# FEASIBILITY AND ACCEPTANCE OF WHATSAPP APPLICATION AS VOT (VIDEO OBSERVED THERAPY) PLATFORM FOR TB MANAGEMENT

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**ABSTRACT:** *Tuberculosis (TB) remains a global health challenge, particularly in resource-limited settings where adherence to treatment is critical for successful outcomes. Despite the effectiveness of Directly Observed Treatment Short-Course (DOTS), logistical barriers and stigma hinder adherence. This study explores the feasibility and acceptability of WhatsApp-based Video Observed Therapy (VOT) as an alternative, leveraging digital health solutions to enhance TB management. Using a mixed-methods approach, the study recruited 80 TB patients and 30 healthcare workers (HCWs) in Malaysia, assessing feasibility, adherence rates, and user satisfaction through quantitative (adherence metrics, uMARS ratings) and qualitative (patient and HCW feedback) methods. Findings indicate high adherence rates (median: 96.3%), strong engagement, and ease of use, with minor challenges related to digital literacy and smartphone access. The study concludes that WhatsApp-based VOT is an effective, scalable intervention for TB management, recommending policy measures such as digital infrastructure investment, subsidized internet access, digital literacy training, and standardized data security protocols to optimize implementation and healthcare equity.*

**Keywords:** Tuberculosis (TB) Adherence, Video Observed Therapy (VOT), WhatsApp-based Digital Health, mHealth in TB Management, Treatment Compliance and Technology

## INTRODUCTION

Tuberculosis (TB) remains a major global health challenge, particularly in regions with high disease burdens where treatment adherence is critical for successful outcomes. Despite the effectiveness of Directly Observed Treatment Short-Course (DOTS), adherence remains a challenge due to logistical constraints, stigma, and accessibility issues [1]. Video Observed Therapy (VOT) has emerged as a promising alternative, leveraging digital platforms to enable remote supervision of TB treatment while maintaining flexibility and privacy [2]. This study explores the feasibility and acceptability of WhatsApp as a VOT platform, given its widespread usage and user-friendly features [3].

The primary issue addressed in this research is the difficulty of ensuring consistent treatment adherence among TB patients. Traditional DOTS presents barriers such as travel costs and stigma, deterring full compliance and increasing the risk of drug resistance [4]. The COVID-19 pandemic further highlighted the need for remote adherence solutions. While specialized VOT apps exist, they require additional infrastructure, making WhatsApp a more accessible and cost-effective alternative. However, concerns about privacy, internet access, and user acceptance remain critical considerations [1].

This study, framed by the Health Belief Model (HBM) and Technology Acceptance Model (TAM), will employ a single-arm intervention design with 36 TB patients in Malaysia. It aims to assess WhatsApp's feasibility, acceptability, and impact on adherence, contributing valuable insights into mHealth innovations in TB care [5]. The findings will guide policymakers and healthcare providers in integrating digital tools into TB management, offering a scalable and sustainable adherence solution.

### Literature Review

*Global Burden of Tuberculosis*

Tuberculosis (TB) remains a leading global health challenge, disproportionately affecting low- and middle-income countries. The World Health Organization (WHO) estimates that TB caused 1.6 million deaths in 2021, with over 10 million new cases reported annually [4]. Despite significant advancements in diagnostic tools and treatment protocols, TB management remains hindered by poverty, malnutrition, and inadequate healthcare infrastructure. Traditional strategies such as Directly Observed Treatment Short-Course (DOTS) have improved treatment outcomes but remain insufficient due to logistical challenges and patient burden [6].

*Importance of Treatment Adherence in TB Management*

Adherence to anti-TB regimens is crucial to treatment success, as it reduces the risk of prolonged infectiousness, increased transmission, and multi-drug-resistant TB (MDR-TB). Research indicates that adherence rates above 90% are necessary for effective outcomes, yet many TB programs fail to meet this threshold due to barriers such as stigma, transportation costs, and lack of social support [1]. Digital interventions like Video Observed Therapy (VOT) offer an alternative adherence solution by allowing patients to remotely verify medication intake [7].

