

Healthcare workers' perceptions of decentralised COVID-19 testing using GeneXpert platforms in Tanzania and Burkina Faso: Implications for outbreak management and pandemic preparedness

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Abstract

Background

Accurate and timely diagnosis is essential for effective management and containment of Corona Virus Disease 2019 (COVID-19) caused by severe acute respiratory coronavirus 2 (SARS-CoV-2). During the pandemic, reliance on overwhelmed central laboratories delayed confirmation of suspected cases in resource-limited settings. Decentralised testing using existing GeneXpert at district and regional facilities has the potential to improve diagnosis, case management, and preparedness for both SARS-CoV-2 and future outbreaks. While GeneXpert platforms have been widely repurposed for SARS-CoV-2 testing, evidence on frontline healthcare workers' perceptions of their implementation in sub-Saharan Africa remains limited. Therefore, this study explored health workers' perceptions of decentralised COVID-19 testing using GeneXpert point-of-care in Tanzania and Burkina Faso to inform future epidemic preparedness.

Methods

A cross-sectional exploratory qualitative study was conducted in Tanzania and Burkina Faso between May and October 2023. Healthcare workers involved in SARS-CoV-2 detection, diagnosis, and patient care were purposively selected for semi-structured in-depth interviews using an open-ended guide to explore their experiences and perspectives. All interviews were audio recorded, transcribed verbatim and analysed using thematic analysis. Data management, coding, and thematic analysis were facilitated using MAXQDA software.

Results

Five key themes emerged from the analysis: awareness of SARS-CoV-2 and COVID-19 pandemic; familiarity with and perceived advantages of the point-of-care (POC)-Xpert Xpress SARS-CoV-2 test; the perceived added value of decentralised SARS-CoV-2 testing for patients with suspected COVID-19; the influence of the POC Xpert Xpress SARS-CoV-2 test on clinical decision-making and its role in epidemic response. Participants demonstrated a strong understanding of SARS-CoV-2 and COVID-19, recognised the diagnostic challenges associated with the disease and consistently emphasised the importance of decentralising SARS-CoV-2 testing through existing GeneXpert platforms to improve timely diagnosis, guide appropriate clinical management, strengthen outbreak containment, and enhance preparedness for future epidemics.

Conclusion

Healthcare workers viewed decentralised SARS-CoV-2 testing using GeneXpert as a valuable way to improve diagnostic access, speed up clinical decisions, and strengthen outbreak response in resource-limited settings. By bringing testing closer to patients, it can reduce turnaround times, improve clinical patient management, and enhance epidemic preparedness. These findings support further investment and research to optimise decentralised testing in routine care.

1. Introduction

According to the World Health Organisation's (WHO) latest global estimates dashboard on the Corona Virus Disease 2019 (COVID-19) pandemic, until July 2026, there were over 779.3 million cumulative cases (1) of COVID-19 with 7.1 million accompanying deaths (2). A major concern during disease outbreaks of public health concern, including the COVID-19 pandemic, is that once the healthcare infrastructure is overwhelmed; testing is only done on individuals with severe symptoms and suspected cases, leaving asymptomatic, uncomplicated and pre-symptomatic cases undetected (3). These undetected cases may serve as a potential reservoir in the community for subsequent serial transmission. This often increases the risk of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection among vulnerable individuals, suspected COVID-19 cases, and healthcare workers, while exposing infected individuals to severe disease and complications (4).

Accurate, rapid and readily available diagnostic tests for diagnosing individuals infected with SARS-CoV-2, the causative agent for COVID-19, are essential for implementing early case detection and management of suspected, pre-symptomatic and uncomplicated cases to control the spread of the deadly virus (5). Reliance on centralised testing at national reference laboratories frequently leads to delays in results provision, largely due to logistical challenges such as sample collection and transportation as well as reliance on real time reverse transcriptase polymerase chain reaction (rRT-PCR) (6, 7). Therefore, the availability and decentralisation of the point-of-care (POC) molecular testing are considered crucial for identifying infected individuals and accurately assessing viral shedding during the convalescence phase. The World Health Organisation has strongly emphasised the need for more intensive and widespread testing of suspected cases to identify SARS-CoV-2 infected individuals for immediate isolation, enabling contact tracing and quarantining to mitigate the rapid spread of the virus (8).

There are several diagnostic tests for diagnosing individuals suspected of having COVID-19 (9–11). The detection of viral RNA to SARS-CoV-2 in respiratory tract samples using SARS-CoV-2 specific rRT-PCR is considered the gold standard (12). However, in many resource-constrained countries such as Tanzania and Burkina Faso, diagnostic facilities and access to rRT-PCR are challenging. These tests are time-consuming and are performed in centralised reference laboratories that face shortage of skilled staff, unreliable transportation networks, and inefficient systems for specimen and result delivery (13).

The GeneXpert molecular POC (Xpert® Xpress SARS-CoV-2/Flu/RSV test assay), (Cepheid Sunnyvale, CA) is an automated POC test for the qualitative detection of SARS-CoV-2 in respiratory tract samples of

patients suspected of COVID-19 and has rapid turnaround time (TAT) (14) (15). Short TATs are crucial not only for case tracing and assisting clinicians in patient management but also in situations requiring urgent treatment and processing and testing of large numbers of samples. GeneXpert has been widely implemented within national tuberculosis (TB) and human immunodeficient virus (HIV) programmes across Africa (16). However, the evaluation of its diagnostic accuracy and the feasibility of its integration with other programmes such as testing for SARS-CoV-2 have not been conducted in resource-constrained settings such as Tanzania and Burkina Faso.

