

Original Research Article

Bridging distance in tuberculosis care: The role of telecounseling in improving treatment adherence and quality of life

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Abstract

Purpose: To determine whether telecounseling could effectively improve treatment adherence and enhance the quality of life of patients with tuberculosis (TB).

Method: The study adopted a quantitative quasi-experimental design involving a non-equivalent control group. Sixty patients diagnosed with tuberculosis were recruited through simple random sampling and subsequently allocated into intervention and control groups. The intervention group received telecounseling delivered via WhatsApp for a period of one month, while the control group continued to receive routine care based on the standard procedures of the Puskesmas. Treatment adherence was assessed using the MARS-5 instrument, and the quality of life of the patients was evaluated using the St. George's Respiratory Questionnaire (SGRQ). Posttest measurements were conducted on the 30th day, and statistical analysis of the data was conducted using the Mann-Whitney test.

Results: The intervention group demonstrated a 6.6 % increase in medication adherence and a 20 % improvement in quality of life, while control group did not show any noticeable improvement.

Conclusion: Telecounseling effectively improves medication adherence and quality of life in TB patients and should be integrated into TB treatment services.

Keywords: Medication adherence, Tuberculosis, Telecounseling, Quality of Life

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INTRODUCTION

Tuberculosis (TB) is a long-term infectious disease that has considerable effects on patients' physical health, mental well-being, and quality of life [1,2]. Globally, Indonesia is the second highest after India in terms of tuberculosis burden. Nationally, the provinces of West Java, East Java, and Central Java contribute the largest number of TB cases due to their large populations [3]. According to the East Java Provincial Department of Health, 43,247

confirmed TB cases were reported in East Java Province during 2021 [3]. At the district level, data compiled from Community Health Centers under the Communicable Disease Control Division of the Lamongan District Health Service, located in Lamongan Regency, East Java, Indonesia, recorded 1,492 TB cases in 2020, which increased to 2,448 cases in 2021. A preliminary survey conducted at community health centers in Lamongan Regency showed that Lamongan Community Health Center reported the highest number of TB cases in 2021

(1,713 cases), followed by Turi Community Health Center with 449 reported cases. These findings indicate that tuberculosis still represents a significant public health issue in Lamongan Regency. Tuberculosis is a chronic infectious disease that significantly affects patients' physical health, mental well-being, and overall quality of life. These changes are both physiological and psychological [4]. The low quality of life in individuals with TB is caused by TB infection, which affects the patient's physical appearance, causes fatigue and makes the patient unable to carry out general activities such as working [2]. TB sufferers also do not have enough rest time because at night, they will experience continuous coughing. A decrease in quality of life is associated with TB medication adherence [5]. The treatment that TB patients undergo has other side effects on various body organ functions, causing the patient to feel an unstable physical condition [6]. The quality of life of patients taking anti-TB medications is closely linked to medication adherence. While assessing whether medication adherence will significantly improve both the patient's quality of life and the frequency of recurrence, cases should also be taken into consideration.

Tuberculosis is usually treated with a course of therapy lasting 7 to 12 months [7]. If tuberculosis treatment is interrupted prematurely, *Mycobacterium tuberculosis* may proliferate again, leading to disease relapse and requiring patients to repeat the intensive phase of treatment [8]. This indicates that to achieve excellent treatment outcomes, manage the spread, and stop the emergence of TB drug resistance, maintaining adherence to TB treatment is vital. [9]. Previous studies have shown that the long duration of treatment and the requirement to take several medications often lead some TB patients to discontinue therapy prematurely due to misunderstandings about their illness. In fact, several studies have reported that a considerable number of patients remain non-adherent to TB treatment regimens [7]. Previous studies show that mobile health offers TB patients effective, efficient, and high-quality services. The efficacy of adopting digital communication mediums for medication monitoring among patients with TB was also examined [10]. For example, previous studies have demonstrated that Video Observed Therapy (VOT), an m-health approach that allows remote monitoring of TB treatment, is more efficient than conventional Directly Observed Therapy (DOT) in supporting medication adherence [11]. Telecounseling refers to the provision of counseling and health support through telecommunication technologies,

such as mobile applications, video communication, or messaging platforms. However, previous telecounseling interventions, which often rely on one-way communication such as messages, applications, or videos, still have limitations because they do not always ensure active patient engagement and adherence to the information provided. Therefore, there is a need to develop an improved communicative telecounseling intervention model to enhance patient interaction and support treatment adherence [12]. This study was conducted to determine whether telecounseling could effectively improve treatment adherence and enhance the quality of life of TB patients.

