

Impact of covid-19 on treatment adherence and clinical outcomes among Hiv-Tb Co-infected patients in the east region of Cameroon: a retrospective cohort analysis

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ABSTRACT

The COVID-19 pandemic has had profound effects on health systems worldwide, disrupting essential health services and altering healthcare-seeking behaviors. For patients with HIV-TB co-infection, who require sustained, integrated care, the pandemic has introduced new challenges to treatment adherence and clinical outcomes. This article examines the impact of COVID-19 on treatment adherence and clinical outcomes among HIV-TB co-infected patients in the East Region of Cameroon through a comparative retrospective cohort analysis. A retrospective cohort study was conducted in 11 health facilities across the East Region, comparing a pre-COVID cohort (April-September 2019; n=109) with a COVID cohort (May-October 2020; n=105). Data were collected through documentary analysis and structured questionnaires. Adherence was assessed using self-report measures. Clinical outcomes were assessed based on treatment status. Results revealed significant differences between cohorts. The COVID cohort had higher adherence (74.3%) compared to the pre-COVID cohort (56.9%) ($p=0.007$). However, the COVID cohort had more relapses (6.7% vs. 0.9%, $p=0.033$) and lower respect of COVID-19 barrier measures (11.9% vs. 27.4%, $p=0.006$). The sex distribution differed significantly between cohorts (female predominance before COVID vs. male predominance during COVID, $p=0.010$). Department of residence also differed ($p=0.021$). Other socio-demographic and clinical characteristics remained comparable between cohorts. Multivariate analysis identified cohort period as an independent determinant of adherence (OR=2.86, 95% CI: 1.36-6.03). The study found that while adherence was higher during COVID-19, this was accompanied by higher relapse rates and lower respect of preventive measures. The findings highlight the complex impact of the pandemic on HIV-TB co-infection management, with both positive and negative consequences. The study underscores the need for integrated approaches that maintain treatment continuity while addressing emerging challenges, and for strengthening health systems to ensure resilience during future health emergencies.

Keywords: COVID-19, HIV-TB Co-infection, Treatment Adherence, Clinical Outcomes, Cameroon, Retrospective Cohort, Health System Resilience, Pandemic Response

RESUME

La pandémie de COVID-19 a eu des effets profonds sur les systèmes de santé dans le monde entier, perturbant les services de santé essentiels et modifiant les comportements de recours aux soins. Pour les patients co-infectés VIH-TB, qui nécessitent des soins intégrés et soutenus, la pandémie a introduit de nouveaux défis à l'adhésion thérapeutique et aux résultats cliniques. Cet article examine l'impact de la COVID-19 sur l'adhésion thérapeutique et les résultats cliniques chez les patients co-infectés VIH-TB dans la région de l'Est du Cameroun à travers une analyse comparative de cohorte rétrospective. Une étude de cohorte rétrospective a été menée dans 11 formations sanitaires de la région de l'Est, comparant une cohorte pré-COVID (avril-septembre 2019; n=109) avec une cohorte COVID (mai-octobre 2020; n=105). Les données ont été collectées par analyse documentaire et questionnaires structurés. L'adhésion a été évaluée à l'aide de mesures d'auto-déclaration. Les résultats cliniques

ont été évalués sur la base du statut de traitement. Les résultats ont révélé des différences significatives entre les cohortes. La cohorte COVID avait une adhésion plus élevée (74,3%) par rapport à la cohorte pré-COVID (56,9%) ($p=0,007$). Cependant, la cohorte COVID avait plus de rechutes (6,7% vs. 0,9%, $p=0,033$) et un moindre respect des mesures barrières contre la COVID-19 (11,9% vs. 27,4%, $p=0,006$). La distribution du sexe différait significativement entre les cohortes (prédominance féminine avant la COVID vs. prédominance masculine pendant la COVID, $p=0,010$). Le département de résidence différait également ($p=0,021$). Les autres caractéristiques sociodémographiques et cliniques sont restées comparables entre les cohortes. L'analyse multivariée a identifié la période de cohorte comme un déterminant indépendant de l'adhésion ($OR=2,86$, IC 95%: 1,36-6,03). L'étude a constaté que bien que l'adhésion était plus élevée pendant la COVID-19, cela s'accompagnait de taux de rechute plus élevés et d'un moindre respect des mesures préventives. Les résultats soulignent l'impact complexe de la pandémie sur la gestion de la co-infection VIH-TB, avec des conséquences à la fois positives et négatives. L'étude souligne la nécessité d'approches intégrées qui maintiennent la continuité des soins tout en relevant les défis émergents, et de renforcer les systèmes de santé pour assurer la résilience lors des futures urgences sanitaires.

