries (7 dispensaries namely El-mahalla El-kubra, samannud, Basioun, Qutur, El-santah, zefta and kafr El-zayat dispensary) in El-Gharbia governorate. data were collected in six months period; the researcher was available two days/week.

Subjects

A convenient sample composed of (150) nurse working in the previously mentioned setting (7 chest dispensaries).

Tools of data collection

One tool was used for data collection in this study: **A structured interviewing questionnaire consists of five parts:**

Part I: Assess socio-demographic characteristics of nurses such as age, gender, marital status, educational level, occupation experience, colleagues' number and TB training

courses; this section includes (7 Q from Q1-Q7).

Part II: Assess nurses past and current medical history; past history (from Q8-Q13) such as having chronic disease, vaccinated with BCG, having scar from BCG vaccine, any TB investigation performed, TB conformation x-ray performed, family member diagnosed as TB patient. Also assess current medical history (from Q15-Q 20) such as having TB general clinical manifestation, having TB pulmonary clinical manifestation, having malnutrition, have adequate sleep hours, work fatigue, taking medication, family member smoking; this section includes (7questions).

Part III: Assessment of nurse's knowledge regarding TB disease. It was adopted from (Shamu et al., 2019) and modified by the investigator; this section includes (34 questions from (Q21-Q54) and measures five domains.

- TB disease. (From Q21– Q28).
- TB infection prevention and control (from Q29– Q34).
- Personal protective equipment (Q35– Q38).
- TB investigation (from Q39 –Q44).
- Treatment (Q45 – Q54).

❖ Scoring system of knowledge:

According to the response obtained from nurses, a scoring system was followed to assess nurses' knowledge; each question scored (2) for the complete correct answer, (1) for the incomplete correct answer and each don't know and wrong answers scored zero (0). These scores were converted into a percent as the following:

- Score < 60% (1<41) is considered unsatisfactory knowledge.
- Score from 60%: $\leq 100\%$ (41 \leq 68) is considered satisfactory knowledge.

Part IV: Assessment of reported practices of nurses related to care of TB patients. It was adopted from (Amiri et al., 2018) and modified by the investigator; this section includes (17 items from Q55-Q71) includes and measures three domains:

- Infection control and use of PPE (5 items)
- Providing environmental controls (6 items)

- Providing health education (6 items)

❖ Scoring system of reported practices:

According to the response obtained from nurses, a scoring system was followed to assess nurses' reported practices regarding care of TB patients. Each item scored (2) for done regularly, (1) for done occasionally and each not done scored zero (0). These scores were converted into a percent as the following:

- Score <60% (1<20) is considered incorrect practices.
- Score from 60%: $\leq 100\%$ (20 \leq 34) is considered correct practices.

Part V: Assessment of nurses' attitude regarding TB patient, it was adopted from (Datiko, Habte, Jerene, & Suarez., 2019) and modified by the investigator; this section includes (11 items)

❖ Scoring system of nurses' attitude:

According to the response obtained from nurses, a scoring system was followed to assess clients' reported attitude regarding TB patients. Each item scored (2) for agree, (1) for naturally and each disagree scored zero (0). These scores were converted into a percent as the following:

- Score <60% (1<13) is considered negative attitudes.
- Score from 60%: $\leq 100\%$ (13 \leq 22) is considered positive attitudes.

II. Operational design

The operational design for this study consisted of three phases, namely the preparatory phase, pilot study, and the fieldwork.

Preparatory phase

This phase included reviewing literatures on nurses' performance for patients with tuberculosis disease. This served to develop the study tools for data collection. During this phase, the researcher visited the selected place to get acquainted with the personnel and the study setting. Development of the tools was under supervisors' guidance and experts' opinions were considered.

Tool validity and reliability:

The tools were tested and evaluated for their face and content validity by a jury group of expertise from community health nursing in Ain Shams University to test the content validity and modifications of the tool done according to the panel judgment on the clarity of sentences, relevance, appropriateness of content, sequence of items and completeness of the tool. The reliability of the study tools assessed by measuring their internal consistency of Cronbach's Alpha coefficient test (0.82).