METHODS

Study design

The study adopted a quantitative quasi-experimental design involving a non-equivalent control group with prospective data collection [13]. Data collection was conducted between May and August 2024 at Lamongan Community Health Center, a primary healthcare facility under the Lamongan District Health Service in Lamongan Regency, East Java, Indonesia, which provides basic medical services, including tuberculosis diagnosis, treatment, and patient monitoring. Participants were categorized into an intervention group and a control group. Before the intervention, a pretest was conducted to measure baseline levels of adherence to TB treatment and quality of life among TB patients, as well as to assess potential initial differences between the two groups. Following the pretest, the intervention group received a telecounseling intervention delivered via WhatsApp for one month. The telecounseling sessions included medication reminders, educational messages about tuberculosis treatment, counseling support, and opportunities for patients to communicate with healthcare providers. Meanwhile, the control group received standard care according to the health center's standard operating procedures (SOP) during treatment visits. A posttest was conducted on the 30th day after the intervention to reassess patients' adherence to TB treatment and quality of life, and to evaluate the effect of the telecounseling intervention.

Ethical approval

This study received ethical clearance from the Health Research Ethics Commission of Muhammadiyah University of Lamongan. Ethical approval was granted under permit number 090/EC/KEPK-S2/11/2023.

Study population

The population consists of TB patients currently receiving treatment or registered at the Lamongan Health Center and Turi Health Center in Lamongan Regency. Patients with TB who matched the specified criteria were selected and assigned at random to one of two groups: control or intervention. The sample comprised TB patients from the Lamongan District Health Center. Sample size was established based on the primary outcome, medication adherence, as guided by clinical methods [14]. Based on the TB patient registry at the facility, there were 70 TB patients undergoing treatment during the study period; therefore, the population size (N) was set at 70. The formula for calculating the method used to determine the difference between two population proportions is shown in Eq 1.

$$n = \frac{N}{1 + (Nxe^2)} \dots\dots\dots (1)$$

where n = sample unit (number of respondents needed); N = population (number of population sizes = 70); e = error value used (0.05).

Based on the sample calculation using the Slovin formula, 60 people were obtained as respondents who were divided into 2 groups, with a total of 30 patients in each group. Eligible TB patients who satisfied the inclusion criteria were then recruited and randomly allocated into control and intervention groups. Participants were selected through a simple random sampling method. Inclusion criteria included TB patients aged 15 - 70 years, undergoing anti-tuberculosis drugs (ATDs) therapy for a minimum of 3 months, and having a smartphone. They were willing to participate in the study from start to finish. Exclusion criteria included uncooperative patients, referred patients, and deceased patients. The telecounseling intervention was delivered through the WhatsApp messaging platform as a mobile health-based telepharmacy service. The intervention included medication reminders, educational messages regarding tuberculosis disease and healthy lifestyle practices, and opportunities for patients to communicate with health workers. Educational materials were shared in the form of digital leaflets, and participants were able to exchange information and receive support through a WhatsApp group moderated by members of the research team.

Data collection and analysis

The instruments used were the Medication Adherence Report-Scale (MARS-5) questionnaire and the St. George's Respiratory

Questionnaire (SGRQ). The two groups were then given a pretest to determine the initial condition and whether there were any differences between participants in the intervention and control groups. An explanation of the study objective was provided to patients before they signed the consent form. Respondents participated voluntarily after receiving comprehensive information about the purpose, procedures, possible risks, and benefits.

The study was conducted in a manner that ensured no harm to the patients, and all participants were treated equally regardless of their background or health status. After the pretest assessment, participants in the intervention group received a telecounseling intervention delivered through WhatsApp for one month. The intervention consisted of regular educational messages about tuberculosis treatment, medication reminders, counseling support, and opportunities for patients to communicate with healthcare providers.

