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A Study to Assess the Knowledge and Practice Regarding Prevention of TB Among Staff Nurses Working in a Selected TB Hospital at Jodhpur

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Abstract

Tuberculosis (TB) remains a major global public health concern, causing significant morbidity and mortality, particularly among healthcare workers. Staff nurses are at heightened risk due to repeated exposure to patients with active TB, making knowledge and adherence to preventive practices critical. The present study was conducted to evaluate the knowledge and practices of staff nurses concerning tuberculosis (TB) prevention at Kamla Nehru TB and Chest Hospital, Jodhpur. A descriptive and non-experimental research design was employed, involving 40 staff nurses who were chosen through a non-probability convenience sampling technique. Data collection was carried out using two tools: a structured knowledge questionnaire and an observational checklist. The questionnaire included 30 multiple-choice items to measure knowledge, while the checklist comprised 15 statements designed to assess nurses' TB prevention practices. Scoring criteria categorize knowledge and practice levels as inadequate, moderate/average, or adequate/good. Content validity of the tools was established by nine experts in medical-surgical nursing, and reliability was confirmed using the split-half method, yielding coefficients of r = 0.84 for the knowledge questionnaire and r = 0.82 for the observational checklist. Data analysis involved descriptive statistics, t-tests to assess correlations, and Chi-square tests to determine associations between demographic variables and knowledge/practice levels. The study highlights the critical role of staff nurses in TB control and emphasizes the need for ongoing education, training, and adherence to infection control measures to prevent occupational TB. Findings from this research can guide healthcare institutions in developing strategies to enhance TB prevention among nursing staff, ensuring both workforce safety and improved patient outcomes.

Keywords: Infection control, knowledge, and practices, staff nurses, TB prevention, tuberculosis (TB)

INTRODUCTION

"Diseases can rarely be eliminated through early diagnosis or good treatment, but prevention can eliminate disease." —*Denis Burkitt*

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Tuberculosis (TB) is one of the oldest chronic communicable bacterial diseases worldwide that has been present in humans since antiquity. TB, an infectious disease, remains one of the primary causes of death in several industrialized countries, as it did from the very beginning. Specific individuals and groups are at higher risk of developing tuberculosis.

Pulmonary Tuberculosis (PTB) is an airborne infectious disease caused by Mycobacterium tuberculosis (MTB). Bacteria are released into the air when an individual with active TB coughs,

sneezes, talks, or sings, and nearby individuals may inhale these droplets, leading to infection. Globally, approximately two billion people (approximately one-third of the world's population) are infected with TB bacteria. Of those infected, roughly one in 10 develop active TB disease. The risk of infection is highest during prolonged close contact with a person with active TB. However, because bacteria often remain latent (inactive) after entering the body, only a small proportion of infected individuals develop active TB. Medical treatment is recommended even for asymptomatic individuals, as it helps eliminate latent bacteria before they become active.

Extrapulmonary tuberculosis (EPTB) accounts for approximately 15% of all TB cases. Diagnosis can be challenging owing to nonspecific imaging and clinical features, often requiring a biopsy. Radiologists need to recognize the imaging patterns of EPTB even when pulmonary TB is not present. The lymphatic system was the most commonly affected site. Necrotic lymph nodes and organ-specific imaging characteristics can increase the likelihood of a diagnosis. Disseminated TB and central nervous system involvement are more frequent in immunocompromised patients, while renal TB may develop in immunocompetent patients after a prolonged latency period between primary lung infection and genitourinary involvement. Other forms of TB, including gastrointestinal, solid organ, and peritoneal TB, are often present with nonspecific imaging findings. In the musculoskeletal system, tuberculous spondylitis is the most common manifestation, is typically diagnosed late, and involves multiple vertebral segments with extensive paraspinal abscesses. Articular TB is the second most common musculoskeletal form of TB, with synovitis being the predominant imaging finding.

Prompt treatment and strict adherence to anti-TB therapy are essential to cure all forms of TB. Treatment generally lasts for at least six months, with medications administered daily. If a patient's sputum remains positive after two months, treatment may be extended to nine months. The World Health Organization (WHO) recommends that TB management should include proper anti-TB medications, patient education, and supervision and support from healthcare providers to ensure effective treatment and compliance [1].

TB transmission depends mainly on the inhalation of droplet nuclei containing Mycobacterium tuberculosis aerosolized by infected patients. Identification of high-risk groups is an important strategy for controlling TB. In addition to well-known risk factors, such as chronic kidney disease, poorly controlled diabetes mellitus (DM), human immunodeficiency virus (HIV) infection, chronic pulmonary disease, liver cirrhosis, autoimmune disease under treatment with biological agents, and being underweight [2].

Tuberculosis (TB) is a major global public health concern worldwide. Individuals who have close contact with patients with active pulmonary TB or who come from TB-endemic regions are at the highest risk for primary infection, whereas those with weakened immune systems are most vulnerable to reactivation of latent TB infection (LTBI). TB can involve virtually any organ and its clinical signs vary depending on the affected system, although common symptoms include fever, night sweats, and weight loss. A diagnosis of LTBI is established when either a tuberculin skin test or interferon-γ release assay is positive in the absence of active disease. TB treatment requires combination therapy to eliminate bacteria, prevent transmission, and reduce the risk of drug resistance, with directly observed therapy recommended for active cases [3].

Occupational exposure to TB is a significant concern for health care workers, particularly staff nurses. The transmission of TB to nursing personnel has been documented in resource-rich medical settings since the 1950s. The likelihood of infection depends on factors such as patient population, type of work, regional TB prevalence, access to healthcare facilities, and effectiveness of TB infection control programs. Nurses are at a higher risk of Mycobacterium tuberculosis (MTB) infection due to repeated exposure to patients with active TB, especially in poorly ventilated areas or when performing procedures that generate contaminated aerosols. The risk is elevated in facilities managing large

numbers of smear-positive TB patients but can be mitigated through effective infection control measures. TB screening is recommended for nurses who work closely with TB patients.

Targeted testing and treatment of individuals with LTBI who are at an increased risk of progressing to active TB are important TB control strategies. However, the tuberculin skin test has limitations: it shows poor specificity in people vaccinated with Bacillus Calmette–Guérin (BCG) vaccine and low sensitivity in immunocompromised individuals, who are most at risk of developing active disease. Blood-based tests, such as the T-SPOT. TB and QuantiFERON-TB Gold detect interferon-γ released by T cells in response to M. tuberculosis–specific antigens and may improve the limitations of the skin test. T-SPOT. TB has been shown to perform better than skin tests in young children and HIV-infected individuals with active TB.

NEED FOR THE STUDY

Tuberculosis (TB) is a significant global public health challenge. Caused by Mycobacterium tuberculosis (MTB), TB primarily affects the lungs (approximately 85% of cases) but can also involve other organs. It is the second leading infectious killer worldwide after COVID-19, surpassing HIV/AIDS, and disproportionately affecting young, productive-age individuals. TB is a leading cause of death among people living with HIV and significantly contributes to antimicrobial resistance. According to the WHO, the highest TB burden is found in Southeast Asia, with 211 cases per 100,000 people.

In 2022, approximately 10.6 million people worldwide contracted TB, including 5.8 million men, 3.5 million women, and 1.3 million children. TB occurs across all countries and age groups but is both curable and preventable. The largest proportion of new TB cases in 2022 occurred in Southeast Asia (46%), followed by Africa (23%) and the Western Pacific (18%). Approximately 87% of new cases were reported in 30 high TB burden countries, including India, China, Indonesia, Bangladesh, the Democratic Republic of Congo, Nigeria, Pakistan, and the Philippines, accounting for the majority.

The economic impact is substantial, with approximately 50% of TB patients and their families facing catastrophic costs (over 20% of household income) due to medical expenses, non-medical expenditures, and income loss, far from the WHO End-TB Strategy target of zero. India alone had 2.8 million TB cases were reported in India alone by 2022 (27% of the global burden), with a case fatality rate of 12% and an estimated 342,000 TB-related deaths, including 11,000 HIV-positive individuals. Multidrug-resistant TB (MDR-TB) remains a major public health concern, with 110,000 cases reported in India by 2022. That year also marked a milestone in TB surveillance, with 2,420,000 cases notified, a 13% increase from 2021, and a treatment initiation rate of 95.5%. Among the states, Delhi reported the highest case notification rate (546 per 100,000), while Kerala reported the lowest (67 per 100,000).

Staff nurses play a crucial role in TB control and elimination; however, their contributions are threatened by occupational TB exposure. Nurses face higher rates of latent and active TB than the general population, particularly in healthcare settings with a high number of undiagnosed TB patients and poorly implemented tuberculosis infection control (TB-IC) programs. Occupational TB can result in workforce attrition and is worsened by stigma, which delays diagnosis, reduces treatment adherence, and affects nurses' well-being. Preventive therapy for staff with LTBI can reduce progression to active disease. Nosocomial TB transmission is a critical public health concern, and rights-based approaches are recommended.

Globally, TB incidence of TB is estimated at 140 per 100,000 people, ranging from 27 per 100,000 in the United States to 554 per 100,000 in the Philippines. The WHO TB management strategy emphasizes six key points: (1) expanding high-quality directly observed treatment short-course (DOTS); (2) addressing challenges such as TB/HIV and MDR-TB; (3) strengthening healthcare systems; (4) involving all care providers; (5) empowering patients; and (6) promoting TB research.

Staff nurses are two–three times more likely to develop active TB than the general population. Studies have shown that while most nurses possess good knowledge and positive attitudes toward TB, their practices regarding TB prevention are often inadequate. TB's prevalence of TB highlights the high-risk faced by healthcare workers involved in patient care, particularly where self-protection measures are not rigorously followed. Regulatory bodies such as the Occupational Safety and Health Administration (OSHA), Centers for Disease Control and Prevention (CDC), and National Institute for Occupational Safety and Health (NIOSH) have implemented guidelines to minimize TB transmission risk in healthcare settings, and adherence to these protocols is critical.

The risk of TB transmission varies depending on the patient population and effectiveness of infection control measures. Transmission risk is highest in facilities managing large numbers of infectious TB patients, especially when diagnosis, isolation, and treatment are delayed, and when respiratory protection measures are absent. In India, repeated exposure to infectious patients is common because of the high number of TB cases treated monthly under Revised National Tuberculosis Control Program (RNTCP) (over 100,000 patients). Medical and nursing trainees are particularly vulnerable because they begin clinical rotations early in their training and perform frequent physical examinations on patients, including those with active TB, resulting in repeated exposure during formative years.

The researcher's practical experience in medical-surgical nursing highlighted that many nursing staff lacked adequate knowledge and practice regarding TB self-protection measures. Staff nurses often fail to follow infection control precautions while performing their duties, increasing their risk of contracting TB. This observation, coupled with a literature review and first-hand experience, motivated the researcher to assess the knowledge and practices of staff nurses regarding TB prevention.

