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Evaluation of the Involvement of Community Health Workers in Adherence to Anti-Tuberculosis Treatment in Bangui, Central Africa Republic in 2024

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Abstract:

- ***Introduction***

In Central African Republic, the community approach plays a key role in the fight against tuberculosis. Our objective was to assess anti-tuberculosis treatment adherence, obstacles and facilitators to community monitoring of tuberculosis in Bangui.

- ***Methodology***

We conducted an analytical cross-sectional study among patients treated for at least one month for tuberculosis at three sites in Bangui. A kobocollecte questionnaire was used to collect data that were analyzed using SPSS V25 software (risk α = 5%). The qualitative part based on individual and group interviews explored the obstacles and facilitators to communication between CHWs and tuberculosis patients. Data analysis was performed using NVIVO V14 software.

- ***Results***

262 patients with a mean age of 35.11±12.88 years were included; the sex ratio was 1.54. The frequency of poor compliance was 13.8%. In univariate analysis, the factors associated with poor compliance were lack of instruction and non-acceptance of home visits by community health workers (p=0.034 and p=0.040 respectively). Barriers to communication between CHWs and patients were fear of stigma, hunger, lack of information about CHWs, non-compliance with the specifications and poor working conditions. Facilitators included community distribution of anti-tuberculosis drugs, nutritional support, peer support and visual aids.

- ***Conclusion***

The implementation of community engagement faces challenges requiring a combined approach, tailored to the needs of beneficiaries.

Keywords: *Evaluation, Compliance, Anti-Tuberculosis Treatment, Community Monitoring.*

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I. INTRODUCTION

Tuberculosis (TB) is an infectious and contagious disease caused by *Mycobacterium tuberculosis* (1) . It remains a global public health problem. According to World Health Organization (WHO) estimates (2) , approximately 10.6 million people developed TB worldwide in 2022. It is the second leading cause of death behind Covid 19. More than 80% of cases and deaths occur in low- and middle-income countries (LMICs). In 2022, the WHO African region was the second most affected by new TB cases (3,4) . In the Central African Republic (CAR), TB remains a major public health challenge with an alarming incidence rate of 540 cases per 100,000 population in 2023 and a mortality of 40% (3) . Although significant efforts have been made, particularly in the National TB Control Programme (NTCP), treatment success rates were 80% and 83% for susceptible TB and multidrug-resistant TB (MDR-TB), respectively; these rates were lower than the WHO target of 90% (5) . This poor performance could be partly due to poor adherence to anti-TB treatment (6,7) . Poor adherence to anti-TB treatment is defined as the extent to which anti-TB drug intake does not coincide with the prescribed treatment. This poor therapeutic adherence, in addition to other factors, compromises the effectiveness of interventions, increases the risk of disease spread and contributes to the emergence of *Mycobacterium resistance. tuberculosis* to anti-tuberculosis drugs (3,4,7–9) . In CAR, insufficient human resources (5.5 per 10,000 inhabitants) and the workload of health providers do not facilitate the monitoring of treatment adherence (5,10) . The community approach represented in part by community health workers (CHWs) is once again receiving increased attention in the TB control policy in CAR, who play a crucial role in awareness-raising, monitoring of tuberculosis patients, and in therapeutic education for patients (5,11) . However, the lack of precise data on their real impact on adherence to anti-tuberculosis treatment in the patients they follow, as well as data on the obstacles and facilitators to communication between CHWs and tuberculosis patients, justify the need to conduct this study (12) . Identifying these barriers, whether related to training issues, stigma, communication techniques or insufficient resources, will enable the development of more targeted and effective implementation strategies in line with the objectives of the WHO roadmap to End TB by 2035 (7,13) .

II. MATERIALS AND METHODS

This study was conducted in three tuberculosis diagnosis and treatment centers (DTC) in Bangui, health region number 7 (RS7), capital of the Central African Republic (CAR) which records two thirds of tuberculosis cases.

