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ORIGINAL RESEARCH

Factors associated with awareness and knowledge of COVID-19 prevention in rural Tanzania: A community-based cross-sectional study

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Abstract

Introduction: By 2022, reported COVID-19 cases had declined worldwide. However, the disease remained a concern in low- and middle-income countries such as Tanzania, where underreporting and limited surveillance may have obscured the true burden. Since there was no definitive cure, continued prevention, including vaccination, mask use, hygiene practices, and social distancing, remained important. Adherence to these measures depends partly on community awareness and knowledge, yet little was known about whether accurate prevention information had reached remote and nomadic communities. This study assessed factors associated with awareness and knowledge of COVID-19 prevention in rural Tanzania.

Methods: A community-based cross-sectional study was conducted in September 2022 in Kibaha and Monduli Districts. Multistage sampling was used to recruit 689 adults aged 18 years and above. Trained interviewers administered structured questionnaires to assess awareness and knowledge of COVID-19 prevention. Knowledge was measured using a 10-item dichotomous scale. Logistic regression was used to identify predictors of awareness that COVID-19 is preventable and adequate knowledge of prevention measures. Analyses were conducted using SPSS version 23.

Results: Among 689 participants, 63.4% were female, 50.2% had primary education, and 78.5% were self-employed. Overall, 97.4% had heard of COVID-19, but only 66.9% recognized that it is preventable. Awareness that COVID-19 is preventable was significantly associated with residence and education. Compared with residents of Mlandizi, participants from Esilalei (AOR = 0.3, 95% CI: 0.14–0.50) and Engutoto (AOR = 0.4, 95% CI: 0.22–0.78) were less likely to report this awareness. Participants with no formal education (AOR = 0.0, 95% CI: 0.01–0.18) and primary education (AOR = 0.1, 95% CI: 0.02–0.45) were also less aware than those with college or university education. Among participants who recognized that COVID-19 is preventable (n = 449), knowledge of prevention strategies was consistently high, with a median score of 10 (IQR: 9–10). Mask use (96.0%) and social distancing (95.3%) were the most frequently recognized measures, while staying home when sick (81.7%) and COVID-19 vaccination (84.6%) were less commonly recognized.

Conclusion: Although general awareness of COVID-19 was high, recognition that the disease is preventable varied by education and residence. Targeted, context-specific communication is needed to ensure that accurate and actionable prevention information reaches underserved, remote, and nomadic communities.

Keywords: COVID-19, prevention, knowledge, awareness, rural, Tanzania.

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INTRODUCTION

CoronaVirus Disease 2019 (COVID-19) caused by Severe Acute Respiratory Syndrome Coronavirus-2 (SARS-CoV-2) has become a global outbreak affecting a total of 753, 001, 888 people with approximately 6, 807, 572 deaths worldwide by January 2023 [1]. In Africa, the disease has affected 8, 941, 043 people and claimed the lives of 174, 152 individuals by January 2023 [1]. In Tanzania, by January 2023, COVID-19 is reported to have affected 42,600 people and caused 846 deaths [1]. Common clinical presentations of COVID-19 include fever, pneumonia, sepsis, septic shock, respiratory insufficiency, and organ failure [2]. The virus is transmitted through person-to-person contact, droplets, and aerosol transmission [3]. Factors that exacerbate the acquisition of the COVID-19 virus within the community include travel to higher COVID-19 risk areas, being older age (> 50 years), smoking, obesity, and having comorbidities like liver disease, hypertension, immunosuppression, cancer, diabetes, organ transplants, and cardiovascular conditions [4]. Since the outbreak, there has been no proven treatment for it and thus the mainstay to fight the outbreak has been the adoption of prevention measures [5]. These measures include social distancing, face masks, proper hand hygiene, vaccination, and health education [6,7].

During the COVID-19 outbreak, mortality was higher in high-income countries (HICs) compared to low and middle-income countries (LMICs) [8]. In HICs, lockdowns and curfews were implemented as attempts to halt the spread of the disease [9,10]. People in many LMICs relied on traditional remedies to protect themselves from acquiring infections as lockdowns and curfews were considered difficult in these settings due to economic hardships [11]. The community consumed herbal medicines containing certain active substances, which have antiviral, antimicrobial, and anti-inflammatory activities, such as Curcumin, Quinine, and Echinacea [12]. It is reported that these herbal compounds are claimed to modulate the immune system of patients, and hence they might have positive effects on preventing or treating COVID-19 [13].

Development, distribution, and availability of several vaccines against the COVID-19 virus have brought new hope in the fight against the disease [14]. Nevertheless, none of the existing prevention measures have been proven to be the most effective against the transmission of the COVID-19 virus. Consequently, COVID-19 continues to spread in many regions. Moreover, despite the availability of COVID-19 vaccines in many countries, people are still hesitant to take vaccines due to beliefs and negative perceptions [15]. Other possible reasons for low uptake include fear of side effects and lack of knowledge about COVID-19 and the COVID-19 vaccine itself [16].

Studies on the community knowledge of COVID-19 prevention from several countries after the outbreak of the pandemic reveal varying findings. In Saudi Arabia, the community was aware that the disease is a viral infection that affects the respiratory system, and is more likely to affect the elderly and people with chronic diseases [3]. Only 50% of the participants were aware of the COVID-19 symptoms and around 50% were knowledgeable about the prevention measures [3]. In Ethiopia, 56.8% were knowledgeable about the clinical presentations and spread of the infection while 65.4% knew five or more prevention measures against COVID-19 transmission [17]. Studies conducted in Jimma Ethiopia and Nepal reported that education level, employment status, and monthly income were the determinants of knowledge of COVID-19 within the community [7,18]. In addition, a study by Dewau et al, (2021) in South Wollo, Ethiopia, reported that people who lived in urban regions had higher knowledge of COVID-19 compared to those who lived in rural areas [17].

