



Research Article

# Clinical Audit on Detection of Tuberculosis at Primary Health Care Corporation, Qatar

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## Abstract

**Background:** Tuberculosis (TB) caused by Mycobacterium tuberculosis (Mtb) is a highly infectious and contagious disease that usually infects the lungs and other parts of the body, such as brain, kidney, and bone [1]. Although, Tuberculosis (TB) is a treatable infection, however it can be fatal if not diagnosed and treated appropriately posing significant threat to the health of population with its associated morbidity and mortality [2]. According to World Health Organization (WHO), TB remained the most common cause of death from a single infectious pathogen in 2019. Considering the significance, TB control programs around the world emphasize on its early detection and immediate treatment to reduce the transmission of infectious cases [3]. Primary Health care providers play an essential role in detecting and diagnosing suspected TB cases, and referring them for treatment, thus helping to prevent spread of the disease [4]. Primary Health Care Corporation (PHCC) is a publicly funded primary healthcare provider in Qatar which provides healthcare services to a large part of the country's population. To address this important issue concerning public health, PHCC has developed and implemented Clinical Guidelines on Detection of TB, to enhance early detection of all TB probable and suspected cases, by providing disease specific protocol on the diagnosis, management, referral and follow up of TB patients and screening of contacts. **Aim:** To ensure that all TB probable and suspected cases are appropriately assessed, diagnosed, and referred in compliance with PHCC Guidelines on the detection of Tuberculosis in Primary Care, to find gaps if any and to generate an action plan for further improvement. **Methodology:** Data of all suspected (103) patients presenting to PHCC Health Centers during 1st Oct 2020 to 31st Mar 2021 was extracted for this audit. Retrospective case note review was conducted on the 103 records and data was collected against 4 audit specific criteria measures, which were selected based on the best practice evidence as derived from clinical guideline recommendations. The results of the audit were entered into a pre-formatted MS Excel for further analysis of the audit findings. **Results:** Based on the documented diagnosis in the medical records, majority of the cases, 93/103(90%) were suspected active TB infection and remaining 10/103(10%) were latent infection. Evidence of appropriate clinical assessment (active and latent TB infections) including the review of signs and symptoms and appropriate history documentation, was found in 83% (86/103) cases.

Reviewing the Compliance of diagnostic tests performed as per the guideline recommendation highlighted, Chest x-ray was requested in 54% (50/93) records of suspected Active TB cases; 46% (23/50) of those reported abnormal findings suggestive of active TB infection. On the other hand, Quantiferon/Skin testing was performed in 99% (102/103) records of suspected TB cases (Active and Latent TB infection) where 34% (35/102) showed positive findings suggestive of TB infection. Of the 35 cases with significant diagnostic test results (abnormal chest x-ray and/or positive Quantiferon/skin tests), 25(71%) followed-up at PHCC Health Centers whereas 10(29%) went directly to HMC. 92% (23/25) of the follow up cases complied with urgent referral as per the Guidelines recommendation and the remaining 8% (2/25) were referred as routine. Although the evidence supported appropriate referral in 92% cases, the completion of Infectious Diseases Notification Form in CIS to report TB cases was found in only 20% (5/25) of follow up cases. **Conclusion:** TB epidemic is worse than previously thought [2]. Compliance with the guidelines improves early case detection and management and prevents further transmission of disease. Findings from the audit evidenced optimal compliance with appropriate clinical assessments performed by physicians to support early detection of suspected cases however documentation needs to improve as per the best practice documentation policy at all levels. Utilization of Confirmatory diagnostic test such as Chest x-ray to confirm the positive findings should be requested for all suspected active TB cases, as only 54% cases had Chest Xray done as per the Guideline. Completion of Infectious Disease Notification form for reporting confirmed positive cases was found in 20% records. This requires optimization of TB notification system, to avoid unnecessary delays in diagnosis. Continuous efforts to improve compliance with best practice protocols for diagnosis, management and notification of suspected TB cases are required to ensure timely detection and prevention of the disease transmission, perhaps, improving patient safety and community health.

**Keywords:** Tuberculosis, Tuberculosis in Qatar, Detection of Tuberculosis, Diagnosis of Tuberculosis

**Abbreviations:** PHCC: Primary health care Corporation; MOPH: Ministry of Public Health; HMC: Hamad Medical Corporation; CDC: Communicable Disease Center; TB: Tuberculosis; QFT: Quantiferon Test; TST: Tuberculin Skin Test; DOTS: Directly Observed Treatment Strategy; WHO: World Health Organisation; GHC: Gulf Health Council ; BHI: Business Health Intelligence.