This was a cross-sectional study, using a mixed approach (quantitative and qualitative). The analytical cross-sectional study conducted among patients treated for at least one month for tuberculosis and the qualitative study guided by the consolidated framework for implementation research (CFIR) was based on individual and group interviews with patients followed in the study sites for tuberculosis, CHWs and agents of different pyramids of the health system involved in the fight against tuberculosis. The kobocollect questionnaire and interview guides were used to collect data which were analyzed (univariate and multivariate) using SPSS V25 software (risk α = 5%) and NVIVO V14, respectively.

Patients hospitalized or unable to give their free, written and informed consent as well as CHWs and health system agents with less than 12 months of experience in tuberculosis control were not included.

The Statcalc software on Epi-info 7.2.5.0 allowed us to calculate the minimum size of our sample based on the prevalence of poor therapeutic compliance obtained in Equatorial Guinea in 2023 (AYALA A. et al.) (14) .

We used simple random sampling to select patients included in the quantitative part and purposive sampling for the qualitative part of the study.

Based on the conditions of anti-tuberculosis treatment described in the guide for the management of TB in adults in the CAR and defining good compliance by taking regularly, every day, without omitting anti-tuberculosis treatment, at the prescribed dose until complete completion of therapy.

III. RESULTS

A. Quantitative Study

A total of 262 patients with a mean age of 35.11±12.88 years were included; the sex ratio was 1.54 (Table 1). The frequency of poor compliance was 13.8%. In univariate analysis, the factors associated with poor compliance were the lack of instruction and non-acceptance of home visits by community health workers with p = 0.034 and p = 0.040 respectively (Table 2). On the other hand, the multivariate analysis with variables having a p ≤ 20% did not find a statistically significant association (Table 2).

Table 1 Distribution According to General Characteristics of Patients Treated for Tuberculosis in Bangui in 2024.

	n=262	%
Age group (Years)		
<25	64	24.4
[25-34]	84	32.1
[35-44]	48	18.3
[45-54]	48	18.3
≥55	18	6.9
Sex		
Female	103	39.3

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/25may2010

Male	159	60.7
Level of study		
Unschooled	84	32.1
Primary	25	9.5
Secondary	105	40.1
University	48	18.3
Marital status		
With couple	126	48.1
Lives alone	136	51.9
Occupation		
Trader	58	22.1
Farmer / Fisherman / Hunter	10	3.8
Student	76	29.0
Official	33	12.6
Worker	30	11.5
Unemployed	55	21.0
Residence (Kilometers)		
[6-14 km]	81	30.9
≤5 km	174	66.4
≥15 km	7	2.7
History of TB		
No	219	83.6
Yes	43	16.4
HIV status		
Negative	154	58.8
Untested	31	11.8
Positive	77	29.4
antiretroviral treatment		
No	3	1.1
Yes	74	28.2
TB Location		
Extra pulmonary TB	24	9.2
pulmonary TB	238	90.8
Type of diagnosis		
Bacteriologically confirmed pulmonary TB	188	71.8
Clinically diagnosed pulmonary TB	50	19.1
TB treatment phase		
Phase continuation	134	51.1
Intensive phase	128	48.9
Followed by an CHW		
No	251	95.8
Yes	11	4.2
Acceptability of an CHW		
No	91	34.7
Yes	171	65.3
Diagnostic and treatment center		
DTC 1	41	15.6
DTC 2	148	56,5
DTC 3	73	27,9

Table 2 Relationships between General Characteristics of Tuberculosis Patients and Therapeutic Compliance among Tuberculosis Patients in Bangui in 2024

	Regressions analyses	
	Simple	**Multiple**
DTC		
DTC 1	1,94 [0,63 - 5,99]; p=0,25	
DTC 2	1,64 [0,67 - 4,05]; p=0,28	
DTC 3	Ref.	
Age group (Years)		