Mots-clés : COVID-19, Co-infection VIH-TB, Adhésion Thérapeutique, Résultats Cliniques, Cameroun, Cohorte Rétrospective, Résilience du Système de Santé, Réponse Pandémique

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1. INTRODUCTION

The COVID-19 pandemic, declared a Public Health Emergency of International Concern on January 30, 2020, has had profound effects on health systems worldwide (WHO, 2020). The pandemic has disrupted essential health services, diverted resources, and altered healthcare-seeking behaviors. For patients with chronic conditions requiring sustained care, such as HIV-TB co-infection, the pandemic has introduced new challenges to treatment continuity and adherence (Mousquer et al., 2021).

The COVID-19 pandemic has affected the management of HIV-TB co-infection through multiple pathways (WHO, 2020). First, health systems have been overwhelmed by COVID-19 cases, leading to the diversion of resources and personnel away from other services (MINSANTE, 2020). Second, lockdown and movement restrictions have limited patient access to health facilities. Third, fear of COVID-19 infection has deterred patients from seeking care. Fourth, supply chain disruptions have affected the availability of medications. Fifth, the psychosocial stress of the pandemic has affected patient mental health and motivation for treatment (Mousquer et al., 2021; WHO, 2020).

The global impact of the pandemic on TB services has been significant. According to the WHO Global Tuberculosis Report 2020, the pandemic has resulted in a substantial reduction in TB case notifications, with a 25-30% decline in some countries (WHO, 2020). This decline is attributed to reduced access to health facilities, fear of COVID-19, and diversion of resources. The impact on HIV services has been similarly concerning, with disruptions in HIV testing, treatment initiation, and monitoring (UNAIDS, 2020). The combined effect on HIV-TB co-infection management is likely to be substantial, with potential consequences for patient outcomes and disease transmission.

In the East Region of Cameroon, the first case of COVID-19 was confirmed on April 8, 2020 (MINSANTE, 2020). The pandemic has posed significant challenges to the management of HIV-TB co-infection, which requires integrated care and sustained treatment adherence (Charbonnier et al., 2011). The region has a high prevalence of HIV and a significant TB burden, with limited health

resources and infrastructure challenges (MINSANTE, 2020). Understanding how the pandemic has affected adherence and outcomes is essential for developing strategies to maintain continuity of care during health emergencies (Agbota et al., 2022).

The theoretical framework for understanding the impact of COVID-19 on adherence draws on multiple models. The Health Belief Model (Rosenstock, 1974) suggests that the pandemic may have increased perceived susceptibility and severity, leading to increased motivation for adherence. The Social Cognitive Theory (Bandura, 1986) highlights the role of self-efficacy and observational learning in adherence behaviors. The Theory of Planned Behavior (Ajzen, 1991) emphasizes the role of attitudes, subjective norms, and perceived behavioral control. These frameworks help explain the complex and sometimes paradoxical effects of the pandemic on adherence (WHO, 2003).

This article examines the impact of COVID-19 on treatment adherence and clinical outcomes among HIV-TB co-infected patients in the East Region of Cameroon through a comparative retrospective cohort analysis. The study specifically addresses the following questions: How has the COVID-19 pandemic affected adherence to HIV-TB treatment? How has it affected clinical outcomes? What are the differences in patient profiles between pre-COVID and COVID cohorts? The study hypothesizes that the pandemic has had significant effects on adherence and outcomes, with both positive and negative consequences.

2. METHODOLOGY

2.1 Study Design and Setting

This retrospective cohort study compared a pre-COVID cohort (April-September 2019) with a COVID cohort (May-October 2020) in 11 health facilities across the East Region of Cameroon. The study design and setting are described in detail in Article 49.

