

Evaluation of COVID-19 Impact on Tuberculosis Service Delivery in Northern Saskatchewan First Nations Communities: A Mixed-Methods Approach

Richa Tikoo¹ MD MPH, Emmanuel Dankwah^{1, 2} MPH PhD, Grace Akinjobi¹ MBBS MPH MSc, Tina Campbell¹ BScN, Nnamdi Ndubuka^{1, 2} MBBS PhD MPH

Corresponding author: Dr. Nnamdi Ndubuka. Email: nnubuka@nitha.com

¹Northern Inter-Tribal Health Authority, Prince Albert, Saskatchewan, Canada

²University of Saskatchewan, Saskatoon, Canada



ABSTRACT

Background

The Coronavirus disease 2019 (COVID-19) pandemic disrupted global health systems, disproportionately affecting vulnerable groups. This study examines its impact on TB care in northern Saskatchewan First Nations communities, highlighting challenges, adaptations, and improvement opportunities.

Methods

We conducted a mixed-methods study to examine the impact of the COVID-19 pandemic on TB service delivery in northern Saskatchewan First Nations communities. Quantitative data were extracted from administrative records to compare service indicators such as outreach activities, nurse visits, and staff training before and during the pandemic. Additionally, we carried out a structured survey with a purposive sample of 37 consented participants, including 25 TB health care workers (HCWs) and 12 clients. We analyzed quantitative data descriptively and applied thematic analysis to qualitative responses to identify disruptions, adaptations, and evolving challenges in TB care.

Results

Our study revealed significant disruptions in TB service delivery during the COVID-19 pandemic. In-person educational sessions dropped from 57% to 43%, while print media use declined from 59% to 41%. Community nurse visits decreased slightly from 52% to 48%. Training for TB workers and nursing staff increased markedly, from 35% to 65% and 36% to 64%, respectively. Also, the survey results showed that 42% of TB clients perceived a decline in care quality, with 84% experiencing longer appointment wait times and 76% facing clinic closures. Among healthcare workers, 72% reported reduced follow-up capacity, 44% noted medication shortages, and 40% observed fewer TB tests conducted. Additionally, 88% of HCWs faced challenges organizing educational sessions, with 56% reporting decreased attendance.

Conclusion

The COVID-19 pandemic exacerbated existing inequities in TB care across northern Saskatchewan's First Nations communities. Addressing these challenges are critical to sustaining TB control efforts and ensuring preparedness for future health emergencies.

Keywords

Tuberculosis, COVID-19, healthcare access, First Nations, northern Saskatchewan, pandemic

Introduction

The Coronavirus disease 2019 (COVID-19) pandemic has presented unprecedented challenges to global healthcare systems, straining resources and testing capacities across diverse settings (1–3). This crisis has disrupted essential health services, raising concerns about the continuity and quality of care delivery (4–6). The diversion of healthcare resources

towards COVID-19 response efforts has heightened apprehensions regarding the management of other prevalent health conditions, including tuberculosis (TB) (1,5).

Despite Canada's overall low incidence of tuberculosis, Indigenous populations continue to experience disproportionately high rates, influenced in part by the

lasting effects of colonialism, structural inequities, and underlying social determinants of health (7,8). In 2022, the TB rate among First Nations exceeded that of non-Indigenous Canadians by 71 times, while in northern Saskatchewan, rates were 621 times higher than the national non-Indigenous average (7,9). The region's demographic and socio-economic characteristics, with a predominantly First Nations population in remote and isolated areas, contribute to complex TB transmission dynamics and healthcare access challenges (8–10). Despite efforts to enhance TB prevention and control through community-based and culturally sensitive healthcare initiatives, the burden of TB persists in northern Saskatchewan (9,10).