## Introduction

Tuberculosis (TB) is a major public health problem globally [3]. Each day over 4100 people lose their lives to TB and close to 28,000 people fall ill with this preventable and curable disease [4]. To address the global burden associated with TB the World Health Organization (WHO) since 1997 has published Global Tuberculosis (TB) report every year, which provides a comprehensive and up-to-date assessment on the status of the TB epidemic, the progress, and the targets at global, regional, and national levels [3].

Although, Tuberculosis (TB) is a treatable infection, however it can be fatal if not diagnosed and treated appropriately posing significant threat to the health of population [2]. TB remained the most common cause of death from a single infectious pathogen in 2019 [3]. The WHO Global TB report 2020 highlighted; an estimated 10.0 million people developed active TB disease in 2019 with 1.4 million TB deaths making TB the 10th leading cause of mortality worldwide [3]. Most cases were reported from South-East Asia (44%), Africa (25%), and the Western Pacific (18%) with adults accounting for 88% and children below 15 years of

age contributing to 12% of all people with TB. Considerably lesser cases were reported in the Eastern Mediterranean (8.2%), the Americas (2.9%) and Europe (2.5%) [3].

Similar to the global trend, Tuberculosis (TB) has remained a common health problem in the State of Qatar. A study conducted in 2018 to review the challenges associated with TB Elimination in Gulf Health Council (GHC) Member States, highlighted Qatar having the third highest incidences of TB in the Gulf region, following Iraq and Kuwait [5]. Qatar has a population that had increased exponentially during the last few years [5]. The remarkable growth which resulted primarily from the influx of larger population of expatriate workers needed to fulfil the country's ambitious development plans has contributed to the significant increase in incidence of TB in Qatar from 24/100,000 in 2015 to 34/100,000 in 2020, as per the latest WHO TB report, 2021 [3].

Ministry of Public Health (MOPH) Qatar supports the United Nations (UN) Sustainable Development Goals, committing to end the epidemic of tuberculosis along with other communicable diseases by 2030 through Implementation of effective Tuberculosis control programs, including effective diagnostic, reporting and treatment strategies [7]. In line with the objectives of Qatar's Public Health prevention strategy [7], Hamad Medical Corporation's (HMC) Communicable Disease Center (CDC), the region's first hospital dedicated to the diagnosis, treatment, and prevention of infectious diseases, in 2018, screened nearly 11,500 people for TB with a total of 1,271 patient getting admitted to the CDC's specialized TB wards as part of ongoing efforts to eradicate the disease; an increase of more than 70% compared to 2017 [8].

In Qatar all cases of TB get notified to the Communicable Disease Control and Prevention Section in the MOPH and due to the stringency of measures imposed on infectious disease control in Qatar, the incidence and prevalence of TB have been relatively lower compared to Asia and other high incidence countries but requires continuous commitment with interventions to improve care and strengthen preventive measures [5].

Global efforts to combat TB have saved an estimated 66 million lives since the year 2000 [3]. In 2020, the emergence of COVID-19 dislodged TB as the top infectious disease cause of mortality globally [3]. Due to the impact of COVID-19 global TB targets got hugely affected along with the reductions in TB case notifications and the patients' receiving treatment, which are speculated to be much worse in 2021 and 2022, highlighting the fragility of TB services globally [3].

WHO has recommended, directly observed therapy (DOT) as global strategy to control TB, ensuring availability and accessibility of diagnostic and treatment network easily to the population to achieve better treatment outcomes of TB patients and minimize contagious cases to reduce the transmission of disease [9]. Numerous studies published in recent years demonstrated TB diagnosis is in many cases subject to significant errors [10]. Missed or delayed diagnosis of TB can be catastrophic because it affects patients and community through delayed treatment, increased period of infectivity, consequently increased transmission of disease, and increased medical costs and mortality [10].

Primary Health care providers play a critical role in TB elimination by detecting TB suspects as a first point of contact in most cases, and referring them for treatment, thus helping to prevent spread of the disease. Ministry of Public Health (MOPH) Qatar adopted the DOT strategy, and Primary Health Care Corporation (PHCC) being the main primary care service provider in Qatar implemented the strategy. To support this strategy PHCC has developed clinical guidelines for detection of TB to provide appropriate care services at PHCC that support in early detection and diagnosis of TB patients and screening of contacts to control transmission of infection. As part of Quality assurance and clinical effectiveness plan, a clinical audit was conducted to evaluate the current practice compliance with Guidelines on the detection of Tuberculosis by the family physicians across the PHCC health centers and to ensure TB suspected patients are appropriately assessed, diagnosed, and referred for further management and follow up, to make recommendations for further improvement of services.

