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One year on - the long-term impact of COVID-19 pandemic and government restrictions on the health-seeking behaviour, financial security and mental health of TB survivors

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Abstract

Background People with tuberculosis (TB) may face long-term physical and psycho-social-economic disability related to TB treatment. The Corona Virus Disease 2019 (COVID-19) pandemic and government restrictions disrupted health care services. We describe health-seeking behaviour, perceived financial impact, and the mental health of TB survivors one year after the COVID-19 pandemic. We further explore factors associated with the perceived impact of COVID-19 and government restrictions on health-seeking behaviour.

Methods This is a cross-sectional study nested in an ongoing observational TB Sequel cohort study. Adults (≥ 18yrs) who had completed treatment for drug-susceptible pulmonary TB in South Africa, the Gambia, and Mozambique before the start of the COVID-19 pandemic, completed a COVID-19 questionnaire which included the WHO tool for Behavioural Insights on COVID-19, the Kessler Psychological Distress Scale (K10) and Medical Outcomes Short Form Survey (SF-36) for health-related quality of life. Questionnaires were administered during scheduled TB Sequel follow-up study visits between 04/2021 and 10/2021. We used publicly available data on the number of COVID-19 cases and the start and end date of each wave to define country-specific COVID-19 "in-wave" and "out-of-wave" phases. We compared psycho-social and economic measures reported during these phases. In addition, we explored factors associated with poor health-seeking behaviour (comprised of moderate or serious impact) using logistic regression.

Results Four hundred eighty seven TB survivors (69% male, median age 33 years IQR 25–42, median time since TB treatment completion 16 months IQR 13–27) completed the COVID-19 questionnaire. About a quarter of TB survivors reported that their financial status ($n = 117$; 24%) or their health-seeking behaviour for any health condition ($n = 128$; 26%) had been seriously impacted by COVID-19 and the governments' response. A third of patients (30.4%) reported

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using coping strategies. Logistic regression indicated that males, living with HIV and being on antiretroviral treatment (ART), being impacted financially during COVID-19, and experiencing social changes, were associated with poor health-seeking behaviour.

Conclusion Governments' response to COVID-19 affected TB survivors' healthcare-seeking behaviour, financial status and mental health. The long-term adverse effects on health-seeking behaviour are important for TB survivors who are at increased risk for recurrent disease and long-term disability in the first two years after treatment completion.

Trial registration Clinical trial number: not applicable.

Keywords TB, COVID-19, Health-seeking behaviour, COVID-19 pandemic

Introduction

Mental health disorders, respiratory, musculoskeletal, hearing, visual, renal, and neurological impairment are among the most commonly reported TB-related disabilities [1]. In addition to the physical disabilities, there are long-term psychological, social and economic consequences that occur beyond TB treatment completion [2]. Although there is little information on the long-term economic impact of TB, a few studies among TB survivors have shown that employment and income are low at TB treatment completion, with limited recovery in the following year [2].

Despite the availability of free TB treatment, costs associated with the disease in low-income settings, are well documented [3–5]. During diagnosis and treatment of TB, patients incur direct costs associated with health-seeking, indirect costs due to missing work, and by missing work patients use up savings and sell their assets [6, 7]. There is however, not enough information about the long-lasting psycho-social and economic impact of TB beyond TB treatment completion.

The COVID-19 pandemic and government restrictions had a negative impact on people accessing health care services and on services themselves. In South Africa, the government immediately responded by declaring a National State of Disaster on March 27 2020. This restricted international travel, closed schools, limited public gatherings, and introduced a mandatory daily curfew between 9 pm and 5 am, restricting the movement of people except for a few categories of essential staff, including health care workers [8]. The restriction on the movement of people had a negative impact on accessing healthcare services. The COVID-19 pandemic also affected services including TB services; from TB case detection, TB hospitals being predesignated as COVID-19 hospitals, and staff from TB programmes, laboratories and wards being diverted to the COVID-19 response. There were also disruptions of routine TB and other essential health services [9]. Furthermore, after TB treatment completion but in the presence of post-TB disabilities, there is more engagement with the healthcare system compared to other groups. COVID-19 with its various restrictions may have prevented patients from engaging with healthcare services following treatment completion.

In The Gambia after the first case was confirmed on 17 March, 2020, the government put in place social mitigation strategies such as keeping physical distance, avoiding public gatherings, and self-isolation [10]. In Mozambique, the first case of Coronavirus Disease 2019 (COVID-19) was confirmed on 22 March, 2020 and by 11 May, 2020 there were 103 cumulative confirmed cases. A strict set of regulations restricting mobility were put in place by the government a few days after Mozambique's first case of COVID-19 was confirmed. All sports and cultural events were suspended, some employees were asked to work from home, and gatherings larger than ten individuals were banned [11].

The COVID-19 pandemic did not only have an impact on healthcare services but also on food security, financial stability and mental health. According to Hlayisi and colleagues (2019), prior to the COVID-19 pandemic in early 2020, the unemployment rate in South Africa was at its highest in history at 29.1%. The COVID-19 epidemic caused unemployment to increase even further, reaching 35.3%. In Mozambique, in 2020, overall employment decreased by 1.9% and the economy lost 3.6% of its growth potential in comparison to a scenario in which COVID-19 was not present [12]. In The Gambia, the COVID-19 pandemic had an impact on employment especially the poorest, women, and rural population who experienced larger loss of employment and income relative to other groups [13]. A study done in South Africa showed that COVID-19 restrictions led to increased experiences of stress and anxiety [14]. In Mozambique there was evidence of the impact of the COVID-19 pandemic on mental health including in both the public and healthcare workers [15, 16].

With limited data on long-term physical and psycho-social-economic disability related to TB treatment and the disruptions of health services and economic activities, we set out to describe health-seeking behaviour, perceived financial impact and mental health among TB survivors one year after the COVID-19 pandemic. We further explore factors associated with perceived impact

of COVID-9 and government restriction on health-seeking behaviour.

Methods

Design

Cross-sectional study with patient interviews.

Study setting and sample

This was a cross sectional study nested in an ongoing prospective observational cohort study, called TB Sequel (https://www.tbsequel.org/) [17]. The parent study (TB Sequel) aims to (i) understand the clinical, microbiological, immunological and socio-economic risk factors affecting or predicting long-term pulmonary function and (ii) determine patient and health system costs related to TB treatment. The parent study is being conducted in four African countries; South Africa, Tanzania, The Gambia and Mozambique. In the first round of TB Sequel, over 1,400 adults diagnosed with pulmonary TB were recruited and followed for at least 24 months after TB treatment initiation Participants were recruited at TB treatment initiation between 09/2017 and 02/2020 and were treated according to the local standard of care by the respective National TB Control Program in each country.

Our sample consisted of adults (≥ 18 years) who were enrolled in the TB Sequel study, had completed treatment for drug-susceptible pulmonary TB through the national TB programmes in South Africa, The Gambia and Mozambique before the start of the COVID-19 pandemic (March 2020), and were returning for scheduled TB Sequel study follow-up visits between April 2021 and October 2021. TB Sequel participants were scheduled to return at 6 months after TB treatment completion and every 12 months thereafter for scheduled follow-up study visits. Participants from Tanzania did not complete the WHO tool for Behavioural Insights on COVID-19 tool as regulatory approvals could not be secured and participants from Tanzania were subsequently excluded.