Pilot study

A pilot study was carried out on 10% (15) nurses at the previously mentioned setting to test the applicability of the constructed tools and the clarity of the included questions. Minor changes were done in the tool based on the results of the pilot study, some corrections and omissions of items were performed as needed. The pilot participants were included in the main study sample.

Fieldwork

- To carry out the study, approval was obtained from the 7 chest dispensaries in el-gharbia governorate. A letter was issued to them from the Faculty of Nursing, Ain-Shams University, explaining the purpose and aim of the study to obtain their permission and cooperation.

- The actual field work was carried out around six months from January 2021 up to June 2021; the investigator was available two days/week (Saturday and Monday). This was done through the working hours (9 am to 1 pm). The investigator met about three to four nurses per day. Investigator had visit Elmahalla-el kubra dispensary twenty visits through ten weeks, samanoud dispensary was visited for four visits through two weeks, Qutere dispensary was visited one visit through one week, Elsanta dispensary was visited four visits through two weeks, Basyon dispensary was visited four visits through two weeks, Kafr El zaiyat was visited six visits through three weeks and Zefta was visited eight visits through four weeks.

- The investigator first met with nurses in the previously mentioned setting, explained the purpose and aim of the study after introducing herself.
- The nurses were assured that the information collected would be treated confidentially, and it would be used only for the research. Then individual participation was done after obtaining the nurse's verbal consent to participate.
- The nurses read and filled the questionnaire by themselves.
- Time consumed to fill out the questionnaire ranged from 25 to 35 minutes for one questionnaire.

III. Administrative design

Approval was obtained through an official letters from Faculty of Nursing, Ain Shams University to the directors of el-garbia chest dispensaries. The investigator then met the dispensaries directors and explained the purpose and the methods of data collection. Additional oral consents were taken from every nurse for approval to participate in the study after explained the purpose of the study.

Ethical consideration

The study was conducted with careful attention to ethical standards of research and rights of the participants, Approval from ethics and research committee at Faculty of Nursing, Ain Shams University was obtained at 1/3/2020.

Verbal approval was obtained from the nurses before inclusion in the study; a clear and simple explanation was given according to their level of understanding, physical and mental readiness. They secured that all the gathered data are confidential and used for research purposes only.

IV. Statistical analysis

Collected data were coded and tabulated using personal computer. Statistical package for social science (SPSS) version 22.0 was used. Descriptive as well as inferential statistics were used to answer research questions. Statistical significance was considered at p -value <0.05 .

Results:

Table (1): shows that 69% of studied nurses; their age were >40 years and 100% of them were female, while 84.0% were married, 74.7% were Intermediate Diploma in Nursing and 8.0% were bachelor of nursing as regarding level of education, also 53.0 % of them were experience from 5 to less than 10 years, 36.7% of them have from 1 to 3 medical staff members working with them in the same workplace and 82.0% of them had training courses on tuberculosis.

Figure (1): reveals that, 78% of studied nurses at Chest Dispensaries had satisfactory total knowledge about tuberculosis while 22% had unsatisfactory knowledge.

Figure (2): shows that, 90% of the nurses had satisfactory level of practices regarding prevention of TB compared to 10% of them had unsatisfactory level of practices.

Figure (3): shows that, 85% of the studied nurses had total positive level of attitude

regarding of TB compared to 15% of them had total negative level of attitude.

Table (2): Illustrates that, there was a statistically significant relation between the nurse's level of knowledge regarding to TB and their ' age, level of education, years of experience but there were high statistically significant differences between their total knowledge and training course.