The COVID-19 pandemic has added further complexity to TB care delivery in northern Saskatchewan (9,11). Managing two simultaneous public health crises has required rapid, adaptive strategies to protect vulnerable populations while striving to maintain essential health services (1,2,12). However, intersecting challenges have emerged, including interruptions in TB diagnosis and treatment, reduced healthcare access, and increased apprehension among both healthcare workers (HCWs) and clients (12,13). While TB is typically a chronic illness and COVID-19 presents more acutely, both are airborne diseases that can affect the lungs and share some symptoms, such as cough, fever, and fatigue. These partial overlaps, combined with concerns about COVID-19 transmission, may have contributed to challenges in TB diagnosis and reduced access to care globally (12).

To address these issues, urgent policy interventions are needed to minimize disruptions in TB care. Understanding COVID-19's full impact on TB service delivery and implementing effective mitigation strategies are crucial (14,15). We aimed to provide a comprehensive understanding of how COVID-19 affected TB case management and service delivery, contributing valuable evidence to guide pandemic-responsive local health system planning.

Methods

Study Design

We implemented a convergent mixed-methods design to evaluate how the COVID-19 pandemic affected TB service delivery in northern Saskatchewan First Nations communities. Our design enabled us to collect and analyze both quantitative and qualitative data concurrently, allowing for a more comprehensive understanding of the COVID-19 impact. Following the methodological guidance

of Fetters et al. (2013), this approach facilitated the integration of statistical findings with lived experiences, thereby enriching the interpretation of results (16).

Setting

Our study took place in the northern region of Saskatchewan, encompassing 33 remote and rural First Nations communities. These communities experience unique healthcare challenges due to geographic isolation and systemic inequities, making them particularly vulnerable to disruptions in care during public health emergencies such as the COVID-19 pandemic(9).

Participants

We engaged two primary groups in this evaluation: TB HCWs and TB clients. The HCWs included nurses, community TB workers, X-ray technicians, pharmacists, and other professionals actively involved in TB service delivery during the pandemic. Their responsibilities spanned diagnosis, treatment administration, patient follow-up, contact tracing, and health education. TB clients were defined as individuals diagnosed with active TB between 2020 and 2022 and receiving treatment during that period. All TB HCWs, including those of First Nations and non-First Nations ancestry, who provided care and First Nations individuals diagnosed with TB who accessed care between 2020 and 2022, were eligible for inclusion. Individuals who did not deliver or receive TB care during this timeframe were excluded from the study.

Data Sources and Data Collection

To assess changes in TB services, we collected both primary and secondary data. Primary data were collected through surveys with TB HCWs and clients selected using purposive sampling. All participants provided informed consent. Recruitment was facilitated through word of mouth, email communication, local health centers, and community outreach, with the assistance of community health staff. Secondary data were drawn from administrative TB program records. The surveys were designed in partnership with participating First Nations communities to ensure cultural relevance and contextual appropriateness. Data collection took place over a four-week period in June 2022.

We distributed two separate surveys, one for HCWs and another for TB clients. Both instruments featured a combination of Likert-scale questions and open-ended prompts. This design enabled us to quantify perceptions while also capturing narrative accounts of service disruptions, adaptations, and community responses.

HCWs received the surveys electronically via email, whereas clients completed theirs in-person during home or clinic visits, ensuring accessibility for participants with limited internet access. Informed consent was obtained from all participants prior to survey completion.

We also extracted administrative data from local TB program records to examine trends in community education sessions, healthcare provider training, and TB nurse visits. These data were segmented into two timeframes: the pre-pandemic period (2018–2019) and the pandemic period (2020–2022), allowing for comparative analysis of service delivery before and during COVID-19.

Data Analysis

We conducted separate analyses for quantitative and qualitative data before integrating findings during the interpretation phase. This approach allowed us to identify areas of convergence and divergence across the datasets, thus enhancing the robustness of our conclusions.

For the quantitative component, we used descriptive statistics to analyze closed-ended survey responses and administrative data. We calculated frequencies and percentages, which were then presented in tables and visual formats to illustrate trends and distributions. Data entry was completed using Microsoft Excel, and all statistical analyses were performed using Stata version 14 (StataCorp, Texas, USA).