Objectives of the Study

1. To evaluate the level of knowledge and practices of staff nurses regarding TB prevention
2. To examine the relationship between knowledge and practices concerning TB prevention among staff nurses
3. To determine the association between staff nurses' knowledge regarding TB prevention and selected sociodemographic variables.
4. To identify the association between staff nurses' practice levels of TB prevention and selected sociodemographic variables.

Operational Definitions

1. *Knowledge:* In this study, knowledge refers to the correct responses provided by staff nurses regarding TB prevention, assessed through a structured knowledge questionnaire and categorized as adequate, moderately adequate, or inadequate.
2. *Practice:* Practice refers to the behaviors adopted by staff nurses to prevent TB transmission, including self-protection measures, hygiene practices, health promotion activities, environmental supervision, and handling of infected materials.
3. *Prevention:* Prevention encompasses measures taken by nursing and paramedical staff to prevent the spread of tuberculosis.
4. *Tuberculosis (TB):* TB refers to pulmonary tuberculosis, a contagious disease primarily affecting the lungs, caused by Mycobacterium tuberculosis and transmitted through airborne droplet nuclei.
5. *Staff nurses:* Staff nurses included individuals who had completed General Nursing and Midwifery, Basic B.Sc. Nursing, Post-Basic nursing, or M.Sc. They are currently employed as registered nurses in TB hospitals.
6. *TB Hospital:* A TB hospital refers to a healthcare facility dedicated to the treatment and recovery of patients diagnosed with tuberculosis.

Hypotheses

H1: There is a significant association between staff nurses' knowledge scores on TB prevention and their selected sociodemographic variables.

H2: There is a significant association between staff nurses' practice scores on TB prevention and their selected sociodemographic variables.

H3: There is a significant correlation between the knowledge and practice scores related to TB prevention among staff nurses.

Assumptions

The study assumes that staff nurses possess some level of knowledge regarding TB prevention.

Delimitations

The study is confined to staff nurses employed in a selected TB hospital.

Conceptual Framework

A conceptual framework provides a theoretical structure for studying a problem, highlighting the selection, organization, and classification of relevant concepts. It consists of interconnected concepts or abstractions, which are logically arranged based on their relevance to a central theme. Conceptual frameworks act as the foundation for formulating the hypotheses to be tested. Their value lies in organizing the study elements, guiding researchers to ask pertinent questions about the phenomena, and offering practical solutions to problems (Figure 1).

The conceptual framework for this study is grounded in Ludwig von Bertalanffy's General Systems Theory (1968), which involves the components of input, process, output, and feedback. According to systems theory, a system comprises a set of elements, individuals, and their environments. An individual receives energy and information from the environment as an input, which is then processed to generate an output that is returned to the environment. These components continually interact and any change in one part affects the entire system. The system operates cyclically, with each element influencing others to achieve a common goal.

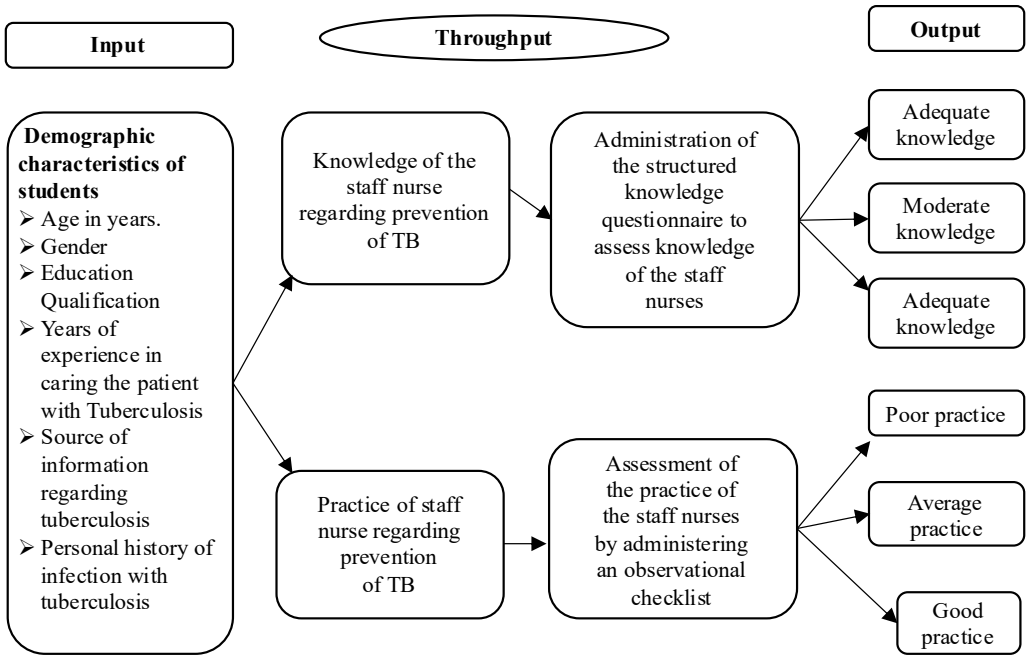

Figure 1. Conceptual framework based on general systems theory by Ludwig von Bertalanffy.

In this study, these principles were applied to explain how inputs, processes, outputs, and feedback interact within the context of staff nurses' knowledge and practices regarding TB prevention.

Input

The input consists of the characteristics and conditions of the people and resources. Individuals' personality affects their learning and aids in influencing others. In this study, input refers to age, gender, education qualification, years of experience in caring for patients with tuberculosis, source of information regarding tuberculosis, and personal history of infection with tuberculosis.

Throughput

The process refers to the differential operational procedures required to achieve the desired output. It includes assessing the knowledge of staff nurses regarding TB prevention by administering a structured knowledge questionnaire. The practice of staff nurses regarding the prevention of TB was observed by administering an observational checklist.

Output

After processing through assessment, the system's output is in the form of the likelihood of the behavior of the individual in accordance with knowledge and practice. In this study, the outcomes included grading of knowledge of the staff nurses as adequate knowledge, moderate adequate knowledge, and inadequate knowledge regarding the prevention of TB and demonstration of practice by the staff nurses for the prevention of TB, which is classified as good practice, average practice, and poor practice.

Feedback

Feedback within the system or from the environment provides information that helps the system determine whether it meets its goal. This was not a part of the present study.

REVIEW OF LITERATURE

A literature review provides a fresh interpretation of the existing material, integrates previous research findings, and traces the development of ideas and major debates within a field. In the context of research, a literature review summarizes prior studies on a topic and can appear as part of a larger research project, thesis, or standalone scholarly article. The primary goal of a literature review is to inform readers about the current state of knowledge, highlight the strengths and weaknesses of previous research, and present differing perspectives. Conducting a literature review before starting a study helps researchers to identify gaps and frame their research questions effectively.

For example, several studies have explored healthcare workers' knowledge and practices regarding tuberculosis (TB).

- *Wani MR, Amin N., et al. (2022)* assessed staff nurses at SMHS Hospital, Srinagar, on their knowledge and self-care practices related to pulmonary TB. Using a quantitative approach and non-probability convenience sampling, the study found that 53.3% of the nurses had strong knowledge, particularly regarding signs, symptoms, and diagnosis. The study also revealed significant relationships between knowledge scores and professional qualifications and experience as well as between self-care practices, age, and qualifications. Overall, nurses demonstrated moderate self-care practices, and a positive correlation was found between knowledge and practice scores [4].
- *Chavan Yuvaraj B., et al. (2022)* conducted a case-control study to examine the sociodemographic factors associated with TB occurrence among staff nurses in a tertiary care hospital. Using snowball sampling and questionnaires, this study compares TB patients and controls. Significant associations were found between TB occurrence and factors such as regularity of meals, body mass index (BMI), duration of exposure to TB patients, TB screening, sleep adequacy, and protein intake. The study emphasized the importance of proper nutrition, screening, and exposure management for TB prevention [5].

- *Dwivedi R, Goswami D., et al. (2022*) performed a cross-sectional study among healthcare workers in Sirohi district, Rajasthan, focusing on knowledge, attitudes, and practices regarding TB management and directly observed treatment (DOT). Among 95 participating staff nurses (mean age 35.82 years), knowledge regarding TB and DOT was good (mean score 6.29 ± 1.08), and 81% had strong knowledge about DOT. However, most nurses exhibited poor attitudes, and only 47% demonstrated adequate practices, with 55% not attending to any TB patient in the last three years [6].
- *Baral MA, Koirala S. (2022)* conducted a cross-sectional study at the Western Regional Hospital in Pokhara, Nepal, to assess nurses' knowledge and practices in TB prevention and control. Using a self-administered questionnaire, this study found that most nurses had insufficient knowledge and poor preventive practices. None of the patients used N95 masks or respirators during patient care, although all used chemical disinfectants for cleaning. Older nurses and those working in wards with isolation rooms showed higher knowledge levels regarding TB infection prevention and control (TBIPC) [7].
- *Erawati M. and Andriany (2022)* conducted a non-experimental, cross-sectional study to identify the factors influencing LTBI among nurses at public health centers in Indonesia. The study involved 98 nurses, with infection status confirmed using the interferon-gamma release assay (IGRA) and data collected through validated questionnaires. This study found that all public health centers had TB prevention facilities. Significant determinants of LTBI included adherence to protocols such as occupational health and safety training (OR = 13.24, 95% CI [2.29–58.55]; p = 0.001), handwashing after patient or specimen contact (OR = 20.55, 95% CI [4.23–99.93]; p = 0.000), and wearing medical masks (OR = 9.56, 95% CI [1.99–45.69]; p = 0.005) [8].
- *Sharma SK, Mishra M., et al. (2021)* conducted a quasi-randomized study among nurses in pulmonary, emergency, respiratory ICU, and general medicine units at AIIMS Rishikesh to evaluate the effect of an m-learning module on knowledge and attitude. The study involved 190 nurses divided equally into experimental and control groups, with only the experimental group receiving m-learning intervention. Results showed that the groups were comparable at baseline, and the intervention significantly improved knowledge in the experimental group compared to the control (18.2 ± 5.4 vs. 12.4 ± 4.4; P < 0.001). However, a single social media-based session did not produce a significant change in attitude (10.3 ± 1.8 vs. 9.9 ± 1.8; P = 0.175) [9].
- *Qader GQ, Seddiq MK., et al. (2021)* performed a cross-sectional study assessing LTBI prevalence among healthcare workers in Afghanistan, a country with a high TB burden. Using systematic sampling, 4,648 workers were invited, and 3,686 completed the tuberculin skin tests. The prevalence of LTBI was 47.2% (1,738 workers). Multivariate analysis indicated that obesity (BMI ≥ 30) and marital status were associated with a higher LTBI risk, whereas being underweight (BMI ≤ 18) or having a normal BMI showed no increased risk. This study highlighted the high burden of LTBI among healthcare workers in Afghanistan [10].
- *Krishnamoorthy Y, Ezhumalai K., et al. (2021)* conducted a cohort study to determine the prevalence and risk factors of LTBI among household contacts (HHC) of pulmonary TB patients. The study included 1,523 household contacts (HHCs), most of whom had lived with the index case (IC) for over a year, and 25% shared the same bed. The prevalence of LTBI among HHCs was 52.6%. The study identified independent risk factors for LTBI, including age 19–64 years or over 65 years and sharing a bed with the IC. These findings emphasize the importance of targeted contact screening, effective tracing, and standardized testing in high TB burden settings [11].
- *Akande, P.A. (2020)* conducted a cross-sectional study to evaluate nurses' knowledge and practices related to tuberculosis infection control (TB-IC) in Ibadan as well as the influence of sociodemographic factors. Data were collected from 200 nurses across two secondary health facilities using a self-administered questionnaire. The findings revealed that the average knowledge and practice scores were 68.2% and 79.9%, respectively. When applying cutoff points of 80% for good knowledge and 100% for good practice, only a small proportion of nurses achieved high scores (10.5% for knowledge and 6% for practice). Knowledge scores were not

significantly associated with sociodemographic characteristics. Among the factors assessed, only work experience showed a significant relationship with practice scores, with nurses with more than 18 years of experience demonstrating lower odds of achieving good practice scores (OR 0.25, 95% CI 0.06–0.94). No significant correlation was observed between knowledge and practice scores, likely because the nurses had not yet received training on the newly introduced TB-IC package [12].