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/25may2010

<25	1,27 [0,32 - 5,07]; p=0.73	
[25-34]	0.38 [0.09 - 1.71]; p=0.21	
[35-44]	0.85 [0.19 - 3.74]; p=0.83	
[45-54]	0.85 [0.19 - 3.74]; p=0.83	
≥55	Ref.	
Sex		
Female	0.64 [0.30 - 1.36]; p=0.25	
Male	Ref.	
Level education		
Unschooled	0,25 [0,07 - 0,88]; **p=0.03**	0,29 [0,08 - 1,08]; =0.065
Primary	1.25 [0,36 - 4,32]; p=0.72	1.13 [0,32 - 4,02]; p=0.85
Secondary	1,10 [0,44 - 2,74]; p=0,83	1,03 [0,41 - 2,63]; p=0,94
University	Ref.	Ref.
Occupation		
Trader	1,09 [0,37 - 3,26]; p=0.86	
Farmer/ Fisherman / Hunter	1.71 [0,30 - 9,77]; p=0.54	
Pupils/students	1,55 [0,58 - 4,13]; p=0.38	
Function	0.68 [0.16 - 2.86]; p=0.60	
Workers	0.49 [0.09 - 2.52]; p=0.39	
unemployed	Ref.	
Residence (Kilometer)		
≤5	0.34 [0.06 - 1.88]; p=0.22	
[6–14]	0.48 [0.08 - 2.73]; p=0.41	
≥15	Ref.	
Marital status		
With couple	1.09 [0.54 - 2.21]; p=0.80	
Alone	Ref.	
History of TB		
No	3,77 [0,87 - 16,31]; p=0,07	3,30 [0,74 - 14,68]; p=0,12
Yes	Ref.	Ref.
HIV status		
Negative	0.67 [0,30 - 1,49]; p=0.33	
Untested	1,58 [0,55 - 4,48]; p=0,39	
Positive	Ref.	
antiretroviral treatment		
No	2,86 [0,24 - 34,35]; p=0,41	
Yes	Ref.	
TB Location		
Extra pulmonary TB	1,76 [0,61 - 5,04]; p=0,29	
pulmonary TB	Ref.	
Type of diagnosis		
Bacteriologically confirmed pulmonary TB	4,12 [0,90 - 18,99]; p=0,069	1,56 [0,42 - 5,76]; p=0,50
Clinically diagnosed pulmonary TB	Ref.	Ref.
TB treatment phase		
Phase continuation	1,40 [0,68 - 2,85]; p=0,35	
Phase intensive	Ref.	
Followed by CHWs		
No	0.40 [0.10 - 1.60]; p=1.96	0.36 [0.08 - 1.59]; p=1.18
Yes	Ref.	Ref.
Acceptability of CHWs		
No	2.09 [1.03 - 4.26]; p=**0.041**	1.59 [0.71 - 3.56]; p=0.26
Yes	Ref.	Ref.

B. Qualitative Study

Individual interviews conducted with six health system agents and focus groups (FGs) conducted with groups of six CHWs and six TB patients respectively, helped identify barriers and facilitators to communication between CHWs and TB patients.

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/25may2010

➢ *Obstacles Encountered by CHWs and TB Patients in Community TB Monitoring*

- *Poor Working Conditions of CHWs*

✓ *Means of Transport and Communication*

Many have abandoned their jobs due to precariousness, which makes it difficult to carry out the tasks assigned to them. Added to this factor is the problem of means of transport and communications for monitoring patients in remote or difficult-to-access areas:

"So the lack of resources also because afterwards I tried to talk, I often talk with them to try to understand their difficulties, but they let me know that normally if they have to make home visits, we should give them a little more, something for transportation and others but maybe if there are no resources for that, it is one of the reasons why they are not able to make home visits as requested in their specifications. So some difficulties that we have in community monitoring" (Individual interview, health professional)

✓ *Financial Constraint*

CHWs are facing financial difficulties, finding themselves unable to provide the necessary support to patients, particularly in terms of monitoring and social support.