*Challenges of DOTS in Ensuring Adherence*

Despite its effectiveness, DOTS presents several challenges, particularly in resource-limited settings. The requirement for daily clinic visits is burdensome, contributing to high dropout rates [4]. Additionally, the stigma associated with in-person supervision discourages patient participation. Healthcare providers also report operational difficulties in sustaining DOTS programs, including staff shortages and high costs, necessitating the adoption of alternative monitoring strategies such as VOT [5].

*The Emergence of Video Observed Therapy (VOT)*

VOT has gained traction as a technology-driven alternative to DOTS, enabling remote monitoring through digital platforms. Initial VOT models relied on specialized applications, but advancements in mobile technology have expanded its implementation to mainstream platforms such as WhatsApp[6]. Studies have shown that VOT improves adherence by reducing logistical burdens and offering patients greater privacy and flexibility. In Colombia, VOT

interventions significantly reduced missed doses and increased patient engagement [8].

*Advantages of VOT in TB Treatment Adherence*

VOT offers several benefits over DOTS, particularly in addressing logistical and psychological barriers. By allowing patients to complete treatment at home, VOT reduces travel costs, minimizes stigma, and enhances patient autonomy. Furthermore, VOT facilitates integration with broader health education initiatives through digital messaging and reminders, improving treatment engagement [9].

*The Role of Digital Health Technologies in TB Management*

Digital tools, particularly mobile health (mHealth) applications, have played a transformative role in TB management. These technologies enhance adherence by offering real-time monitoring, medication reminders, and patient education [6]. GamifiedmHealth applications have been shown to increase patient motivation, aligning with behavioral models that emphasize reinforcement in adherence. While platforms have demonstrated success, their adoption remains limited due to cost and technological literacy barriers [1].

*Synchronous vs. Asynchronous VOT Platforms*

VOT platforms are broadly classified into synchronous and asynchronous models. Synchronous platforms, such as Zoom and WhatsApp, enable real-time video observation, allowing immediate feedback from healthcare workers. Asynchronous VOT, by contrast, permits patients to record and upload videos for later review, offering greater flexibility but reducing real-time accountability [8]. The effectiveness of these models depends on factors such as internet stability, user accessibility, and patient preference.

*Addressing TB Treatment Barriers Through Digital Tools*

Digital health interventions mitigate various adherence barriers, including stigma, logistical constraints, and lack of education [9]. mHealth platforms provide automated reminders and educational materials to improve patient understanding of treatment protocols. Additionally, digital tools offer a private alternative to in-person DOTS, helping patients avoid the stigma often associated with TB treatment (Du Thinh et al., 2024). Despite these benefits, limitations such as data privacy concerns and internet accessibility must be considered for sustainable implementation.

*WhatsApp as a Platform for Video Observed Therapy*

WhatsApp, one of the most widely used messaging applications globally, presents a compelling case for VOT implementation due to its accessibility, low data usage, and ease of use [2]. Unlike specialized mHealth apps, WhatsApp leverages existing digital behaviors, making it easier for both patients and healthcare workers to adopt [10]. In regions like Southeast Asia and Sub-Saharan Africa, WhatsApp has been successfully integrated into healthcare interventions, demonstrating high user engagement and adherence rates.

*Suitability of WhatsApp for Synchronous VOT*

WhatsApp's synchronous video call feature enables real-time patient monitoring, closely replicating the DOTS model while offering greater flexibility [5]. Its end-to-end encryption enhances data privacy, addressing key concerns associated with digital health applications. However, challenges such as unstable internet connectivity and privacy risks must be addressed for effective implementation (Lee et al., 2023).