Compared to rRT-PCR, GeneXpert POC systems for SARS-CoV-2/Flu/RSV offer considerable potential for rapid case detection, as they require less sophisticated infrastructure and are designed for ease of use by operators with minimal training and experience (17). The system can therefore be widely deployed across broader geographical regions in resource-constrained settings. However, before its wider deployment in these settings, it is imperative to assess its feasibility in the selected healthcare settings.

Effective outbreak management requires engagement with healthcare stakeholders to identify practical local solutions (18). Rapid POC testing can support triage, isolation, and treatment decisions (19), while limited diagnostic capacity continues to delay public health response in resource constrained settings (20). The WHO's call to "test, test, test" highlighted the importance of knowing who is infected during a pandemic (21). Point-of-care devices that are rapid, robust, cost-efficient, usable in remote settings are therefore critical for surveillance and containment (22).

Within the EXPERT-CoV-2 project, we evaluated the diagnostic accuracy and operational implementation of the POC Xpert® Xpress SARS-CoV-2/Flu/RSV assay for patient management, case detection, contact tracing and isolation among individuals suspected of SARS-CoV-2 infection (manuscript in preparation). This qualitative sub-study, explored healthcare workers' perceptions of using district- and health-centre-based GeneXpert platforms for decentralised SARS-CoV-2 testing. Tanzania, for example, had 342 GeneXpert devices across 306 testing sites by the end of 2023, providing an existing molecular diagnostic network that could support integration with testing for other infectious diseases (23).

2. Methodology

2.1. Study Area

The study was conducted between May and October 2023 in selected health facilities in Tanzania (Fig. 1) and Burkina Faso (Fig. 2) that had GeneXpert devices and participated in the EXPERT-CoV-2 study. Sites were purposively selected to represent lower-level health facilities where decentralised molecular testing could reduce reliance on national reference or zonal laboratories.

2.2. Study Design and Approach

A cross-sectional exploratory qualitative study was conducted using IDIs with key informants (KIs) to obtain comprehensive insights into healthcare workers' perceptions and experiences of decentralised

SARS-CoV-2 testing using GeneXpert platforms. This design was selected to facilitate an in-depth exploration of the contextual factors, implementation experiences, perceived benefits, and challenges associated with integrating decentralised COVID-19 diagnostic services into existing healthcare systems.

2.3. Target Population

Participants were clinicians, nurses, and laboratory personnel directly involved in COVID-19 diagnosis, patient care, or implementation of the EXPERT-CoV-2 study at selected health facilities in Tanzania (Fig. 1) and Burkina Faso (Fig. 2).

2.4. Sampling Method

Purposive sampling was employed to select KIs because it enables the deliberate recruitment of information-rich participants with relevant knowledge, expertise, and experience of the phenomenon under investigation (24). At least two professional healthcare workers from each selected cadre were chosen from each health facility or institution, making a total of 35 participants for Tanzania and Burkina Faso.

2.5. Inclusion and exclusion criteria

Eligible participants were healthcare workers at the selected facilities who participated in EXPERT-CoV-2 implementation and provided written informed consent. Individuals who were ill, absent during data collection or unwilling to consent were excluded.

2.6. Gathering and processing of data

Interviews were conducted in Kiswahili in Tanzania and French in Burkina Faso by experienced social scientists and trained research assistants using semi-structured, open-ended IDI topic guides. The semi-structured interview guides were specifically developed based on the study objectives, research question, appropriate literature and the local implementation context (Supplementary file 1). The questions in the topic guides aimed to investigate healthcare professionals' views on the SARS-CoV-2 testing using the GeneXpert- POC technology, available as part of HIV/TB programmes at regional and district healthcare facilities.

Before each interview, participants were provided with information about the study and gave written informed consent. With participants' permission, interviews were audio-recorded and supplemented by field notes. A total of 35 IDIs were conducted in private locations convenient to the participants; with each interview lasting approximately 45 minutes, and data collection continued until thematic saturation was reached.

2.7. Data Management and Analysis

Data were thematic analysed using Braun and Clarke's six phase approach (2006) (25). Interviews were transcribed verbatim, translated into English, and checked against audio-recordings for accuracy. The

team read transcripts repeatedly, generated and reviewed codes, resolved discrepancies through discussion, and organised agreed codes into categories and themes aligned with the study objectives. MAXQDA supported data management, coding, and theme organization.

2.8. Quality Assurance and Trustworthiness of the Study Findings

The study team completed a refresher International Conference of Harmonisation Good Clinical Practice (ICH-GCP) training before field work. The principal investigator also trained research assistants and co-investigators on the study protocol and SOPs before data collection began. The trustworthiness of the study findings was ensured by applying the four criteria for rigour in qualitative research: credibility, transferability, dependability, and confirmability (26). Credibility was enhanced through the purposive selection of information-rich participants, systematic engagement with the study data, and member checking, whereby preliminary interpretations were reviewed with selected participants to confirm the accuracy and relevance of the findings. Regular discussions among the research team during the coding and interpretation processes further strengthened the consistency and depth of the analysis.