The telecounseling sessions were conducted once a week and allowed patients to provide feedback or ask questions regarding their treatment and medication adherence. In contrast, the control group received routine counseling and information according to the standard operating procedures (SOP) of the community health center during their regular treatment visits, without additional digital counseling support. A posttest assessment was conducted on the 30th day after the telecounseling intervention to evaluate changes in medication adherence and overall quality of life.

The data generated from this study were analyzed statistically to evaluate the proposed hypotheses. Descriptive statistics were used to outline the demographic and clinical characteristics of the participants. The influence of the telecounseling intervention on medication adherence and quality of life in TB patients was examined by comparing results between the intervention and control groups. Mann–Whitney U test was applied to examine differences between the two groups before and after the intervention.

Baseline demographic characteristics between the two groups (intervention and control) were compared to assess the equivalence of the groups prior to the intervention. Group comparisons were performed using the Mann–Whitney U test due to the non-normal distribution of the data. Statistical significance was determined at a p -value < 0.05.

RESULTS

Table 1 presents the demographic characteristics of the participants. Most TB patients were aged 26 – 45 years ($n = 29$, 48.3 %) and male ($n = 36$, 60.0 %). The majority had an elementary school education ($n = 23$, 38.3 %), and most were entrepreneurs ($n = 20$, 33.3 %). Analysis showed that the demographic profiles of participants in the intervention and control groups were comparable, with no significant differences ($p > 0.05$). Figure 1 shows the comparison of medication adherence and quality of life between the control and intervention groups prior to and following the telecounseling intervention. Among

participants in the intervention group, the proportion of patients with good medication adherence increased from 76.7 % at pretest to 83.3 % at posttest, while poor adherence decreased from 23.3 % to 16.7 %. In contrast, the control group showed no change, with good adherence remaining at 63.3 % and poor adherence at 36.7 %. Regarding quality of life, the intervention group demonstrated a substantial improvement, with the proportion of patients reporting good quality of life increasing from 30 % before intervention to 90 % after intervention. Meanwhile, the control group demonstrated only a minimal improvement, from 33.3 % to 36.7 %.

Table 1: Characteristics of respondents ($n = 60$)

Characteristic	Total	n (%)		p-value
		Control	Experiment	
Age (Years)				
12-25	7 (11.7)	3 (10.0)	4 (13.3)	0.402 ^a
26-45	29 (48.3)	14 (46.7)	15 (50.0)	
46-65	21 (35.0)	10 (33.3)	11 (36.7)	
≥ 65	3 (5.0)	3 (10.0)	0	
Gender				
Male	36 (60.0)	19 (63.3)	17 (56.7)	0.601 ^a
Female	24 (40.0)	11 (36.7)	13 (43.3)	
Education				
Elementary School	23 (38.3)	13 (43.4)	5 (16.7)	0.102 ^a
Junior High School	14 (23.3)	8 (26.7)	8 (26.7)	
Senior High School	16 (26.7)	9 (30.0)	10 (33.3)	
	6 (10.0)		6 (20.0)	
	1 (1.7)		1 (3.3)	
Job				
Farmer	14 (23.3)	6 (20.0)	14 (46.7)	0.911 ^a
Civil Servant	5 (8.3)	1 (3.3)	2 (6.7)	
Entrepreneur	20 (33.3)	0	5 (16.7)	
Student	3 (5.0)	11 (36.7)	7 (23.3)	
Housewife	18 (30.0)	12 (40.0)	2 (6.7)	