- *Mogan KA, Kapoor R., et al. (2020*) conducted a cross-sectional study at Safdarjung Hospital in Delhi to screen sanitation workers for tuberculosis and identify associated risk factors. The study included 362 current sanitation workers, selected through convenience sampling. Data were collected using a pretested semi-structured questionnaire based on the guidelines of the RNTCP guidelines. Among the participants, 28 (7.7%) reported presumptive TB. Common symptoms included cough lasting more than two weeks (85.7%), fever or night sweats for more than two weeks (46.4%), significant weight loss (53.5%), hemoptysis (14.2%), and symptoms suggestive of extrapulmonary TB (53.5%).
- *Sukartini T, Wibowo AE., et al. (2020)* carried out a cross-sectional study to examine the relationship between nurse characteristics and their tuberculosis prevention and control behaviors in East Java, Indonesia. The study included 40 nurses working in TB wards, who met the inclusion criteria. The dependent variable was TB prevention and control behavior, while the independent variables included nurse characteristics, such as education, training, working time, knowledge, attitude, and motivation. The results showed no significant associations between any of the nurse characteristics and TB prevention or control behaviors: education ($p = 0.525$), training ($p = 0.316$), working time ($p = 0.190$), knowledge ($p = 0.798$), and attitude or motivation ($p = 1.000$). The study concluded that nurse characteristics did not influence TB prevention and control practices [13].
- *Nautiyal RG, Mittal S., et al. (2019)* conducted a cross-sectional study to assess the knowledge of TB among pulmonary TB (PTB) patients at Haldwani Block of Nainital District of Uttarakhand, India. A semi-structured questionnaire was administered to 111 new and previously treated PTB patients. The results showed that only 43.2% of PTB patients were aware that TB was caused by germs and 48.6% knew that it was not a hereditary disease. Only 13.5% of PTB patients knew that a vaccine was available, and a majority (68.5%) were aware of covering the mouth and nose while coughing and sneezing to prevent the disease. Overall, only two-thirds (65%) of the patients had a good knowledge of TB. Approximately one-third of PTB patients have poor knowledge of TB [14].
- *Dhaked S, Sharma N., et al. (2019)* conducted a prospective study using a predesigned, pretested, semi-structured questionnaire to interview caregivers of pediatric TB patients, with follow-ups at the end of the intensive and continuation treatment phases. A total of 141 participants were included in this study. The results showed that extrapulmonary TB (70.2%) was nearly three times more common than pulmonary TB. By the end of the intensive phase, symptoms such as chest pain, breathlessness, and eye redness were resolved, while fever, cough, and skin lesions improved by the end of the continuation phase. Malnourished children gained an average of 2.6 kg, which was slightly less than the 3.0 kg gain observed in children with normal nutritional status. The treatment success rates were 96.2% in category 1 and 90% in category 2 patients [15].
- *Kumar MG, Joseph B., et al. (2019)* carried out a descriptive longitudinal study to determine the incidence of LTBI among staff nurses at a tertiary hospital in Bengaluru. A total of 600 staff nurses were stratified according to their work profiles, including doctors, nurses, laboratory technicians, aides, pharmacists, and dietary and housekeeping staff with patient contact. TB screening questionnaires and tuberculin skin tests (TST) were used for data collection. Initially, 120 of 598 participants (20.1%) tested positive for LTBI. After one year, among 345 previously negative participants retested, 67 (19.4%) showed a positive TST. LTBI prevalence was significantly associated with age, residence, education, work commute time, and mode of transport, while incidence was linked to sex, residence, education, commute time, and marital status [16].

- *Singh K, Pabla H., et al. (2019)* conducted a cross-sectional study at a tertiary care hospital in Solan, Himachal Pradesh, to assess nurses' awareness of TB over a one-year period. Data from 180 staff nurses revealed low knowledge of predisposing factors, first-line drugs under DOTS treatment, patient-specific drug boxes, and drug side effects. The study concluded that nurses' knowledge and awareness of TB were unsatisfactory, highlighting the need for regular workshops and seminars to improve their understanding [17].
- *Alotaibi B, Yassin Y., et al. (2019)* conducted a cross-sectional study to evaluate knowledge, attitude, and practice (KAP) regarding TB among staff nurses deployed during Hajj. This study involved 540 participants from 17 countries, including physicians, nurses, and other hospital staff from 13 hospitals. The results showed that nearly half of the staff nurses had prior experience managing TB patients. Overall, participants demonstrated average knowledge (mean score, 52%), above-average attitude (73%), and good practice (85%) regarding TB management [18].
- *Krithika SA, Jayanthi NN., et al. (2018)* conducted a cross-sectional study at SRM Medical College and Research Centre in Kanchipuram district, involving 224 nursing staff. The findings revealed a high awareness (71.8%) regarding TB causation by bacteria, airborne transmission, and overcrowding as risk factors. However, fewer participants knew that TB did not spread through breastfeeding (54.9%) or handshakes (33%) and that ATT should continue during pregnancy. Knowledge regarding TB prevention (56%) and ATT availability was also low, highlighting gaps in nurses' understanding of TB transmission and management [19].
- *SH H, Siti NS., et al. (2018)* conducted a cross-sectional study of 275 nurses in a teaching hospital in Kuala Lumpur to assess TB knowledge and practices. The results showed that most respondents had good knowledge (70.2%) and practice (63.3%) of TB management. Minor gaps were noted in the sputum collection methods (knowledge gap, 1.8%; practice gap, 0.4%). Workplace setting was the only demographic factor that was significantly associated with knowledge and practice levels ($p = 0.028$). The study emphasized the importance of implementing TB infection control (TB-IC) measures to minimize infection risk in hospital settings [20].
- *Van Rensburg AJ, Engelbrecht M, et al. (2018)* conducted a cross-sectional survey across all 41 primary healthcare (PHC) facilities in Mangaung, South Africa, to evaluate the TB-related knowledge, attitudes, and practices of PHC nurses using self-administered questionnaires. The findings revealed multiple gaps in TB prevention knowledge, attitudes, and practices among the nurses. Good TB practices were associated with positive TB attitudes and knowledge, but the link between knowledge and practice was not influenced by training, attitudes, or nurse categories. This study reinforced previous observations that nurses often lack sufficient knowledge, attitudes, and practices to effectively protect themselves and others from TB and highlighted the need for further research to understand the factors influencing TB prevention behavior among nurses [21].
- *Janagond G, Ganesan V, et al. (2017)* conducted a prospective study to evaluate the risk of TB infection among staff nurses actively engaged in clinical duties. A total of 206 staff nurses completed a structured questionnaire, and TB infection was assessed using the TST, with ≥10 mm induration as the positivity threshold. Positive participants underwent further clinical and radiographic evaluations to exclude active TB. The study found that the participants' ages ranged from 18 to 71 years, with a mean of 27.13 years, and the mean TST induration was 6.37 mm. Overall, 36.8% (76/206) of patients were TST-positive, although there was no evidence of active TB. During the study period, two staff nurses developed pulmonary TB, both of whom initially tested negative [22].
- *Pardeshi GS, Kadam D, et al. (2017)* carried out a cross-sectional study at a government tertiary healthcare center in India to examine medical residents' perceptions of occupational TB risk. Of the 305 residents approached, 263 (94%) completed the structured questionnaire, and 200 responded to an open-ended question. Daily exposure to TB patients was reported by 64% of the respondents, 5% had a prior TB history, and 69% were aware of TB infection control guidelines. Most participants expressed concerns about contracting TB (78%) and drug-resistant TB (88%).

The main themes emerging from the responses included fear of drug-resistant TB (50%), health consequences of the disease (20%), social and professional impacts (19%), exposure to TB patients (16%), inadequate infection control measures (14%), and the effects of a high workload on health (8%) [23].

- *Gupta R, Sood, et al. (2017)* conducted a cross-sectional study to compare TB knowledge and related practices among nursing staff at medical colleges and peripheral healthcare units in Himachal Pradesh, India. Nurses from both settings attending training at the Training Center, Chheb Kangra, were randomly selected. The results indicated that medical college nurses demonstrated lower TB knowledge than nurses working in peripheral healthcare units. Among peripheral nurses, those posted at Community Health Centers had the highest knowledge, while PHC staff had the lowest knowledge. The study recommended that TB training under the RNTCP should target both peripheral healthcare nurses and those working in medical colleges [24].
- *Bhandari SR, Bande R (2016)* conducted a study to assess the level of knowledge and awareness about TB infection control among medical students and nursing staff in Nashik. The study included 88 medical students and 48 nursing staff at college and nearby hospitals regarding the KAP of tuberculosis. The results showed that medical students had more knowledge, attitudes, and practices regarding tuberculosis than nursing staff, and the difference was found to be statistically significant [25].
- *Mirtskhulava V, Whitaker JA, et al. (2015)* conducted a cross-sectional study in Georgia to examine healthcare workers' (HCWs) knowledge, beliefs, and behaviors regarding tuberculosis infection control (TB-IC), including LTBI screening and treatment among staff nurses. Using an anonymous 55-item self-administered survey, 240 HCWs participated in the study, including 48% physicians and 39% nurses. This study found that the average TB knowledge score was 61%. Only 60% of staff nurses reported regular use of respirators when interacting with TB patients, and only 52% were willing to undergo annual LTBI screening, whereas 48% were willing to undergo LTBI treatment. Multivariate analysis revealed that staff nurses who were concerned about contracting multidrug-resistant TB (MDR-TB), valued the screening of TB contacts, or were physicians were more likely to accept annual LTBI screening. Conversely, those working in outpatient TB facilities or perceiving a high personal risk of reinfection were less likely to accept LTBI treatment [26].
- *Kansal AR, Mahal R, et al. (2014)* conducted a study in Delhi to assess the learning needs, knowledge, and attitudes of nurses working in tertiary TB care institutions. Data were collected from a total of 400 nurses. Findings showed that only 20% of nurses were knowledgeable about category 4 TB treatment, its regimen, and related RNTCP records and reports, whereas 80% expressed a desire to learn these areas. Approximately 30% had knowledge regarding ACMS, treatment regimens, and TB diagnosis per RNTCP guidelines, and 50% reported being familiar with TB history, etiology, pathophysiology, ATT side effects, treatment categories, and the nurse's role in patient care. The mean knowledge score was 31.54 out of 50 (63.08%). Demographic factors, such as age, gender, qualification, and designation, did not significantly affect knowledge scores; however, learning sources, training, and experience were influential. The mean attitude score was 69.77 ± 8.0, with only qualification affecting the score among the demographic variables [27].
- *Mathew A, David T, et al. (2013)* conducted a nested case-control study to identify risk factors for TB among staff nurses at a tertiary teaching hospital in India. The study included 101 nurses with active TB and 101 randomly selected nurses without TB as controls from a total of 6,003 staff members. The groups were similar in age. Logistic regression analysis identified that a BMI below 19 kg/m², frequent patient contact, and working in medical wards or microbiology laboratories were independently associated with an increased risk of acquiring TB [28].