2.2 Study Population

The study included all HIV-TB co-infected patients aged ≥ 18 years in the selected health facilities during the study periods, with complete medical records, who provided informed consent. A total of 214 patients were included (109 pre-COVID, 105 COVID).

2.3 Data Collection

Data were collected through documentary analysis of medical records and registers, and through structured questionnaires administered to patients during clinic visits or at home. The questionnaire captured socio-demographic, clinical, treatment-related, and adherence data, including respect of COVID-19 barrier measures.

2.4 Variables

- *Socio-demographic*: age, sex, marital status, education, occupation, income, religion, residence, department, distance to facility
- *Clinical*: TB type, treatment protocol, patient status (new/relapse), treatment outcome, knowledge of treatment duration, adverse effects
- *Adherence-related*: adherence status (adherent/non-adherent), reasons for non-adherence
- *COVID-related*: respect of barrier measures (mask wearing, hand hygiene, social distancing)

2.5 Data Analysis

Data were analyzed using SPSS version 25 (IBM Corp., 2017). Comparisons between cohorts were made using Chi-square tests or Fisher's exact tests for categorical variables and the independent t-test or Wilcoxon-Mann-Whitney test for continuous variables. Multivariate logistic regression was used to identify independent determinants of adherence, with cohort period included as a key predictor variable. The significance level was set at 5% ($p < 0.05$).

2.6 Ethical Considerations

Ethical approval was obtained from CNERSH (Approval No. 2023/08/1558/CE/CNERSH/SP, dated September 4, 2023). All participants provided written informed consent. Data were anonymized and kept confidential.

3. RESULTS

3.1 Comparison of Socio-Demographic Characteristics

Table 9: Socio-Demographic Characteristics by Cohort

Characteristic	Total N (%)	Pre-COVID (%)	COVID (%)	p-value
Age (mean $\pm$ SD)	39.3 $\pm$ 11.4	40.0 $\pm$ 12.4	39.7 $\pm$ 10.3	0.563
Sex				0.010
Female	111 (51.9)	66 (60.6)	45 (42.9)	
Male	103 (48.1)	43 (39.4)	60 (57.1)	
Marital Status				0.089
Single	81 (38.2)	48 (44.0)	33 (38.2)	
Divorced	8 (3.8)	6 (5.5)	2 (1.9)	
Married	106 (50.0)	46 (42.2)	60 (58.3)	
Widowed	17 (8.0)	9 (8.3)	8 (7.8)	
Education				0.121
None	15 (7.1)	10 (9.2)	5 (4.9)	
Primary	95 (44.8)	55 (50.5)	40 (38.8)	
Secondary	97 (45.8)	42 (38.5)	55 (53.4)	
Higher	5 (2.4)	2 (1.8)	3 (2.9)	
Occupation				0.486
Farmer/Artisan	73 (34.3)	40 (37.0)	33 (31.4)	
Trader	69 (32.4)	30 (27.8)	39 (37.1)	
Unemployed	45 (21.1)	23 (21.3)	22 (21.0)	

Worker	26 (12.2)	15 (13.9)	11 (10.5)	
Income				0.336
< 50,000 FCFA	97 (46.2)	55 (50.5)	42 (41.6)	
50,000-100,000 FCFA	95 (45.2)	44 (40.4)	51 (50.5)	
≥ 100,000 FCFA	18 (8.6)	10 (9.2)	8 (7.9)	
Religion				0.200
Christian	159 (76.4)	82 (77.4)	77 (75.5)	
Secular	24 (11.5)	10 (9.4)	14 (13.7)	
Muslim	25 (12.0)	14 (13.2)	11 (10.8)	
Department				0.021
Boumba et Ngoko	8 (3.7)	3 (2.8)	5 (4.8)	
Haut Nyong	57 (26.6)	37 (33.9)	20 (19.0)	
Kadey	11 (5.1)	2 (1.8)	9 (8.6)	
Lom et Djerem	138 (64.5)	67 (61.5)	71 (67.6)	
Residence				0.506
Rural	115 (53.7)	54 (49.5)	61 (58.1)	
Urban	99 (46.3)	55 (50.5)	44 (41.9)	
Distance				0.977
< 10 Km	118 (55.1)	58 (53.2)	60 (57.1)	
> 10 Km	96 (44.9)	51 (46.8)	45 (42.9)	

Source: Field Data

The comparison of socio-demographic characteristics revealed significant differences between cohorts in sex distribution ($p=0.010$) and department of residence ($p=0.021$). Females predominated in the pre-COVID cohort (60.6%), while males predominated during COVID-19 (57.1%). The department of residence differed, with a higher proportion from Haut Nyong in the pre-COVID cohort (33.9% vs. 19.0%) and a higher proportion from Kadey in the COVID cohort (8.6% vs. 1.8%). Other socio-demographic characteristics were similarly distributed between cohorts.