Qualitative responses were reviewed thematically, identifying recurring patterns related to access barriers, adaptive strategies, and community needs during the pandemic. These themes were then juxtaposed with quantitative findings to inform a richer, contextualized interpretation of the impact on TB services.

Ethical Considerations

In accordance with Article 2.5 of the Tri-Council Policy

Statement: Ethical Conduct for Research Involving Humans (TCPS 2, 2022), our evaluation qualifies as a program evaluation and does not require REB review. Article 2.5 states: “Quality assurance and quality improvement studies, program evaluation activities, and performance reviews... when used exclusively for assessment, management or improvement purposes, do not constitute research for the purposes of this Policy, and do not fall within the scope of REB review.” Our evaluation was part of the broader NITHA TB Program Review, approved by NITHA leadership, and carried out in alignment with OCAP® principles and culturally appropriate ethical practices.

Results

Our evaluation of administrative records and survey data from TB HCWs and clients revealed substantial disruptions in TB service delivery across northern Saskatchewan First Nations communities during the COVID-19 pandemic.

Administrative Records: Changes in TB Program Activities

Our analysis of TB program data highlighted changes in service delivery, outreach, and training (Table 1). Prior to COVID-19, in-person education was the primary engagement method, accounting for 57% (17 of 30) of sessions. This declined to 43% (13 of 30) during the pandemic as remote communication became more prominent. Print materials dropped from 59% (201 of 339) to 41% (138 of 339). Notably, radio messaging emerged as a new strategy, comprising 100% (3 of 3) of audio-based outreach.

Community TB nurse visits decreased slightly, from 52% (101 of 195) pre-pandemic to 48% (94 of 195) during COVID-19. In contrast, training activities increased significantly. TB worker training rose from 35% (26 of 74) to 65% (48 of 74), while nursing staff training increased from 36% (20 of 56) to 64% (36 of 56).



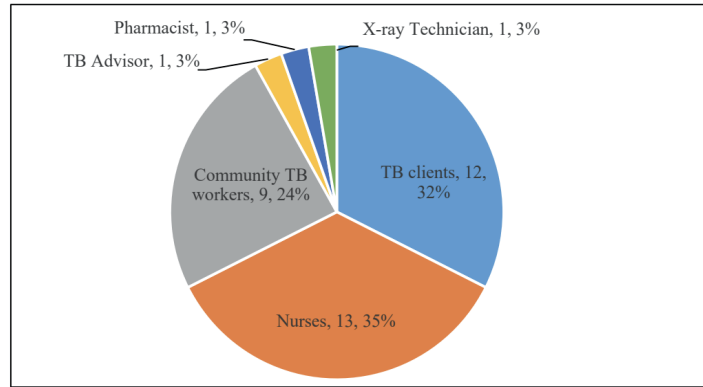
Table 1. TB service delivery before and during the COVID-19 pandemic					
Characteristics	Total	Pre-COVID-19 Pandemic		COVID-19 Pandemic	
	Number	Number	%	Number	%
Community Education and Awareness					
In-person educational sessions	30	17	57%	13	43%
Print Media (newsletters, pamphlets and posters)	339	201	59%	138	41%
Audio (radio messages)	3	0	0%	3	100%
Nurse Visits					
Community nurse visits	195	101	52%	94	48%
Staff Training sessions					
TB worker training	74	26	35%	48	65%
Nursing staff training	56	20	36%	36	64%

Survey Findings: TB Client and HCW Perspectives

All 37 participants completed the surveys in full. As a result, all descriptive statistics were calculated using the complete dataset, with no missing responses. Of the 37 survey respondents, 12 (32%) were TB clients and 25

(68%) were HCWs. Among HCWs, 35% were TB nurses, 24% community TB workers, and others included X-ray technicians and pharmacists (Figure 1). All HCWs were female. TB clients were 67% female, with half aged 29 or younger.

Figure 1. Distribution of Study Respondents



TB Clients' Perspectives

Figure 2 showed that TB clients reported that TB services declined during the pandemic. Around 42% perceived a reduction in care quality, and 25% expressed dissatisfaction. Reported challenges included long wait times (84%), clinic closures (76%), diagnostic delays (59%), and transportation issues (58%). One client noted, "Before the pandemic, TB care was easier."