Data sources and sample size

A convenient sample was used for this study since this study was nested in an ongoing prospective observational cohort study. The TB Sequel study team identified eligible participants during scheduled follow-up visits. The team informed eligible participants about the study, and if they were willing to participate, obtained written informed consent from participants. Trained study staff administered a questionnaire that included the World Health Organisation (WHO) tool for Behavioural Insights on COVID-19 [15, 16]. In July 2020 the WHO released a survey tool and guidance to monitor behavioural insights on COVID-19 (https://www.who.int/europe/publications/i/item/WHO-EURO-2020-696-40431-54222). The instrument was available in English and was verbally translated into local languages by local study staff. The tool included questions on experiences with COVID-19, the probability of getting COVID-19, preparedness and self-efficacy, prevention behaviours etc. (Supplementary file 1.) At the same visit, the study team also administered the Medical Outcomes Short Form Survey (SF-36), Kessler Psychological Distress Scale (K10) and Household Food Insecurity Access Scale (HFIAS) questionnaire to measure health-related quality of life (HRQoL), psychological distress and food insecurity respectively. The study team entered responses on paper forms and later captured these into an online data collection tool in OpenClinica® (https://www.openclinica.com/).

Additionally, we obtained COVID-19 data from publicly available data on monthly COVID-19 cases and obtained dates at which different levels of lockdown were imposed.

Study variables

Demographics

Data for age, gender, marital status, HIV status, ART status, treatment initiation year, and employment status were obtained from the main TB Sequel cohort (using the unique TB Sequel study ID to link patients across the cohort database and the COVID-19 health-seeking questionnaire dataset).

Health-seeking behaviour

Self-reported data on health-seeking behaviour, impact on financial status and interview date was obtained from the COVID-19 health-seeking questionnaire dataset. Each participant was only interviewed once as they were coming for their scheduled visit in the main study. For household impact, participants were asked to rate the extent that COVID-19 and the government restrictions impacted their household financially on a scale of 1 to 5, (1-no impact, 2-little impact, 3-moderate impact and 4-serious impact and 5-very serious impact). Participants also provided reasons for their choice, and the most common ways in which they were impacted (e.g. missed a visit to a health facility, missed a medication collection visit, ran out of usual medication, delayed going to the clinic, delayed taking a family member to the clinic, could not take a child for routine child immunizations). A similar approach was followed for health-seeking behaviour, where participants were asked to what extent COVID-19 and the government response had affected their health-seeking behaviour on a scale of 1 to 5 (1-no impact, 2-little impact, 3-moderate impact,4-serious impact and 5-very serious impact). Participants also provided reasons for their choice, and the most common ways in which health-seeking behaviour was affected (e.g. high cost of food/living, reduced working hours/income,

stopped working (self-employed), retrenched, restrictions to send/receive money, lost capital and general financial strain).

Psychological distress

Psychological distress was assessed using the Kessler Psychological Distress Scale (K10). Each item was scored from one 'none of the time' to five 'all of the time'. Scores of the 10 items were then summed, yielding a minimum score of 10 and a maximum score of 50. Scores under 19 are likely to be well, scores 20–24 are likely to have a mild mental disorder, scores 25–29 are likely to have a moderate mental disorder and scores 30 and over are likely to have a severe mental disorder [18].

Health-related quality of life (HRQoL) scores were calculated using standard methods for the RAND 36-Item Health Survey [19]. From the 36-item scale, we calculated the eight domains; physical functioning (10 items), physical role limitations (four items), bodily pain (two items), general health perceptions (five items), energy/vitality (four items), social functioning (two items), emotional role limitations (three items) and present the mean, standard deviation and Cronbach's alpha for the eight domains. We use the median cut-off to define poor HRQoL (< median) and good HRQoL (≥ median).

Time since TB treatment completion was defined as time (days) between the date when TB treatment was completed (obtained from the TB Sequel cohort study) and the date of the visit (when the interview and the questionnaire were completed).

Changes due to COVID-19. Changes due to COVID-19 were also added to the list of variables. Social changes was defined as how COVID-19 affected relationships, increased psychological distress or food/income security. Household composition was defined as household composition changed since COVID-19, Yes/No. Coping strategies was captured as either, borrowed money, used savings or sold assets/property.

Table 1 Publicly accessible data was used to define the COVID-19 "in-wave"

Country	Wave	Wave start	Wave end
South Africa*	1	01 June 2020	28 August 2020
	2	28 November 2020	05 February 2021
	3	01 May 2021	15 August 2021
	4	01 December 2021	20 December 2021
The Gambia[$]	1	20 July 2020	28 September 2020
	2	05 January 2021	05 May 2021
	3	07 July 2021	01 October 2021
	4	03 January 2022	07 February 2022
Mozambique[#]	1	01 January 2021	12 April 2021
	2	15 June 2021	25 September 2021
	3	04 December 2021	06 February 2022

Source:

*South Africa - National Institute for Communicable Diseases, "An update on COVID-19 outbreak in South Africa," 2021. [Online]. Available: https://www.nicd.ac.za/wp-content/uploads/2021/07/An-update-on-COVID-19-outbreak-in-South-Africa.pdf

[$]The Gambia - Worldometer - www.worldometers.info

[#]Mozambique - Worldometer - www.worldometers.info

COVID-19 dates

Government response (restrictions) includes measures that governments' implemented during the COVID-19 pandemic to reduce the spread of the virus (e.g. social distancing, lockdown, curfews, restrictions on movement, etc.). We used publicly available data on the number of COVID-19 cases and the start and end date of each wave to define country-specific COVID-19 "in-wave" and "out-of-wave" phases. We compared measures reported during these phases. For all the countries, we defined "in-wave" as the period when there was a surge in new COVID-19 infections between 2020 and 2021 and "out-of-wave" as the period when new infections were low as shown in Table 1. Reported cases informed the start and end dates of each wave as decided by respective governments. The start of a wave date was set at a sustained increase before the declaration of the wave. The end of a wave date was set at the date at which the end of the wave threshold was reached (Table 1). Patients were classified into "in-wave" or "out-of-wave" based on their visit date.

Statistical analysis

Descriptive statistics (frequencies, medians, and interquartile ranges) were used to present the characteristics of TB survivors in the three countries.

First, to assess the impact of government response on health-seeking behaviour and financial status, we looked at the proportions that reported no impact, little, moderate, and serious impact on financial status and health-seeking behaviour.

Second, we looked at health-seeking behaviour over the study period by month and compared this to the total number of COVID-19 cases reported for each country. Additionally, for South Africa (where detailed information on the COVID-19 waves and restrictions were available), we report total COVID-19 cases over time and during different levels of restrictions and the proportion seeking care between March 2021 to October 2021. The South African government put in place five levels of restrictions, Level 5 was when drastic measures were implemented on the other hand Level 1 meant most normal activities were allowed to resume.

For health-related quality of life (HRQoL), we present the mean, standard deviation, and Cronbach's alpha for the eight domains, stratified by the perceived impact of COVID-19 on health-seeking behaviour. For reliability, a Cronbach's alpha value of > 0.80 was used to define good internal consistency of the SF-36 domains (Table 3). To

compare domains for those who perceived a moderate to serious impact of COVID-19 on health-seeking behaviour versus those who reported little or no impact, we used the Wilcoxon rank-sum or Kruskal-Wallis test for non-parametric data and the student t-test for parametric or normally distributed data.

Last, we explored factors associated with poor health-seeking behaviour (defined as moderate or serious impact) using logistic regression to estimate the Odds Ratio (OR) and corresponding 95% confidence intervals (CIs). We restricted the analysis to those that responded to the question on health-seeking behaviour (complete case analysis) (Table 2). Variables in the crude analysis with a p-value < 0.25 along with a priori variables and those that were clinically important were considered in the multivariate analysis. All data analysis was done using Stata statistical software version 15 (Stata Corp, Texas, USA).