Transferability was supported by providing detailed descriptions of the study context, participant characteristics, sampling procedures, and data collection processes, allowing readers to assess the applicability of the findings to similar settings. Dependability was ensured through the maintenance of an audit trail documenting methodological decisions, data management procedures, coding processes, and analytical steps. Confirmability was achieved through the use of verbatim transcripts, systematic documentation of analytical decisions, and illustrative participant quotations, ensuring that the findings were grounded in participants’ perspectives and experiences rather than researcher assumptions (26)

3. Results

3.1. Socio-demographic Characteristics of the participants

Table 1 presents the socio-demographic characteristics of the study participants from Tanzania and Burkina Faso. A total of 35 participants were enrolled, consisting of 8 (23%) females and 27 (77%) males. Of the participants interviewed, 20 (57%) were from Tanzania, and the remaining 15 (43%) were from Burkina Faso. The majority (71%) of the study participants were aged between 25 to 45 years. All participants were KIs who had attained college or university education.

Table 1
Research Participants' Socio-demographic Characteristics from Tanzania and Burkina Faso (N = 35)

Characteristics	Clinicians N = 11 (31%)	Laboratory staff N = 14 (40%)	Nurses N = 10 (29%)
Countries			
Tanzania	8 (73%)	11 (79%)	1 (10%)
Burkina Faso	3 (27%)	3 (21%)	9 (90%)
Sex			
Male	8 (73%)	10 (71%)	9 (90%)
Female	3 (27%)	4 (29%)	1 (10%)
Age (in years)			
25–35	2 (18%)	9 (64%)	0 (0%)
36–45	5 (46%)	5 (36%)	4 (40%)
46–55	3 (27%)	0 (0%)	6 (60%)
≥ 56	1 (9%)	0 (0%)	0 (0%)
Data collection methods			
In-depth interviews	11 (100%)	14 (100%)	10 (100%)
Level of education			
College or university education	11 (100%)	14 (100%)	10 (100%)

Five themes emerged: awareness regarding the SARS-CoV-2 virus and COVID-19; familiarity with and perceived advantages of the POC-Xpert Xpress SARS-CoV-2 test compared to other POCs in testing samples from individuals suspected of SARS-CoV-2 infection (*insights into the benefits of using Xpert Xpress test for diagnosing COVID-19*); and the additional value of the POC Xpert Xpress SARS-CoV-2 test at decentralised facilities and laboratories in testing SARS-CoV-2 from COVID-19 suspected patient samples (*the perceived benefits of implementing the Xpert Xpress test in decentralised settings for testing samples from individuals suspected of COVID-19*). Other emerged themes include the influence of the POC Xpert Xpress SARS-CoV-2 test on guiding clinical action such as prescription of antiviral medication, antibiotics, additional testing, and patient satisfaction (*how the test impacts clinical decisions such as prescribing antiviral medications, antibiotics and patient satisfaction*), and the influences of the POC Xpert Xpress SARS-CoV-2 test in the epidemic response in terms of case detection, contact tracing, and isolation to control the spread of SARS-CoV-2 and COVID-19 pandemic (*the role of the test in*

case detection, contact tracing, and isolation to control the spread of SARS-CoV-2 and the COVID-19 pandemic).

3.2. Awareness regarding the SARS-CoV-2 virus and COVID-19

Participants in both countries possessed a high degree of knowledge about the SARS-CoV-2 virus and COVID-19, including its origin, transmission, symptoms, and prevention measures. They described the pandemic as unexpected and disruptive, with substantial health consequences. Representative quotations are presented below.

“I heard about the COVID-19 pandemic in 2020 when we were informed that a new disease had emerged. It originated in the city of Wuhan, China, but has since spread to various European countries. It seems that the disease started with people who went to buy foodstuffs at seafood stores. At that time, we had no COVID-19 cases in Tanzania until, I think, March or April 2020, when it was announced that the first COVID-19 patient was found in Tanzania”. Participant number 11, Clinician, Male, Tanzania.

“When COVID-19 was at its peak, we were still in school. From the information we received from different sources, we learned that COVID-19 originated in China, and that the first case in Burkina Faso was reported on March 9, 2020”. Participant number 04, Nurse, Male, Burkina Faso.

Participants described respiratory droplets, close contact, and contaminated surfaces as key transmission routes:

COVID-19 is a viral disease caused by Coronavirus. It is spread by contact, by sneezing, coughing, or talking with an infected person, which will spread the germ, which will then be deposited on surfaces, and a healthy person who comes into contact with the germ can become contaminated. And the sick person may sneeze or cough on a healthy person, who may also be contaminated. Participant number 35, Clinician, Male, Burkina Faso.

“Basically, it is an airborne disease in the sense that the Coronavirus is transmitted from one person to another when the infected person sneezes or coughs at a short distance and the uninfected person breathes in the air that contains viruses. Sometimes, if a person with COVID-19 coughs on surfaces, the virus can stay on those surfaces, and if another person touches them, he/she can be infected”. Participant number 13, Clinician, Male, Tanzania.

Participants commonly identified fever, cough, flu-like symptoms, weakness, and breathing difficulty as COVID-19 symptoms:

“A patient infected by this Coronavirus experiences coughs, severe flu and fever, but sometimes if the condition is more severe, the patient is unable to breathe”. Participant number 07, Nurse, Female, Tanzania.