RESEARCH METHODOLOGY

This article focuses on the description and various steps undertaken to collect and organize the data for the study. The research methodology refers to the systematic procedures followed by a researcher,

starting with the identification of the research problem to reach the final conclusion. This is essentially the science of conducting research in a systematic and scientific manner. This methodology forms the backbone of any research, as it provides a structured framework or blueprint for conducting the study.

The research methodology is a structured approach to solving a research problem and outlines the general plan for organizing the study to obtain valid and reliable data. The present study aimed to assess the knowledge and practices of staff nurses regarding the prevention of tuberculosis (TB). This chapter provides an overview of the steps followed by the researcher to conduct the study [29].

Research Approach

The choice of research approach is a fundamental step in planning data collection. The research approach represents a structured set of procedures used to gather meaningful and relevant information. This reflects how the research is planned and organized. In this study, a descriptive research approach was adopted that emphasizes understanding and describing the current condition or problem in detail [30].

Research Design

The research design refers to the overall plan or strategy used to answer the research question and test the research hypothesis. It provides a framework for selecting subjects, controlling variables, and determining the statistical methods for data analysis. This study used a non-experimental descriptive research design (Figure 2).

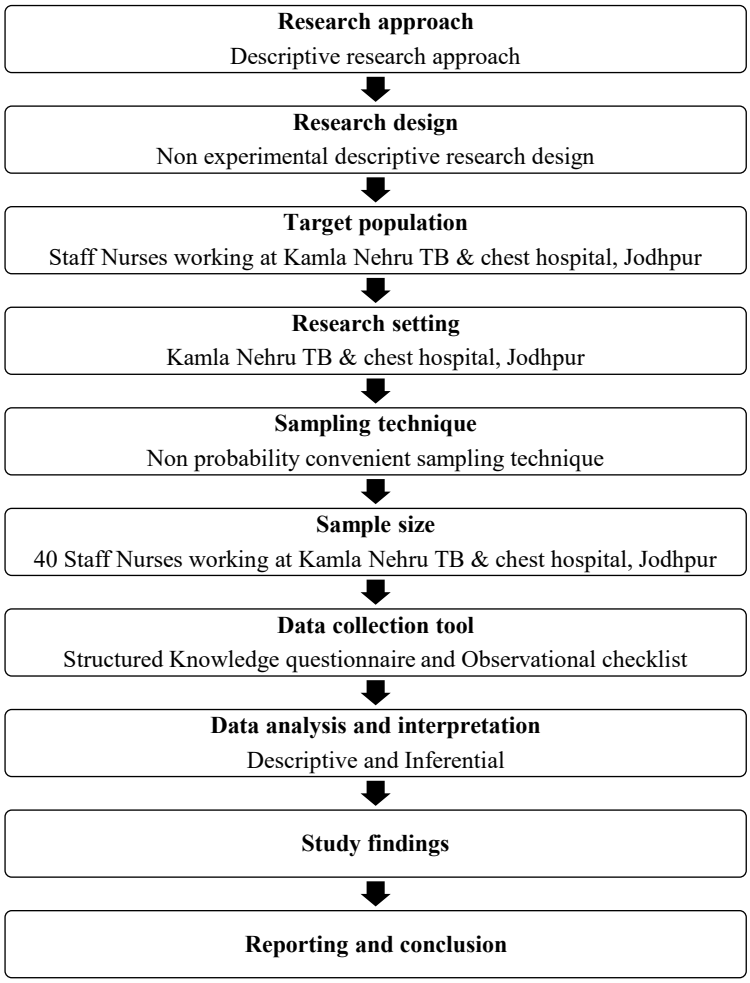

Figure 2. Schematic representation of research design.

Variables

Variables are measurable characteristics of a concept.

- *Dependent variable:* Knowledge and practices of staff nurses regarding TB prevention.
- *Demographic/extraneous variables:* Age, sex, educational qualification, years of experience in caring for TB patients, sources of TB-related information, and personal history of TB infection [31–34].

Setting of the Study

The research setting referred to the location of the study. The study was conducted at Kamla Nehru TB and Chest Hospital, Jodhpur.

Population

Population refers to the entire group of individuals sharing specific characteristics to which the researcher intends to generalize the results. The population for this study comprised staff nurses working at Kamla Nehru TB and Chest Hospital in Jodhpur.

Sample and Sample Size

The sample is a subset of the population selected for participation in the study. The sample for this study included 40 staff nurses working at Kamla Nehru TB and Chest Hospital in Jodhpur.

Sampling Technique

The sampling technique refers to the selection of representative participants from the population. In this study, non-probability convenience sampling was used to select participants.

Sampling Criteria

Inclusion Criteria:

- *Staff nurses employed in the selected TB hospital*
- *Nurses present during data collection*
- *Nurses willing to participate in the study.*

Exclusion Criteria

- *Staff nurses are not present during data collection.*
- *Nurses not working in the TB hospital.*
- *Nurses unwilling to participate in the study.*

Selection and Development of Tool

Data collection tools are instruments used to measure or observe the variables in a study. Based on the study objectives, a structured knowledge questionnaire and observational checklist, including sociodemographic characteristics, were selected as the most appropriate tools for obtaining responses from the participants.

Development of Tool

Instrument development requires a high degree of research expertise as the instrument must be reliable and valid. The tool was developed in English after reviewing related literature, based on the experience of the investigator, and based on consultation with subject experts.

Tool for Data Collection

To gather the necessary data, the investigator used the following tools:

Section A: Demographic Variables

This section recorded the demographic information of staff nurses working at the selected TB hospital in Jodhpur, including age, sex, educational qualification, years of experience with TB patients, sources of TB-related information, and personal history of TB infection.

Section B: Structured Knowledge Questionnaire

A structured knowledge questionnaire consisting of 30 multiple-choice questions was used to assess nurses' knowledge of TB prevention.

Section C: Observational Checklist

An observational checklist with 15 items was used to evaluate the practices of staff nurses in preventing TB.

Scoring Procedure

Section B: Structured Knowledge Questionnaire

Each correct response was scored as 1 and incorrect responses were scored as 0. The total possible score ranged from 0 to 30. The knowledge levels were categorized as follows:

- *Less than 50%:* Inadequate knowledge
- *50–75%:* Moderately adequate knowledge
- *More than 75%:* Adequate knowledge

Section C: Observational Checklist

Each item on the checklist was scored "1" for yes and "0" for no, with a total score range of 0–15. The practice levels were classified as follows.

- *Less than 50%:* Poor practice
- *50–75%:* Average practice
- *More than 75%:* Good practice

Content Validity

The tool was validated by nine experts in the field of medical-surgical nursing who reviewed the items for clarity, relevance, and appropriateness. Minor modifications were made based on feedback.

Reliability of the Tool

The reliability of the knowledge questionnaire and observational checklist was assessed using the split-half method to determine internal consistency. The test was divided into two halves, and the correlation was calculated using Spearman's rank correlation. The reliability coefficient for the full test was estimated using the Spearman–Brown prophecy formula. The reliability of the knowledge questionnaire was $r = 0.84$, and that of the observational checklist was $r = 0.82$, indicating that the tools were reliable.

Pilot Study

A pilot study was conducted on four staff nurses at the L.N. Memorial Hospital and Research Center, Jodhpur, on September 15, 2023, after obtaining permission from the hospital director. Non-probability convenience sampling and inclusion criteria were applied. The pilot study assessed the feasibility of the research, the appropriateness of the tools, and planning for statistical analysis. The findings indicated that the tools were understandable and that the study was feasible.

Procedure of Data Collection

Formal written permission was obtained from the superintendent of Kamla Nehru TB and Chest Hospital, Jodhpur. This procedure mirrored that of the pilot study. A total of 40 staff nurses were included, and data collection took place over four weeks, from November 3, 2023, to November 30, 2023. After obtaining informed consent, nurses were interviewed using a structured knowledge questionnaire and an observational checklist. Confidentiality was ensured, and each interview lasted approximately 30–35 minutes. At the end of the session, we thank the participants for their cooperation.

Plan for Data Analysis

Data analysis involves systematic organization and interpretation of the research data to test the research hypothesis. In this study, data from 40 staff nurses were analyzed using descriptive and inferential statistics [35–37]:

1. Descriptive statistics, including measures of central tendency, variation, and percentile scores were calculated for each variable.
2. The "t" test was used to assess correlations between knowledge regarding TB prevention among staff nurses.
3. Chi-square tests were applied to determine the association between demographic variables and knowledge and practices regarding TB prevention.
4. Data were presented in tables and diagrams for clarity.

Data Analysis and Interpretation

An analysis refers to a detailed examination of the components or structure of a subject. Research involves calculating specific measures and identifying patterns or relationships that exist within the collected data.

This study focuses on the analysis and interpretation of data gathered from 40 staff nurses working at a selected TB hospital in Jodhpur. Data were collected using a structured knowledge questionnaire to evaluate their knowledge, and an observational checklist to assess their practices regarding TB prevention.

Descriptive and inferential statistics were used to analyze the data collected [38]. The findings were finalized and organized in accordance with the plan for data analysis. This is presented in the following sections.

- Demographic profile of staff nurses.
- Knowledge of staff nurses regarding prevention of TB.
- Practice of staff nurses regarding prevention of TB.
- Correlation of the knowledge and practice of staff nurses regarding prevention of TB.
- Association of knowledge scores of staff nurses regarding prevention of TB with selected demographic variables.
- Association of practice scores of staff nurses regarding prevention of TB with selected demographic variables.

Demographic Profile of Staff Nurses

Table 1 and Figure 3 reveals that the majority 37.50% of the staff nurses were aged between 40 and 49 years, followed by 27.50% of them aged between 30 and 39 years, 20% of them were aged between 20 and 29 years, and the remaining 15% of the staff nurses were aged above 50 years.

Table 2 and Figure 4 reveal that the majority 72.50% of staff nurses were female, and the remaining 27.50% were male.