Ethics

This study was reviewed and approved by all respective Ethics Committees' at each study site as well as for coordinating institutions [17]. All participants enrolled in the TB Sequel study provided written informed consent. Participants were assigned a unique study identification number for identification purposes, and all electronic data extracted from the clinical data management system were de-identified. The surveys used in this analysis were conducted at visits where patients were reimbursed.

Results

Four hundred eighty seven TB survivors completed the COVID-19 questionnaire; 137 (28%) from Mozambique, 231 (47%) from The Gambia, and 119 (25%) from South Africa. The median age was 33 years (IQR (33–42) and 68.6% were male. The median time since TB treatment completion was 26 months (IQR 16–27), and most were returning for either their 24-month or 36-month study visit (from treatment initiation). Very few people (5.8%) were married in Mozambique compared to South Africa (27.7%) and The Gambia (40.3%). More TB survivors were living without HIV (67.6%) however, this varied by country (7.8% in The Gambia, 44.5% in Mozambique, and 66.4% in South Africa) (Table 2).

Perceived impact of COVID-19 on health-seeking behaviour

When assessing the influence of COVID-19 on health-seeking behaviour based on the timing of COVID-19 waves, we noted that delays in taking family to the clinic and not taking a child(ren) for routine immunization were predominantly experienced during the COVID-19 waves (Figure 1). Missing a medication collection visit was predominantly experienced outside of the COVID-19 waves. Over one quarter (26.6%) of participants reported severe impact on health seeking behaviour, with 36.7% in The Gambia 30.7% in South Africa, and 5.9% in Mozambique. Nearly two-thirds (61.3%) of participants from Mozambique reported no impact, while in South Africa 36.8% reported no impact, and The Gambia only 14.4% reported no impact.

Perceived impact of COVID-19 on financial status

We asked participants to what extent, on a scale of 1 to 5, had COVID-19 and the government restrictions affected their household financial status. One year after the start of the COVID-19 pandemic, 35.3% of TB survivors interviewed from South Africa, 28.7% from The Gambia and 6.8% from Mozambique reported a serious impact on their household financial status (Table 2). One in five patients reported a change in employment status, and half experienced reduced working hours since the start of COVID-19.

The most commonly reported financial impact was reduced working hours and income (52%) (Figure 2), followed by stopping work (21%) and retrenchment (13%). In The Gambia, South Africa, and Mozambique, 41.5%, 22.7%, and 18.3% of patients respectively, reported using capital (dissaving). This may be accomplished by tapping into a savings account, selling assets or property, or borrowing against future income. When assessing the influence of COVID-19 on financial status based on the timing of COVID-19, high costs of food/living and reduced working hours/income were more commonly experienced during the COVID-19 waves (Figure 2). Overall 31.9%, 18.3%, and 66.9% in South Africa, The Gambia, and Mozambique respectively, reported little or no impact on their financial status as a result of COVID-19 and the government restrictions.

Perceived impact of COVID-19 on mental health

We assessed psychological distress using the Kessler Psychological distress (K10) (Cronbach's alpha = 0.85) (Table 2). Overall, 29.4% of participants experienced some level of psychological distress, with 13% falling into the moderate to severe categories. Mozambique had the lowest levels of distress (only 1 moderate case, no severe). The Gambia showed the highest distress moderate (10.8%) and severe distress (8.7%). South Africa had moderate results, with 14.3% (combined moderate + severe) still experiencing notable distress.

We assessed health-related quality of life using the 36-Item Short Form Health Survey (SF-36), comparing participants who reported no impact versus those who reported an impact on health-seeking behaviour (HSB). Across nearly all SF-36 domains, individuals who reported an impact on HSB scored significantly lower than those who reported no impact, indicating poorer

Table 2 Characteristics of TB survivors in Mozambique, The Gambia, and South Africa who completed the COVID-19 questionnaire at a TB Sequel follow-up visit ($n=487$)

	Mozambique	Gambia	South Africa	Total	*p*-value
	***N*=137**	***N*=231**	***N*=119**	***N*=487**	
	***N* (%)**	***N* (%)**	***N* (%)**	***N* (%)**	
At recruitment into the TB Sequel study					
Age					< 0.001
18–29	47 (34.3)	114 (49.4)	21 (17.6)	182 (37.4)	
30–39	42 (30.7)	66 (28.6)	54 (45.4)	162 (33.3)	
40–49	24 (17.5)	32 (13.9)	34 (28.6)	90 (18.5)	
50–59	19 (13.9)	15 (6.5)	5 (4.2)	39 (8.0)	
60+	5 (3.6)	4 (1.7)	5 (4.2)	14 (2.9)	
Sex					0.097
Female	53 (38.7)	66 (28.6)	34 (28.6)	153 (31.4)	
Male	84 (61.3)	165 (71.4)	85 (71.4)	334 (68.6)	
Education					
No formal schooling	5 (3.7)	72 (31.2)	0 (0.0)	77 (15.8)	< 0.001
Primary school	48 (35.0)	27 (11.7)	22 (18.5)	97 (19.9)	
Secondary school	68 (49.6)	56 (24.2)	14 (11.8)	138 (28.3)	
High school or equivalent	8 (5.8)	68 (29.4)	77 (64.7)	153 (31.4)	
Vocational training	0 (0.0)	5 (2.2)	4 (3.4)	9 (1.8)	
University	8 (5.8)	3 (1.3)	2 (1.7)	13 (2.7)	
Marital Status					< 0.001
Divorced/Separated	13 (9.5)	13 (5.6)	9 (7.6)	35 (7.2)	
Living with Partner	53 (38.7)	0 (0)	21 (17.6)	74 (15.2)	
Married	8 (5.8)	93 (40.3)	33 (27.7)	134 (27.5)	
Single	56 (40.9)	120 (51.9)	52 (43.7)	228 (46.8)	
Widowed	7 (5.1)	5 (2.2)	4 (3.4)	16 (3.3)	
HIV status					< 0.001
Negative	76 (55.5)	213 (92.2)	40 (33.6)	329 (67.6)	
Positive	61 (44.5)	18 (7.8)	79 (66.4)	158 (32.4)	
Year of treatment initiation/recruitment					< 0.001
2017	2 (1.5)	19 (8.2)	2 (1.7)	23 (4.7)	
2018	29 (21.3)	89 (38.5)	40 (33.6)	158 (32.5)	
2019	105 (77.2)	123 (53.2)	77 (64.7)	305 (62.8)	
TB Sequel follow-up visit after completion of TB treatment					
Time since treatment completion					
Median days (IQR)	27 (17–27)	26 (15–28)	16 (13–27)	26 (16–27)	< 0.001
Timing of COVID-19 questionnaire					< 0.262
"Out-of-wave"	56 (40.9)	95 (41.1)	59 (49.6)	210 (43.1)	
"In-wave"	81 (59.1)	136 (58.9)	60 (50.4)	277 (56.9)	
Proportion returning for					< 0.001
24 months study visit	51 (37.5)	71 (35.9)	41 (51.3)	163 (39.4)	
36 months study visit	71 (52.2)	107 (54.0)	37 (46.2)	215 (51.9)	
48 months study visit	14 (10.3)	20 (10.1)	2 (2.5)	36 (8.7)	
Current employment status					< 0.001
Full-time work (> 30 h per week)	47 (35.6)	112 (48.7)	37 (32.5)	196 (41.2)	
Part-time work (15–30 h per week)	18 (13.6)	18 (7.8)	20 (17.5)	56 (11.8)	
Casual work (irregular hours)	7 (5.3)	35 (15.2)	4 (3.5)	46 (9.7)	
Looking for work	34 (25.8)	4 (1.7)	40 (35.1)	78 (16.4)	
Not in the paid workforce	1 (0.8)	58 (25.2)	5 (4.4)	64 (13.4)	
Other	25 (18.9)	3 (1.3)	8 (7)	36 (7.6)	
Employment status changed since before COVID-19					< 0.001
No	132 (96.3)	165 (71.4)	93 (78.1)	390 (80.1)	
Yes	5 (3.7)	66 (28.6)	26 (21.9)	97 (19.9)	