“What we know about the symptoms of COVID-19 is that we have a certain number of signs common to other diseases, such as fever, which is most often long-lasting and resistant to the usual treatment, headaches, colds, coughs, diffuse pain, and, in some cases, vomiting and nausea”. Participant number 23, Nurse, Male, Burkina Faso.

Prevention responses were similar across counties and emphasised mask use, hand hygiene, distancing, isolation of suspected cases, and other infection prevention measures:

“There are different ways you can protect yourself from the Coronavirus, which include maintaining social distancing, wearing masks, sanitising, hand washing etiquette with soap and running water, and avoiding touching surfaces that are touched by many people”. Participant number 01, Lab staff, Male, Tanzania.

“To protect yourself against COVID-19, first of all, you need to wash your hands. Any suspected case that is detected is quarantined, and you also need to wear a mask, which became compulsory alongside regular handwashing etiquette. It's an obligation in the prevention of COVID-19, and you also must sneeze into the crease of the elbow and take barrier measures”. Participant number 26, Lab staff, Male, Burkina Faso.

3.3 Familiarity and Advantages of the POC Xpert Xpress SARS-CoV-2 test compared to other POC tests and PCR in testing COVID-19 samples

The POC Xpert Xpress SARS-CoV-2 test is better known among laboratory personnel than clinicians and nurses when it comes to analysing COVID-19 samples. This is because, in contrast to physicians and nurses, laboratory personnel regularly use this device, though a few clinicians and nurses were also acquainted with the POC Xpert Xpress SARS-CoV-2 tests. Participants highlighted rapid TAT, ease of use, diagnostic accuracy, and the ability to leverage existing GeneXpert infrastructure as key advantages over centralised testing approaches.

“I am very familiar with the POC Expert Xpress SARS-CoV-2 test. The first advantage is that it is easy to perform because there is no lengthy testing procedure. You simply collect the sample, place it in the cartridge, insert the cartridge into the machine, and the test runs automatically. Another advantage is the rapid turnaround time, with results available within 30–45 minutes. However, I cannot comment on its overall effectiveness because, as far as I know, the POC Expert Xpress SARS-CoV-2 test is still being evaluated. Based on my experience, though, patients who had symptoms were indeed confirmed to have the virus using this test”. Participant number 12, Lab staff, Female, Tanzania.

I am acquainted with this device. As I mentioned, one of its advantage is that, it requires less work and reduces the turnaround time for results, which contributes to improved patient care. We did not encounter any particular problems while using the test. It is a sensitive test that provides fairly reliable results, and compared with other PCR systems, I believe it is a test that should be recommended”. Participant number 22, Lab staff, Male, Burkina Faso.

3.4 The additional value of the POC Xpert Xpress SARS-CoV-2 test at decentralised facilities and laboratories in testing suspected COVID-19 patient samples

The participants reported that the POC Xpert Xpress SARS-CoV-2 test adds significant value at decentralised health facilities and laboratories when testing samples from suspected COVID-19 patients and other ailment samples. This is because testing services have been brought closer to the community, and the machine provides quick results that enable doctors to treat patients correctly. Additionally, participants noted that, apart from detecting multiple pathogens, GeneXpert devices are equipped with backup batteries, allowing for continuous sample testing even when the main power supply is disrupted for the entire day.

“The machine is very easy to use. Someone can be trained in a short time and operate it confidently. The GeneXpert system can process multiple samples and deliver results rapidly, although this depends on the machine’s capacity. For example, our 16-module machine can analyse 16 samples in less than two hours”. Participant number 20, Lab staff, Male, Tanzania.

“Yes, the test has added value. During the pandemic many centres were already equipped with the GeneXpert system. Therefore, implementing this test only requires making the cartridges available and installing the appropriate software on existing GeneXpert machines. No specialised training is needed because health workers are already familiar with operating the system. As a result, facilities that already have GeneXpert devices can readily adopt the test by installing the software and ensuring a consistent supply of cartridges”. Participant number 21, Lab staff, Female, Burkina Faso.

3.5 The influence of POC Xpert Xpress SARS-CoV-2 test on clinical action such as prescription of antiviral medication, antibiotics, additional testing and patient satisfaction.

The POC Expert Xpress SARS-CoV-2 test was acknowledged as having a great contribution to clinical action such as the prescription of antiviral medication, antibiotics, additional testing, and enhancing patient satisfaction. In addition to processing multiple samples simultaneously, the POC Expert Xpress SARS-CoV-2 test was praised for its ability to provide accurate specimen results promptly for the relevant disease. Since the symptoms of COVID-19 are similar to those of other common respiratory tract diseases, participants felt that if this test is conducted and determines whether the patient has COVID-19 or not, it will help healthcare providers treat COVID-19 or conduct additional testing promptly, thereby improving patient satisfaction with the care received. This is a crucial component in facilitating differential diagnosis based on laboratory results, rather than relying solely on empirical treatment following clinical algorithms, which can often be speculative.

“I think this test is very useful because the symptoms of COVID-19 are similar to those of other diseases that are common in our setting. By confirming whether a patient has COVID-19 or not, the test enables health care providers to initiate appropriate treatment promptly or conduct additional investigations in a timely manner when COVID-19 is ruled out”. Participant number 10, Lab staff, Male, Tanzania.