Table 1. Frequency and percentage distribution of staff nurses by their age (N = 40).

Age in years	Frequency	Percentage
20–29	08	20.0
30–39	11	27.50
40–49	15	37.50
above 50	06	15.0
Total	40	100.0

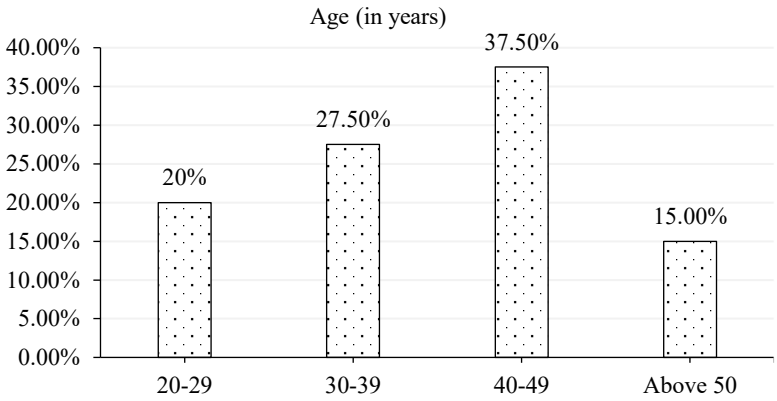

Figure 3. Bar diagram shows percentage distribution of staff nurses by their age.

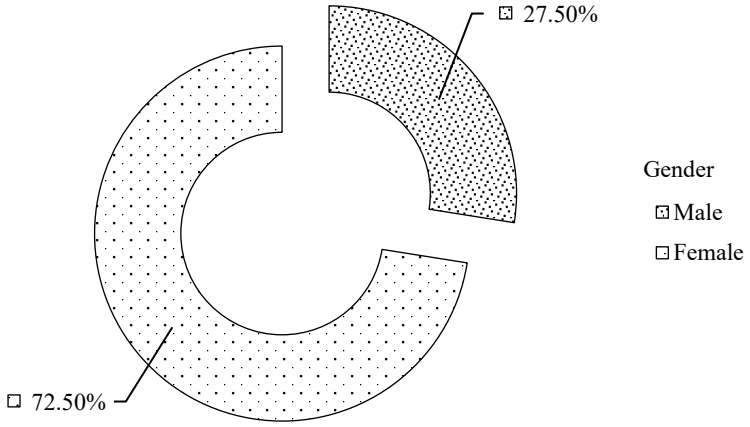

Figure 4. Doughnut diagram showing percentage distribution of staff nurses.

Table 2. Frequency and percentage distribution of staff nurses by their gender (N = 40).

Gender	Frequency	Percentage
Male	11	27.50
Female	29	72.50
Total	40	100.0

Table 3. Frequency and percentage distribution of staff nurses according to their education qualification (N = 40).

Education qualification	Frequency	Percentage
G.N.M.	30	75.0
B.Sc. Nursing	06	15.0
Post-Basic B.Sc. Nursing	04	10.0
M.Sc. Nursing	0	0.0
Total	**40**	**100.0**

Table 3 and Figure 5 reveals that the majority 75% of the staff nurses had General Nursing and Midwifery (GNM). as their educational qualification, 15% of them had a B.Sc. Nursing as their educational qualification, the remaining 10% of the staff nurses had Post-Basic B.Sc. Nursing as their education qualification, and none of the staff nurses had an M.Sc. nursing as an educational qualification.

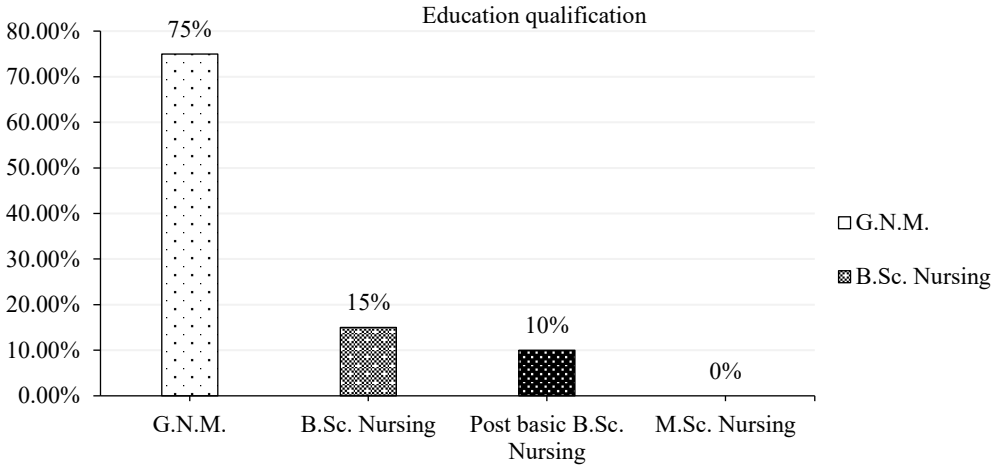

Figure 5. Bar diagram shows percentage distribution of staff nurses by theireducation qualification.

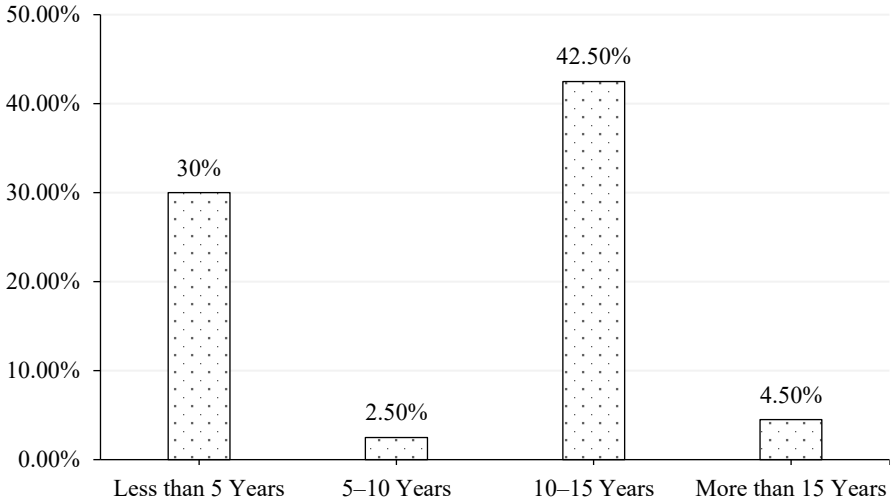

Figure 6. Bar diagram shows percentage distribution of staff nurses by their experience with Tuberculosis patients.

Table 4. Frequency and percentage distribution of staff nurses by their experience with tuberculosis patient (N = 40).

Years of experience in caring the patient with Tuberculosis	Frequency	Percentage
Less than 5 Years	12	30.0
5–10 Years	05	12.50
10–15 Years	17	42.50
More than 15 Years	06	15.0
Total	40	100.0

Table 4 and Figure 6 reveal that the majority 42.50% of staff nurses had 10–15 years of experience with TB patients, followed by 30% with less than 5 years of experience, 15% with more than 15 years of experience, and 12.50% with 5–10 years of experience with TB patients.

Table 5 and Figure 7 reveal that the majority 35% of the staff nurses obtained information from books and journals, followed by 32.50% of the staff nurses obtained information from health workers, 20% of the staff nurses obtained information from mass media, and the remaining 12.50% of the staff nurses received information from family and friends.

Table 5. Frequency and percentage distribution of staff nurses according to their source of information regarding tuberculosis (N = 40).

Source of information regarding tuberculosis	Frequency	Percentage
Mass media	08	20.0
Health workers	13	32.50
Books and journals	14	35.0
Family and friends	05	12.50
Total	40	100.0

Table 6. Frequency and percentage distribution of staff nurses by their personal history of infection with tuberculosis (N = 40).

Personal history of infection with tuberculosis	Frequency	Percentage
Yes	04	10.00
No	36	90.00
Total	40	100.0

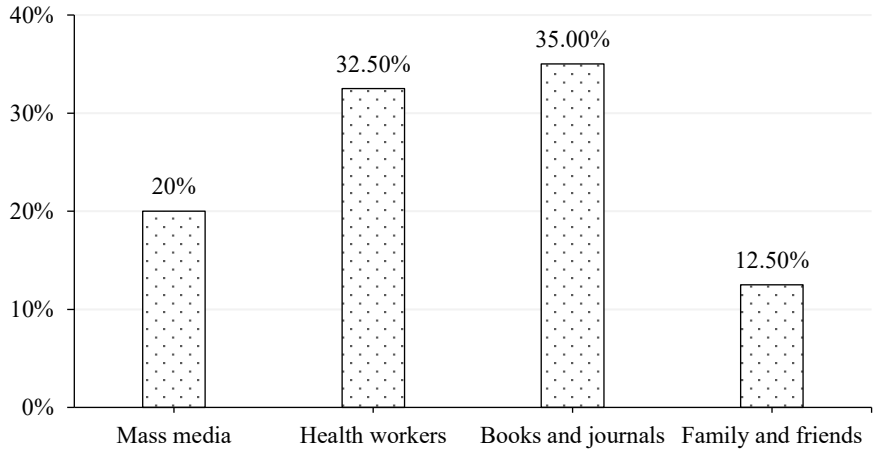

Figure 7. Bar diagram showing percentage distribution of staff nurses according to source of information regarding tuberculosis.

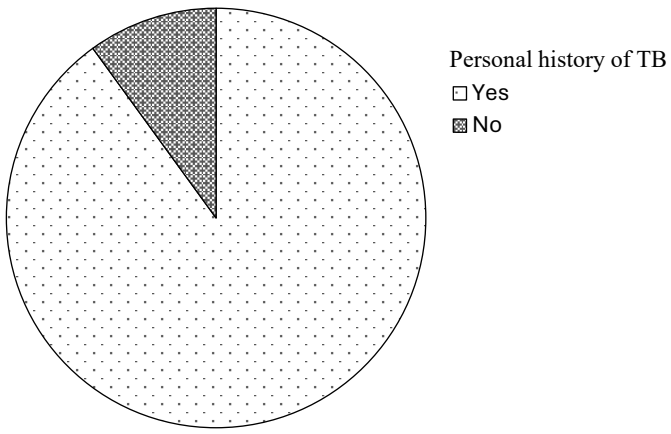

Figure 8. Pie diagram shows percentage distribution of staff nurses by theirpersonal history of infection with tuberculosis.

Table 6 and Figure 8 reveal that 90% of the staff nurses did not have a personal history of tuberculosis infection, and the remaining 10% of the staff nurses had a personal history of tuberculosis infection.