In Tanzania, as in many other settings, the spread of COVID-19 persisted despite the implementation of recommended prevention and control strategies [19]. These measures have included the use of face masks, hand hygiene practices such as handwashing and sanitizer use, and vaccination [20]. The Johnson & Johnson (J&J) vaccine was the most widely available COVID-19 vaccine in Tanzania and was provided free of charge through public and selected private healthcare facilities [21]. Outreach programs were also conducted to ensure access to vaccination services, including in hard-to-reach areas [22]. Nevertheless, the continued transmission of COVID-19 raises concerns not only about the effectiveness of these prevention strategies but also about the level of community awareness, knowledge, and utilization of the available preventive measures.

To ensure the proper utilization of the available prevention measures against COVID-19, the community should be aware with adequate knowledge of the COVID-19 prevention measures. However, there is a scarcity of information on the awareness and knowledge of the community, particularly those living in rural areas on COVID-19 prevention. Therefore, this study was designed to assess the awareness and knowledge of COVID-19 prevention in rural Tanzania.

METHODS

Study design

In September 2022, a community-based cross-sectional study was conducted to assess awareness of and community knowledge about COVID-19 prevention measures in rural and nomadic areas of Tanzania.

Study settings

This cross-sectional study was conducted in two regions of Tanzania, Arusha from the northern part and Pwani along the coast. Arusha comprises seven districts, and one district, namely Monduli, was selected for the study. Monduli (Maasai Land) in the Arusha region was selected to represent both a rural and a nomadic area. Monduli covers an area of 6993 km2 and is administratively subdivided into 15 wards. Its inhabitants

are mostly Maasai, mainly pastoralists, and reporting a low literacy rate [23], and have a population of about 227,585 inhabitants (Census 2022). On the other hand, the Pwani region comprises seven districts, and Kibaha District (Kibaha DC) was selected to represent the rural population. Kibaha covers a relatively small area of 1520 km2 and is administratively subdivided into 11 wards with a population of 123,367 inhabitants (Census 2022).

Study population and eligibility criteria

The study population included community members aged 18 years and older who had lived in the study area for at least one year. The study excluded seriously ill and mentally ill patients, as well as those who could not communicate fluently in Kiswahili. There was no translation assistance during data collection. Seriously ill patients and individuals with mental illness were excluded because the face-to-face, interviewer-administered questionnaire required participants to respond meaningfully, which was not feasible for these groups.

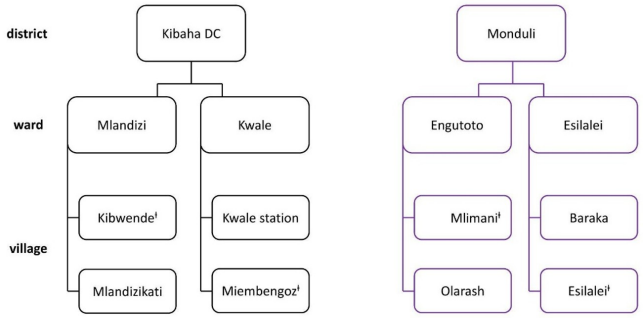
Sample size calculation

Using a formula for a single proportion by Kish and Lisle (Kish & Lisle 1965) for an infinite population size [24], a minimum sample size of 640 participants was computed to answer the study objectives. Consider the following formula: n = z2* P(100-P) * Deff/ e2, whereby the proportion (p) of the population having adequate knowledge regarding COVID-19 prevention measures was assumed to be 50%, the margin of error of 5%, 95% confidence interval and Deff of 1.5 (design effect). A minimum sample of 574.24 was obtained. Assuming the 10% of non-respondents and dropout responses, we obtained a target sample of 640. Provided that two districts had two different population sizes (www.nbs.go.tz), we used proportion sampling to select study participants from each district considering a ratio of 1:2.3 for Kibaha relative to Monduli. Therefore, a minimum of 194 participants were planned for Kibaha and 446 participants for Monduli. The final sample size was 689, out of which 243 were from Kibaha and 446 from Monduli.

Sampling strategy

Multi-stage sampling strategy was adopted to recruit participants for this study. In the first stage, we purposefully selected two regions of Arusha and Pwani from the Northern and eastern zones. Arusha is one of the regions that were badly hit by COVID-19 in the second and third waves while Pwani is among the regions that were not badly hit. Furthermore, the two regions were selected to represent a diversity of cultures, from mostly nomads in Arusha to peasants and petty traders in Pwani DC. In the second stage, from Pwani and Arusha, we randomly selected one district, Monduli district in Arusha and Kibaha district in Pwani. In the third stage, for each selected district, we listed all wards and stratified them as rural or urban. From each stratum, we randomly selected one ward for inclusion in the study. We treated the ward as our cluster and stratified it into rural and urban groups. From Monduli, two wards were selected, Engutoto and Esilalei, for urban and rural wards, respectively. Similarly, two more wards from Kibaha DC were selected, Mlandizi representing the urban ward and Kwala for the rural ward.