" And if a patient does not show up for an appointment, we try every way to call them using their number recorded in the register to understand the reason for their absence... But we too are human, one day we are faced with a financial problem, it will be difficult for these patients to provide them with social support, because the days when we do not have financial means available it will have enormous consequences for these patients." (FG CHWs)

- *Lack of Information on CHWs*

The majority of patients were not informed about the existence of CHWs or their crucial role in patient monitoring. Some patients under anti-tuberculosis treatment questioned during our interview, expressed their surprise to discover the existence of these CHWs only during their hospital appointment visits or at an advanced stage of treatment. This lack of knowledge of CHWs was affirmed through several testimonies:

«I *think that at the beginning I arrived at the place where the medication was supposed to be given but I was not told that there were health workers on that, who would follow me at home."* (FG, TB Patient)

" I was not informed about the existence of community relays. I never know that there are community relays responsible for advising us at home. " (FG, TB patients)

" I've never heard of CHWs. I just go to the hospital." (FG, TB patients)

"Doctor, to be honest with you, we have never heard of CHWs*."* (FG, TB patients)

- *Stigmatization*

✓ *Family-Related Stigma*

Patients on TB treatment face social rejection, not only within their own homes, but also in the community. This discrimination leads to significant isolation, creating an environment that is not conducive to communication and commitment to treatment adherence:

" You know when you have tuberculosis even in your own home you are left out, that's all, you are discriminated against, you are left out, eh you are all alone, you are behind the house no one wants to approach you eh... if your own family rejects you imagine for the others." (FG, TB patient)

✓ *Stigma Related to the Environment*

Many TB patients express their desire to maintain their privacy and avoid their illness becoming known to those around them. They fear that CHW home visits will reveal their treatment and that they will be stigmatized by their community. Some even ask for visits to be conducted in discreet locations, away from their homes, so that others will not discover their status:

" The solution I would like you to implement is even if you come to my house, in my neighborhood, you can give advice to others generally but to say that it is me who is taking medication, everyone in the neighborhood will finger me... When I caught TB, my family knew nothing about it. It was only me who followed my treatment until 6 months that today I am cured." (FG, TB Patients)

"It is true, there are obstacles to home visits. Before going to the patient's house, we call them first. As you know, a disease like TB is a stigmatizing disease, a shameful one, and no patient wants anyone to know about their disease. So we call the person two days in advance… They don't want the CHWs to go there to the house so that the surroundings know that they are taking medication." (FG, CHW)

✓ *Stigma Related to HIV Status*

The stigma associated with TB and HIV creates reluctance among some patients to receive CHWs, especially when they are from the same neighborhood. Fear of dissemination of sensitive information and discrimination leads to reluctance to accept CHW visits:

"...well sometimes, as some CHWs are from the neighborhood, some people are a little hesitant to receive these CHWs at home but that's completely normal because imagine if the person is known to have HIV or tuberculosis and it's someone from the neighborhood who comes, they're probably afraid that we're going to spread the news, uh... there will be stigmatization, discrimination and all that so they're afraid of all that huh so these are obstacles linked to home visit activities." (Individual interview, health professional)

- *Power Problem*

Food needs are perceived by patients on anti-TB treatment as a higher priority than the therapeutic advice

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received. During home visits, some patients expressed frustration by refusing to receive CHWs, when they came without bringing food. This lack of food support led to attitudes of rejection:

" There came a time when one of my patients refused to receive me at his home... Subsequently, during the next home visit with him for therapeutic support without anything in hand, as soon as he saw us coming empty-handed, he ran away to hide inside the house while telling his parents to let us know that he was away... He ended up saying that every day that advice, advice but his problem was not this advice, that he takes the medications that make him very tired and therefore his problem is not this advice but rather something else, the food was waiting for us to bring him food such as bread, porridge, etc. and not only the advice." (FG, CHWs)