“For example, the Xpert Xpress we routinely use helps clinicians identify the pathogen responsible for the patients’ illness. When a patient presents with symptoms such as a cold or cough, particularly during the COVID-19 pandemic, there is often a tendency to assume that Coronavirus is the causative agent. However,

experience has shown that this assumption is frequently incorrect, as other respiratory pathogens may be responsible. By identifying the causative pathogen, the test helps reduce diagnostic uncertainty and minimises inappropriate prescribing, including unnecessary use of antiviral medications where appropriate. Although treatment options for viral infections remain limited, the test supports more informed and accurate clinical decision-making". Participant number 22, Clinician, Male, Burkina Faso.

3.6 The influences of the POC Xpert Xpress SARS-CoV-2 test in the epidemic response in terms of case detection, contact tracing and isolation to control COVID-19.

Participants understood that the POC Xpert Xpress SARS-CoV-2 test has a significant impact on epidemic response, particularly in case detection, contact tracing, and isolation to control COVID-19. They argued that the test is highly valuable because it provides quick results, allowing for rapid treatment of the patient and prompt tracing and testing of those who have been in contact with them. Additionally, it enables deliberate precautions to be taken to ensure that the patient does not infect others. This test also aids the isolation of those who are infected and permits the release of those who are not, as test results are available at the POC, eliminating the need to quarantine patients who are not infected with SARS-CoV-2 whose test results indicate they do not have COVID-19.

"This test is highly valuable because, when COVID-19 first emerged, patients suspected of having the disease prompted contact tracing and quarantine of their close contacts before the diagnosis was confirmed. As a result, many individuals were unnecessarily isolated and unable to carry out their normal activities, leading to the loss of valuable manpower. By using this test, we can rapidly confirm whether a patient had COVID-19, allowing public health measures to be targeted appropriately and enabling timely, disease-specific patient management". Participant number 08, Clinician, Male, Tanzania.

"Yes, the test is very useful, because the results generated are provided to clinicians, who can then determine the appropriate management approach based on the identified pathogen, including the most suitable treatment and, when necessary, the need for patient isolation. The test detects a range of pathogens, and identifying the specific causative organism allows for more targeted treatment rather than relying primarily on empirical or probabilistic therapy. By providing accurate results, the test helps reduce unnecessary prescriptions and supports better clinical management of patients". Participant number 23, Nurse, Male, Burkina Faso.

4. Discussion

Healthcare workers in Tanzania and Burkina Faso perceived decentralised SARS-CoV-2 testing using GeneXpert - POC platforms as an effective approach for improving access to rapid molecular testing, facilitating timely clinical decision-making, and strengthening preparedness for respiratory disease outbreaks. The findings underscore the potential for leveraging existing GeneXpert platforms within HIV and TB programmes available at district hospitals and health centres to expand molecular diagnostic capacity in resource constrained settings, where specialised testing is often confined to regional or national reference laboratories. The importance of such decentralised capacity became particularly

evident during the COVID-19 pandemic, when delays in access to diagnostic services hindered timely patient management and outbreak control.

The COVID-19 pandemic emerged at a time when many low- and middle-income countries (LMICs) were already grappling with the dual burden of communicable and non-communicable diseases, placing an unprecedented pressure on limited healthcare resources. Consequently, governments had to prioritise resource allocation while maintaining essential health services. The SARS-CoV-2 diagnosis relied primarily on accredited national reference laboratories equipped to perform rRT-PCR, the diagnostic gold standard (12, 27). However, global shortages of rRT-PCR reagents severely constrained the capacity in LMICs. These challenges were compounded by limited access to personal protective equipment (PPE) and, later COVID-19 vaccines, further hindering effective outbreak control.

The COVID-19 pandemic therefore underscored the need for practical, scalable approaches to expand molecular diagnostic capacity in resource constrained settings. One such strategy was to leverage existing GeneXpert platforms within national TB and HIV programmes, which were already widely deployed at district hospitals and health centres. The availability of the GeneXpert molecular POC (Xpert® Xpress SARS-CoV-2/Flu/RSV assay, Cepheid Sunnyvale, CA) enabled these platforms to be repurposed for SARS-CoV-2 testing. In this study, the assay was implemented at the research level to evaluate the feasibility of decentralising SARS-CoV-2 diagnosis in Tanzania and Burkina Faso, with a long term goal of integrating COVID-19 testing into already established TB/HIV diagnostic networks.

Building on the decentralisation strategy idea, a pilot implementation of GeneXpert-based SARS-CoV-2 screening was conducted in Tanzania and Burkina Faso. The present study subsequently explored healthcare workers' perceptions of using the GeneXpert-POC platform for diagnosing SARS-CoV-2 among patients presenting with symptoms suggestive of COVID-19.

Healthcare workers both in Tanzania and Burkina Faso demonstrated a high level of awareness of COVID-19, including its clinical presentation, transmission, prevention, and diagnostic approaches. Given that the participants were trained health professionals actively involved in patient care and disease surveillance during the pandemic, this finding was expected. Their knowledge is likely attributable to professional training, continuous updates on COVID-19 guidelines, and frontline experience in managing suspected and confirmed cases. Similar findings have been reported in India, Pakistan, Singapore, Indonesia, and Ghana, where participants demonstrated a good knowledge of COVID-19 and its prevention and control measures (28–33). In contrast, studies from Ethiopia, Jordan and Iraq reported lower or moderate levels of knowledge among healthcare workers, underscoring disparities in access to training and health information across settings (34, 35). In Tanzania, initial uncertainty surrounding the pandemic was subsequently replaced by strengthened national response measures, including wider use of PPE, implementation of public health interventions, and rollout of COVID-19 vaccination, all of which may have contributed to improved awareness among healthcare workers (36).