A ward is usually made up of several villages where community members live. Two villages were randomly selected from each ward, one with a healthcare facility and the other without a healthcare facility (Figure 1). In the fifth stage, we adopted systematic sampling to include every nth household from the selected councils, wards, and villages. For each household, all adults aged 18 and above were listed and grouped by sex (men and women). Using a simple random sampling one man and one woman were interviewed. If a household had only one woman and a man, both were included. In households with only one individual, aged above 18 years was included.



[1] *villages with a healthcare facility*

Figure 1. Flowchart of village selection.

Data collection procedure

A questionnaire with structured questions was prepared based on the literature review and the researchers' knowledge of COVID-19 prevention measures. The questionnaire contained three main sections: section one collected demographic characteristics; section two collected information on awareness of COVID-19; and the third section assessed the community's knowledge of COVID-19 prevention measures. Before data collection, we pretested the questionnaire in Upanga ward, Dar es Salaam, to assess the clarity of the questions among five individuals. We clarified the questions after confirming our study objectives, then proceeded with data collection.

In each district, the Community Health System Coordinator introduced the research team to ward officials, who in turn facilitated introductions at the village and hamlet levels. At the hamlet level, community health workers (CHWs) introduced the team to households. Nine data collectors were recruited and trained in the study objectives, ethical considerations, and use of the data collection tool. Four data collectors were assigned to Kibaha District and five to Monduli District. Data were collected using tablets with a questionnaire uploaded to Solstice, a web-based data collection platform.

One-to-one, face-to-face interviews were conducted with selected household members using an interviewer-

administered questionnaire. Data collectors read each question aloud and recorded participants' responses. The questionnaire was developed by the research team based on existing COVID-19 literature and the Tanzanian context and was translated from English into Kiswahili prior to data collection. Interviews lasted approximately 20–30 minutes. Data were uploaded daily to the server for quality checks, downloaded into a spreadsheet for review and cleaning, and feedback on identified issues was provided to data collectors to support continuous improvement in data quality.

Variables

Awareness of the preventability of COVID-19 was assessed among participants who had heard of the pandemic using a single-item question: "Are you aware that COVID-19 is preventable?" Participants who responded affirmatively were further asked a follow-up question to identify their source(s) of information. Response options included relatives, radio, television, government leaders, healthcare providers, traditional healers, CHWs, and religious leaders. Knowledge of community members was measured using a 10-item questionnaire with two options. Community members were asked whether they agreed or disagreed with a range of covid 19 prevention measures. The options included i) using water and soap as among ways to prevent Covid-19 transmission; ii) using sanitizer as among ways to prevent Covid-19 transmission; iii) washing door knobs with soap and water as among ways to prevent Covid-19 transmission; iv) avoiding touching eyes and face with unwashed hands as among ways to prevent Covid-19 transmission; v) avoiding handshake as among ways to prevent Covid-19 transmission; vi) use of facemask as among ways to prevent Covid-19 transmission; vii) covering nose and mouth during coughing or sneezing as among ways to prevent Covid-19 transmission; viii) social distancing as among the ways to prevent Covid-19 transmission; ix) staying at home when feeling sick as among ways to prevent Covid-19 transmission; and x) getting vaccinated against Covid-19 as among ways to prevent Covid-19 transmission. The correct response was assigned a 1, and a 0 for an incorrect answer. In our study, the internal validity consistency for the questionnaire was found to be high (Cronbach α=0.89). Individual scores were summed up to form a composite score of "level of knowledge of prevention method for Covid-19", ranging from 0 to 10. The median knowledge score was used as the cut-off to classify participants as having adequate or inadequate knowledge of COVID-19 prevention measures.

Data analysis

We retrieved data from the Solstice software to SPSS version 23 for data analysis. Findings are summarized using frequency and percentages, and the median (interquartile range) is used to summarize age. Univariate binary logistic regression was performed to identify predictors of adequate knowledge in the community. To minimize the risk of excluding potentially important predictors and confounders during preliminary screening, variables with p-values ≤ 0.20 were included in the multivariable binary logistic regression model.

Ethics approval

Ethical clearance for this study was obtained from the Muhimbili University of Health and Allied Sciences research and ethics committee with the registration number (MUHAS-REC-05-2022-1165). Permission to conduct data collection was obtained from the ministry responsible and the district administration prior to data collection. Before the data collection process commenced, the study's purpose was explained to the participants, and permission was granted. All methods were performed in accordance with the Declaration of Helsinki. All participants provided written informed consent prior to participating in the study.

Table 1. Demographic characteristics of the study participants (n =689).

Variables	n (%)
Sex	
Male	252 (36.6)
Female	437 (63.4)
Median (Interquartile) age (years)	35 (26 – 50)
Age (years)	
<=25	168 (24.4)
26 – 35	189 (27.4)
36 – 45	126 (18.3)
46 – 55	82 (11.9)
56 – 65	65 (9.4)
>65	59 (8.6)
Marital status	
Married	513 (74.5)
Not married	176 (25.5)
Residence	
Esilalei	210 (30.5)
Engutoto	236 (34.3)
Kwala	139 (20.2)
Mlandizi	104 (15.1)
Employment status	
Employed	25 (3.6)
Not employed	123 (17.9)
Self-employed	541 (78.5)
Education level	
No formal education	190 (27.6)
Primary education	346 (50.2)
Secondary education	113 (16.4)
Vocational training	10 (1.5)
College/University	30 (4.4)

RESULTS

Demographic characteristics of the study participants

Out of 689 participants, 437(63.4%) were female, and the median (interquartile range) age of the participants was 35 (26 -50) years. A total of 189 (27.4%) were aged 26-35 years. Almost half (346; 50.2%) of the study participants had primary education, and 541 (78.5%) were self-employed (Table 1).