^aMann Whitney test

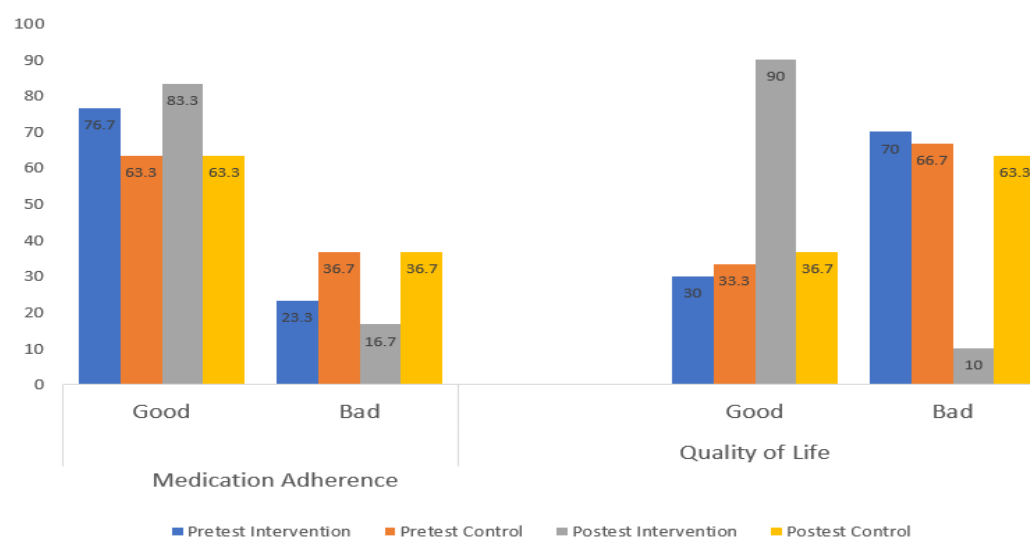


Figure 1: Comparison of adherence to TB treatment and quality of life between patients receiving telecounseling and those receiving standard counseling before and after the intervention

Table 2: Disparities in adherence to antituberculosis and quality of life among TB patients (n= 60)

Result	Medication Adherence		Quality of life	
	Control	Experiment	Control	Experiment
Mean Rank	26.92	34.08	36.52	24.48
Asymp. sig (2-tailed)	0.04 ^a		0.008 ^a	

^aMann Whitney test

The statistical tests performed on the effects of telecounseling on patient quality of life and adherence to TB therapy reveal a notable disparity (p-value <0.05) between the pre and post-telecounseling values. Telecounseling improves the overall well-being and encourages patients with TB to consistently take their medication.

DISCUSSION

Quality of life assessments are helpful tools for evaluating the consequences or effects of health conditions or chronic illnesses, as well as the effects of therapy or medication [15]. To assess the quality of life of patients with TB, this study made use of the St George Respiratory Questionnaire (SGRQ), which consists of three areas for measuring quality of life: activity, symptoms, and effects. The intervention group experienced a substantial improvement, with the proportion of patients reporting good quality of life increasing from 30 % at the pre-test to 90 % after the telecounseling intervention. Meanwhile, the control group showed only a modest rise from 33.3 % before the intervention to 36.7 % afterward. This improvement may be associated with the ongoing TB treatment received at the Community Health Center, which gradually improves patients' health status. However, the improvement was less pronounced than that observed in the intervention group, suggesting that additional counseling support, such as telecounseling, may further enhance patients' quality of life during TB treatment. The collaboration between organizations has not been properly created in compliance with the prescribed regulations [16].

Data from both experimental and control groups indicate that most respondents demonstrated high levels of medication adherence, as presented in Table 2. However, 16.7 % of respondents in the experimental group and 36.7 % of those in the control group showed lower adherence to TB treatment. The MARS-5 questionnaire responses indicated that the most frequently reported behaviors related to lower adherence were forgetting to take medication and occasionally stopping medication temporarily. Previous studies have reported that medication non-adherence among tuberculosis patients occurs due to unintentional factors, such

as forgetting doses, as well as intentional factors related to patients' perceptions and beliefs about TB treatment [7,17]. In addition, adverse drug reactions from antituberculosis medications, including rifampicin, isoniazid, pyrazinamide, streptomycin, and ethambutol, may contribute to treatment interruption. Commonly reported adverse effects include joint pain associated with pyrazinamide, gastrointestinal disturbances such as nausea and loss of appetite related to rifampicin, dizziness associated with streptomycin, and hepatotoxicity (elevated liver enzymes or hepatitis) associated with isoniazid [2]. These adverse reactions may influence patients' willingness to continue long-term TB therapy [18].

Adherence to the medication regimen is crucial for achieving optimal therapeutic outcomes. Several factors may contribute to medication adherence among TB patients, including their understanding of the disease and its treatment, the lengthy treatment period, and the need to take several medications [19]. Family support and socioeconomic conditions may also affect adherence [20]. In Indonesia, antituberculosis medications are provided free of charge through the national tuberculosis control program. However, TB patients may still experience an economic burden related to the disease, such as transportation costs to health facilities, loss of productivity, and other indirect expenses. These factors may indirectly influence patients' ability to maintain consistent adherence to treatment.