Staffing shortages were felt directly—59% reported fewer clinic staff, and 42% received care remotely rather than in-person. Psychosocial concerns also surfaced: 25% felt fear or stigma due to overlapping TB and COVID-19 symptoms, though 66% still felt comfortable attending clinics. One participant shared, "I kept telling my brother to get tested, but he couldn't access the community health clinic."

Client feedback on TB education was mixed. Only 33% felt adequately informed by outreach materials, and 50% believed educational efforts had weakened during the pandemic. One participant remarked, "The quality of education regarding TB risk factors was better before COVID-19."

TB HCWs' Perspectives

A prevailing sentiment among HCWs was that TB services became a lower priority: "Everyone forgot about TB because COVID-19 took over." About 40% reported challenges in delivering TB care, and 44% noted medication supply issues. Attendance dropped, with 36% observing fewer clients and 64% modifying medication delivery methods (Figure 3).

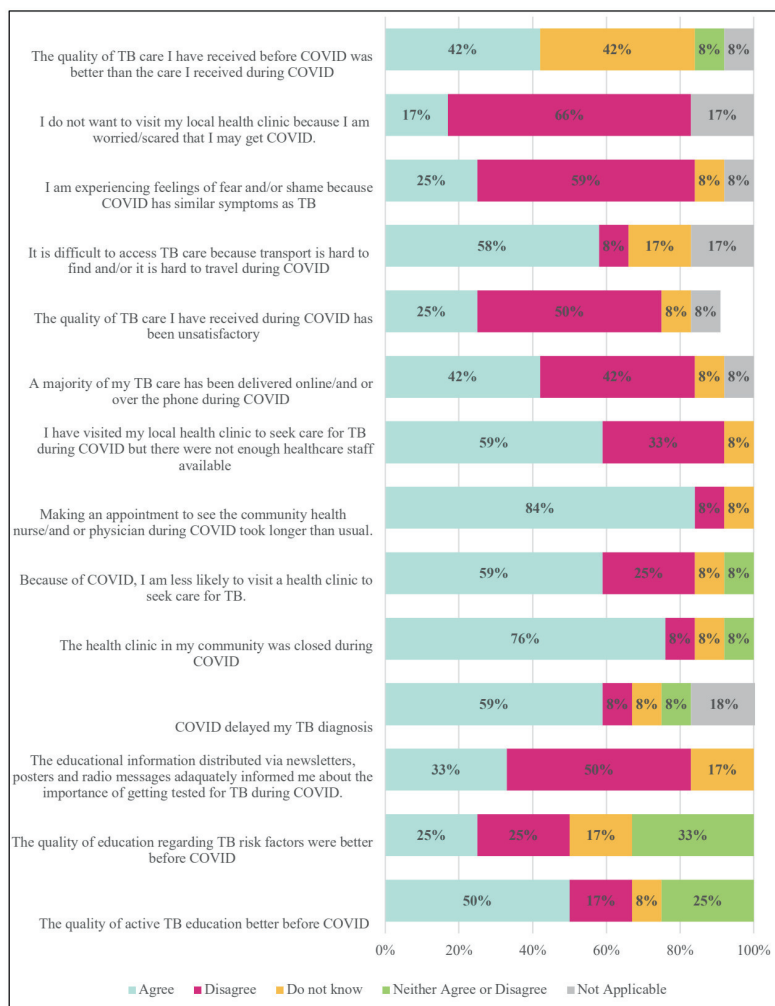
Follow-up care was significantly affected—72% stated their capacity to deliver it had decreased.

Key activities like contact tracing, and testing suffered, with 44% reporting a reduction in these services. Staff reassignments further strained resources, with 44% of HCWs redirected to COVID-19 duties. One commented, "Having a full-time TB nurse would be helpful. We've had too many casual nurses, and things like TSTs and contact tracing fall through the cracks."