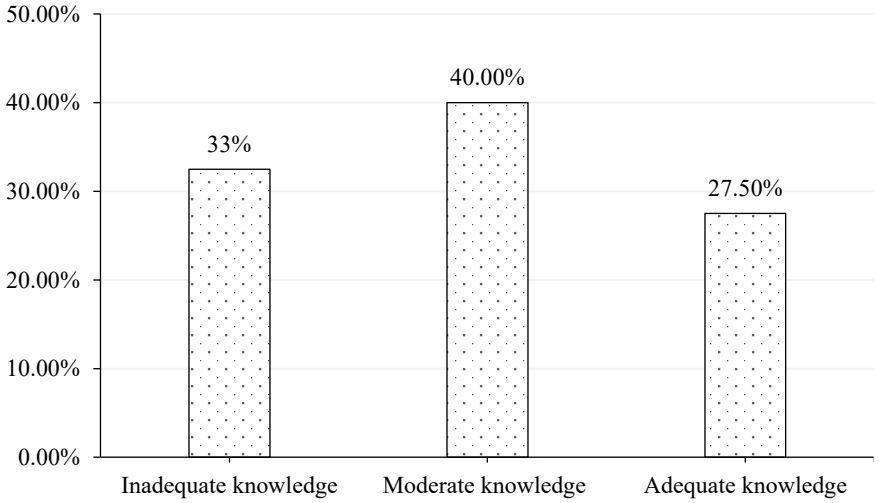

Figure 9. Bar diagram showing percentage distribution of knowledge level of staffnurses regarding prevention of TB.

Table 7. Frequency and percentage of knowledge level of staff nurses regarding prevention of TB (N = 40).

Knowledge level	Frequency	Percentage
Inadequate knowledge	13	32.50
Moderate knowledge	16	40.0
Adequate knowledge	11	27.50
Total	40	100.0

Table 8. Mean, mean percentage, and standard deviation for knowledge of staff nurses (N = 40)

S.N.	Knowledge aspects	No. of items	Max.score	Mean	Mean %	Median	SD
1.	General information about TB and risk assessment for TB transmission	08	08	5.33	66.63	05	1.54
2.	Management of TB patient by engineering control	05	05	3.43	68.60	04	1.01
3.	TB prevention, respiratory protection, use of personal protective equipment (PPE), and training of health care workers	17	17	9.93	58.41	10	2.93
Overall knowledge		30	30	18.68	62.27	19	4.78

Knowledge of Staff Nurses Regarding Prevention of TB

Table 7 and Figure 9 reveal that the majority 40% of staff nurses had moderate knowledge, 32.50% had inadequate knowledge, and 27.50% had adequate knowledge regarding TB prevention.

Table 8 and Figure 10 show that the maximum mean percentage obtained by the staff nurses is found in the aspect of management of TB patients by engineering control (68.60%), followed by 66.63% in the aspect of general information about TB and risk assessment for TB transmission, and the least mean percentage obtained for TB prevention, respiratory protection, use of personal protective equipment (PPE), and training of healthcare workers (58.41%). The overall mean ± SD of knowledge score of staff nurses was 18.68 ± 4.78 and the mean percentage was 62.27%.

Practice of Staff Nurses Regarding Prevention of TB

Table 9 and Figure 11 reveal that the majority of staff nurses (57.50 %) had average practice, 27.50% had good practice, and 15% had poor practice regarding TB prevention.

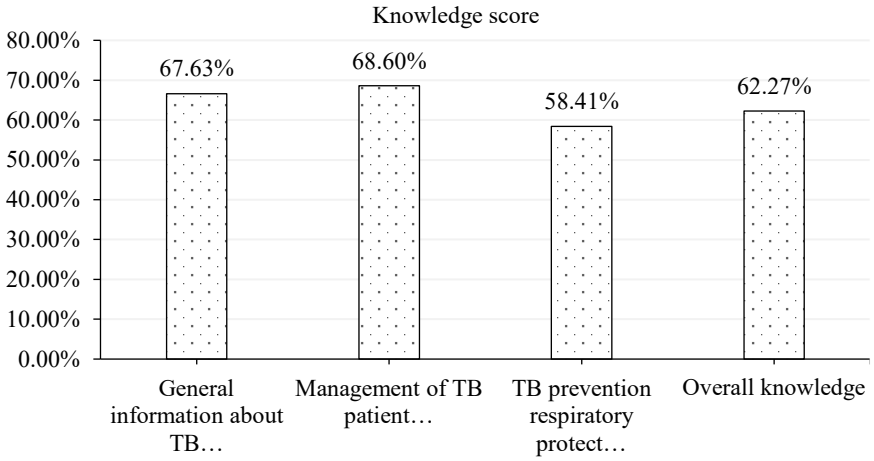

Figure 10. Bar diagram shows mean percentage of knowledge scores of staffnurses.

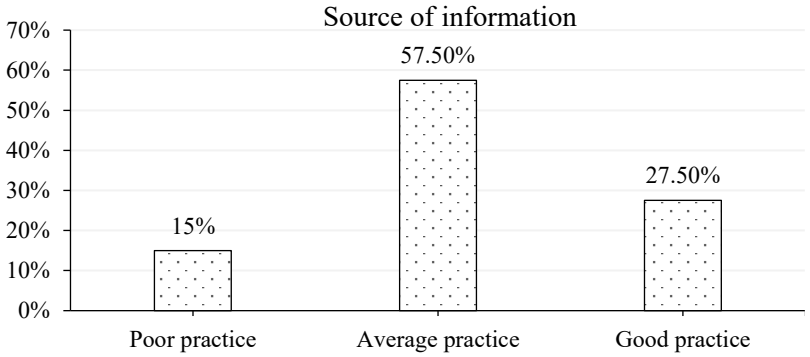

Figure 11. Bar diagram showing percentage distribution of practice level ofstaff nurses regarding prevention of TB.

Table 9. Frequency and percentage distribution of practice level of staff nurses regarding prevention of TB (N = 40).

Practice level	Frequency	Percentage
Poor practice	06	15.0
Average practice	23	57.50
Good practice	11	27.50
Total	40	100.0

Table 10. Correlation between overall knowledge score and overall practice score of staff nurses (N = 40).

S.N.	Knowledge aspects	No. of items	Max. score	Mean	SD	Mean %	Correlation coefficient(r)
1.	Overall knowledge	30	30	18.68	4.78	62.27	0.351
2.	Overall practice	15	15	10.93	2.20	72.87	

Correlation of Knowledge and Practice Score of Staff Nurses

Table 10 and Figure 12 show that the overall mean ± SD of knowledge score of staff nurses was 18.68 ± 4.78 with a mean percentage of 62.27%. The overall mean ± SD of practice score of staff nurses was 10.93 ± 2.20, with a mean percentage of 72.87%. The computed value of Karl Pearson's correlation coefficient was +0.351, which shows that there is a positive relationship between the overall knowledge score and the overall practice score of staff nurses regarding the prevention of tuberculosis.

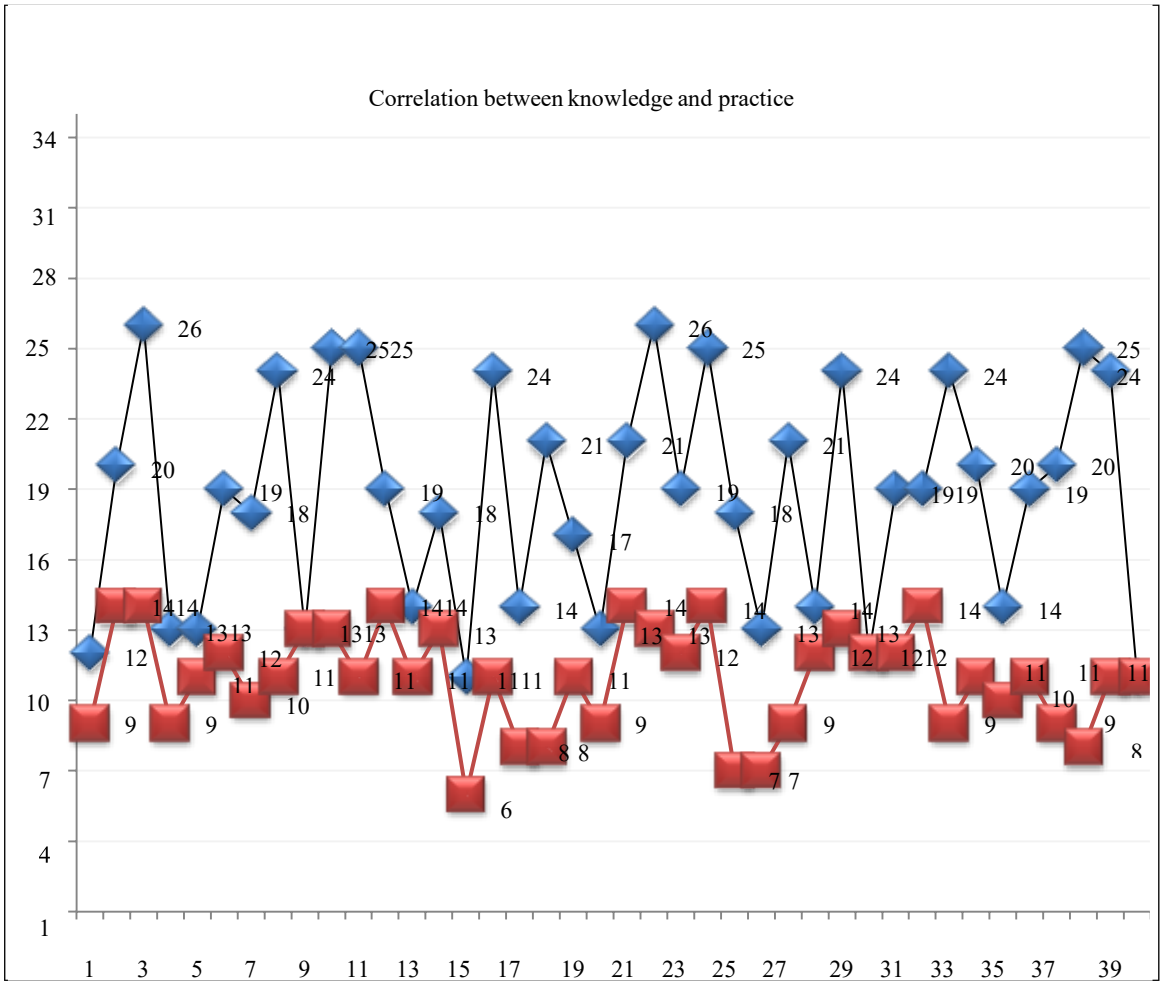

Figure 12. Line diagram showing correlation between overall knowledge score and overall practice score of staff nurses.

The obtained r value of 0.351 was greater than the table value of 0.195, at a significant level of 0.05. Therefore, "r" value is found to be significant. Hence, the hypothesis states that there is a significant positive relationship between the overall knowledge and practice scores of staff nurses.

Association of Knowledge Scores of Staff Nurses with Selected Demographic Variables

Table 11 shows x^2 value computed between the knowledge score of staff nurses regarding prevention of TB with selected demographic variables such as source of information regarding tuberculosis and personal history of infection with tuberculosis were significant at 0.05 level. Variables such as age, gender, education qualification, and years of experience in caring for the patient with tuberculosis were not significant at 0.05 level. Therefore, the hypothesis stated there will be significant association between knowledge score of staff nurses regarding prevention of TB with selected demographic variables is accepted.