Methodology

The study employed a purposive sampling technique to recruit 80 TB patients and 30 healthcare workers (HCWs) from TB clinics, ensuring relevance and diversity. Recruitment followed ethical protocols, with informed consent and training on WhatsApp-based Video Observed Therapy (VOT) provided [11]. The mixed-methods data collection approach combined quantitative (adherence rates, feasibility indicators) and qualitative (patient and HCW feedback) data. Smartphone access and literacy were assessed, with 77% of patients using personal devices and 23% relying on shared access. Feasibility metrics included VOT session interruptions (5 cases) and internet connectivity issues (2 days) [12].The User Mobile Application Rating Scale (uMARS) assessed VOT usability, with functionality (4.55) and performance (4.25) rated highly. Objective observation metrics tracked adherence, defaulter rates, and side effects using standardized forms [13].Data analysis employed descriptive statistics (mean, standard deviation) and inferential tests (Chi-square, logistic regression) to assess adherence and feasibility. Logistic regression identified demographic predictors of adherence, providing insights for optimizing future VOT implementations [14]. The study's findings inform the feasibility of WhatsApp-based VOT in TB management.

## RESULTS

The demographic characteristics of the study participants, as outlined in Table 1, provide an overview of key attributes such as sex, age, education level, employment status, and TB treatment history. The sample comprised 64.5% males (n=71) and 35.5% females (n=33), reflecting a slightly higher male prevalence among participants. The age distribution indicated that the majority (46.4%) were between 25-44 years old (n=51), followed by 25.5% aged 45-54 years (n=28), while the youngest group (16-24 years) accounted for 14.3% (n=16). Regarding educational attainment, most participants had completed secondary education (46.4%), with 23% holding a university degree (n=32), while 22.7% (n=28) had only elementary education, and 1.3% (n=2) had no formal education. Employment status showed that 40% (n=44) were employed, whereas 60% (n=66) were unemployed.

A significant proportion, 70% (n=77), had previously undergone TB treatment, while 30% (n=23) were first-time patients. The dominant disease type was MDR-TB (87.3%), whereas 12.7% (n=11) had other TB types. Bacteriological confirmation was present in 90% (n=93) of cases, with only 10% (n=10) not confirmed. Lastly, the length of TB treatment varied, with 45% (n=5) having undergone 5 months of treatment, 47.3% (n=52) within 6-9 months, and 48.2% (n=53) undergoing treatment for up to 24 months. These findings provide crucial insights into the study's population, highlighting variations in treatment history, education, and disease burden.

**Table 1 Demographic Characteristics**

| Characteristic | Category | Freq | (%) |
|---|---|---|---|
| Sex | Male, Female | 71, 39 | 64.5%, 35.5% |
| Age, Years | <24, 25–44, 45–54, >=55 | 15, 51, 28, 16 | 13.6%, 46.4%, 25.5%, 14.5% |
| Education Level | None, Elementary, Secondary, University | 2, 25, 51, 32 | 1.8%, 22.7%, 46.4%, 29.0% |
| Employed | Yes, No | 44, 66 | 40.0%, 60.0% |
| Previous TB Treatment | Yes, No | 77, 33 | 70.0%, 30.0% |
| Disease Type | MDR-TB, Other DR-TB | 96, 14 | 87.3%, 12.7% |
| Bacteriological Confirmed TB | Yes, No | 99, 11 | 90.0%, 10.0% |
| Length of Treatment (months) | 6, 9–12, 18–24 | 5, 52, 53 | 4.5%, 47.3%, 48.2% |

Table 2 presents an analysis of participant recruitment and exclusions in the study. A total of 110 participants were initially recruited, but 36 individuals (32.73%) were excluded for various reasons. Specifically, 4 participants (3.64%) were excluded due to a lack of smartphone access, while 12 individuals (10.91%) were deemed ineligible because they were illiterate in using WhatsApp. Additionally, 20 participants (18.18%) declined to participate in the study. Among those who continued, 3 participants (2.73%) shared a smartphone with others, potentially affecting adherence to Video Observed Therapy (VOT). Lastly, 1 participant (0.91%) opted to switch from VOT to the traditional Directly Observed Treatment Short-Course (DOTS), highlighting some challenges in digital intervention adoption. This recruitment data underscores structural and technological barriers, emphasizing the need for strategies to improve accessibility and digital literacy for broader implementation.