Several strategies have been developed to improve adherence to antituberculosis therapy through digital communication technologies, including telepharmacy services such as e-consultation, mobile health (mHealth) interventions, and Video Observed Therapy (VOT) [21]. In this study, telecounseling was delivered through WhatsApp as a form of mobile health-based telepharmacy intervention aimed at supporting medication adherence and providing health education for TB patients.

Based on the overall data of this study, treatment given in the form of telepharmacy monitoring by telecounseling is more effective in increasing compliance with taking medication for TB patients compared to just being given educational information and counseling when

carrying out routine medication. As in previous studies, evaluating the efficacy of utilizing digital communication platforms is a solution for monitoring TB treatment with a high level of compliance, and is more effective than monitoring the daily dose of antituberculosis without telecommunication [22]. Additional studies confirm that WhatsApp visual media telecommunications are more efficient for long-distance health services. By providing sufficient time and flexibility, this medium allows respondents to inquire about TB treatment, preventive measures, and the possibility of transmitting the disease to their family members [23]. Meanwhile, in the control group, providing educational information and counseling after dispensing medications was considered to slightly increase treatment compliance in TB patients. This may occur because patients may not fully comprehend the educational and counseling information delivered by healthcare workers during routine TB treatment monitoring. Apart from that, it may be because there was so much information given to the patient that led to some limitations in understanding at that particular point in time [24].

CONCLUSION

Telecounseling services have enabled the delivery of services provided directly to TB patients in their homes. It allows for bidirectional communication, which enhances adherence to TB treatment among patients to their drug regimen, ultimately improving their overall quality of life.

DECLARATIONS

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Ethical approval

Ethical clearance was received from the Health Research Ethics Commission of Muhammadiyah University of Lamongan (approval no. 090/EC/KEPK-S2/11/2023).

Use of Artificial intelligence/Large language models

The authors confirm that AI-based tools were used solely for language editing and manuscript polishing purposes (e.g., grammar, phrasing, and

clarity). No AI tools were used to generate content, interpret data, or influence study design, results, or conclusions. All intellectual contributions, study analyses, and interpretations reported in the manuscript are the original work of the authors.

Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Conflict of interest

No conflict of interest is associated with this work.

Contribution of authors

We declare that this work was done by the author(s) named in this article, and all liabilities pertaining to claims relating to the content of this article will be borne by the authors. Conceptualization, data collection and analysis, and manuscript writing - D.R.O.; Literature search – A. R.; Instrument validation – D.R.O.; Analysis and interpretation – P.R.U.; Research permit – A.R.

REFERENCES

1. WHO Global TB Report. *Global Tuberculosis Report 2022*. Vol. 4, World Health Organization 2022. 2022; 168.
2. Octavia DR, Hermansyah A, Nita Y, Priyandani Y, Pristianty L, Ming LC, et al. The adherence–quality of life paradox in tuberculosis care after COVID-19: a cross-sectional study in Indonesia. *Discov Public Heal* 2025; 22(1): 704. Available from: <https://doi.org/10.1186/s12982-025-01111-6>
3. Lolong DB, Irianto J, Kusriani I, Tarigan IU, Letelay AM, Tobing KL, et al. Factors contributing to multidrug-resistant tuberculosis among sputum culture-positive pulmonary tuberculosis patients in Indonesia: A cross-sectional study. *Asian Pac J Trop Med* 2025; 18(9): Available from: https://journals.lww.com/aptm/fulltext/2025/09000/factor_s_contributing_to_multidrug_resistant.4.aspx
4. Azalla CR, Maidar, Ismail N. Analysis of the quality of life of pulmonary tuberculosis patients regarding adherence to tuberculosis treatment in the Pidie Jaya Regency area in 2019. *J Aceh Med* 2020; 4(2): 122–136.
5. Liu X, Lan H, Bai X, Li Q, Wen Y, Feng M, et al. Sleep quality and its associated factors among patients with tuberculosis: A cross-sectional study. *Front Public Health* 2023; 10: 1047425.