Association of Practice Scores of Staff Nurses with Selected Demographic Variables

Table 12 shows x^2 value computed between the practice score of staff nurses regarding prevention of TB with selected demographic variables such as years of experience in caring the patient with tuberculosis and source of information regarding tuberculosis were significant at 0.05 level. Variables such as age, gender, education qualification, and personal history of infection with tuberculosis were not significant at 0.05 level. Therefore, the hypothesis stated there will be significant association between practice score of staff nurses regarding prevention of TB with selected demographic variables is accepted.

Table 11. Association of knowledge scores of staff nurses with selected demographic variables (N = 40).

Variables	Inadequate knowledge	Moderate knowledge	Adequate knowledge	Chi square x^2	Df	P-value (0.05)	Inference
1. Age in years.							
(a) 20–29	0	5	3	5.99	6	12.59	NS
(b) 30–39	4	4	3				
(c) 40–49	7	4	4				
(d) Above 50	2	3	1				
2. Gender							
(a) Male	3	5	3	0.24	2	5.99	NS
(b) Female	10	11	8				
3. Education qualification							
(a) G.N.M.	11	13	6	6.83	6	12.59	NS
(b) B.Sc. Nursing	0	2	4				
(c) Post B.Sc. Nursing	2	1	1				
(d) M.Sc. Nursing	0	0	0				
4. Years of experience in caring the patient with tuberculosis							
(a) Less than 5 years	2	7	3	4.48	6	12.59	NS
(b) 5–10 Years	2	2	1				
(c) 10–15 Years	7	4	6				
(d) More than 15Years	2	3	1				
5. Source of information regarding tuberculosis							
(a) Mass media	3	4	1	13.37	6	12.59	S
(b) Health workers	1	4	8				
(c) Books and journals	7	5	2				
(d) Family and friends	2	3	0				
6. Personal history of infection with tuberculosis							
(a) Yes	0	0	4	11.72	2	5.99	S
(b) No	13	16	7				

DISCUSSION

In the discussion, the major findings of the study are discussed with consideration of the objective and hypothesis of the study.

Demographic profile of staff nurses: Regarding the age of the staff nurses, the majority (37.50%) were aged between 40 and 49 years, followed by 27.50% aged 30–39 years, 20% aged 20–29 years, and 15% aged > 50 years. Regarding sex, the majority (72.50%) were female and 27.50% were male. For educational qualification, the majority (75%) had a G.N.M. and 15% had a B.Sc. Nursing: 10% had Post-Basic B.Sc. Nursing, and none had an M.Sc. Nursing.

Experience with TB patients: A majority (42.50%) had 10–15 years of experience, followed by 30% with less than five years, 15% with more than 15 years, and 12.50% with 5–10 years. Regarding the source of information regarding tuberculosis, the majority (35%) received information from books and journals, followed by 32.50% from health workers, 20%, mass media, and family and friends (12.50 %). Regarding personal history of tuberculosis infection, 90% did not have a personal history and 10% did.

Table 12. Association of practice scores of staff nurses with selected demographic variables (N = 40).

Variables	Poor practice	Averages practice	Good practice	Chi square x^2	Df	P-value (0.05)	Inference
1. Age in years							
(a) 20–29	0	5	3	3.31	6	12.59	NS
(b) 30–39	3	5	3				
(c) 40–49	2	9	4				
(d) above 50	1	4	1				
2. Gender							
(a) Male	2	7	2	0.68	2	5.99	NS
(b) Female	4	16	9				
3. Education qualification							
(a) G.N.M.	2	19	9	8.07	6	12.59	NS
(b) B.Sc. Nursing	2	2	2				
(c) Post B.Sc. Nursing	2	2	0				
(b) M.Sc. Nursing	0	0	0				
4. Years of experience in caring the patient with tuberculosis							
(a) Less than 5 Years	2	9	1	16.55	6	12.59	S
(b) 5–15 Years	2	3	0				
(c) 15–25 Years	1	6	10				
(d) More than 25 Years	1	5	0				
5. Source of information regarding tuberculosis							
(a) Mass media	0	7	1	12.73	6	12.59	S
(b) Health workers	2	6	5				
(c) Books andjournals	1	9	4				
d) Family andfriends	3	1	1				
6. Personal history of infection with tuberculosis							
(a) Yes	0	3	1	0.91	2	5.99	NS
(b) No	6	20	10				

Knowledge of Staff Nurses Regarding Prevention of TB

The findings of this study showed that 40% had moderate knowledge, 32.50% had inadequate knowledge, and 27.50% had adequate knowledge regarding the prevention of TB.

Practice of Staff Nurses in TB Prevention

The results of the study indicate that regarding tuberculosis prevention practices among staff nurses, 57.50% demonstrated an average level of practice, 27.50% exhibited good practice, and the remaining 15% displayed poor practice [39].

Correlation Between Knowledge and Practice of Staff Nurses in TB Prevention

The analysis revealed that the overall mean ± SD knowledge score was 18.68 ± 4.78 (equivalent to 62.27%), while the overall mean ± SD practice score was 10.93 ± 2.20 (equivalent to 72.87%). The calculated Pearson correlation coefficient was +0.351, indicating a positive relationship between knowledge and practice of tuberculosis prevention among staff nurses. Because this r value (0.351) exceeds the critical table value (0.195) at a significance level of 0.05, the hypothesis of a significant positive relationship between the overall knowledge score and the overall practice score is accepted [40].

Association of Knowledge Score with Selected Demographic Variables

The Chi-square test showed that the knowledge scores of staff nurses regarding TB prevention were

significantly associated (at the 0.05 level) with the demographic variables of "source of information regarding tuberculosis" and "personal history of tuberculosis infection." In contrast, variables including age, gender, educational qualification, and years of experience in caring for tuberculosis patients did not show a significant association (at the 0.05 level). Therefore, the hypothesis that there is a significant association between knowledge scores and selected demographic variables is accepted [41].

Association of Practice Score with Selected Demographic Variables

The findings indicated that the practice scores for TB prevention were significantly associated (at the 0.05 level) with the variables "years of experience in caring for a patient with tuberculosis" and "source of information regarding tuberculosis." However, age, gender, educational qualification, and personal history of tuberculosis infection did not show significant associations (at the 0.05 level). Accordingly, the hypothesis that there is a significant association between practice scores and selected demographic variables is accepted [42].

CONCLUSION

Conclusions were drawn from the findings and represent an integrated synthesis of the data. Crafting these conclusions entails logical reasoning and the creative construction of a meaningful whole from discrete pieces of information yielded through data analysis, as well as from previous research. It also involves sensitivity to subtle variations in data and openness to alternative explanations in the context.

Following detailed analysis, this study reached the following conclusions:

- A plurality (40%) of staff nurses demonstrated moderate knowledge regarding TB prevention, while 32.50% exhibited inadequate knowledge, and 27.50% showed adequate knowledge.
- With respect to practices concerning TB prevention, 57.50% of staff nurses were rated as having average practice, 27.50% had good practice, and 15% had poor practice.
- The correlation coefficient ($r = 0.351$) exceeded the critical table value ($r = 0.195$) at a significance level of 0.05. Thus, the 'r' value is statistically significant, indicating a meaningful positive relationship between overall knowledge scores and overall practice scores among the staff nurses.

However, the majority of the demographic variables of the staff nurses indicated a non-significant association with knowledge, except for the source of information regarding tuberculosis and personal history of infection with TB.

The majority of the demographic variables of the staff nurses indicated a non-significant association with practice, except years of experience in caring for patients with tuberculosis and source of information regarding tuberculosis.

Nursing Implications

The results of this study can be applied to various domains of the nursing profession.

Nursing Practice

Nursing practices should be based on scientific knowledge. Nurses can contribute to the profession by accumulating new knowledge regarding the use of self-care practices and testing old knowledge and practices. They can take on professional accountability to educate and motivate other staff members. Information about self-care practices to prevent the spread of TB is not always available in resource books commonly used by nurses. Hence, nurses working in hospitals and communities should enhance their knowledge regarding self-care practices to prevent the spread of TB through other means. Protocols should be kept in the nurses' working areas.

Nursing Education

Nursing education is vital for equipping nurses to promote the health and well-being of individuals and communities. To deliver effective care in modern healthcare settings, nurses must possess advanced

knowledge and deep understanding of their practices. Nursing students should be motivated to engage in creative and meaningful health education initiatives to support health promotion. The curriculum should integrate modern methods and strategies, offering students opportunities for innovation and hands-on experiences in delivering health education. This approach helps to expand awareness of self-care practices aimed at preventing the spread of tuberculosis (TB) across broader populations.

Nursing Administration

Nursing administration is crucial for overseeing and managing the nursing personnel. Administrators serve as the foundation for ensuring that nurses have access to resources and opportunities to enhance their knowledge about tuberculosis (TB) prevention. It is essential that nurses be given dedicated time to provide health education focused on self-care practices aimed at preventing the transmission of TB within the community. Furthermore, nursing administration should encourage skill development among staff members by promoting in-service training and continuing education programs. They should develop clear policy guidelines and provide relevant information, education, and training. There should be protocols to be made in wards regarding the use of self-care practices against pulmonary tuberculosis.

Nursing Research

Nursing personnel are important healthcare personnel close to patients and should take the initiative to conduct further research regarding self-care practices to prevent the spread of TB and provide correct information to improve knowledge regarding the prevention of TB. This research study enhances the scientific body of professional knowledge in the field of nursing science, including replicating the study in other healthcare settings, using a larger sample. There is a need for extensive and intensive research in the areas of knowledge, practice, and attitude of nurses regarding self-care practices to prevent the spread of TB, provision given by institutions, and economic and psychosocial support provided by nurse administrators and institution administrators.

Recommendations

- A similar study can be replicated on larger samples, thereby findings can be generalized.
- A comparative study can also be done between the other paramedical staff.
- Similar study can be done in different settings.
- A similar study can be undertaken with control group.
- A similar study can be undertaken by using different teaching methods.

Limitations

- *Sample* size was small (n = 40); hence, the generalization of the findings was limited.
- This study was conducted using a non-probability convenience sampling technique, thereby restricting the generalization of the findings.
- This study did not include a control group. The investigator had no control over the events that took place between the pre-test and post-test.
- Study is restricted to only nursing staff of a selected TB hospital at Jodhpur.
- The study is lim*ited to six weeks only.*

REFERENCES

1. World Health Organization. Global Tuberculosis Report. 2021. Geneva (CH): World Health Organization; 2021.
2. Central TB Division, Directorate General of Health Services, Ministry of Health and Family Welfare. TB India 2005: RNTCP Status Report – Frontline TB Care Providers Working Towards Freedom from TB. New Delhi (IN): Ministry of Health and Family Welfare; 2005.
3. Centers for Disease Control and Prevention. Clinical testing and diagnosis for tuberculosis. Atlanta (GA): Centers for Disease Control and Prevention; 2023.
4. Wani MR, Amin N, Yasmin B, Wani D. A descriptive study to assess the knowledge and practice

of self-care regarding transmission, prevention and management of pulmonary tuberculosis among staff nurses working at SMHS Hospital Srinagar with a view to develop an information booklet. Indian J Holist Nurs. 2022;13(1):1–6. doi:10.24321/2348.2133.202201.