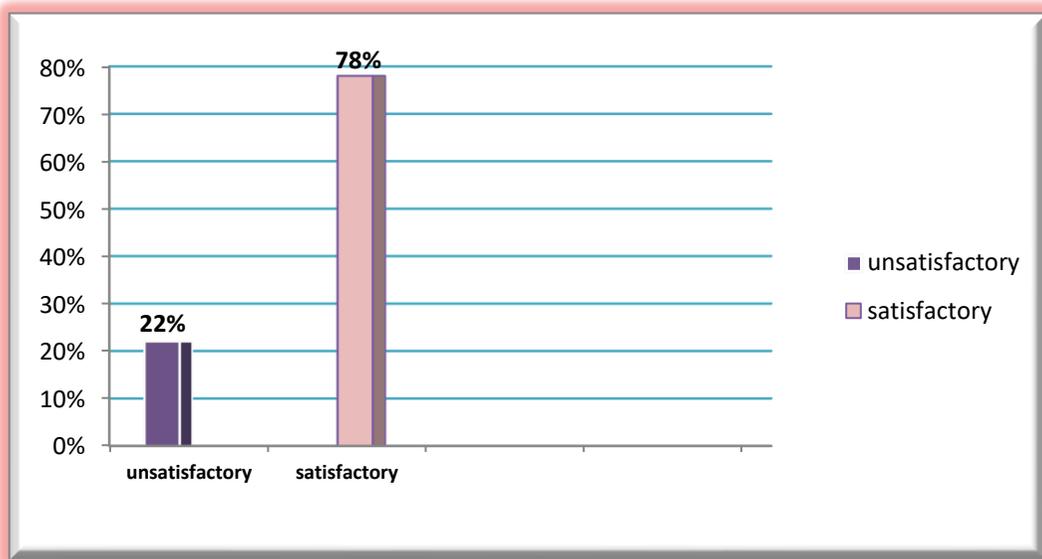
Table (3): reveals that, there was a statistically significant relation between total practice of the nurses and their ' age, level of education, years of experience while highly significances between practices and training.

Table (4): Indicates that, there was a statistically significant relation between total nurses ' knowledge about TB disease and their total level of practice $p= 0.005$.

Table (5): demonstrates that there was a statistically significant relation between the positive attitude of the studied nurses and satisfactory level of their knowledge $p=0.05$

Table (1): Distribution of studied nurses at Chest Dispensaries according to their Socio demographic characteristics (n=150)

Items	N	%
Age:		
20< 30	12	8.7
30<40	34	22.6
>40	104	69.0
Gender:		
Female	150	100.0
Marital Status:		
Single	6	4.0
Married	126	84.0
Widow	18	12.0
Level of education:		
Intermediate Diploma in Nursing	112	74.7
Postgraduate diploma	26	17.3
Bachelor of Nursing	12	8.0
Years of Experience:		
less than one year	10	6.7
From a year - less than 5	11	7.3
From 5 years - less than 10	80	53.3
More than 10 years	49	32.7
The number of medical staff members working in the same workplace		
From 1 to 3	55	36.7
From 3 to 5	53	35.3
More than 5	42	28.0
Training courses on tuberculosis before or while working		
Yes	123	82.0

**Figure (1):** Distribution of studied nurses at Chest Dispensaries according to their total knowledge about tuberculosis n= 150