Table 2 (continued)

	Mozambique	Gambia	South Africa	Total	*p*-value
	N **= 137**	***N*** **= 231**	***N*** **= 119**	***N*** **= 487**	
	N **(%)**	***N*** **(%)**	***N*** **(%)**	***N*** **(%)**	
Reduced working hours during COVID-19					
No change	95 (69.3)	89 (38.5)	62 (52.1)	246 (50.5)	< 0.001
Changed	42 (30.7)	142 (61.4)	57 (47.9)	241 (49.5)	
Household composition changed since before COVID-19	57 (47.9)	142 (61.5)	42 (30.7)	241 (49.5)	< 0.001
Health-seeking behaviour (HSB)	*N* = 137	*N* = 229	*N* = 114	*N* = 481	
No impact	84 (61.3)	33 (14.4)	42 (36.8)	159 (33.1)	< 0.001
Little impact	31 (22.6)	48 (21.0)	20 (17.5)	99 (20.6)	
Moderate impact	14 (10.2)	64 (27.9)	17 (15.0)	95 (19.7)	
Serious impact	8 (5.9)	84 (36.7)	35 (30.7)	128 (26.6)	
Financial status	*N* = 133	*N* = 230	*N* = 119	*N* = 482	
No impact	89 (66.9)	42 (18.3)	38 (31.9)	169 (35.0)	< 0.001
Little impact	19 (14.3)	59 (25.7)	24 (20.2)	102 (21.2)	
Moderate impact	16 (12.0)	63 (27.4)	15 (12.6)	94 (19.5)	
Serious impact	9 (6.8)	66 (28.7)	42 (35.3)	117 (24.3)	
Coping strategies during COVID-19	*N* = 136	*N* = 229	*N* = 119	*N* = 484	
Borrowed money	13 (9.6)	81 (35.3)	16 (13.5)	110 (22.7)	< 0.001
Used savings	7 (5.2)	9 (3.9)	8 (6.8)	24 (5.0)	0.503
Sold assets or property	5 (3.7)	5 (2.2)	3 (2.5)	13 (2.7)	0.689
Social changes					
Affected relationships	0 (0.0)	4 (1.9)	3 (4.2)	7 (2.2)	< 0.001
Increased psychological distress or anxiety	1 (2.3)	91 (44.2)	18 (25.4)	110 (34.5)	0.975
Food or income insecurity	42 (97.7)	110 (53.4)	50 (70.4)	202 (63.3)	0.010
Perceived psychological distress (K10)					< 0.001
Likely to be well (< 19)	115 (84.0)	141 (61.0)	88 (74.0)	344 (70.6)	
Mild mental disorder (20–24)	21 (15.3)	45 (19.5)	14 (11.8)	80 (16.4)	
Moderate mental disorder (25–29)	1 (0.7)	25 (10.8)	9 (7.6)	35 (7.2)	
Severe mental disorder (≥ 30)	0 (0.0)	20 (8.7)	8 (6.7)	28 (5.8)	
Health-related quality of life					
Mean (SD)					

Abbreviations: *HSB* Health-seeking behaviour, *HRQoL* Health-related quality of life

perceived health status (Table 3). There were differences were noted in energy/fatigue (mean = 46.45 vs. 59.23; $p < 0.0001$) and social functioning (mean = 54.45 vs. 69.75; $p < 0.0001$), suggesting that perceived strength and social engagement were particularly affected among those whose HSB was impacted. Those who reported an impact on HSB scored significantly lower in emotional well-being (mean = 67.86 vs. 73.70; $p = 0.0006$), pain (mean = 49.16 vs. 59.02; $p = 0.0009$), and general health perceptions (mean = 44.39 vs. 48.59; $p = 0.0080$).

Health-seeking behaviour and COVID-19 cases

We compared the timing of health seeking and COVID-19 cases. In total, 56.9% of interviews were conducted during COVID-19 waves, while 43.1% were conducted outside of these periods (when cases of new infections were low). In Figure 3, we observed a sharp decrease in people seeking care whenever there was a sharp rise in COVID-19 cases in Mozambique and The Gambia.

In South Africa, in addition to comparing the timing of health-seeking and COVID-19 cases, we also compared it with the different levels of restrictions. Figure 4 shows the total number of COVID-19 cases over time and the proportion seeking care between March 2021 to October 2021. We observed low health-seeking behaviour in March 2021 which may be related to overcoming wave 2 in South Africa with 19,042 reported cases. However, because the COVID-19 cases were low from April 2021 we noted an increase in the number seeking care which also corresponded to Alert Level 1 when most normal activities were allowed to resume. The decline in health-seeking behaviour between June 2021 and August 2021 corresponded to the increase in confirmed COVID-19 cases during the same months.