5. Chavan YB, Shenoy PS. Tuberculosis among resident doctors and nurses in a tertiary care hospital: A case-control study. J Fam Med Prim Care. 2022;11(5):1771–1775. doi:10.4103/jfmpc.jfmpc_1089_21. PubMed PMID: 35800525.
6. Dwivedi R, Goswami D, Singh P, Singh K. Assessment of knowledge, attitude, practice (KAP) regarding directly observed therapy (DOT) in tuberculosis among ASHA workers from tribal subpopulation zone of Rajasthan. J Fam Med Prim Care. 2022;11(11):6783–6788. doi:10.4103/jfmpc.jfmpc_2258_21. PubMed PMID: 36993051.
7. Baral MA, Koirala S. Knowledge and practice on prevention and control of tuberculosis among nurses working in a regional hospital, Nepal. Front Med. 2022;8:788833. doi:10.3389/fmed.2021.788833. PubMed PMID: 35223880.
8. Erawati M, Andriany M. Determinants of latent tuberculosis infection among nurses at public health centers in Indonesia. Belitung Nurs J. 2022;8(1):28–34. doi:10.33546/bnj.1846. PubMed PMID: 37521074.
9. Sharma SK, Mandal A, Mishra M. Effectiveness of m-learning on knowledge and attitude of nurses about the prevention and control of MDR TB: A quasi-randomized study. Indian J Tuberc. 2021;68(1):3–8. doi:10.1016/j.ijtb.2020.10.013. PubMed PMID: 33641848.
10. Qader GQ, Seddiq MK, Rashidi KM, Manzoor L, Hamim A, Akhgar MH, et al. Prevalence of latent tuberculosis infection among health workers in Afghanistan: A cross-sectional study. PLoS One. 2021;16(6):e0252307. doi:10.1371/journal.pone.0252307. PubMed PMID: 34061873.
11. Krishnamoorthy Y, Ezhumalai K, Murali S, Rajaa S, Jose M, Sathishkumar A, et al. Prevalence and risk factors associated with latent tuberculosis infection among household contacts of smear positive pulmonary tuberculosis patients in South India. Trop Med Int Health. 2021;26(12):1645–1651. doi:10.1111/tmi.13693. PubMed PMID: 34654061.
12. Akande PA. Knowledge and practices regarding tuberculosis infection control among nurses in Ibadan, south-west Nigeria: A cross-sectional study. BMC Health Serv Res. 2020;20:280. doi:10.1186/s12913-020-05156-y. PubMed PMID: 32252759.
13. Sukartini T, Wibowo AE, Bakar A. The relationship of nurse characteristics with prevention behavior and control of pulmonary tuberculosis infection. Eurasian J Biosci. 2020;14(2): 2663–2668.
14. Nautiyal RG, Mittal S, Awasthi S, Singh RK. Knowledge about tuberculosis among pulmonary tuberculosis patients: A cross-sectional study from Uttarakhand. J Fam Med Prim Care. 2019;8(5):1735–1740. doi:10.4103/jfmpc.jfmpc_51_19. PubMed PMID: 31198746.
15. Dhaked S, Sharma N, Chopra KK, Khanna A, Kumar R. Treatment seeking pathways in pediatric tuberculosis patients attending DOTS centers in urban areas of Delhi. Indian J Tuberc. 2018;65(4):308–314. doi:10.1016/j.ijtb.2018.06.007. PubMed PMID: 30522618.
16. Kumar MG, Joseph B, Goud BR, Joseph M, Rajitha M. Risk of tuberculosis infection among healthcare workers in a tertiary care hospital in Bengaluru City. Indian J Occup Environ Med. 2019;23:83–89. doi:10.4103/ijoem.IJOEM_269_18. PubMed PMID: 31619881.
17. Singh K, Pabla H, Chawla S, A A, Pabla H, Chawla S. Awareness about tuberculosis among nurses working in a tertiary care hospital in Solan, Himachal Pradesh. Int J Community Med Public Health. 2019;6:3081–3086. doi:10.18203/2394-6040.ijcmph20192855.
18. Alotaibi B, Yassin Y, Mushi A, Maashi F, Thomas A, Mohamed G, et al. Tuberculosis knowledge, attitude and practice among healthcare workers during the 2016 Hajj. PLoS One. 2019;14(1):e0210913. doi:10.1371/journal.pone.0210913. PubMed PMID: 30682065.
19. Krithika SA, Jayanthi NN, Subramanian S. Awareness of tuberculosis among nurses. Int Arch Integr Med. 2018;5(4):153–160.
20. Hng SH, Siti Nabihah S, Siti Nabilah S. Knowledge and practice among nurses on management of tuberculosis in a teaching hospital. Med Health. 2018 Jun;13(1):153–164. doi:10.17576/MH. 2018.1301.15.

21. Van Rensburg AJ, Engelbrecht M, Kigozi G, Van Rensburg D. Tuberculosis prevention knowledge, attitudes, and practices of primary health care nurses. Int J Nurs Pract. 2018;24(6):e12681. doi:10.1111/ijn.12681. PubMed PMID: 30066350.
22. Janagond AB, Ganesan V, Vijay Kumar GS, Ramesh A, Anand P, Mariappan M. Screening of health-care workers for latent tuberculosis infection in a tertiary care hospital. Int J Mycobacteriol. 2017;6(3):253–257. doi:10.4103/ijmy.ijmy_82_17. PubMed PMID: 28776523.
23. Pardeshi GS, Kadam D, Chandanwale A, Deluca A, Khobragade P, Parande M, et al. TB risk perceptions among medical residents at a tertiary care center in India. Tuberc Res Treat. 2017;2017:7514817. doi:10.1155/2017/7514817. PubMed PMID: 29359043.
24. Gupta R, Sood A, Kaistha M, Bhardwaj A, Sharma T. Comparative study of knowledge and practices regarding tuberculosis amongst the nursing staff of medical college and peripheral health care unit. Int J Community Med Public Health. 2017;4(10):3625–3629. doi:10.18203/2394-6040.ijcmph20174222.
25. Bhandari SR, Bande R. Knowledge, attitude, and practice against tuberculosis infection control among medical students and nursing staff. J Contemp Med Dent. 2016;4(2):29–32.
26. Mirtskhulava V, Whitaker JA, Kipiani M, Harris DA, Tabagari N, Owen-Smith AA, et al. Determinants of tuberculosis infection control-related behaviors among healthcare workers in the country of Georgia. Infect Control Hosp Epidemiol. 2015;36(5):522–528. doi:10.1017/ice.2015.5. PubMed PMID: 25648218.
27. Kansal AR, Mahal R, Behera D, Sarin R. A study to assess learning need, knowledge, and attitude of nurses regarding tuberculosis care under RNTCP in two tertiary care tuberculosis institutions of Delhi, India. Asian J Nurs Educ Res. 2014;4(1):30–34.
28. Mathew A, David T, Thomas K, Kuruvilla PJ, Balaji V, Jesudason MV, et al. Risk factors for tuberculosis among health care workers in South India: A nested case-control study. J Clin Epidemiol. 2013;66(1):67–74. doi:10.1016/j.jclinepi.2011.12.010. PubMed PMID: 22521578.
29. Raviglione MC, Uplekar MW. WHO's new Stop TB Strategy. Lancet. 2006;367(9514):952–955. doi:10.1016/S0140-6736(06)68392-X. PubMed PMID: 16546550.
30. Richeldi L. An update on the diagnosis of tuberculosis infection. Am J Respir Crit Care Med. 2006;174(7):736–742. doi:10.1164/rccm.200509-1516PP. PubMed PMID: 16799073.
31. Rodriguez-Takeuchi SY, Renjifo ME, Medina FJ. Extrapulmonary tuberculosis: Pathophysiology and imaging findings. RadioGraphics. 2019;39:2023–2037. doi:10.1148/rg.2019190109. PubMed PMID: 31697616.
32. Sepkowitz KA. Tuberculosis and the health care worker: A historical perspective. Ann Intern Med. 1994;120(1):71–79. doi:10.7326/0003-4819-120-1-199401010-00012. PubMed PMID: 8250459.
33. Sia IG, Wieland ML. Current concepts in the management of tuberculosis. Mayo Clin Proc. 2011;86(4):348–361. doi:10.4065/mcp.2010.0820. PubMed PMID: 21454737.
34. Shaban D. (2017). Tuberculosis (TB): Causes, Symptoms, Treatment. [online] WebMD. Available from: https://www.webmd.com/lung/understanding-tuberculosis-basics
35. World Health Organization. Global Tuberculosis Report. Geneva (CH): World Health Organization; 2017.
36. World Health Organization. WHO Consolidated Guidelines on Tuberculosis: Module 2: Screening – Systematic Screening for Tuberculosis Disease. Geneva (CH): World Health Organization; 2021.
37. World Health Organization. (2026). Tuberculosis. [online] World Health Organization, Geneva (CH). Available from: https://www.who.int/news-room/fact-sheets/detail/tuberculosis
38. Azeredo ACV, Holler SR, de Almeida EGC, Cionek OAGD, Loureiro MM, Freitas AA, et al. Tuberculosis in health care workers and the impact of implementation of hospital infection-control measures. Workplace Health Saf. 2020;68(11):519–525. doi:10.1177/2165079920919133. PubMed PMID: 32502371.
39. Lacerda TC, Souza FM, Prado TND, Locatelli RL, Fregona G, Lima RCD, et al. Tuberculosis infection among primary health care workers. J Bras Pneumol. 2017;43:416–423. doi:10.1590/s1806-37562016000000211. PubMed PMID: 29340489.
40. Masuku S, Olorunju S, Mooa RS, van der Walt M, Peu MD. Association of knowledge and practice

of tuberculosis infection prevention and control policies among health care personnel at a regional hospital, in Gauteng Province of South Africa. Int J Afr Nurs Sci. 2023;19:100588. doi:10.1016/j.ijans.2023.100588.

41. Vigenschow A, Edoa JR, Adegbite BR, Agbo PA, Adegnika AA, Alabi A, Massinga-Loembe M, Grobusch MP. Knowledge, attitudes and practices regarding tuberculosis amongst healthcare workers in Moyen-Ogooué Province, Gabon. BMC Infect Dis. 2021 May 27;21(1):486. doi: 10.1186/s12879-021-06225-1. PMID: 34039304; PMCID: PMC8157668.
42. Wang XN, He TL, Geng MJ, Song YD, Wang JC, Liu M, Hoosdally SJ, Cruz ALG, Zhao F, Pang Y, Zhao YL, He GX. Prevalence of and risk factors for tuberculosis among healthcare workers in Chinese tuberculosis facilities. Infect Dis Poverty. 2018 Mar 24;7(1):26. doi: 10.1186/s40249-018-0407-6. PMID: 29592797; PMCID: PMC5872547.