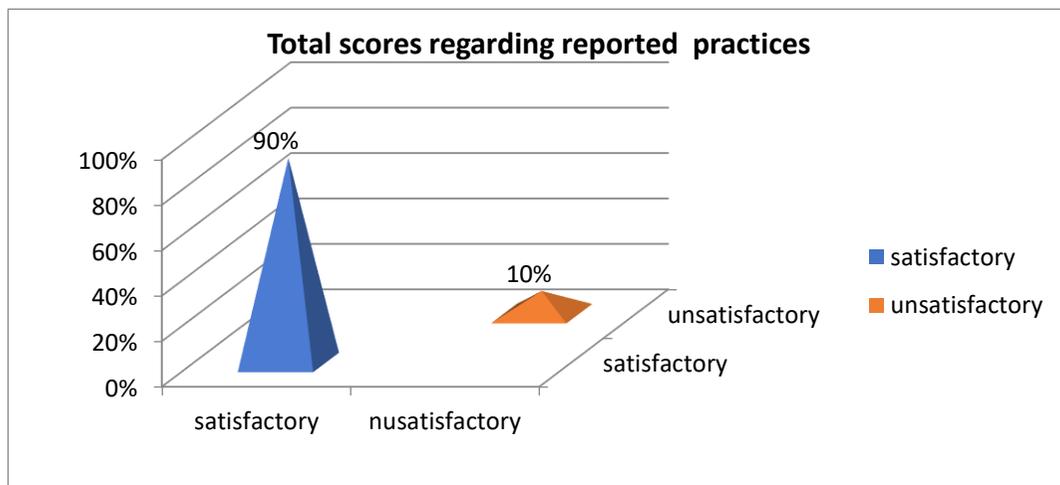


Figure (2): distribution of nurses ' total scores regarding satisfactory and unsatisfactory practices (n=150).

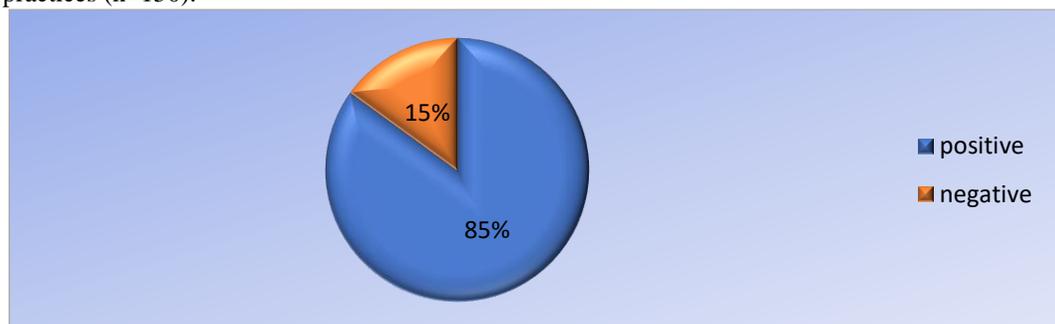


Figure (3): Distribution of studied nurses at Chest Dispensaries according to their total attitude towards patient with tuberculosis n= 150

Table (2): Relation of total score of nurses ' knowledge and socio-demographic characteristics (n=150).

Socio-demographic characteristics	Total Knowledge Unsatisfactory (n=33)		Satisfactory (n=117)		X ²	P-value
	No	%	No	%		
Age in years						
20 - 30	3	2.0	9	6.0	0.130	0.0093*
30 - 40	7	4.7	27	18.0		
>40	23	15.3	81	54.0		
Educational level						
Intermediate Diploma in Nursing	25	16.7	87	58.0	3.032	0.0021*
Postgraduate diploma	6	4.0	20	13.3		
Bachelor of Nursing	3	2.0	9	6.0		
Years of Experience						
less than one year	2	1.3	8	5.3	0.134	0.0098*
From a year - less than 5 years	2	1.3	9	6.0		
From 5 years - less than 10 years	18	12.0	62	41.3		
More than 10 years	11	7.3	38	25.3		
Training courses on tuberculosis						
Yes	27	18.0	96	64.0	0.001	0.0009**
No	6	4.0	21	14.0		

**HS. p= <0. 001

* S. p= <0.05

Table (3): Relation of total score of nurse's practices and socio-demographic characteristics (n=150).

Socio-demographic characteristics	Total practices				X ²	P-value
	Unsatisfactory (n=15)		Satisfactory (n=135)			
	No	%	No	%		
Age in years						
20 - 30	2	1.3	10	6.7		
30 - 40	3	2.0	31	20.7	0.662	0.0071*
>40	10	6.7	94	62.7		
Educational level						
Intermediate Diploma in Nursing	11	7.3	101	67.3		
Postgraduate diploma	3	2.0	23	15.3	0.109	0.0094*
Bachelor of Nursing	1	0.7	11	7.3		
Years of Experience						
less than one year	1	0.7	9	6.0		
From a year - less than 5 years	1	0.7	10	6.7	0.012	0.0099*
From 5 years - less than 10 years	8	5.3	72	48.0		
More than 10 years	5	3.3	44	29.3		
Training courses on tuberculosis						
Yes	12	8.0	111	74.0	0.045	0.0008**
No	3	2.0	24	16.0		

**HS. p= <0. 001

* S. p= <0.05

Table (4): Correlation between total staff nurse' knowledge and total reported practices regarding TB disease (n=150).