Additionally, 36% observed a decline in patients visiting clinics for treatment. This was exacerbated by barriers such as limited access to medical transportation. One HCW noted, "Reduce barriers to sending clients by medical taxi... it became more difficult during the pandemic."

Public health functions were similarly impacted. Seventy-two percent reported reduced contact tracing, and 68% noted interruptions in TB screening. Several HCWs

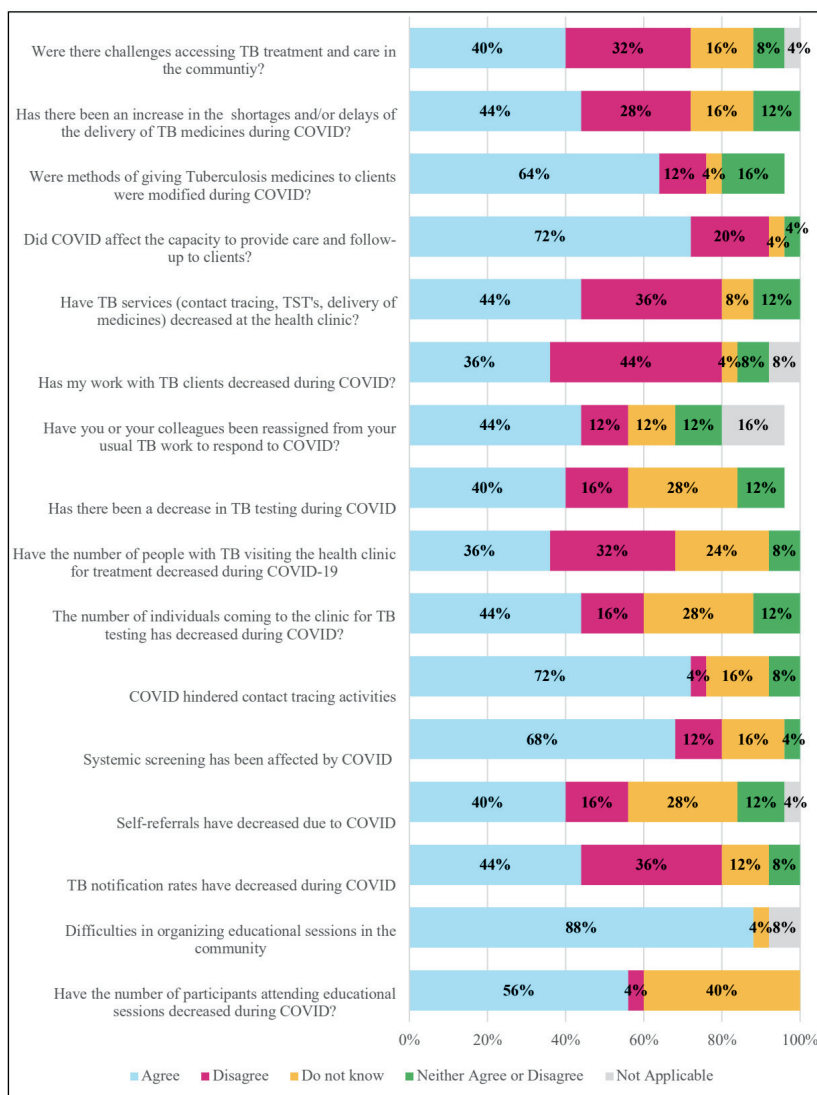
Figure 2. TB Clients survey questions and responses



mentioned the value of mobile clinics in restoring access, with one stating, "The resumption of mobile clinics with mobile x-rays has been crucial in restoring access to care."

Finally, community outreach faced severe disruptions. Eighty-eight percent of HCWs had difficulty organizing education sessions, and 56% noted reduced attendance—showing how the COVID-19 pandemic hindered not only clinical services but also essential health promotion activities.