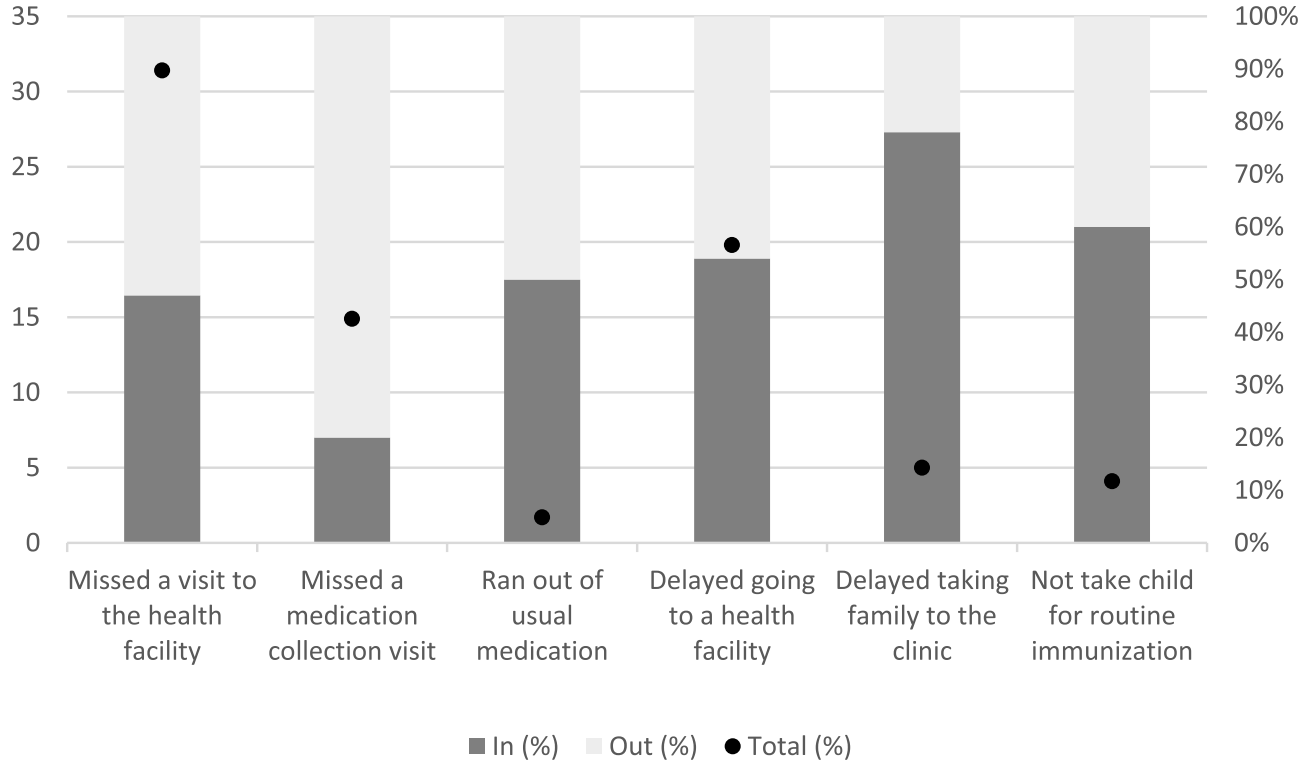


Fig. 1 Perceived effects of COVID-19 on health-seeking behaviour among those who reported an impact and the reason ($n = 121$). The impact of COVID-19 on health-seeking behaviour (dots) as a percentage of those who reported any degree of impact (minimal, moderate, or severe), and then among these, whether it occurred "in-wave" or "out-of-wave"

Factors associated with the perceived impact of COVID-19 and government restriction on health-seeking behaviour (moderate/serious)

Table 4 shows crude and adjusted estimates from a logistic regression model with 95% confidence intervals (CI) for experiencing moderate or serious perceived impact of COVID-19 and government restrictions on health-seeking behaviour.

Compared to those who were psychologically well or with mild psychological distress, those reporting moderate to severe psychological distress (K10 score ≥25) did not affect their perception of COVID-19 on their health-seeking behaviour (OR 1.56 95% CI 0.34-7.07). Similarly, poor HRQoL was not associated with a moderate to serious impact of COVID-19 on health-seeking behaviour (OR 0.60 95% CI 0.35-1.15).

TB survivors who reported food security were more likely to perceive a lower impact of COVID-19 on health-seeking behaviour (OR 6.50, 95% CI 1.35-31.31). While the sample size is limited, this finding supports the notion that individuals who are food secure are more inclined to seek healthcare, thus more likely to perceive an impact [19].

Factors associated with higher likelihood of perceiving a moderate to serious impact were: those living in The Gambia compared with South Africa, (aOR 5.39, 95% CI (2.12-13.69); males impact (aOR 2.0 95% CI 1.04-3.77); people living with HIV and on ART (aOR 3.33, 95% CI 1.30-8.51); and those who reported social changes (any report of affected relationships, increased psychological distress or anxiety or food or income insecurity) (aOR 3.22, 95% CI 1.76-5.89). There was a strong independent relationship between moderate or serious impact of COVID-19 on health-seeking behaviour and reporting a moderate or severe impact of COVID-19 on financial status (aOR 9.53, 95% CI 4.00-22.69; aOR 27.41 95% CI 9.90-75.43).

Discussion

In this study, we describe health-seeking behaviour, perceived financial impact and the mental health of TB survivors one year after the COVID-19 pandemic. Our findings show that Governments' response to COVID-19 affected healthcare-seeking behaviour, financial status and caused psychological distress.

In terms of financial impact our results show that during the COVID-19 pandemic and government restrictions, TB survivors suffered job losses and reduced working hours. Our results support other studies and reports in terms of the financial impact of COVID-19 on individuals in South Africa including TB survivors. For example, according to a report by the South African

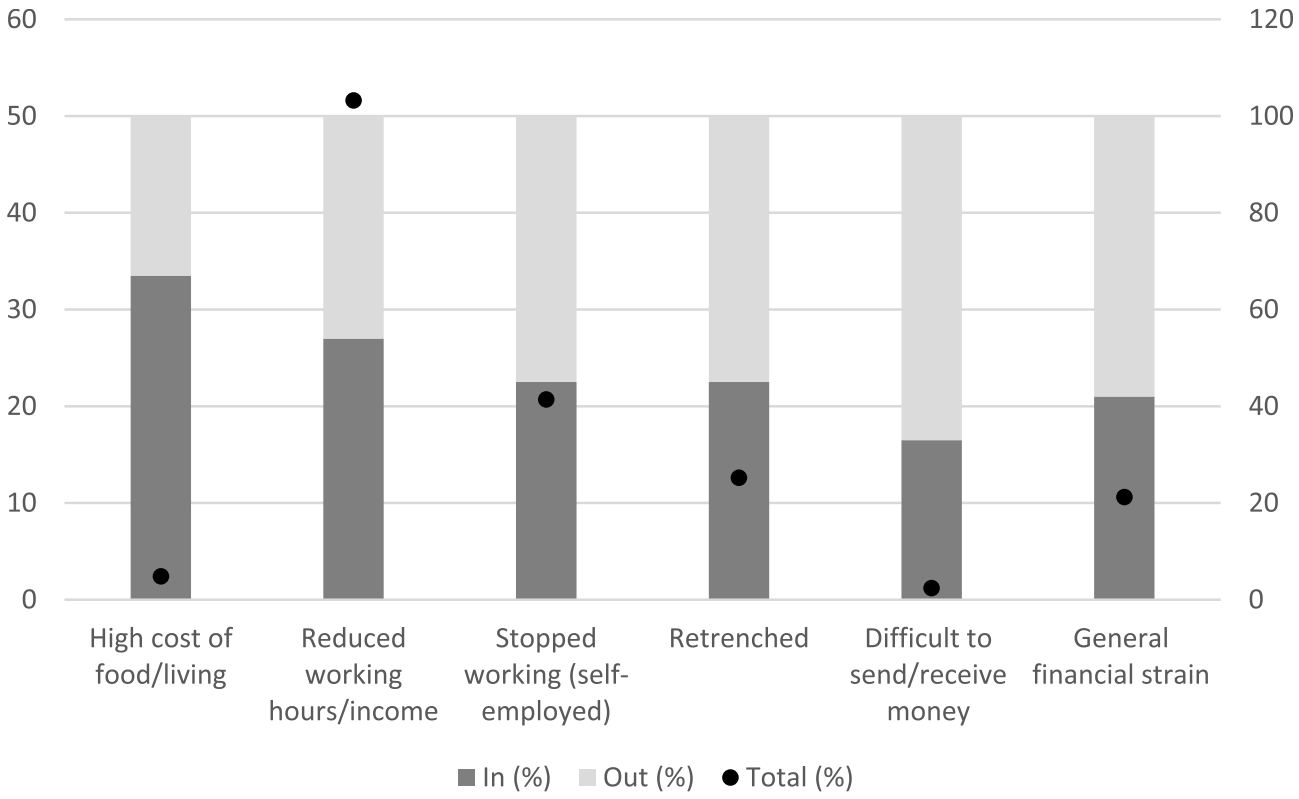


Fig. 2 Perceived impact of COVID-19 on financial status among those who reported an impact and the reason (*n* = 246). The impact of COVID-19 on financial status (dots) as a percentage of those who reported any degree of impact (minimal, moderate, or severe), and then among these, whether it occurred"in-wave" or "out-of-wave"

Table 3 Health-related quality of life scores, stratified by perceived impact of COVID-19 on health-seeking behaviour