Nurses ' practices	Nurses ' knowledge	
	r	p-value
	1	0.005*

*S. p= <0.05

Table (5): Relation between total nursing staff ' knowledge and total attitude

Total knowledge	Total attitude				x ²	p-value
	Negative n=23		Positive n=127			
	No.	%	No.	%		
Unsatisfactory	18	12.0	99	66.0	0.001	0.0009**
Satisfactory	5	3.3	28	18.7		

**HS at p= <0. 001

*S. p= <0.05

Discussion

Considering the essential role of nurses in the control and prevention of TB, their qualification to face the problem must include theory and practical activities, enabling them to manage the disease with knowledge to implement new strategies. However, since training on TB is not always sufficient to prepare professionals to deal with the disease, it is necessary to evaluate the level of knowledge of the professionals and the structure of this training in education programs, in order to adapt

teaching strategies to the knowledge gaps identified (Carvalho et al., 2019).

According to the socio-demographic characteristics of nurses, the current study revealed that more than two thirds of them aged more than 40 years, all of them were female, also most of them were married, three quarter of them were intermediate diploma in nursing while little of them were bachelor of nursing. In relation to experience about half of them have from 5 to less than 10 years experience, more than third of them have from 1 to 3 medical

staff personals working with them in the same workplace. Also, more than third of them have from 3 to 5 medical staff personals working with them in the same workplace, meanwhile majority of them had training courses on tuberculosis. This finding disagreed with **Shah et al., (2018)** who studied “Tuberculosis Awareness among Nurses Working in Tertiary Care Hospital Peshawar”, conducted in **Pakistan**, who founded that quarter of participants were males and about three quarter were females. Numbers of the subjects from 18-25 years were more than two thirds and little of them were above 35. Concerning the educational level of the respondents; majority of them were diploma holders, Experience of the participants from 1-3 years were more than half of them, and little of them from 6-9 years.

In relation to nurses' total knowledge about tuberculosis, the current study concluded that more than three quarters of studied nurses had satisfactory total knowledge about tuberculosis while less than one quarter had unsatisfactory knowledge. This finding not consistent with **Sima et al., (2019)** who studied “Health care providers' knowledge, attitude and perceived stigma regarding tuberculosis in a pastoralist community in Ethiopia: a cross-sectional study”, conducted in **Ethiopia**, who founded that overall knowledge of the participants regarding TB; approximately two thirds of them had a poor level of knowledge about TB.

In connection with nurses' total practices, the current study shows that the majority of the studied nurses had satisfactory level of practices regarding prevention of TB. This finding in contrast with **Akande et al., (2020)** who studied “Knowledge and practices regarding tuberculosis infection control among nurses in Ibadan”, conducted in **Nigeria** and founded that more than three quarter of the studied nurses had satisfactory level of practices.

With regard to nurses' total attitude towards patient with tuberculosis, the current study concluded that more than three quarters of the studied nurses had total positive level of

attitude regarding TB compared to less than one quarter of them had total negative level of attitude. This finding disagreed with **Sima et al., (2019)** who studied “Health care providers' knowledge, attitude and perceived stigma regarding tuberculosis in a pastoralist community”, conducted in **Ethiopia** and founded that a large proportion of the participants had an un favorable attitude towards TB patients.

Regarding relation between nurses' knowledge and socio-demographic characteristics, the current study presented that there was a statistically significant relation between the nurse's level of knowledge regarding to TB and their ' age, level of education, years of experience but there were high statistically significant differences between their total knowledge and training course. This finding disagreed with **Bisallah et al., (2018)** who studied “Knowledge, Attitude, and Practice of Primary health care Workers regarding Tuberculosis disease in Minna municipal council area, Niger Stat”, conducted in **Nigeria** and founded that there was no association between educational level, training workshop attendance and years of service with knowledge of tuberculosis.