Figure 3. Health Care Worker survey questions and responses



Mixed Methods Integration: Narrative Synthesis

The administrative data, quantitative survey results, and qualitative narratives all align to present a consistent picture of how TB services were disrupted during the COVID-19 pandemic. Many clients in the quantitative responses indicated decline in care quality and longer wait times, with some expressing in qualitative interviews that TB care was much easier before the pandemic. HCWs shared in qualitative narratives that their capacity for patient follow-up and contact tracing was reduced, often feeling that TB was deprioritized amid the COVID-19 response. This was supported by administrative

data showing fewer nurse visits. Education and outreach efforts also suffered, with clients in the quantitative surveys perceiving a drop in the quality of TB education. Administrative records indicated a decline in print materials and an increased reliance on radio messaging as an alternative method. Staffing challenges were notable in the quantitative survey data, reporting fewer clinic staff and changes in medication delivery. HCWs emphasized in qualitative data the importance of having dedicated TB nurses to prevent care gaps. Finally, administrative data documented increased staff training and orientation efforts, usually for new personnel.

Table 2. Summary of mixed-methods findings on TB service impacts amid COVID-19

Theme	Quantitative Survey Data	Qualitative Quotes	Administrative Data
Service Access	42% of clients reported reduced care quality and 84% experienced longer wait times	“Before the pandemic, TB care was easier.”	Shift in service delivery focus; Decline in in-person sessions
Follow-up & Contact Tracing	72% of HCWs reported reduced follow-up capacity; 44% noted decreased contact tracing	“Everyone forgot about TB because COVID-19 took over.”	Decline in nurse visits
Education & Outreach	50% of clients felt TB education weakened during the pandemic	“The quality of education regarding TB risk factors was better before COVID-19.”	Decline in print materials; emergence of radio messaging
Staffing	59% noticed fewer clinic staff; 64% HCWs changed medication delivery	“Having a full-time TB nurse would be helpful... things fall through the cracks.”	Increased staff TB training and orientation

Discussion

Our study provides critical insight into the disruptions caused by the COVID-19 pandemic on TB service delivery in northern Saskatchewan, particularly within First Nations communities. Triangulation of administrative records, survey responses, and participant narratives revealed consistent patterns of disruption to TB services during the COVID-19 pandemic. Together, these data sources reinforce one another, demonstrating that TB care faced significant interruptions, reduced outreach, and strained staffing, thereby validating the study’s overall findings. While disruptions to healthcare were experienced across many regions during the COVID-19 pandemic, the barriers identified in this study were heightened in First Nations communities perhaps due to persistent structural disadvantages (10,11).

TB Clients’ Perspectives

Clients’ voices in our study revealed deep concerns about healthcare quality and access during the pandemic. Many cited fears of stigma, especially due to overlapping symptoms between COVID-19 and TB, which led to reluctance in seeking care. This stigma compounded existing access issues and parallels observations from other regions where TB patients experienced increased social isolation and anxiety (2,12,17). In addition, transportation emerged as a key structural barrier to care, a recurring issue in the remote and rural communities, consistent with some existing literature (2,12,15). Inaccessibility to reliable transportation continues to hinder timely care, perpetuating health inequities and exacerbating disease burden.

We also documented delays in TB diagnosis and disruptions in appointment scheduling. These challenges may reflect both the broader pressures of the pandemic response and pre-existing vulnerabilities in service delivery, emphasizing the need for responsive, client-centered care models, especially during public health emergencies (15,18). In response to COVID-19 pandemic-related risks, healthcare systems pivoted toward virtual care. While telephone and online consultations offered a safe alternative, they were not always accessible or culturally appropriate, limiting their effectiveness (19,20).

The pandemic’s toll extended to healthcare infrastructure itself. Clinic closures and the reduced availability of HCWs significantly impeded TB care delivery. Our findings reinforce earlier reports pointing the vulnerability of rural health systems and the critical need for resilient infrastructure and workforce capacity during crises(5,21).

Participants also expressed dissatisfaction with educational materials, pointing to a disconnect between communication tools and cultural relevance. This gap indicates a broader need for inclusive health promotion strategies. Literature strongly supports the need to design health information that resonates with the cultural values and communication preferences of Indigenous communities (2,22). We echo calls for health systems to invest in culturally sensitive approaches that foster genuine engagement and trust (20)

TB HCWs’ Perspectives

The HCWs we interviewed consistently reported that COVID-19 restrictions impeded routine TB care delivery.