" Regarding hunger, when the CHWs go there, the patients say they want the... what? They want the food to eat, they take the medicines. There is a lot of hunger." (FG, CHWs)

" We arrive in front of the patients, they see us and sometimes they pull faces because they think that we are bringing them food products, WFP products, but when they see that we come empty-handed, they refuse to receive us, that is what is the problem and especially the problem of WFP products. And since we do not have the means to give them, we cannot give them anything." (FG, CHWs)

- *Failure to Comply with Specifications*

Some CHWs do not fully fulfill their role, particularly with regard to home visits. Patients, after all the difficulties they face, are not properly followed up by the CHWs, as one of the DTC managers testifies:

"There is no shortage of difficulties, so the main difficulties that we encounter in community monitoring of tuberculosis patients are first of all, I would say that there is a failure to respect the specifications of community health workers. We recruited community health workers who were assigned to different health facilities, but unfortunately these community health workers do not fully assume their roles which are defined in their specifications. I can give the example of home visits which are rarely done, that's it. So that is part of the difficulties that we have and then..." **(**Individual interview, health professional)

➢ *Facilitators Encountered by CHWs and TB Patients in Community TB Monitoring*

- *Community Distribution of Anti-Tuberculosis Drugs*

The importance of CHWs intervention to ensure continuity of treatment at home, especially during difficult periods when the patient is unable to come to the hospital, is a key factor in building trust with patients:

" I accept that the CHWs visit me at home because, uh, maybe when the disease gets worse, I can explain to them so that they go there and bring me my medication so that I can continue taking it because there are days when the disease gets worse and I can't even go to the hospital. The community worker, once informed, could go and get my medication and simply bring it to me. " (FG, Patients)

- *Nutritional Support*

Using small gestures like gifts to foster communication with patients. As one CHW points out, this simple gesture can have a significant impact on the patient relationship, helping to create an environment conducive to open discussion and effective follow-up:

" When we go to our patients, we have something in hand so that once we arrive and before starting the conversation, we give it to facilitate communication. So when we go, we prepare ourselves with some gifts in hand to make the patient sit down for communication." (FG, CHWs)

- *Visual Aids*

Visual tools can enhance the effectiveness of health messages, often in situations of illiteracy or in contexts where verbal communication alone may be insufficient:

"We see patients that we are interacting with, we give them advice, but when we advise them with images, it will push them to understand the message more quickly." (FG, CHWs)

"With the image, I say that why, if we have image boxes that allow us to illustrate our messages as we go along, he will say, huh so things are like that huh. I emphasize that why? During the home visits that we conduct, sometimes we gather families to talk to them, which allows the person to look in order to be convinced, there is none. Once you come in, they do not keep anything as a key message. However, the image could remain in their memories and he will adhere to the treatment because he will understand how TB develops up to the current stage where it has arrived. So this problem of image boxes must be there to help us in communicating with our patients." (FG, CHWs)

"Awareness raising with projections and other things like image boxes can also help so that each individual looks at this evidence and is convinced to take precautions to better fight against this disease." (FG, CHWs)

- *Support from Former Tuberculosis Patients*

Former tuberculosis patients are seen as important relays for supporting new patients. The CHWs in his testimony during a FG advocates for the integration of these former patients in awareness-raising strategies, arguing that they are better able to understand and guide patients thanks to their personal experience:

"And as our peer just pointed out, if we took the affected people to train them, he has experienced the disease and if he is the one who takes charge of this work, the work will work. But imagine someone who has never experienced the disease, we take him to train him, he has never felt the experience of the disease or has never experienced a case in his family, what will he advise others? Whereas in his family if one of the members such as his father suffered from the disease, he

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/25may2010

suffered with his father, he is eligible to provide therapeutic support to patients. The one who has had TB and who has gone through this same path until recovery, he knows the treatment better with the training he will receive. He will do the job better." (FG, CHWs)

"We have an association of former tuberculosis patients, those who are affected by tuberculosis, who are there, and our wish is that everyone can be... all tuberculosis patients can join this because there they discuss everything that we are talking about here, and among themselves they can raise awareness among the peers" (FG, CHWs)

"We have an association of former tuberculosis patients, those who are affected by tuberculosis, who are there, and our wish is that everyone can be... all tuberculosis patients can join this because there they discuss everything... I think that if it is the community itself that raises awareness among others I think that it will work much better." (Individual interview, health professional)

Valuing local skills: The success of this initiative highlights the importance of valuing and strengthening local skills, highlighting the potential of veterans as agents of positive change.