## Methods

### Definition

#### Tuberculosis (TB)

Tuberculosis, commonly known as TB, is a contagious and an often-severe airborne disease caused by a mycobacterial

infection. TB typically affects the lungs (Pulmonary TB), but it also may affect any other organ of the body (Extra Pulmonary TB).

#### Tuberculosis suspect case

Any person who presents with symptoms or signs suggestive of tuberculosis. The most common symptom of pulmonary TB is a productive cough for  $\geq 2$  to 3 weeks duration, which may be accompanied by other respiratory symptoms (shortness of breath, chest pains, and hemoptysis), and or constitutional symptoms (loss of appetite, weight loss, fever, night sweats and fatigue).

#### Latent tuberculosis infection

Latent tuberculosis refers to presence of *Mycobacterium tuberculosis* in the body without signs or symptoms, or radiographic or bacteriologic evidence of tuberculosis disease. The only sign of TB infection is a positive reaction to the tuberculin skin test or QuantiFERON blood test. Persons with latent TB infection are not infectious.

#### Active Tuberculosis Infection

Active tuberculosis refers to a multiorgan disease that occurs in someone infected with *Mycobacterium tuberculosis* characterized by signs or symptoms of active disease, or both. Active tuberculosis can be caused by primary infection or as a reactivation of latent tuberculosis and is distinct from latent tuberculosis infection, which occurs without signs or symptoms of active disease.

#### Data Source

PHCC operates an EHR system called CERNER which was the primary source of data collection and was used to retrieve information from the patient health records. The data was collected by conducting retrospective case note analysis to determine the compliance with appropriate assessment for suspected TB patients and the referral protocols for positive cases against 4 audit specific criteria measures selected, based on the best practice evidence derived from the PHCC Guidelines on the Detection of Tuberculosis.

#### Methodology

An extensive review of the literature was undertaken during the preparative phase of the audit by the author who was also responsible for data collection in collaboration with the BHI department. Report was extracted by BHI to retrieve the data for newly suspected TB cases across the 28 health centers under PHCC during the audit period 1st October 2020, to 31st March 2021 and the audit was conducted to review the 6 months practice at PHCC health centers. The inclusion criteria were all newly suspected TB patients who presented to PHCC Health Centers for screening and detection of TB. A total of 103 of electronic health records were retrieved from 14 health centers. The following

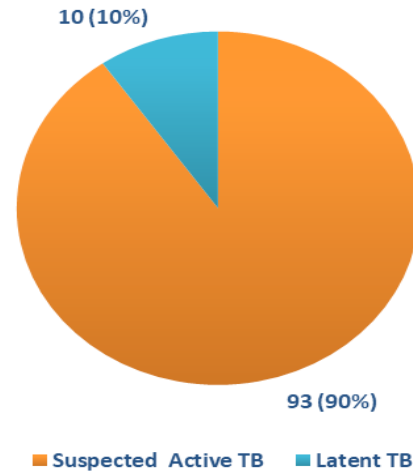
variables were extracted from the EHR for the target population: HC Number, Date of Birth, Age (Years), Gender, Health Center/ Location and Appointment Date. Patients which were already on TB treatment were excluded from the audit. Excel based audit tool was developed by incorporating information and data required to respond to the audit criteria. Data was entered to a pre-formatted MS Excel Audit tool, analyzed and then generated into tables.

**Ethical Considerations:** The audit was conducted to improve the quality of patient care and presented no risk of harm to the participants. There were no sources of information disclosure and the data presentation was anonymized.

**Results**

During the audit period, total 103 suspected TB cases presented to PHCC health centers. Further review of the case presentations elucidated, 93(90%) suspected active TB cases with symptoms and signs suggestive of active infection and 10(10%) latent TB cases which suggested reactivation of latent tuberculosis, as highlighted see in (Figure 1).