COVID-19 awareness among study participants

Of the 689 study participants, 671 (97.4%) were aware of COVID-19. Among these, 23 (3.4%) reported having ever experienced COVID-19–related signs or symptoms. Of the 671 participants who were aware of COVID-19, 449 (66.9%) knew that the disease was preventable. Notably, 19 (82.6%) of those who had experienced symptoms were aware of its preventability.

Most participants reported multiple sources of information (Figure 2). Radio and television were the most common sources (34.8%), followed by relatives (23.7%), while traditional healers were the least cited source (0.8%).

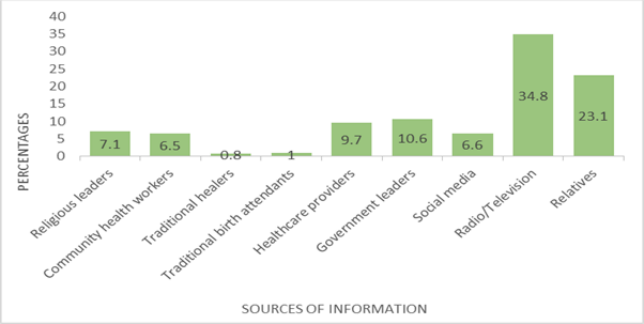


Figure 2. Sources of information about Covid-19 among study participants.

Factors associated with awareness of COVID-19 prevention

To analyze the factors associated with awareness of COVID-19 prevention, the analysis included respondents who had heard of COVID-19 within each category. In the multivariable analysis, sex, age, marital status, and employment status were not significantly associated with awareness that COVID-19 is preventable. However, place of residence and education level remained significant predictors. Respondents from Mlandizi were less likely to be aware that COVID-19 is preventable than respondents from Esilalei and Engutoto, with adjusted odds ratios of 0.30 (95% CI: 0.14–0.50) and 0.40 (95% CI: 0.22–0.78), respectively. Similarly, respondents with no formal education, AOR of 0.04 (95% CI: 0.01–0.18), and those with primary education, AOR of 0.10 (95% CI: 0.02–0.45) had significantly lower odds of being aware that COVID-19 is preventable compared with respondents with college or university education (Table 2).

Knowledge of the community on the COVID-19 prevention measures

Using the 10-item COVID-19 prevention knowledge assessment and computing scores based only on valid responses, knowledge levels were consistently high across respondents. Most participants were classified as having excellent knowledge, with very few demonstrating moderate or poor knowledge (Table 3). The median knowledge score was 10 (IQR: 9–10), indicating a uniformly strong understanding of recommended prevention measures. When dichotomized, 411 (91.5%) of respondents had adequate knowledge (≥7/10).

Item-level analysis (Table 4) showed high awareness of handwashing, mask use, and social distancing (>94%), but lower knowledge regarding staying at home when sick (81.7%) and COVID-19 vaccination (84.6%).

Analysis of factors associated with good knowledge of COVID-19 preventive measures found that only place of residence was significantly associated (Table 5). Participants residing in the Engutoto ward were significantly more likely to have adequate knowledge compared with those residing in Mlandizi ward (AOR = 9.4; 95% CI: 2.58–34.01).

DISCUSSION

We aimed to assess factors associated with community awareness and knowledge of COVID-19 prevention measures. Overall, 97.4% of participants were aware of COVID-19; however, among those aware, only 66.9% recognized that the disease is preventable, 20.6% believed it is not, and the remainder were uncertain. Radio and television, along with relatives, were the community's predominant sources of information. Although most participants (91.5%) demonstrated adequate knowledge of COVID-19 prevention strategies, knowledge levels were consistently high, with a median score of 10 (IQR: 9–10).

The most frequently recognized measures were face mask use (96.0%) and social distancing (95.3%), whereas staying at home when sick (81.7%) and COVID-19 vaccination (84.6%) were less commonly identified. The relatively lower recognition of staying at home when sick and vaccination suggests that while hygiene-related messages were well understood, measures requiring behavioral change and trust in biomedical interventions were less well internalized. These findings indicate that, despite strong overall knowledge, specific gaps remained in understanding key preventive behaviors.

The findings on the awareness of the community on COVID-19 and knowledge of the prevention measures are comparable to other studies regarding COVID-19 in Malaysia, the United States of America (USA), and China, whereby the majority (70 -99.5%) of the respondents had adequate knowledge on COVID-19 and prevention measures [5,25,26]. However, the findings are inconsistent with studies conducted in 2020 and 2021 in Saudi Arabia, Ethiopia, Egypt, and Nigeria, which reported community knowledge of COVID-19 and pre-

ventive measures below 70% [3,17,27]. The observed discrepancies could be attributed to the timing of data collection, the area of data collection (urban vs. rural), and the countries where data were collected. The campaigns were implemented through several platforms, including health facilities, social media, radio, and television, and using influential people such as musicians and movie actors. The campaigns aimed to educate the community about what COVID-19 is, how it is transmitted, how it can be prevented, and the benefits of vaccination. Surprisingly, despite the efforts invested in promoting COVID-19 vaccination in Tanzania, knowledge of COVID-19 vaccination was low in this study compared to other strategies.

Table 2. Factors associated with the awareness that COVID-19 is preventable (n =671).