			Total		No impact on HSB (*n* = 258)		Impact on HSB (*n* = 223)		*P* value**
Scale[#]	Items	Alpha*	Mean	SD	Mean	SD	Mean	SD	
Physical functioning	10	0.93	61.79	25.70	64.16	23.50	58.41	28.08	0.0188
Role functioning/physical	4	0.84	29.57	43.85	45.37	40.78	24.36	41.34	0.0284
Role functioning/emotional	3	0.83	63.15	47.00	68.26	45.17	57.16	48.46	0.0125
Energy/fatigue	4	0.86	53.55	21.66	59.23	21.14	46.45	20.19	0.0000
Emotional well-being	5	0.90	71.05	18.01	73.70	16.71	67.86	18.89	0.0006
Social functioning	2	0.85	63.07	32.94	69.75	29.92	54.45	34.92	0.0000
Pain	2	0.78	54.52	31.38	59.02	30.15	49.16	32.20	0.0009
General health	5	0.78	46.64	16.67	48.59	17.46	44.39	15.36	0.0080
Health change	1	—	20.55	25.64	22.3	23.18	17.87	27.72	0.0659

High score defines a more favorable health state; each item is scored on a 0 to 100 range so that the lowest and highest possible scores are 0 and 100, respectively; score of 50 indicating average health

[#]Using the 36-Item Medical Outcomes Short Form Health Survey (SF-36)

National Treasury, the COVID-19 pandemic had a significant impact on the South African economy, with an estimated loss of 300 billion Rand in tax revenue for the 2020/2021 fiscal year alone [20]. Our results show that the financial impact felt during COVID-19 was as a result of job losses, reduced working hours and high cost of food. Loss of jobs highlighted in our study was reported in The Gambia. A report on the impact of COVID-19 on poverty in The Gambia showed that unemployment rates increased from 9.5% to 11.5% from 2019 to 2021, also that there was a reduction in economic activity since people's incomes had decreased and the prices of goods increased [21]. Even in situations where there are no pandemics TB survivors are known to suffer job losses and income losses after TB treatment completion [6, 7, 22].

A third of patients reported a loss of capital (dissaving). Dissaving is a useful indicator of financial hardship [23] and is when individuals spend money beyond their available income. This may be accomplished by tapping into savings, selling assets or property or borrowing against

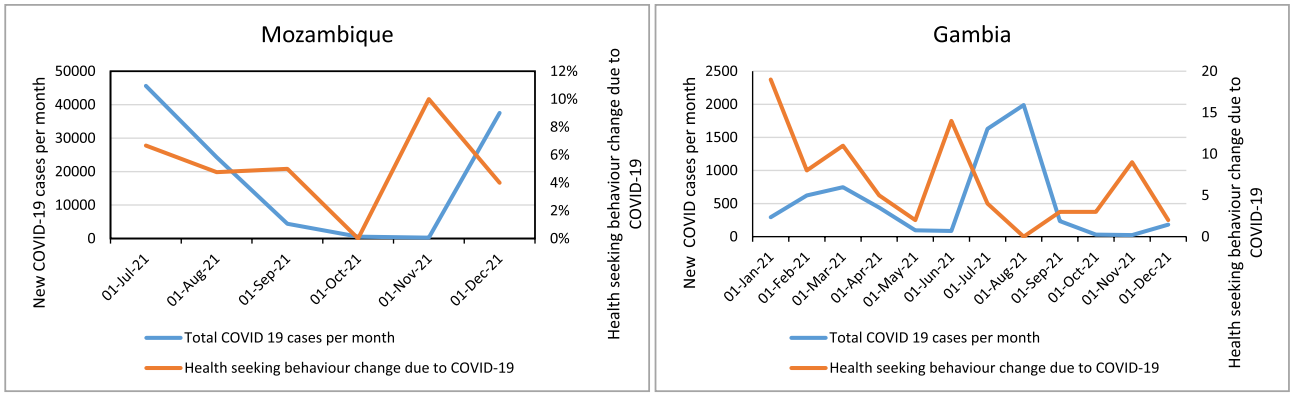
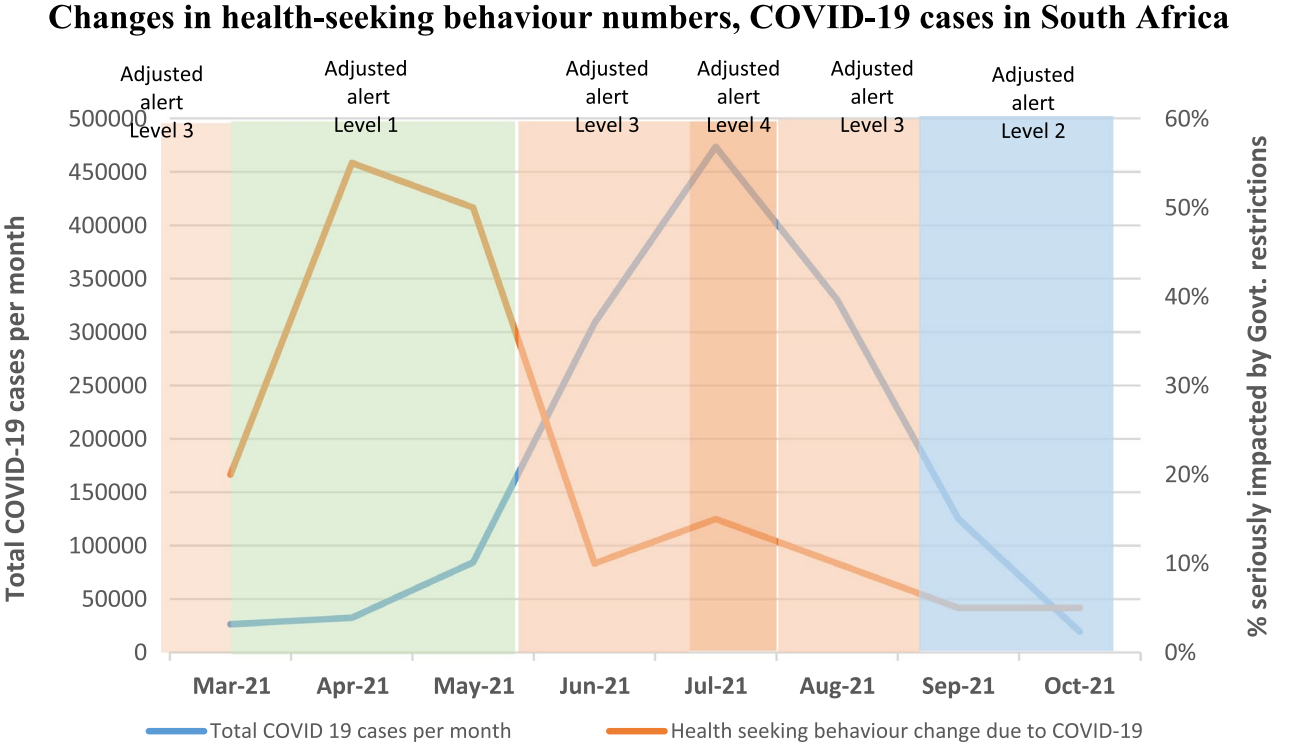


Fig. 3 Health-seeking behaviour of TB survivors and COVID-19 cases in Gambia and Mozambique between March 2021 and October 2021



Adjusted alert level

5	4	3	2	1
Drastic measures implemented	***Extreme precautions - some activity to resume.***	***Restrictions on many activities.***	***Physical distancing & restrictions on social activities***	***Most normal activity allowed to resume***

Fig. 4 Health-seeking behaviour of TB survivors and COVID-19 cases in South Africa between March 2021 and October 202