**Classification of TB cases**



**Figure 1:** Classification of Suspected TB cases

Audit Criteria	Number of Records Reviewed	Number of records with evidence of Compliance	Percentage Compliance
<b>Criteria 1:</b> Clinicians assessed, and suspected TB based on the following: <ul style="list-style-type: none"> <li>• Signs and symptoms</li> <li>✓ persistent cough of greater than 2-3 weeks and not responding to antibiotics</li> <li>✓ Cough for greater than 2-3 weeks with one additional symptom, including fever, night sweats, weight loss or hemoptysis</li> <li>• History (family and social) and being at risk</li> </ul>	103	86	83%
<b>Criteria 2:</b> Diagnostic tests of all suspected patients to confirm the disease <ul style="list-style-type: none"> <li>• 2a: Chest X-ray requested/done for suspected ACTIVE TB cases</li> <li>• 2b: QuantiFERON/Tuberculin Skin Test requested and done (ACTIVE/LATENT TB CASES)</li> </ul>	93 103	50 102	54% 99%
<b>Criteria 3:</b> Patients with evidence of diagnostic results (Chest x-ray and/or positive tuberculin/QuantiFERON test) referred as urgent referral to HMC-CDC for further management	25	23	92%
<b>Criteria 4:</b> Infectious Diseases Notification Form shall be completed for all positive cases based on diagnostic test	25	5	20%
<b>Total</b>	349	266	76%

**Table 1:** Summary of the Audit Findings on Detection of Tuberculosis Guideline.

**Table 1:** Above shows suboptimal overall Compliance of 76% (266/349) with the Guidelines on the detection of Tuberculosis.



**Criterion 1:** Evaluating appropriateness of the assessments performed illustrated an optimal level of compliance in 83% (86/103) cases, which had clear documentation of signs and symptoms as well as review of History to support the suspicion of TB. Remaining 17% records either had no evidence of clinical assessment done or assessment was not done as per the criteria above.

Criteria 2	Diagnostic test performed	Abnormal/ Positive Findings
2a: Chest X-ray for suspected ACTIVE TB cases	54%(50/93)	46%(23/50)
2b: QuantiFERON/Tuberculin Skin Test for suspected ACTIVE/LATENT TB cases	99%(102/103)	34%(35/102)

**Table 2:** Diagnostic tests performed to confirm findings suggestive of TB infection

**Table 2:** Shows the diagnostic tests performed as recommended by the Guideline along with the findings.

**Criterion 2:** As illustrated in (Table 2) above, reviewed compliance with diagnostic tests performed to confirm findings suggestive of TB infection. Results highlighted, Chest x-ray as per the recommendation of the Guideline was requested in 54% records of suspected active TB cases, where 46% of the cases which had chest Xray performed reported abnormal findings suggestive of TB infection. Whereas Quantiferon/Skin testing as per the Guidelines, was done in 99% records of suspected TB cases (active/latent infection), 34% of which showed positive findings suggestive of TB infection. Total 35 cases with positive diagnostic findings suggestive of TB infection confirmed by Abnormal Chest Xray/ Positive QuantiFERON/Tuberculin Skin Test, were identified.

**Criterion 3:** Assessing if the Patients with positive diagnostic findings had URGENT referral to HMC-CDC for further management showed that, only 25 cases out of the 35 suspected positive cases, had proof of follow up appointments and 93% (23/25) of the those complied with urgent referral done as per the Guidelines. The other 10 cases with positive diagnostic findings did not follow up at PHCC and went directly for specialist consultation to HMC.

**Criterion 4:** Evaluating Completion of Infectious Diseases Notification Form in Cerner for reporting all positive cases based on the results of the diagnostic tests performed demonstrated poor compliance with only 20% (5/25) cases having documentation of the form in CERNER highlighting the gaps in both documentation and reporting of TB cases.

## Discussion

TB is still common in Qatar as well in other GHC member states [5]. Although member states of Gulf Health Corporation (GHC) has made individual efforts to implement the TB elimination strategies recommended but based on the trends post advent of COVID-19 pandemic, TB incidence is likely going to increase globally and will continue in an unfavorable direction unless

critical consideration and actions to mitigate the threats that can reverse trends are adopted [5]. The primary objective of this audit was to evaluate TB diagnosis and reporting services at PHCC and identify areas where patient care can be improved. Overall results of the audit showed suboptimal compliance with TB screening, diagnostic, referral and follow-up systems of patients.

Generally, audit findings from appropriate clinical assessment performed by physicians in majority of the cases, evidenced good clinical practice by physicians towards the establishment of relevant clinical diagnosis. Conversely, compliance with diagnostic tests conducted to confirm findings suggestive of TB infection have not reported consistent results. Although almost full adherence to Diagnostic protocol of Quantiferon/ Tuberculin Skin Testing was achieved, but the Underutilization of Chest Xray to confirm the diagnosis in suspected active cases with only 54% compliance, highlighted opportunities of missed diagnosis. It has been demonstrated in various studies that the main cause of diagnostic errors in TB patients is missing basic diagnostic measures such as chest radiograph and sputum smear and culture, contributing to the unprecedented delay in diagnosis [10]. By missing and delaying the diagnosis of TB, the chances of controlling the spread of this disease are lost as these errors allow the organism to infect a number of other populations contributing to larger spread of infection [10].