Variables	Is COVID-19 preventable: Yes n/N (%)	COR (95% CI)+	AOR (95% CI)+
Sex			
Female	282/426 (66.2)	0.9 (0.66–1.29)	
Male	167/246 (67.9)	Ref	
Age category (years)			
≤25	99/163 (60.7)	1.0 (0.51–1.79)	
26–35	133/187 (71.1)	1.5 (0.81–2.85)	
36–45	85/123 (69.1)	1.4 (0.71–2.69)	
46–55	58/81 (71.6)	1.6 (0.75–3.22)	
56–65	40/63 (63.5)	1.1 (0.51–2.27)	
≥66	34/55 (61.8)	Ref	
Marital status			
Married	329/498 (66.1)	0.9 (0.60–1.27)	
Not married	120/174 (69.0)	Ref	
Place of residence			
Esilalei	102/202 (50.5)	0.2 (0.10–0.35)	0.3 (0.14–0.50)
Engutoto	158/233 (67.8)	0.4 (0.22–0.71)	0.4 (0.22–0.78)
Kwala	103/135 (76.3)	0.6 (0.31–1.16)	0.7 (0.35–1.43)
Mlandizi	86/102 (84.3)	Ref	Ref
Employment status			
Unemployed	72/122 (59.0)	0.2 (0.06–0.69)	0.4 (0.10–1.43)
Self-employed	355/525 (67.6)	0.3 (0.08–0.96)	0.8 (0.22–2.99)
Employed	22/25 (88.0)	Ref	Ref
Education level			
No formal education	75/178 (42.1)	0.04 (0.01–0.16)	0.04 (0.01–0.18)
Primary education	235/341 (68.9)	0.12 (0.03–0.49)	0.10 (0.02–0.45)
Secondary education	101/113 (89.4)	0.44 (0.09–2.07)	0.40 (0.08–1.93)
College/University	38/40 (95.0)	Ref	Ref

+COR= Crude odds ratio, AOR= Adjusted odds ratio, CI = Confidence interval)

Although awareness and knowledge are crucial elements in developing a good attitude regarding utilizing the prevention measures [11,28]. Religious beliefs and public misconceptions about COVID-19 may have affected the practice of the use of prevention measures [29]. In Ethiopia, it was reported that despite the community having adequate knowledge of COVID-19 prevention, the majority did not prefer face masks and participated in various social gatherings [7,11]. Our findings contribute to the global body of knowledge, which shows that while educating the community is important, other strategies to change the community's attitude toward COVID-19 prevention measures should also be implemented. In addition, Tanzania, like other developing countries, adopted the use of community health workers to raise community awareness of COVID-19 and prevention measures such as vaccines. The strategy has shown benefits, particularly in rural areas, as most community members are aware that COVID-19 is preventable and that measures such as wearing masks, social distancing, regular handwashing, the use of sanitizers, and vaccination are effective.

This study also found that many people in rural areas received most of their COVID-19 information from radio and television, relatives, and government leaders. The few people mentioning CHWs as a source of informa-

tion suggest that community health worker strategies were effective in certain segments of the population but did not achieve uniform coverage across all groups, particularly nomadic and hard-to-reach populations. The findings on the source of information vary by the study area. The Study conducted in urban areas reported the Ministry of Health, television, and social media as the major sources of information [28,30]. The reliance on radio/TV and relatives, with minimal engagement from healthcare providers, may partly explain the uneven distribution of knowledge, as interpersonal and informal channels are prone to distorting and selectively transmitting health information.

Table 3. Classification of COVID-19 prevention knowledge.

Score	Knowledge level	n	%
0–3	Poor	15	2.2%
4–6	Moderate	11	1.6%
7–8	Good	38	5.5%
9–10	Excellent	625	90.7%

Median score was 10 (IQR: 0-10)

The rural-urban difference in the source of information is attributed to the availability of electricity and internet services, and the household economy, which enables people to afford smartphones. In contrast to a study conducted in Saudi Arabia, where only 2.3% mentioned relatives as sources of information, this study found that 23.1% of participants mentioned relatives [3]. In China and the USA, 51.7% and 57.9% of the public rely on the internet as a source of information, respectively [26]. In addition, healthcare providers were mentioned by only 9.7% of the study participants as sources of information. Although some of the hamlets visited had no health facilities, the findings highlight the need to strengthen the linkages between healthcare providers and the community and to improve methods of delivering health information, particularly during outbreaks, to people living in rural and hard-to-reach areas. Some people probably resisted COVID-19 prevention measures because they received false information from unqualified individuals.

Lastly, this study has demonstrated that education and residence determine awareness toward COVID-19 prevention. The findings are similar to those reported in Ethiopia, Malaysia, and Saudi Arabia [18,25,28]. In Saudi Arabia, a study of a large sample of bachelor's degree holders found that the community had good knowledge, attitudes, and practices regarding COVID-19 prevention. In this study, many nomads who live in hard-to-reach areas were less likely to be aware that COVID-19 is preventable. As in other studies, the findings emphasize the need to ensure that accurate information reaches people in rural areas on time.

Table 4. Knowledge of the community on the COVID-19 prevention measures (n = 449).