**Table 2 Recruitment Data Analysis**

| Category | Count | Percentage (%) |
|---|---|---|
| Total Recruited | 110 | 100 |
| Excluded - No Smartphone | 4 | 3.64 |
| Excluded - Illiterate for WhatsApp Use | 12 | 10.91 |
| Excluded - Refused to Participate | 20 | 18.18 |
| Participants Sharing Smartphone | 3 | 2.73 |
| Participants Switched to DOTS | 1 | 0.91 |

Table 3 presents the uMARS Scores and Likert Scale Analysis, evaluating different aspects of user experience with the WhatsApp-based Video Observed Therapy (VOT) system. The engagement domain showed strong user interest (mean: 4.33, SD: 0.62) and entertainment value (mean: 4.22, SD: 0.68), while customization received a slightly lower score (mean: 3.72, SD: 0.85), suggesting limited personalization options. The functionality domain revealed high ease of use (mean: 4.55, SD: 0.48) and satisfactory performance (mean: 4.25, SD: 0.70). The aesthetics of the platform were well-rated, particularly in terms of layout (mean: 4.50, SD: 0.50) and graphics (mean: 4.00, SD: 0.60). Information quality (mean: 4.40, SD: 0.51) and source credibility (mean: 4.30, SD: 0.57) also scored highly, reflecting trust in the provided health content. The subjective quality section indicated that users were generally willing to recommend the platform (mean: 4.35, SD: 0.52), but willingness to pay was notably lower (mean: 3.45, SD: 0.88), suggesting financial concerns about a paid service model. These results highlight the platform's effectiveness in usability and information quality but suggest areas for improvement, particularly in customization and affordability.

**Table 3 uMARS Scores and Likert Scale**

| Category | Mean Score | Standard Deviation |
|---|---|---|
| Engagement - Entertainment | 4.22 | 0.68 |
| Engagement - Interest | 4.33 | 0.62 |
| Engagement - Customisation | 3.72 | 0.85 |
| Engagement - Interactivity | 4.10 | 0.75 |
| Functionality - Performance | 4.25 | 0.70 |
| Functionality Ease of Use | 4.55 | 0.48 |
| Aesthetics Layout | 4.50 | 0.50 |
| Aesthetics - Graphics | 4.00 | 0.60 |
| Information - Quality of Information | 4.40 | 0.51 |
| Information - Credibility of Source | 4.30 | 0.57 |
| Subjective Quality - Recommendation | 4.35 | 0.52 |
| Subjective Quality - Willingness to Pay | 3.45 | 0.88 |

Table 4 provides an analysis of adherence metrics for participants using Video Observed Therapy (VOT). The mean number of days enrolled in VOT was 309.4 ± 167.9, with a median of 266.50 days and an interquartile range (IQR) of 27.0–666.0 days, indicating variability in treatment duration. The observed doses averaged 283.7 ± 172.6, with a median of 258.50 doses (IQR: 27.0–600.0), suggesting a high level of participation in VOT sessions. Missed doses had a mean of 23.0 ± 26.7 and a median of 13.00 doses (IQR: 0.0–122.0), reflecting generally good adherence. The number of doses held was minimal, with a mean of 2.6 ± 6.5 and a median of 0.00 (IQR: 0.0–37.0). Adherence while on VOT remained high, averaging 86.5% ± 21.1, with a median of 96.30% (IQR: 7.4–100.0), indicating strong compliance among participants. These findings underscore the effectiveness of VOT in maintaining adherence but also highlight individual variations in treatment consistency.