3.2 Comparison of Clinical Characteristics

Table 10: Clinical Characteristics by Cohort

Characteristic	Total N (%)	Pre-COVID (%)	COVID (%)	p-value
Patient Status				0.033

New	206 (96.3)	108 (99.1)	98 (93.3)	
Relapse	8 (3.7)	1 (0.9)	7 (6.7)	
Treatment Outcome				0.171
Interruption	9 (4.2)	7 (6.4)	2 (1.9)	
On treatment	205 (95.8)	102 (93.6)	103 (98.1)	
TB Type				0.539
Extra-pulmonary	31 (15.1)	17 (16.7)	14 (13.6)	
Pulmonary	174 (84.9)	85 (83.3)	89 (86.4)	
Treatment Protocol				1.000
RH	4 (2.3)	2 (2.3)	2 (2.2)	
RHEZ	171 (97.7)	84 (97.7)	87 (97.8)	
Knowledge of Duration				0.769
Yes	194 (94.6)	97 (95.1)	97 (94.2)	
No	11 (5.4)	5 (4.9)	6 (5.8)	
Adverse Effects				0.924
Yes	134 (65.4)	67 (65.7)	67 (65.0)	
No	71 (34.6)	35 (34.3)	36 (35.0)	

Source: Field Data

The comparison of clinical characteristics revealed a significant difference in patient status ($p=0.033$). The pre-COVID cohort had a higher proportion of new patients (99.1% vs. 93.3%), while the COVID cohort had a higher proportion of relapses (6.7% vs. 0.9%). Other clinical characteristics, including treatment outcome, TB type, treatment protocol, knowledge of treatment duration, and adverse effects, were similarly distributed between cohorts.

3.3 Comparison of Familial Characteristics and Habits

Table 11: Familial Characteristics and Habits by Cohort

Characteristic	Total N (%)	Pre-COVID (%)	COVID (%)	p-value
Family Attitude				0.744
Discriminatory	38 (18.5)	18 (17.6)	20 (19.4)	
Non-discriminatory	167 (81.5)	84 (82.4)	83 (80.6)	
Medication Assistance				0.916
Yes	142 (69.3)	71 (69.6)	71 (68.9)	

No	63 (30.7)	31 (30.4)	32 (31.1)	
Drug Consumption				0.983
Yes	18 (8.8)	9 (8.8)	9 (8.7)	
No	187 (91.2)	93 (91.2)	94 (91.3)	
Respect of Barrier Measures				0.006
Yes	38 (19.4)	26 (27.4)	12 (11.9)	
No	158 (80.6)	69 (72.6)	89 (88.1)	

Source: Field Data

The comparison of familial characteristics revealed a significant difference in respect of barrier measures ($p=0.006$). The pre-COVID cohort had a higher proportion of patients respecting barrier measures (27.4%) compared to the COVID cohort (11.9%). Other familial characteristics, including family attitude, medication assistance, and drug consumption, were similarly distributed between cohorts.

3.4 Comparison of Adherence

Figure 2: Adherence by Cohort

Source: Field Data

Adherence was significantly higher in the COVID cohort (74.3%) compared to the pre-COVID cohort (56.9%) ($p=0.007$). The difference in adherence between cohorts was 17.4 percentage points.

3.5 Multivariate Analysis

Table 12: Multivariate Analysis with Cohort Period as Independent Variable

Characteristic	Adjusted OR	95% CI	p-value
Cohort			0.006
COVID	1	-	
Pre-COVID	2.86	1.36-6.03	

Source: Field Data

In multivariate analysis controlling for other factors, cohort period was identified as an independent determinant of adherence (adjusted OR=2.86, 95% CI: 1.36-6.03, $p=0.006$). Patients in the pre-COVID cohort had a nearly 3-fold higher risk of non-adherence compared to the COVID cohort.