Item	Correct response n (%)
• Hand washing using water and soap is among the ways for the prevention of COVID-19 transmission	426 (94.9)
• Using hand sanitizer/s is among the ways the prevention of COVID-19 transmission	424 (94.4)
• Washing or applying sanitizer to a frequently touched surface (e.g., door lockers) is among the ways to the prevention of COVID-19 transmission	406 (90.4)
• Keeping unwashed hands away from the face is among the ways to the prevention of COVID-19 transmission	405 (90.2)
• Avoiding shaking hands and hugging is among the ways for the prevention of COVID-19 transmission	425 (94.7)
• Use of face masks is among the ways for the prevention of COVID-19 pandemic transmission	431 (96)
• Covering coughs and sneezes with a clean cloth or mask is among the ways for the prevention of the COVID-19 pandemic transmission	422 (94)
• Social distancing is among the ways for the prevention of COVID-19 pandemic transmission	428 (95.3)
• Staying at home when sick is among the ways for the prevention of COVID-19 pandemic transmission	367 (81.7)
• COVID-19 vaccination is among the ways for the prevention of COVID-19 transmission	380 (84.6)
	Adequate response n (%)
• Overall knowledge of the community on COVID-19 prevention strategies	411 (91.5)

Strengths and limitations

This study was conducted in rural settings and employed a cross-sectional design; therefore, causal associations cannot be established. However, triangulating two rural settings with different geographic locations and economic activities strengthens the robustness of our findings. Additionally, including nomadic and hard-to-

reach populations, who are often underrepresented in COVID-19 knowledge studies, enhances the contextual relevance of these results. These findings may therefore be applicable to rural areas in Tanzania with similar socio-economic characteristics. A key limitation of this study is that attitudes and practices were not assessed; consequently, the relationship between knowledge and behavioral compliance could not be directly established, and any linkage drawn from existing literature should be interpreted with caution.

Table 5. Factors associated with adequate knowledge of the COVID-19 prevention measures among community members (n = 449).

Variables	Knowledge of prevention measures: Adequate n/N (%)	COR (95% CI)+	AOR (95% CI)+
Sex			
Female	257/282 (91.1)	0.9 (0.43–1.75)	
Male	154/167 (92.2)	Ref	
Age (years)			
≤25	88/99 (88.9)	Not estimable†	
26–35	120/133 (90.2)	Not estimable†	
36–45	77/85 (90.6)	Not estimable†	
46–55	53/58 (91.4)	Not estimable†	
56–65	39/40 (97.5)	Not estimable†	
≥66	34/34 (100.0)	Ref	
Marital status			
Married	302/329 (91.8)	1.1 (0.54–2.35)	
Not married	109/120 (90.8)	Ref	
Place of residence			
Esilalei	89/102 (87.3)	1.2 (0.53–2.79)	1.1 (0.50–2.64)
Engutoto	155/158 (98.1)	9.2 (2.54–33.28)	9.4 (2.58–34.01)
Kwala	94/103 (91.3)	1.9 (0.75–4.59)	1.9 (0.80–4.94)
Mlandizi	73/86 (84.9)	Ref	Ref
Employment status			
Unemployed	62/72 (86.1)	0.3 (0.04–2.45)	0.3 (0.03–2.31)
Self-employed	328/355 (92.4)	0.6 (0.08–4.47)	0.6 (0.08–4.69)
Employed	21/22 (95.5)	Ref	Ref
Education level			
No formal education	66/75 (88.0)	0.4 (0.08–1.99)	
Primary education	213/235 (90.6)	0.5 (0.12–2.39)	
Secondary education	96/101 (95.0)	1.1 (0.20–5.75)	
College/University	36/38 (94.7)	Ref	

+COR= Crude odds ratio, AOR= Adjusted odds ratio, CI = Confidence interval)

Conclusion

This study demonstrates that while general awareness of COVID-19 was very high in rural Tanzanian communities, understanding that the disease is preventable and knowledge of specific prevention measures varied across the population. Although most respondents were classified as having adequate knowledge, important gaps remained in recognizing measures that require behavioral change and trust in biomedical interventions, such as staying at home when sick and vaccination. Hygiene-related preventive measures were widely recognized, whereas these behavioral and biomedical strategies were less well understood.

These findings suggest that broad public health messaging alone is insufficient to ensure a comprehensive understanding of all prevention measures. Future outbreak preparedness and response efforts should prioritize targeted, context-specific communication strategies that reach hard-to-reach and underserved groups through trusted channels, while strengthening the role of healthcare providers and community health workers in delivering accurate and consistent health information.

DECLARATIONS

AI utilization
We acknowledge the use of AI in improving clarity of concepts during the writing.

Competing interests
The authors declare that they have no competing interests, and all authors confirm accuracy.

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Author contributions
NS, MK, and GK participated in the design, data collection, and analysis, and drafted the manuscript. DLM and GF participated in project supervision and reviewed the manuscript. All authors read and approved of the final manuscript.

Data availability
The datasets analyzed during the current study are available from the corresponding author on reasonable request.

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ABSTRACT IN SPANISH

Factores asociados con la conciencia y el conocimiento sobre la prevención de la COVID-19 en zonas rurales de Tanzania: un estudio transversal comunitario

Introducción: Para 2022, el número de casos notificados de COVID-19 había disminuido a nivel mundial. Sin embargo, la enfermedad seguía siendo una preocupación importante en países de ingresos bajos y medianos como Tanzania, donde probablemente muchos casos no fueron detectados debido al subregistro y a la vigilancia limitada. Dado que no existía una cura definitiva, era importante que la población continuara practicando medidas preventivas como la vacunación, el uso de mascarillas y una adecuada higiene. El grado en que las personas seguían estas recomendaciones dependía con frecuencia de cuánto sabían y comprendían sobre la COVID-19. Sin embargo, no estaba claro cuánta información llegaba a las personas que vivían en comunidades remotas o nómadas. Por ello, este estudio evaluó los factores asociados con la conciencia y el conocimiento comunitario sobre la prevención de la COVID-19 en zonas rurales de Tanzania.