6. Mereškevičienė R, Danila E. The adverse effects of tuberculosis treatment: a comprehensive literature review. *Medicina* 2025; 61(5): 911.
7. Octavia DR, Hermansyah A, Nita Y, Zairina E. Enhancing tuberculosis patient safety: The impact of interprofessional collaboration-based telecare on drug-related problems in a randomized control trial. *Indian J Tuberc* 2025; Available from: <https://doi.org/10.1016/j.ijtb.2025.04.010>
8. Laili FN, Octavia DR, Muhtaromah M. The relationship between adherence to TB-RO treatment and the outcome of tuberculosis patient therapy at Muhammadiyah Hospital, Lamongan. *J Sci Health* 2023; 5(5): 659–665.
9. Bea S, Hyesung L, Ju HK, Seung HJ, Son H, Kwon J, et al. Adherence and associated factors of treatment regimen in drug-susceptible tuberculosis patients. *Front Pharmacol* 2021; 12: 1–9.
10. Indah FP, Ilimi AF, Ratnaningtyas TO. Digital health intervention for enhancing self-perceived and compliance with anti-tuberculosis treatment. *Malahayati Int J Nursing Health Sci* 2022; 5(1): 17–23.
11. Story A, Aldridge RW, Smith CM, Garber E, Hall J, Ferenando G, et al. Smartphone-enabled video-observed versus directly observed treatment for tuberculosis: a multicentre, analyst-blinded, randomised, controlled superiority trial. *Lancet (London, England)* 2019; 393(10177): 1216–1224.
12. Gashu KD, Gelaye KA, Mekonnen ZA, Lester R, Tilahun B. Does phone messaging improve tuberculosis treatment success? A systematic review and meta-analysis. *BMC Infect Dis* 2020; 20(1): 1–13.
13. Notoatmodjo. *Health research methodology*. Jakarta: Rineka Cipta 2012.
14. Charan J, Biswas T. How to calculate sample size for different study designs in medical research? *Indian J Psychol Med* 2013; 35(2): 121–126.
15. Williams JI, Wood-Dauphinee S. Assessing quality of life: measures and utility. *Institute of Medicine. Quality of Life and Technology Assessment*. F Mosteller, Editor 1989: 65–115.
16. Worgu GO, Onotai LO, Asuquo EO. Medication Adherence among Pulmonary Tuberculosis Patients in Treatment Centers in a Southern Nigerian Local Government Area: Question Mark on Performance of DOTS Services. *Niger Med J* 2023; 63(5): 418–424.
17. Octavia DR, Hermansyah A, Nita Y. A randomized-controlled trial study of telecare-based interprofessional collaboration: A new strategy in tuberculosis treatment. *Trop J Nat Prod Res* 2025; 9: 6336–6341.
18. Tiore LL, Ersido T, Handiso TB, Areba AS. Non-adherence to anti-tuberculosis treatment and associated factors among TB patients in public health facilities of Hossana town, Southern 2024; 1–9.
19. Abubakar A, Blandina OA, Cabu R. Patient adherence to tuberculosis (TB) treatment at the Maba City Community Health Center, East Halmahera 2022; 2(1): 27–34.
20. Tukayo IJH, Hardyanti S, Madeso MS. Factors influencing adherence to anti-tuberculosis medication in pulmonary tuberculosis patients at Waena Community Health Center. *J Nursing Trop PAPUA* 2020; 3(1): 145–150.
21. Octavia DR, Hermansyah A, Nita Y. The readiness and acceptance of patients with tuberculosis to use telecare. *Pharm Educ* 2024; 24(3): 251–255.
22. Garfein RS, Doshi RP. Synchronous and asynchronous video observed therapy (VOT) for tuberculosis treatment adherence monitoring and support. *J Clin Tuberc Other Mycobact Dis* 2019; 17: 100098.
23. Pujihastuti N, Priyo P, Priyanto S. WhatsApp reminder and educational video to improve pulmonary tuberculosis patient control compliance during the pandemic. *Indonesian Nursing Media* 2022; 5(4): 280.
24. Appiah MA, Arthur JA, Gborgblorvor D, Asampong E, Kye-Duodu G, Kamau EM, Dako-Gyeke P. Barriers to tuberculosis treatment adherence in high-burden tuberculosis settings in Ashanti region, Ghana: a qualitative study from patients' perspective. *BMC Public Health* 2023; 23(1): 1317.