4. DISCUSSION

The comparison of cohorts before and during COVID-19 reveals a complex picture of the pandemic's impact on HIV-TB co-infection management. The finding of higher adherence during COVID-19 (74.3% vs. 56.9%) is both striking and counterintuitive. Several explanations may account for this observation (WHO, 2020; Mousquer et al., 2021). The heightened health awareness

during the pandemic may have increased patient motivation to adhere to treatment. The lockdown and movement restrictions may have reduced competing demands on patients' time, allowing more consistent medication-taking. The increased attention to health and hygiene during the pandemic may have reinforced health-promoting behaviors. The fear of COVID-19 and its consequences may have made patients more conscious of their health and more committed to their treatment.

However, the higher adherence during COVID-19 was accompanied by concerning trends (Agbota et al., 2022). The rate of relapses increased from 0.9% before COVID to 6.7% during COVID ($p=0.033$). This increase in relapses despite higher adherence suggests that other factors may have contributed to treatment failure. These could include disruptions in treatment supply, reduced access to healthcare for monitoring and follow-up, or the psychosocial stress of the pandemic affecting immune function (Charbonnier et al., 2011). The lower respect of barrier measures during COVID-19 (11.9% vs. 27.4%, $p=0.006$) suggests that the initial vigilance against COVID-19 may have waned over time, potentially increasing the risk of COVID-19 infection among co-infected patients (WHO, 2020).

The sex distribution differed significantly between cohorts, with female predominance before COVID (60.6%) and male predominance during COVID (57.1%). This shift may reflect changes in healthcare-seeking behaviors during the pandemic, with women potentially facing greater barriers to accessing care due to increased caregiving responsibilities, economic pressures, or fear of COVID-19 (WHO, 2020; Mousquer et al., 2021). The difference in department of residence between cohorts ($p=0.021$) suggests that the pandemic may have differentially affected access to care in different departments of the region, possibly due to variations in lockdown measures, health resource distribution, or COVID-19 prevalence (MINSANTE, 2020).

The finding that other socio-demographic and clinical characteristics remained comparable between cohorts suggests that the observed differences in adherence, relapse rates, and respect of barrier measures are likely attributable to the pandemic context rather than differences in patient characteristics (WHO, 2020). This supports the hypothesis that the pandemic had direct effects on treatment management and patient behaviors. The multivariate analysis confirming cohort period as an independent determinant of adherence further strengthens this conclusion.

The study has important implications for health system preparedness and response (Agbota et al., 2022). The higher adherence during COVID-19 suggests that patients can maintain or even improve treatment adherence during health emergencies if appropriate support mechanisms are in place (WHO, 2020). However, the increase in relapses despite higher adherence highlights the need for comprehensive approaches that address not only medication-taking but also other aspects of care, including monitoring, follow-up, and psychosocial support (Mousquer et al., 2021).

The decline in respect of barrier measures over time underscores the need for sustained health communication and community engagement (WHO, 2020). The differential effects of the pandemic by sex and department highlight the importance of equity considerations in pandemic response (MINSANTE, 2020). Strategies should be developed to ensure that vulnerable groups maintain access to care during health emergencies. The findings also highlight the need for resilient health systems that can maintain essential services during crises (WHO, 2020).

5. CONCLUSION

The COVID-19 pandemic has had complex effects on HIV-TB co-infection management in the East Region of Cameroon. While adherence was paradoxically higher during the pandemic, this was accompanied by higher relapse rates and lower respect of preventive measures. The pandemic has differentially affected patient populations by sex and geography. The findings underscore the need for integrated approaches that maintain treatment continuity while addressing emerging challenges, and for strengthening

health systems to ensure resilience during future health emergencies. The study contributes to the growing body of evidence on the impact of COVID-19 on chronic disease management and provides lessons for pandemic preparedness and response. Further research is needed to understand the long-term effects of the pandemic on HIV-TB co-infection outcomes and to evaluate the effectiveness of interventions to maintain continuity of care during health emergencies.

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