Table 4 Factors associated with the perceived impact of COVID-19 and government restriction on health-seeking behaviour (moderate/serious) ($n=481$)

Factor		*n/N*	% with outcome	Crude OR (95% CI)	*P* value	Adjusted OR (95% CI)
Country	South Africa	52/114	45.6%	ref	< 0.001	ref
	The Gambia	149/230	64.8%	2.19 (1.39–3.50)		**5.39 (2.12–13.69)**
	Mozambique	22/137	16.1%	0.22 (0.13–0.41)		0.48 (0.18–1.27)
Age	18–29	88/180	48.9%	ref	0.567	
	30–39	80/160	50.0%	1.04 (0.68–1.60)		
	40–49	37/88	42.0%	0.76 (0.45–1.27)		
	50–59	13/39	33.3%	0.52 (0.25–1.08)		
	60+	5/14	35.7%	0.58 (0.19–1.80)		
Sex	Female	88/152	34.9%	ref	0.002	ref
	Male	170/329	51.7%	1.99 (1.34–2.97)		**1.96 (1.03–3.74)**
Education	High school or equivalent	88/150	58.7%	ref	0.005	ref
	No formal schooling	41/77	53.2%	0.80 (0.46–1.39)		0.41 (0.16–1.01)
	Primary school	32/97	33.0%	0.35 (0.20–0.59)		0.48 (0.19–1.19)
	Secondary school	53/135	39.3%	0.46 (0.28–0.73)		0.94 (0.43–2.03)
	Vocational training	3/9	33.3%	0.35 (0.08–1.46)		0.46 (0.06–3.50)
	University	6/13	46.2%	0.60 (0.19–1.88)		3.23 (0.56–18.60)
Marital status	Divorced/Separated	13/35	37.1%	ref	< 0.001	ref
	Living with Partner	20/74	27.0%	0.63 (0.27–1.5)		2.01 (0.51–7.94)
	Married	77/130	59.2%	2.45 (1.1–5.3)		2.66 (0.83–8.26)
	Single	110/226	48.7%	1.60 (0.77–3.3)		2.18 (0.72–6.61)
	Widowed	3/16	18.8%	0.39 (0.09–1.63)		0.67 (0.09–5.29)
HIV status	Negative	162/327	49.5%	ref	0.007	ref
	Positive on ART	18/64	28.1%	0.39 (0.22–0.72)		**3.33 (1.30–8.51)**
	Positive not on ART	43/90	47.8%	0.93 (0.58–1.49)		2.10 (0.88–4.84)
Median time (months) since completion	< 26 months	110/231	47.6%	ref	0.672	
	≥ 26 months	113/250	45.2%	0.91 (0.63–1.30)		
Current employment status	Full-time work	133/251	53.0%	ref	0.044	ref
	Part-time work	29/61	47.5%	0.80 (0.46–1.40)		1.70 (0.73–4.03)
	Unemployed	60/167	35.9%	0.50 (0.33–0.74)		1.23 (0.63–2.39)
Employment status changed since before COVID-19	No change	148/384	38.5%		< 0.001	ref
	Status changed	75/97	77.3%	5.43 (3.23–9.12)		2.10 (0.96–4.46)
COVID-19 wave	Out-of-wave	97/206	47.1%	ref	0.484	
	In-wave	126/275	45.8%	0.90 (0.67–1.16)		
Perceived psychological distress (K10)	None (< 20)	175/380	46.1%	ref	0.560	
	Any distress (≥ 20)	4/7	57.0%	1.56 (0.34–7.07)		
Financial impact	No impact	21/168	12.5%	ref	< 0.001	ref
	Little impact	32/99	32.3%	3.34 (1.80–6.22)		1.33 (0.62–2.88)
	Moderate impact	66/92	71.7%	17.77 (9.33–33.80)		**9.53 (4.00-22.69)**
	Serious impact	10/117	88.9%	56.00 (26.82-116.88)		**27.41 (9.90-75.43)**
Used any savings	No	146/369	39.5%	ref	< 0.001	ref
	Yes	76/109	69.7%	3.51 (2.22–5.56)		0.67 (0.33–1.36)
Borrowed money	No	205/453	75.0%	ref	0.007	ref
	Yes	18/24	45.3%	3.63 (1.41–9.31)		0.81 (0.22–2.95)
Sold Property	No	212/464	45.6%	ref	0.038	ref
	Yes	10/13	76.9%	3.96 (1.07–14.58)		0.79 (0.13–4.77)
Social changes	No	58/247	23.5%	ref	< 0.001	ref
	Yes	168/319	72.3%	8.51 (5.62–12.89)		**3.22 (1.76–5.89)**
Food security	Food insecure	30/60	50.0%	ref	0.020	
	Food secure	13/15	86.7%	6.50 (1.35–31.31)		

Table 4 (continued)

Factor		*n/N*	% with outcome	Crude OR (95% CI)	*P* value	Adjusted OR (95% CI)
Perceived HRQoL (median)	≥ 40 (good HRQoL)	114/215	53.0%	ref	0.009	ref
	< 40 (poor HRQoL)	109/266	40.9%	1.63 (1.13–2.33)		0.66 (0.36–1.21)

Abbreviations: *HRQoL* Health-related quality of life

#Social changes include any report of affected relationships, increased psychological distress or anxiety or food or income insecurity

future income. Self-employed people and small businesses were affected by the COVID-19 pandemic. This is similar to what was reported in a report on the Impact assessment of the COVID-19 pandemic on micro, small and medium sized enterprises in The Gambia. The report showed that the pandemic had an impact on the livelihoods of traders with 62% of micro, small and medium sized enterprises reporting that the pandemic led to a reduction in their earnings [6, 24]. Following an income shock, households typically reduce spending and assets, diversify income sources, and adjust household composition or location [25]. Half of the patients reported a change in household composition since the start of COVID-19.

According to our findings, governments' response to COVID-19 affected the healthcare-seeking behaviours of TB survivors with people missing scheduled visits and avoiding seeking care for other non-COVID-19 conditions. This was supported by other reports in the region. In South Africa, the Human Science Research Council reported that among people living with HIV, 13% did not have access to their medication during the COVID-19 lockdown [26]. In Mozambique, a study done on the effects of COVID-19 on child health services utilization and delivery reported a decrease in child consultations at the start of the COVID-19 pandemic and persistent declines in monthly consultations [27]. In Ethiopia, about 39% of patients with chronic diseases were reported to have poor health-seeking behaviour [28]. Interestingly, missing a medication collection visit was predominantly experienced outside of the COVID-19 waves, possibly due to fear of COVID-19 transmission, stigma surrounding respiratory symptoms, financial losses, lack of passenger transportation, cost of transportation, and accessibility of healthcare workers [18].

Our findings show that TB survivors experienced notable distress. There are significant differences in psychological distress across countries. Mozambique appears to have better mental well-being, while The Gambia shows the highest burden. The findings may reflect underlying socio-economic, health, or contextual differences that should be explored further.

In all three countries, when there was a sharp rise in COVID-19 cases, there was a sharp decrease in TB survivors seeking care. Our findings echo similar trends reported by others; for example, in TB testing in South Africa, the social distancing measures implemented from 16th-27th March 2020 resulted in a decline in daily testing volumes compared to the preceding week [29]. During the time of South Africa's level 5 lockdown implementation in late March 2020, or even a little earlier, a dramatic fall in ART initiations was observed in every province, possibly in response to the declaration of a state of disaster in the middle of March 2020 [30].