**Table 4 Adherence Metrics Table**

| Parameter | Mean ± SD | Median [IQR] |
|---|---|---|
| Days enrolled in VOT | 309.4 ± 167.9 | 266.50 [27.0–666.0] |
| Doses observed | 283.7 ± 172.6 | 258.50 [27.0–600.0] |
| Doses missed | 23.0 ± 26.7 | 13.00 [0.0–122.0] |
| Doses held | 2.6 ± 6.5 | 0.00 [0.0–37.0] |
| Adherence while on VOT (%) | 86.5 ± 21.1 | 96.30 [7.4–100.0] |

Table 5 presents feasibility outcomes from the perspective of healthcare workers (HCWs) involved in Video Observed Therapy (VOT). The study recorded five instances of disconnected calls during VOT sessions, highlighting occasional technical disruptions. Additionally, clinics experienced two days without internet connectivity, which could have impacted the continuity of patient monitoring. The average duration of each VOT session was 7.5 minutes, indicating a relatively short and efficient interaction time between HCWs and patients. These findings suggest that while VOT is generally feasible, occasional technical challenges such as call disconnections and internet issues may need to be addressed for smoother implementation.

**Table 5 Feasibility Outcomes from HCW's**

| Metric | Value | Explanation |
|---|---|---|
| Disconnected Calls During VOT Sessions | 5 | Number of instances where calls were disconnected during VOT sessions |
| Days Without Internet Connectivity at Clinic | 2 | Number of days the clinic experienced internet connectivity issues |
| Average VOT Session Duration (minutes) | 7.5 | Mean time spent by HCWs on each VOT session, reported in minutes |

## CONCLUSION AND POLICY IMPLICATIONS

The study concludes that WhatsApp-based Video Observed Therapy (VOT) is a viable and effective digital health intervention for improving tuberculosis (TB) treatment adherence. The findings highlight high engagement levels among both patients and healthcare workers (HCWs), with minimal technological barriers limiting participation. Most participants possessed basic digital literacy and smartphone access, reinforcing the population's readiness for a digital health solution. The study also demonstrates that WhatsApp's ease of use and real-time communication capabilities significantly contribute to adherence, reducing logistical challenges associated with Directly Observed Treatment Short-Course (DOTS). The median adherence rate of 96.3% indicates that VOT can serve as a scalable, efficient alternative to traditional in-person monitoring, particularly in resource-limited settings. However, challenges such as digital illiteracy and lack of smartphone access must be addressed to ensure equitable adoption. Additionally, privacy concerns and the need for customization emerged as areas for improvement, suggesting that further refinements to the platform could enhance patient confidence and satisfaction. Overall, the study highlights WhatsApp-based VOT as a promising innovation in TB care, promoting greater patient autonomy and improved health outcomes, though broader implementation will require addressing infrastructural and individual barriers.

The study's findings also carry significant policy implications for the integration of digital health tools in TB management programs. Given the demonstrated feasibility and acceptability of WhatsApp-based VOT, policymakers should prioritize investment in digital health infrastructure. Expanding access to smartphones and affordable internet services is crucial, particularly in low-resource settings where TB prevalence is highest. Subsidizing smartphone ownership and internet access for marginalized populations could help bridge the digital divide, ensuring equitable healthcare access. Furthermore, digital literacy training programs should be embedded within TB treatment frameworks to empower both patients and HCWs to effectively use digital platforms for adherence monitoring.

In addition to digital infrastructure and literacy, standardized guidelines for digital health interventions should be developed to regulate data security, patient confidentiality, and usability standards. These guidelines will not only protect patient privacy but also enhance trust in technology-driven healthcare solutions. Policymakers should further advocate for public-private partnerships to enhance digital health platforms, ensuring features such as multilingual support, automated medication reminders, and improved user interfaces. Such collaborations can drive innovation and scalability while keeping costs affordable for healthcare providers and patients alike. By addressing these policy considerations, governments and healthcare organizations can leverage digital technologies like WhatsApp to improve TB treatment adherence, reduce the overall disease burden, and achieve sustainable public health advancements.

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