Métodos: Se realizó un estudio transversal comunitario en septiembre de 2022 en los distritos de Kibaha y Monduli. Se utilizó un muestreo multietápico para reclutar a 689 adultos de 18 años o más. Entrevistadores capacitados administraron cuestionarios estructurados para evaluar la conciencia y el conocimiento de los participantes sobre la prevención de la COVID-19. El conocimiento se midió mediante una escala dicotómica de 10 ítems. Se utilizó regresión logística para identificar predictores de conocimiento adecuado sobre la prevención de la COVID-19. Todos los análisis se realizaron con SPSS versión 23.

Resultados: De los 689 participantes, el 63,4% eran mujeres, el 50,2% tenía educación primaria y el 78,5% trabajaba por cuenta propia. En general, el 97,4% había oído hablar de la COVID-19, aunque solo el 66,9% reconocía que la enfermedad es prevenible. La conciencia de que la COVID-19 es prevenible se asoció significativamente con el lugar de residencia y el nivel educativo. En comparación con los residentes de Mlandizi, los participantes de Esilalei (AOR = 0,3; IC 95%: 0,14–0,50) y Engutoto (AOR = 0,4; IC 95%: 0,22–0,78) tenían menor probabilidad de reconocer que la enfermedad es prevenible. Del mismo modo, las personas sin educación formal (AOR = 0,0; IC 95%: 0,01–0,18) y aquellas con educación primaria (AOR = 0,1; IC 95%: 0,02–0,45) mostraron una conciencia significativamente menor que los participantes con educación universitaria o superior. Entre quienes reconocían que la COVID-19 es prevenible (n = 449), el conocimiento de las estrategias de prevención fue consistentemente alto. La mediana de la puntuación de conocimiento fue 10 (RIC: 9–10), lo que indica una comprensión sólida y consistente de las medidas preventivas recomendadas. Las medidas reconocidas con mayor frecuencia fueron el uso de mascarilla (96,0%) y el distanciamiento social (95,3%), mientras que quedarse en casa cuando se está enfermo (81,7%) y la vacunación contra la COVID-19 (84,6%) fueron menos reconocidas.

Conclusión: A pesar de la alta conciencia general sobre la COVID-19, el reconocimiento de que la enfermedad es prevenible varió según el nivel educativo y el lugar de residencia. Aunque el conocimiento de las medidas preventivas entre quienes eran conscientes de su prevención fue consistentemente alto, persistieron brechas importantes entre las personas con menor nivel educativo y quienes vivían en zonas de difícil acceso. Por tanto, las estrategias de salud pública deberían priorizar enfoques de comunicación específicos y adaptados al contexto, para garantizar que la información preventiva precisa y aplicable llegue a comunidades desatendidas y nómadas.

Palabras clave: COVID-19, prevención, conocimiento, conciencia, rural, Tanzania.

REFERENCES

[1] https://www.worldometers.info/coronavirus/.

[2] Stanislaw Stawicki SP, Jeanmonod R, Miller AC, Paladino L, Gaieski DF, Yaffee AQ et al. The 2019-2020 Novel Coronavirus (Severe Acute Respiratory Syndrome Coronavirus 2) Pandemic: A Joint American College of Academic International Medicine-World Academic Council of Emergency Medicine Multidisciplinary COVID-19 Working Group Consensus Paper. J Glob Infect Dis. 2020 May 22;12(2):47-93.

[3] AbuAlhommos AK, Alhadab FE, Almajhad MM, Al-

mutawaa R, Alabdulkareem ST. Community knowledge of and attitudes towards COVID-19 prevention techniques in Saudi Arabia: A cross-sectional study. Int J Environ Res Public Health. 2021; 18(23):12783.

[4] Helmy YA, Fawzy M, Elaswad A, Sobieh A, Kenney SP, Shehata AA. The COVID-19 pandemic: A comprehensive review of taxonomy, genetics, epidemiology, diagnosis, treatment, and control. J Clin Med. 2020 Apr 24;9(4):1225

[5] Gao H, Hu R, Yin L, Yuan X, Tang H, Luo L et al. Knowledge, attitudes and practices of the Chinese public with respect to coronavirus disease (COVID-19): an online cross-sectional survey. BMC Public Health. 2020 Nov 30;20(1):1816.

[6] Abdullahi L, Onyango JJ, Mukiira C, Wamicwe J, Githiomi R, Kariuki D et al. Community interventions in Low-And Middle-Income Countries to inform COVID-19 control implementation decisions in Kenya: A rapid systematic review. PLoS One. 2020 Dec 8;15(12):e0242403.

[7] Bukata IT, Dadi LS, Ayana AM, Mengistu D, Yewal D, Gizaw TS, Woldesenbet YM. Knowledge, attitudes, and practice toward prevention of COVID-19 among Jimma Town residents: A community-based cross-sectional study. Front Public Health. 2022 Apr 27;10:822116.

[8] COVID-19 Excess Mortality Collaborators. Estimating excess mortality due to the COVID-19 pandemic: a systematic analysis of COVID-19-related mortality, 2020-21. Lancet. 2022 Apr 16;399(10334):1513-1536.