IV. DISCUSSIONS

❖ *Quantitative Study*

A. Descriptive results

➢ *General Characteristics of the Population*

- *Age*

The population studied was mainly made up of young adults aged under 35 (56.5%) with a average age of 35.12 years ± 15 years. In the Central African context, several studies have found a similar mean age (1.26) . This age group could be linked by the fact that young adults represent the sexually and economically active age group with risk of HIV infection which is a risk factor for TB. Our results showed a high frequency of poor adherence among subjects in the 18 to 25 age group. In CAR, a retrospective cohort study on ART adherence carried out in 2021 showed a predominance of poor adherence among subjects under 25 years of age (46) . This age group could be linked to the status of pupil or student, socially and economically active age groups and subject to displacement (47) .

- *Sex*

We found a male predominance, giving a sex ratio of 1.54. This could be linked to socio-economic and cultural factors, in our context, which limit the accessibility of training to women. In CAR, a study carried out in 2019 on patients hospitalized in the Medical Services found a female predominance (1) . Our results were also observed in other countries of sub-Saharan Africa showing a male predominance compared to women (12,26,46,48) . Poor therapeutic adherence was observed more in men (16%) than in women (11%). Studies published in 2019 and 2021 by Dje and Laghari established a statistically significant link between adherence and sex (49,50) .

- *Education Level*

A high proportion of the patients surveyed had a secondary education level (40.1%), followed by those who were not in school (32.1%). This could be explained by the consequences of the crises that impacted school attendance at the national level. The low rate of school enrollment in the population affected by TB has been demonstrated in the literature (51) .

- *Marital Status*

The majority of TB patients included in our study were not living with a partner (51.9%). This could be explained by the consequences of the humanitarian crisis that severely affected the population, subject to displacement, death of the spouse, etc. In Ethiopia, Dessalegn Ajema found 59% of TB patients living with a partner in a stable security context (51) . The proportion of adherence to anti-TB treatment was almost equal in these two categories. Anna Leddy and colleagues in Uganda, demonstrated that men with TB received substantial support from their female partners to take their anti-TB medications (52) .

- *Occupation*

Informal workers (unemployed, workers and traders) represent a significant proportion of the study population (54.6%) compared to pupils and students (29%). In our series, fishermen, farmers, hunters, pupils and students were less compliant with anti-TB treatment, highlighting the consequences of certain occupations on access to health care in relation to service hours in the diagnostic and treatment center (DTC).

- *Residence*

66.4% of patients live within 5 km of their DTC. However, we observed a trend where the frequency of poor treatment adherence increases with the distance between the patient's home and the DTC. The impact of high stigma related to tuberculosis and the assimilation of TB to HIV within the family could explain this result (53) . This result could also be in line with logistical and financial constraints.

- *Location of Tuberculosis*

Patients with PTB represented 90.8% of the sample. This is consistent with literature data where PTB is the most common form (12,27,54) . A high proportion of poor adherence to anti-TB treatment was observed among patients with PTB (21%) compared to patients with the pulmonary form (13%). This result could be explained by the fact that the extrapulmonary form of tuberculosis is most often little known to the general public.

- *Type of Diagnosis*

A high proportion of the included patients were bacteriologically confirmed PTB cases (71.8%). In Mali, sputum analysis was the most common examination performed with proportions of 76 to 91% respectively (48.54) . The higher proportion of poor adherence to anti-TB treatment was observed among patients with clinically

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diagnosed PTB (27%) than among PTB+ cases (15%) probably due to the belief in the established diagnosis.