The audit observed good compliance to the protocol of urgent referral to secondary care for further specialist consultation and management for the positive cases which came for follow up visit. However more than a quarter of our positive cases (29%) did not follow up with primary care physicians and went directly for specialist consultation to HMC accentuating the poor adherence with follow-up recommendations. Many studies in different countries noted that their problem of the referral system lies in the poor specialist referral process and communication between primary-care physicians and consultants. However, in

our audit the major issue was that the patients' point of contact during follow up in many cases was altered from primary care physician to a specialist or consultant at secondary care without appropriate referral or transfer leading to poor continuity of care, therefore compromising the quality and safety of patient care. No documentation was found to assess whether the patient went to secondary care to seek specialist review due to the severity of the symptoms or reasons otherwise such as patient preference, dissatisfaction or poor follow up arrangements at primary care level. The causes were unidentified as it was beyond the scope of the audit and will require further extensive review, but the findings emphasized on potential gap in the follow up system unable to trace patients to show up for scheduled follow-up appointments to primary physician.

Furthermore, the audit findings elucidated poor compliance with the policy of Infectious Disease Reporting including completion of the Infectious disease Notification form for all positive cases. This outlined the inconsistencies in documentation and notification of TB cases against the actual cases. Also highlighted in WHO's Global TB report 2021, a huge drop in TB case notifications in 2020 compared with 2019 globally; stressing that the gap between the number of people who fell ill with TB and the number of newly diagnosed and reported cases have widened substantially [3]. WHO 'End TB strategy' aims to eradicate TB deaths by 95% and lower the incidence of new TB cases by 90% between 2015 and 2035 [9]. Although anti-TB medicines have prevented millions of deaths around the world, but due to underreporting of TB cases the diagnostic and treatment gap still remains in place and requires sustained, concerted efforts and focus globally to reach TB pre-elimination by 2035 [10].

Qatar has a well-financed health system for Infectious Disease Control including the TB national programs for the diagnosis and treatment of TB but several challenges still exist including critical health system limitations in identification and treatment of high-risk populations such as the immigrants from high-risk countries, Diabetics and HIV cases [5]. However, with its strong governance and stewardship towards the TB control program Qatar is firmly directed to achieve the MOPH TB Elimination goals with ongoing support and collaboration between PHCC and the Communicable Disease Center of HMC.

Based on the results of our audit our recommendations focused on the following goals to improve effective diagnosis and reporting of TB, to minimize the damages with associated infectivity, thereby, effectively improving disease control in the community:

- (1) Raising health literacy of healthcare staff by conducting local health center-based audit to improve adherence to Guidelines and minimize public health burden associated with the disease,
- (2) Observe best practice clinical assessment of suspected TB using clinical reasoning to support the diagnosis and optimize utilization

of diagnostic test like chest x ray to confirm the diagnosis in TB cases,

- (3) Provide physicians feedback on the errors in the diagnosis and treatment process and the patient safety concerns, giving them opportunity to discuss cases in routine rounds at health center, departmental/Health Center Meetings, etc

- (4) Ensure appropriate referral and reporting of suspected cases through completion of Notification form as well as tracing of patients to show up on the scheduled follow-ups and

- (5) Sharing the findings on compliances with the Guideline to the Clinical staff at all levels specifically targeting the low compliance areas to enhance the TB control program and, perhaps, improved patient safety and community health.

## Conclusion

The Audit provided an overarching view of the present situation of TB detection and reporting, highlighting the primary care compliance with the appropriate use of the evidence based best practice protocols in the detection and diagnosis of TB cases within the community. From the lessons learnt from the Audit greater emphasis will be paid on the necessity of efforts to organize and improve the Communicable disease diagnosis, notification, referral and follow up systems to avoid any lapses in future and sustain the impact of TB control programs globally and, perhaps, improve patient safety and community health. Effective communication of TB cases to CDC, and coordination between different health authorities specially in countries with high burden of TB with other countries, in notification and follow up of active cases who are diagnosed abroad will help in future step to assess the appropriateness of treatment regimens and will further help in controlling the spread of disease. Reaudit will be conducted to ensure actions are taken to improve the compliances. Also, further action plan will be developed to improve criteria with low performance in the re-audit and will be measured in the next audit cycle. This cycle will continue until an optimal level of compliance is reached.

**Implication:** The continuous cycle of clinical auditing is a framework that allowed us to identify the needed areas of improvement in early TB case detection and management to control the disease and prevent its transmission by establishing SMART action plans to sustain the improvements.

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