Their experiences emphasized logistical and systemic barriers, including medication shortages and delays in supply chains challenges that mirror global patterns seen in other healthcare systems during emergencies (2). Despite these constraints, HCWs adapted by modifying medication delivery strategies and adopting creative solutions to maintain continuity of care, consistent with a previous study (1). These innovations reflect the resilience and commitment of frontline staff, yet such adaptations were insufficient to offset broader service interruptions. Service disruptions particularly in follow-up and treatment monitoring remained a persistent concern. Reassignment of healthcare staff from TB-specific duties to pandemic response roles further strained local capacity, reducing both TB screening and management efforts. Our findings align with previous studies that documented similar workforce reallocation and its impact on TB services globally (5,21).

We also observed declines in TB testing and treatment-seeking behavior, raising alarms about the COVID-19 pandemic's indirect impact on disease surveillance and control. Clients avoided clinics out of fear of COVID-19 exposure, while healthcare providers struggled to maintain screening and contact tracing programs. These findings corroborate previous work that showed reduced TB detection and weakened case-finding infrastructure during the pandemic (5,21). Importantly, contact tracing and systematic screening are foundational to TB control in high-burden settings. Our data indicate that these activities suffered significantly, supporting earlier assertions about setbacks in TB control due to COVID-19 pandemic-related disruptions (6,10,23).

Education and outreach also encountered major setbacks. Public health restrictions, coupled with low client turnout, undermined efforts to deliver TB-focused educational sessions. This decline shows an urgent need for targeted, culturally appropriate health communication to counter misinformation and re-engage clients. Prior research revealed the role of customized interventions in shaping health-seeking behavior, particularly among marginalized populations (24,25). Community trust in the healthcare system can only be strengthened through inclusive engagement strategies and locally tailored messaging (15,26).

Strengths and Limitations

Our mixed-methods design, combining quantitative data with qualitative narratives from HCWs and TB clients, allowed for a rich, context-specific exploration of COVID-19 pandemic-related disruptions. Our program evaluation involved First Nations individuals diagnosed with TB and

included healthcare workers, some of whom were of First Nations ancestry. While not all staff shared cultural backgrounds with the communities served, the evaluation was guided by OCAP® principles and informed by community engagement, offering insights grounded in local context and respectful of First Nations data sovereignty. However, we acknowledge several limitations: the use of self-reported data may introduce potential bias, the cross-sectional design might limit causal inference, and the study's geographic focus may constrain extrapolation. The small sample size, particularly among TB clients, may limit the statistical power of the quantitative data and restrict the generalizability of the findings. The limited four-week data collection period may have excluded seasonal variations and reduced overall participation. However, the range of participants and TB experiences captured during the pandemic may help to partially mitigate this limitation. Our interpretation focused on patterns, proportions, and qualitative insights rather than direct year-to-year comparisons, to reduce potential bias from differing durations. Future research should incorporate longitudinal approaches and larger, more diverse samples to further elucidate the evolving impacts of health emergencies on TB care.

Conclusion

Our findings reveal that the COVID-19 pandemic significantly disrupted TB service delivery in northern Saskatchewan's First Nations communities, amplifying pre-existing health inequities. Barriers such as healthcare worker shortages, medication delays, stigma, and limited access to culturally appropriate care undermined TB prevention and treatment efforts. While healthcare workers showed adaptability, systemic gaps persisted. Strengthening healthcare resilience may require culturally informed, community-led approaches, sustainable infrastructure, and targeted outreach. Prioritizing First Nations health sovereignty and equity is essential to ensure continuity of care and prepare for future health emergencies. These lessons must inform policy and practice to protect vulnerable populations and reduce TB burden sustainably. Future research should further explore how program-specific factors influence the continuity and resilience of health services during public health emergencies.

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