- *Background*

A large majority of tuberculosis patients were new cases (83.6%). In Mali, Diarra et al. found 92% of new cases of TB (12) . This difference could be linked to the fact that tuberculosis relapses are frequently encountered among PLHIV with the HIV incidence rate remaining high in CAR compared to Mali (11,15). Former tuberculosis patients were more compliant with anti-TB treatment (95%) compared to new tuberculosis patients (84%). The observed result could be explained by the fact that patients with tuberculosis relapse learned from previous therapeutic errors to better comply with treatment principles.

- *TB/HIV Coinfection*

The TB/HIV coinfection rate observed in our sample was 29.4%. This result could have several explanations through the fact that TB is one of the opportunistic infections frequently encountered among PLHIV and also by the fact that some sites of our study are located in the HEALTH CENTER offering at the same time the care of HIV. The DTC of our study are located in the HEALTH CENTER which at the same time offer the care of PLHIV. The proportion of TB/HIV coinfection obtained during our study follows the national trend which was 30% in 2021 (11) . Previous studies conducted in Mali reveal proportions of TB/HIV coinfection which were 12.38% (54) and 15.11% (48) , reflecting the reality of the context with low HIV incidence (6,15) . A high proportion of poor adherence was recorded among TB/HIV co-infected patients (16%) compared to HIV-negative patients (11%).

- *Processing Phase*

Our study revealed an almost equal distribution of patients in the first and second phase of anti-tuberculosis treatment, namely 48.9% and 51.1% respectively, with an increasing trend in poor adherence to anti-TB treatment among patients in the second phase of treatment (16%) than among patients in the first phase (12%). This finding could be explained by the fact that the intensive phase of treatment is the most critical phase of the disease where the patient is obliged to follow his treatment correctly unlike the continuation phase where patients generally feel cured especially with the negative results of bacteriological monitoring.

- *Followed by CHWs*

A very high proportion of patients included in our study could not benefit from CHW follow-up (95.8%). This situation could be explained by the fact that CHWs generally target patients who are irregular in their treatment and those identified as being at risk of poor treatment adherence (55) . In previous studies, TB patients indicated that CHWs played a very important role in their treatment process by visiting them at home regularly or, at the limit, communicating with them by telephone regularly, thus reinforcing treatment adherence (55,56) .

- *Acceptability of CHWs*

A proportion of 65.3% of our respondents expressed favorable acceptability towards the intervention of CHWs. This situation could be linked to the fear of stigma related to the fact that these CHWs come from the same community in which the patient lives. Beena Thomas et al found a decrease in the acceptability of CHWs by patients with TB in a qualitative approach published in 2020 in relation to the perception of a reduction in face-to-face contact with health professionals (53) .

- *Distribution of Patients According to DTC*

DTC 2 recorded more than half of our sample (56.5%) which could be explained by the fact that it is located in a university hospital compared to the other two DTC located in the urban health centers (CSU) of Bangui.

➢ *Compliance*

A proportion of 13.7% of patients were unable to properly adhere to their anti-tuberculosis treatment. Several reasons were provided by our respondents during this study, including poor reception, side effects of anti-tuberculosis drugs, hunger, bereavement, mistaken belief about anti-TB drugs, transportation problems, perception of tablets, as well as financial, professional and structural constraints, in relation to other data in the literature (57–59) . Very variable proportions ranging from 11.9 to 26% of poor adherence have been described in the literature (51,57,59,60) . The differences in rates could be related to different methodological criteria such as the use of the Morisky-8 scale used in Ethiopia to measure poor adherence to treatment, which differs from our operational definition. It is also important to note that the studies conducted in Ethiopia included participants under 18 years of age (15-17 years), an age group particularly vulnerable to difficulties in adherence to treatment due to their status as minors.