[9] Shimul SN, Alradie-Mohamed A, Kabir R, Al-Mohaimeed A, Mahmud I. Effect of easing lockdown and restriction measures on COVID-19 epidemic projection: A case study of Saudi Arabia. PLoS One. 2021 Sep 9;16(9):e0256958.

[10] Velias A, Georganas S, Vandoros S. COVID-19: Early evening curfews and mobility. Soc Sci Med. 2022 Jan;292:114538

[11] Adane D, Yeshaneh A, Wassihun B, Gasheneit A. Level of Community readiness for the prevention of COVID-19 pandemic and associated factors among residents of Awi Zone, Ethiopia: A community-based cross-sectional study. Risk Manag Healthc Policy. 2021 Apr 13;14:1509-1524.

[12] Umeta Chali B, Melaku T, Berhanu N, Mengistu B, Milkessa G, Mamo G, Alemu S, Mulugeta T. Traditional medicine practice in the context of COVID-19 pandemic: Community claim in Jimma Zone, Oromia, Ethiopia. Infect Drug Resist. 2021 Sep 16;14:3773-3783.

[13] Kocaadam B, Şanlier N. Curcumin, an active component of turmeric (Curcuma longa), and its effects on health. Crit Rev Food Sci Nutr. 2017 Sep 2;57(13):2889-2895.

[14] World Health Organization, Covid-19 Vaccines: Safety Manual. 2021.

[15] Toure AA, Traore FA, Camara G, Magassouba AS, Barry I, Kourouma ML et al,. Facilitators and barriers to COVID-19 vaccination among healthcare workers and the general population in Guinea. BMC Infect Dis. 2022 Sep 27;22(1):752.

[16] Dubik SD. Understanding the facilitators and barriers to COVID-19 vaccine uptake among teachers in the Sagnarigu Municipality of Northern Ghana: A cross-sectional study. Risk Manag Healthc Policy. 2022 Feb 24;15:311-322.

[17] Dewau R, Mekonnen TC, Tadesse SE, Muche A, Bogale GG, Tadesse Amsalu E. Knowledge and practice of clients on preventive measures of COVID-19 pandemic among governmental health facilities in South Wollo, Ethiopia: A facility-based cross-sectional study. PLoS One. 2021;16(3):e0247639.

[18] Shrestha A, Thapa TB, Giri M, Kumar S, Dhobi S, Thapa H et al,. Knowledge and attitude on prevention of COVID-19 among community health workers in Nepal-a cross-sectional study. BMC Public Health. 2021 Jul 19;21(1):1424.

[19] Mugambe RK, Ssekamatte T, Kisaka S, Wafula ST, Isunju JB, Nalugya A et al,. Extent of compliance with COVID-19 prevention and control guidelines among supermarkets in Kampala Capital City and Mukono Municipality, Uganda. PLoS One. 2021 Oct 28;16(10):e0258840.

[20] Mosha IH, Mussa TR, Mwanga HH. Compliance with infection prevention and control standard precautions among physiotherapists in regional referral hspitals in Dar es Salaam, Tanzania. TMJ. 2025;36(1):31-57.

[21] Rwegerera F, Mwenesi M, Njiro BJ, Tinuga F, Kinyunyi P, Giattas MR et al,. The COVID-19 vaccination rollout in Tanzania: The role of coordination in its success. Vaccines. 2025; 13(5):484.

[22] Mathenge V, Onuekwe C, Nass S, Akim C, Msunyaro E, Mfinanga E et al,. Strategies to improve COVID-19 vaccination coverage in Manyara region, Tanzania, July to September 2022: best practices and lessons learned. Pan Afr Med J. 2023;45(Suppl 1):3.

[23] https://www.sensesatlas.com/territory/maasai-villages.

[24] Singh AS and Masuku MB. Sampling techniques & determination of sample size in applied statistics research : an overview. Int J Econ Commer. 2014;2:1–22.

[25] Azlan AA, Hamzah MR, Sern TJ, Ayub SH, Mohamad E. Public knowledge, attitudes and practices towards COVID-19: A cross-sectional study in Malaysia. PLoS One. 2020 May 21;15(5):e0233668.

[26] Xiong Y, Weng X, Snyder B, Ma L, Cong M, Miller EL et al,. Perceptions and knowledge regarding the COVID-19 pandemic between U.S. and China: a mixed methods study. Global Health. 2022;18(1):76.

[27] Elnadi H, Odetokun IA, Bolarinwa O, Ahmed Z, Okechukwu O, Al-Mustapha AI. Correction: Knowledge, attitude, and perceptions towards the 2019 Coronavirus Pandemic: A bi-national survey in Africa. PLoS One. 2021 Feb 17;16(2):e0247351.

[28] Feleke BT, Wale MZ, Yirsaw MT. Knowledge, attitude and preventive practice towards COVID-19 and associated factors among outpatient service visitors at Debre Markos compressive specialized hospital, north-west Ethiopia, 2020. PLoS One. 2021;16(7):e0251708.

[29] Mekonnen HS, Azagew AW, Wubneh CA, Belay GM, Assimamaw NT, Agegnehu CD et al. Community's misconception about COVID-19 and its associated factors among Gondar town residents, Northwest Ethiopia. Trop Med Health. 2020 Dec 7;48:99.

[30] Olaimat AN, Aolymat I, Shahbaz HM, Holley RA. Knowledge and information sources about COVID-19 among university students in Jordan: A cross-sectional study. Front Public Health. 2020 May 29;8:254.