The findings of this study suggest that integrating the Xpert® Xpress SARS-CoV-2/Flu/RSV assay into existing TB/HIV programmes could substantially strengthen decentralised molecular diagnosis in

Tanzania and Burkina Faso. Because the GeneXpert platforms are already widely deployed at regional, district and selected health facilities, expanding their use for respiratory pathogen detection represents a practical and cost-effective strategy for improving access to rapid diagnostics during public health emergencies. Participants consistently perceived the platform as reliable, easy to use, and clinically valuable, findings that are consistent with previous diagnostic accuracy studies demonstrating the high performance of the GeneXpert assay for SARS-CoV-2 detection (17, 37)

Decentralised SARS-CoV-2 testing through existing GeneXpert networks has the potential to reduce reliance to national reference laboratories, shorten TATs, and facilitate timely clinical and public health interventions. Rapid diagnosis enables prompt case detection, patient isolation, contact tracing, and appropriate treatment, thereby strengthening outbreak response while reducing pressure on already overstretched laboratory systems. Although GeneXpert platforms have been used for SARS-CoV-2 testing in Burkina Faso, their routine deployment as part of decentralised TB/HIV diagnostic services remains limited in both study countries.

Beyond COVID-19, the multiplex Xpert® Xpress SARS-CoV-2/Flu/RSV assay provides simultaneous detection of SARS-CoV-2, influenza A/B, and RSV, enabling clinicians to make evidence-based differential diagnoses for patients presenting with similar respiratory symptoms. This reduces reliance on syndromic management and empirical treatment, supports more appropriate prescribing of antivirals and antibiotics, and improves patient management. When SARS-CoV-2 infection is excluded, clinicians can promptly investigate alternative causes of illness rather than delaying further diagnostic wake-up. Similar benefits of decentralised GeneXpert testing have been reported in Mexico, Madagascar, Indonesia and Oman, where the platform improved diagnostic capacity and clinical decision-making in these resource limited settings (38–40).

The versatility of the GeneXpert platform further strengthens its value for integrated disease control. In addition to TB and HIV-related diagnostics, the platform supports testing for several infectious diseases, including sexually transmitted infections, while cartridges for emerging pathogens such as Mpox and Ebola are increasingly becoming available or under evaluation (40, 41).

Leveraging this existing infrastructure would maximise previous investments, reduce the logistical costs associated with transporting specimens to national reference laboratories, and improve preparedness for future epidemics. During the COVID-19 pandemic, dependence on centralised testing resulted in prolonged delays in diagnosis and patient management, highlighting the importance of expanding molecular diagnostic capacity close to the affected communities.

Our preliminary diagnostic accuracy analyses also demonstrated a good agreement between the GeneXpert platform and rRT-PCR, further supporting its potential role in decentralised SARS-CoV-2 testing (manuscript in preparation). Collectively, these findings support the integration of Xpert® Xpress SARS-CoV-2/Flu/RSV assay into existing TB/HIV diagnostic networks to strengthen equitable access to rapid molecular diagnostics, improve patient care, optimise antimicrobial stewardship, and enhance preparedness for future outbreaks in resource limited settings (38, 42).

4.1. Strengths and Limitations

A notable strength of this study is the use of methodological triangulation, drawing on perspectives from three distinct professional groups: laboratory scientists, clinicians, and nurses. These KIs provided enhanced credibility and depth of the findings regarding the feasibility and perceived value of decentralised GeneXpert-POC testing for SARS-CoV-2 diagnosis and outbreak preparedness.

Nevertheless, several limitations should be considered. First, the rapid evolution of diagnostic technologies and the wider availability of SARS-CoV-2 testing since the data collection may limit the contemporary applicability of some findings (43). Second, as the findings are based on participants' perceptions, they should not be interpreted as evidence of measurable improvement in TAT, clinical outcomes, or epidemic control. Finally, although the interviews conducted in French and Kiswahili were translated into English using back-translation procedures to preserve accuracy, some contextual nuances may have been lost during translation.

4.2. Conclusions

This study emphasises the importance of decentralising COVID-19 testing by leveraging existing GeneXpert platforms at district and regional health facilities. Healthcare workers viewed decentralised SARS-CoV-2 testing using GeneXpert as a valuable way to improve diagnostic access, speed up clinical decisions, and strengthen outbreak response in resource-limited settings. By enhancing diagnostic capacity at lower levels of the healthcare system, this strategy will reduce TATs, improve clinical patient management, and enhance epidemic preparedness. These findings support further investment and research to optimise decentralised testing in routine care.