According to relation of nurse's practices and socio-demographic characteristics, the current study indicated that, there was a statistically significant relation between total practice of the nurses and their ' age, level of education, years of experience while highly significances between total reported practices and their training course. This finding consistent with **Listiowati et al., (2021)** who studied “Relationship between Knowledge and Using Personal Protective Equipment in Tuberculosis Ward and Polyclinic of Hospital X”, conducted in **Indonesia** and founded that there was a significant relationship between age, level of education and training course and the practice of nurses but disagree that no relationship between years of service and practice.

In regard with correlation between nurse' knowledge and reported practices, the current study revealed that there statistically significant

relation between total nurses' knowledge about TB disease and their total level of practice. This finding agreed with **Tefera et al., (2017)** who studied "Actual practice of healthcare providers towards prevention and control of Multidrug-resistant tuberculosis (MDR-TB) at Borumeda Hospital", conducted in **Ethiopia** and founded that having good level of knowledge was associated with good practices.

According to relation between nurses' knowledge about TB and their attitude, the current study demonstrates that, there was a statistically significant relation between the negative attitude of the studied nurse and unsatisfactory level of knowledge and statistically significant relation between the positive attitude and satisfactory level of nurse's knowledge. This finding in line with **Fana et al., (2019)** who studied "Knowledge, attitudes, and prevention practices of drug resistant tuberculosis in the Eastern Cape Province", conducted in **South Africa** and founded significantly association between knowledge and attitudes.

Conclusion

The current study findings concluded as the following:

More than three quarters of studied nurses had satisfactory total knowledge about tuberculosis and positive attitude and majority of the studied nurses had satisfactory level of practices regarding prevention of TB.

Furthermore, there wasn't statistically significant relation between the nurse's level of knowledge regarding to TB and their' age, level of education, years of experience and training course. Moreover, there wasn't statistically significant relation between total practice of the nurses and their' age, level of education, years of experience and training course. Additionally, there wasn't statistically significant relation between total nurses' knowledge about TB disease and their total level of practice. Finally, there was a statistically significant relation between the positive attitude and satisfactory level of nurse's knowledge.

Recommendations

Based upon the results of the current study the following recommendations suggested:

1. Wide health survey and periodic checkup including x-ray and laboratory investigations should be done for nurses and their families for early detection of latent TB.
 2. Conduct more courses in other nursing and medical subjects such as infection control and quality of medical care.
 3. Develop training team that works hard to identify training needs and put plans to increase nurse's awareness in all aspects and improve their practice.
 4. specialize isolation area for TB patient and strict instruction should be done to triage patient just when they arrive the dispensary for follow up.
 5. Encourage nurses to make postgraduate studies and attend medical and nursing conferences to increase their knowledge.
- For further research;**
6. Investigate the factors that motivate and obstacles affecting nurses' compliance to personal protective equipment in chest dispensaries in el-gharbia governorate.
 7. Investigate threats and opportunities for implementing TB-ending by 2030 program.

References

- Akande, P. A. (2020).** Knowledge and practices regarding tuberculosis infection control among nurses in Ibadan, south-west Nigeria: a cross-sectional study. *BMC health services research*, 20(1), 1-10.
- Amiri, F. B., Doosti-Irani, A., Sedaghat, A., Fahimfar, N., & Mostafavi, E. (2018).** Knowledge, attitude, and practices regarding HIV and TB among homeless people in Tehran, Iran. *International journal of health policy and management*, 7(6), 549.
- Bisallah, C. I., Amali, A. M., Katagum, Y. M., Usman, M. B., & Ramadan, A. M. (2018).** Knowledge, Attitude, and Practice of Primary health care Workers regarding Tuberculosis disease in Minna municipal council area, Niger State, Nigeria. *IOSR*