During the COVID-19 pandemic, public health guidelines, service updates, and COVID-19 information were primarily disseminated through digital platforms, including websites, social media. For those without access to smartphones, computers, or internet connectivity were often excluded from these communication channels, possibly leading to health seeking delay.

The association between HIV status, specifically being on antiretroviral therapy (ART), and experiencing a serious impact on health-seeking behaviour underscores the heightened vulnerability of individuals living with HIV during the COVID-19 pandemic. This finding underscores the importance of integrated healthcare services and targeted support for populations with pre-existing health conditions. Being seriously financially impacted during COVID-19 was associated with moderate or serious impact on health-seeking behaviour, highlighting the notion that poor financial status hinders the decision to use health services leading to poor care-seeking behaviour [31].

Additionally, the marginal association observed between lack of formal education and the serious impact of COVID-19 restrictions on health-seeking behaviour underscores the need for education and awareness campaigns tailored to vulnerable populations. Addressing barriers related to education can empower individuals to make informed decisions regarding their health, thereby mitigating the adverse effects of pandemics on healthcare access.

Our finding also highlights that males have poor seeking behaviour compared to females, this is consistent with literature [32–34]. A study in South Africa explored factors that contribute to men's poor health seeking behaviour and found some of the factors to be fear of knowing own health status, consulting friends and masculinity beliefs [33]. There is need to recognize the challenges faced by men in health seeking behaviour and urgently address them.

We found an association between social changes (any report of affected relationships, increased psychological distress or anxiety or food or income insecurity) and experiencing a serious impact on health-seeking behaviour. This finding is similar to findings from a study done in South Africa which showed that during the COVID-19 pandemic relationships were impacted in three most common ways; communication and connection; strained relationships; and job and economic loss [35].

Implications

These findings highlight the importance of considering the broader socio-economic and healthcare implications of pandemic responses. Future pandemic preparedness efforts should prioritize strategies to mitigate the negative impact on healthcare-seeking behaviour, particularly among vulnerable populations, and address the underlying social determinants of health to build resilience and improve response effectiveness. National TB programmes should integrate contingency plans that ensure uninterrupted access to TB services during pandemics. This includes maintaining drug supply chains, decentralizing treatment delivery (e.g., community-based or digital adherence technologies), and designating TB services as essential healthcare that remains operational during lockdowns or public health restrictions. Policymakers should consider targeted interventions to support people affected with TB and other health conditions, especially in regions with higher vulnerability, by addressing financial hardships, ensuring continuity of care, and integrating mental health and psychosocial support services into pandemic response plans. Policymakers should embed financial support mechanisms such as transport vouchers, food parcels, and cash transfers into pandemic response frameworks. Pandemic preparedness plans must incorporate mental health and psychosocial services as a standard component of care for TB patients and other vulnerable groups. Community health workers and TB nurses should be trained to recognize psychological distress and refer patients for support, and tele-counseling services should be expanded to ensure access even during movement restrictions. In summary, addressing the complex interplay between socio-economic factors, healthcare access, and psychological well-being is crucial for enhancing pandemic preparedness, mitigating long-term impacts, and improving patient support during public health emergencies like the COVID-19 pandemic.

Our findings may contribute to the body of evidence and data regarding the impact of COVID-19 on health-seeking behaviour. The findings would enable national TB treatment programmes to strengthen the capacity of primary health care facilities to improve their post-TB care to TB survivors.

Limitations

The findings in this study are limited by the lack of a control group since we only interviewed TB survivors. We only include TB Sequel study participants. Participant's experienced trust, established relationships with study staff, and better experience (i.e., no queuing and receive a reimbursement etc.) so this may have influenced their health-seeking behaviour and the perceived financial or psycho-social impact of COVID-19. Not everyone is completing the COVID-19 questionnaire at the same point after treatment, which means that responses could be influenced by the time elapsed since treatment completion (and related follow-up visits) rather than by the COVID-19 restrictions themselves. In other words, the need for healthcare engagement might vary depending on the time since treatment ended, and may not be as significantly impacted by lockdown measures.

This study is a cross sectional study therefore; we cannot establish causality because it's impossible to determine whether the exposure preceded the outcome. We used logistic regression model to estimate Odds Ratios (OR) which can over-estimate where the outcome is >10% and is not a rare event.

TB Sequel is an observational cohort study so some explanatory variables may not have been collected and the analysis could only include what data was collected through the COVID-19 questionnaire and the main cohort data. We only considered individuals who attended a TB Sequel follow-up visit from April to October 2021. We did not conduct interviews with those who returned outside of this timeframe, nor do we possess data on those who did not return at all. Additionally, we are uncertain if the psycho-socio-economic effects of COVID-19 influenced their health-seeking behaviour. For some of the TB Sequel participants who had COVID-19 before the interview, this may have in itself contributed to additional out-of-pocket expenses for testing and treatment of symptoms, contributing to the perceived financial impact of COVID-19.

Another limitation is recall bias; participants were asked to recall things that had happened a year or more before the interview date.

Conclusion

Governments' response to COVID-19 affected TB survivors' healthcare-seeking behaviour, financial status and mental health. The impact was more pronounced among males, TB survivors living with HIV on ART, and those experiencing significant financial and social hardships. The long-term adverse effects on health-seeking behaviour are important for TB survivors who are at increased risk for recurrent disease and long-term disability in the first two years after treatment completion. The study emphasizes the need for future pandemic preparedness

strategies to address socio-economic and healthcare implications, focusing on reducing healthcare-seeking behaviour and addressing health determinants. Policymakers should implement targeted interventions to support TB survivors, particularly in vulnerable regions, by addressing financial difficulties, ensuring continuity of care, and integrating mental health services into pandemic response plans.

Abbreviations

SDOH	Social determinants of health
TB	Tuberculosis
COVID-19	Corona Virus Disease 2019
WHO	World Health Organisation
SF-36	Medical Outcomes Short Form Survey
K10	Kessler Psychological Distress Scale
HFIAS	Household Food Insecurity Access Scale
HRQoL	Health-related quality of life
HSB	Health-seeking behaviour
OR	Odds Ratios

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s12889-025-24006-2.

Supplementary Material 1.

Authors' contributions

DE, KL and NJ conceptualized the study and methodology. NJ performed the analysis and wrote the first draft. DE and KH helped with the interpretation of results. OI, AR, SC, KL, AM, MR, DE, KH provided interpretation of results and critical review of the manuscript.

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Data availability

The datasets generated and/or analyzed during the current study are not publicly available as the data are owned by the study sites (universities) and governed by the Human Research Ethics Committee (University of the Witwatersrand, Johannesburg, South Africa). All relevant data are included in the paper, but the full data are available from the Health Economics and Epidemiology Research Office for researchers who meet the criteria for access to confidential data and with permission from the custodians of the data. Contact the organisation at information@heroza.org for additional information regarding data access. The WHO tool for behavioural insights on COVID-19 is available and free to use (https://www.who.int/europe/publications/i/item/WHO-EURO-2020-696-40431-54222).

Declarations

Ethics approval and consent to participate

This study is performed in accordance with the study protocol, the Declaration of Helsinki (October 2013) and the WHO Handbook for Good Clinical Research Practice (July 2002) as well as other applicable national and other regulatory guidelines. This study was reviewed and approved by all respective Ethics Committees' at each study site as well as for coordinating institutions [17]. All participants enrolled in the TB Sequel study provided written informed consent. Participants were assigned a unique study identification number for identification purposes, and all electronic data extracted from the clinical data management system were de-identified. The surveys used in this analysis were conducted at visits where patients were reimbursed.

Competing interests

The authors declare no competing interests.

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