Abbreviations

COVID

19 Coronavirus disease 2019

EDCTP European and Developing Countries Clinical Trial Partnership

IDIs In-depth interviews

IRSS Institut de Recherche en Sciences de la santé

LMICs Low and middle income countries

MRCC Medical Research Coordinating Committee

NIMR National Institute for Medical Research

POC Point of care

PPE Personal Protective Equipment

rRT-PCR real time Reverse Transcriptase - Polymerase Chain Reaction

RSV Respiratory Syncytial Virus

SARS-CoV-2 Severe acute respiratory coronavirus 2

TAT Turnaround time

UA University of Antwerp

UCPH University of Copenhagen

UNIKIN University of Kinshasa

UV University of Valencia

URCN Unité de Recherche Clinique de Nanoro

WHO World Health Organization

Declarations

Ethics Approval and Consent to Participate

Ethical approval was obtained from the National Institute for Medical Research Medical Research Coordinating Committee (NIMR-MRCC), Tanzania (Ref. No. NIMR/HQ/R.8a/Vol.IX/3892, and the National Ethics Committee for Health Research (CERS- comité de recherche en sciences de la santé in French) of Burkina Faso, which is under the Ministry of Health, 09 BP 7009 Ouagadougou 09 Burkina Faso) (Ref. No. 2022-03-047). In Tanzania, additional permissions were obtained from the Regional Administrative Secretaries of Tanga and Dar es Salaam (Refs: RM/R.20/1 Vol. III/91 and EA. 260/307/01B/40, respectively), whereas in Burkina Faso, approvals were secured from the Ministry of Health and Public Hygiene, from the Regional Directorate of Health of Hauts Bassins, and from health facilities managers. Before data collection, the research team introduced the study to relevant health facility administration. Written informed consent was obtained from all participants before interviews, with signed copies retained by both participants and the study team. The study only interviewed healthcare workers and did not include collection or use of human tissues or samples and was conducted in accordance to relevant ethical guidelines and regulations. The main study was registered at ClinicalTrials.gov (NCT05514886) on 10 August 2022.

Consent for publication

Permission to publish was granted by the NIMR-MRCC, also from all co-authors from participating institutions. This study did not have any identifying images or other personal or clinical data that could compromise the anonymity of the participants”.

Competing Interests

The authors declare no competing interests.

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Author Contribution

DTRM, EAL and VB conceptualised the study idea supervised data collection activities and wrote the first draft of the manuscript. DTRM, EAL, JRM, EFL, OK, BK, MCT, SG participated in data collection activities and provided critical reviews on the initial draft of the manuscript. EAL, SG, FF, JP, JRM, FG, MA, CW, JPAL, CDR, OK, BK, IS, VM, VB participated in the data analyses. All authors had full access to the study data, critically reviewed and agreed on the final content of the manuscript prior to submission for publication consideration.

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Data Availability

All relevant data are included in the manuscript as statements, figures, and tables. However, additional materials, including audio recording or other supporting documents, are available from the corresponding author upon reasonable request, subject to approval from the collaborating institutions and execution of a Data Transfer Agreement (DTA) approved by the NIMR-MRCC.