- Journal of Dental and Medical Sciences (IOSR-JDMS) e-ISSN, 17(2), 60-66.
- Carvalho, C. D. F., Ponce, M. A. Z., Silva-Sobrinho, R. A. D., Mendez, R. D. R., Santos, M. A. D., Santos, E. M. D., & Wysocki, A. D. (2019).** Tuberculosis: knowledge among nursing undergraduate students. *Revista Brasileira de Enfermagem*, 72, 1279-1287.
- Chaves Torres, N. M., Quijano Rodriguez, J. J., Porras Andrade, P. S., Arriaga, M. B., & Netto, E. M. (2019).** Factors predictive of the success of tuberculosis treatment: A systematic review with meta-analysis. *PLoS One*, 14(12), e0226507.
- Datiko, D. G., Habte, D., Jerene, D., & Suarez, P. (2019).** Knowledge, attitudes, and practices related to TB among the general population of Ethiopia: Findings from a national cross-sectional survey. *PloS one*, 14(10), e0224196.
- El Emeiry, F., Shalaby, S., El-Magd, G. H. A., & Madi, M. (2019).** Treatment outcomes of tuberculosis among new smear-positive and retreatment cases: a retrospective study in two Egyptian governorates. *The Egyptian Journal of Chest Diseases and Tuberculosis*, 68(3), 274.
- Fana, T. E., Ijeoma, E., & Sotana, L. (2019).** Knowledge, attitudes, and prevention practices of drug resistant tuberculosis in the eastern Cape Province, South Africa. *Tuberculosis Research and Treatment*.
- Kanabalan, R. D., Lee, L. J., Lee, T. Y., Chong, P. P., Hassan, L., Ismail, R., & Chin, V. K. (2021).** Human tuberculosis and Mycobacterium tuberculosis complex: A review on genetic diversity, pathogenesis and omics approaches in host biomarkers discovery. *Microbiological research*, 246, 126674.
- Kanchar, A., & Swaminathan, S. (2019).** Tuberculosis control: WHO perspective and guidelines. *The Indian Journal of Pediatrics*, 86(8), 703-706.
- Krithika, S. A., Jayanthi, N. N., & Subramanian, S. (2018).** Awareness of tuberculosis among nurses. *IAIM*, 5(4), 153-160.
- Listiowati, E., & Rianti, F. E. (2021).** Relationship between Knowledge and Using Personal Protective Equipment in Tuberculosis Ward and Polyclinic of Hospital X. *Mutiara Medika: Jurnal Kedokteran dan Kesehatan*, 21(1), 20-25.
- Shah M, Hayat G, Ilahi F, Khan K, Seyahosh Z, et al. (2018)** Tuberculosis Awareness Among Nurses Working in Tertiary Care Hospital Peshawar. *Infect Dis Diag Treat: IDDT-123*. DOI:10.29011/2577-1515. 100023.
- Shamu, S., Kuwanda, L., Farirai, T., Guloba, G., Slabbert, J., & Nkhwashu, N. (2019).** Study on knowledge about associated factors of Tuberculosis (TB) and TB/HIV co-infection among young adults in two districts of South Africa. *PloS one*, 14(6), e0217836.
- Sima, B. T., Belachew, T., & Abebe, F. (2019).** Health care providers' knowledge, attitude and perceived stigma regarding tuberculosis in a pastoralist community in Ethiopia: a cross-sectional study. *BMC health services research*, 19(1), 1-11.
- Srinivasan, S., Jones, G., Veerasami, M., Steinbach, S., Holder, T., Zewude, A., ... & Kapur, V. (2019).** A defined antigen skin test for the diagnosis of bovine tuberculosis. *Science advances*, 5(7), eaax4899.
- Tefera, G., & Seid, Y. (2017).** Actual practice of healthcare providers towards prevention and control of Multidrug-resistant tuberculosis (MDR-TB) at Borumeda Hospital, Ethiopia. *African Journal of Pharmacy and Pharmacology*, 11(12), 152-160.
- Trisnawati, C. D. A., & Ulama, S. N. (2020).** Relationship between the Role of Nursing Educators with Compliance and Lung Tuberculosis Control Patients in Medika Mulia Hospital. *International Journal of Multi Discipline Science (IJ-MDS)*, 3(2), 52-58.