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Figures

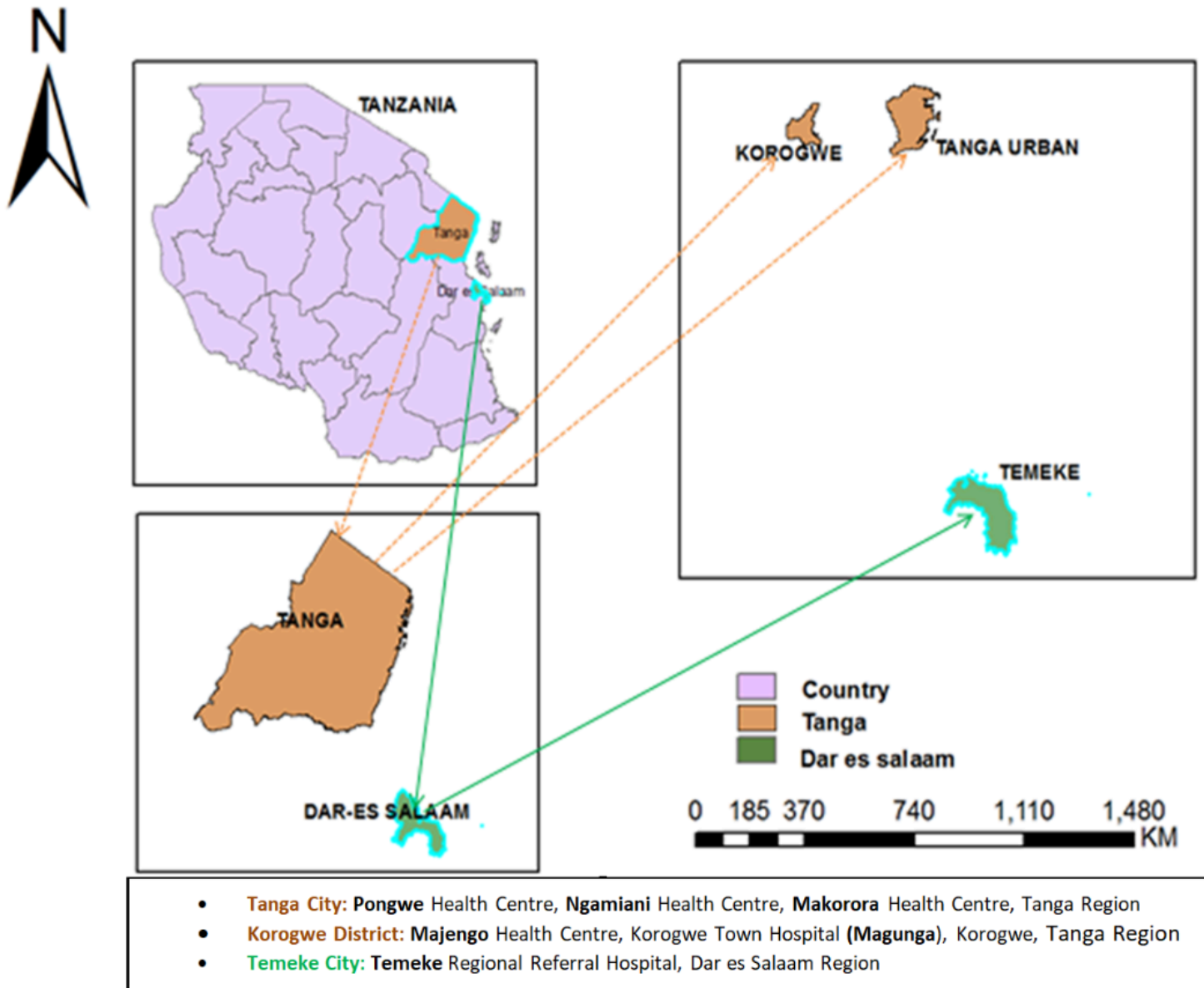


Figure 1

Distribution of health facilities that participated in in-depth interviews (IDIs) in Tanga and Dar es Salaam Regions, Tanzania. The IDIs were conducted in five health facilities: Two health facilities from Korogwe Town Council (**Korogwe Town Hospital, Majengo Health Centre**); three health facilities in Tanga City (**Pongwe Health Centre, Ngamiani Health Centre, Makorora Health Centre**) and one health facility from Dar es Salaam (**Temeke Regional Referral Hospital**).

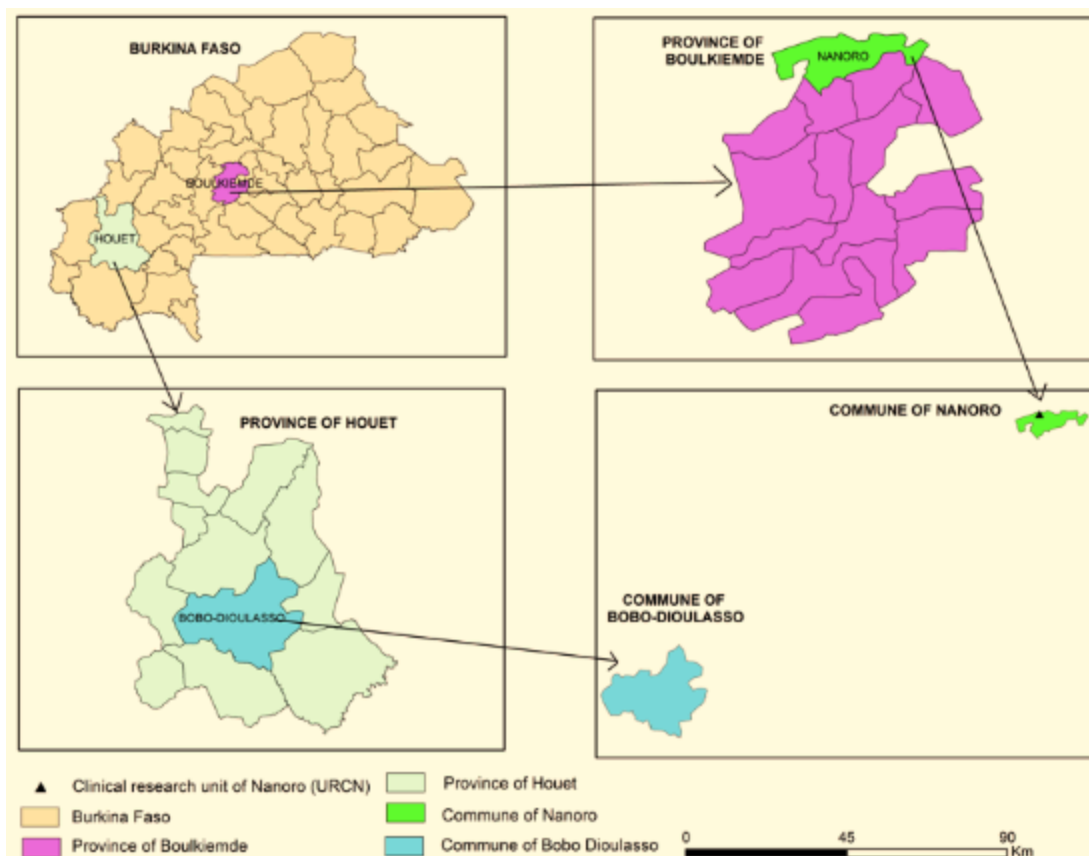


Figure 2

Distribution of health facilities that participated in IDIs in Nanoro and Bobo-Dioulasso, Burkina Faso. The IDIs were conducted in six health facilities: **Teaching Hospital Center Souro Sanou, reference laboratory for the Hauts Bassins Region, private Medical Centre Jourdain, private Medical Centre Ibn Hafiz, peripheral Health Centre of Colma 1 and peripheral Health Centre of Accarville.**

Supplementary Files

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- [SupplementaryFile1InterviewGuideforHealthcareWorkersEXPERTCoV2Final03Jul2023.pdf](#)