B. Analytical Results

➢ *Education Level*

In our study, statistical analysis revealed that patients with no education were statistically significant in 25% of cases likely to have non-adherence to treatment compared to patients with university education (p=0.034). This result could be explained by the influence of illiteracy on the understanding of treatment and the importance of medical follow-up. A study conducted in Ethiopia by Getahun et *al.* found a statistically significant association in 23.8% of cases between primary and secondary education level with adherence to anti-tuberculosis treatment (55). Anna Leddy et *al.* in Uganda, demonstrated that the limited level of literacy was one of the obstacles to the implementation of DOTS for some people with tuberculosis (52).

➢ *Acceptability of CHWs*

Our results showed that TB patients who did not agree to CHW home follow-up had a statistically significant two-fold increased chance of adherence to treatment compared to patients who agreed to CHW home follow-up (p=0.041). This result could be explained by the fact that patients who did not agree to CHW home follow-up may not have difficulty

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adhering to treatment. A recent study in Malawi found no change in CHW involvement and better treatment adherence (61)

❖ *Qualitative Data*

A. Barriers to Communication Between CHWs and Patients Treated for TB

➢ *Fear of Stigmatization*

Most participants in our study highlighted social stigma as a major barrier to communication between CHWs and patients on anti-TB treatment.

- *Fear of Stigmatization from Family and Friends*

Patients on anti-TB treatment face social rejection, not only within their own household, but also in the community, leading to significant isolation. In 2020, Beena Thomas and colleagues found a link with improved family involvement in TB care (social influences) (53) .

- *Fear of Stigmatization caused by the TB/HIV Association*

The major obstacle to effective communication between CHWs and patients on anti-TB treatment lies in the fact that PLHIV prefer to choose centers located further from their place of residence, often due to their PLHIV status. Mainly to protect their confidentiality and avoid any stigma associated with the TB/HIV combination (62,63) . This preference for DTC outside their area of residence complicates the management of their home follow-up by CHWs, the majority of whom still do not have up-to-date information on these patients followed in more distant DTC. A socio-anthropological study carried out by Bernard SEYTRE in Côte d'Ivoire found that the majority of respondents associated HIV/AIDS infection with the fear of being stigmatized (63–66) . In 2020, Beena Thomas and colleagues also highlighted these social influences through the high stigma related to tuberculosis and HIV within the family (53) .

➢ *Poor Working Conditions of CHWs*

The factors related to poor working conditions (financial constraints, logistics, etc.) obtained from our respondents are related to the data in the literature. The problem of means of transport and communications for monitoring patients in remote or difficult-to-access areas. CHWs are facing financial difficulties, finding themselves unable to provide the necessary support to patients, particularly in terms of home monitoring and social support (14,55,66) . (61) . Beena Thomas and colleagues found in 2020, greater patient acceptance linked to the perception of improved relationships between the patient and healthcare professionals thanks to increased telephone communications and SMS reminders (53) . Anna Leddy, in a qualitative study, reported limited access to electricity to charge their mobile phones to make dosage confirmation calls, and poor network connectivity, and that women were more likely to have problems accessing mobile phones than men with TB (52) .

➢ *Failure to Comply with the CHW Specifications*

Some CHWs do not adhere to their specifications, resulting in a barrier to communication between them and TB patients. This could be explained by the insufficient quality of training offered, the lack of provision of training tools to CHWs, or logistical problems (67) . Beena Thomas and colleagues described suboptimal facilitation conditions , including inadequate training of health professionals in the program and uneven changes in workload (53) . In a cohort study on patients identified at risk of poor adherence to TB treatment, carried out by Reynold Washington in 2023, highlighted the limitation of CHWs in their skills in managing patients in the field (55) .

➢ *Lack of Information on CHWs*

Several patient testimonies showing a lack of awareness of CHWs by patients under anti-TB treatment could be explained by a lack of coordination between health providers and CHWs. Health providers may not have received a briefing on these key health actors and on the other hand, a lack of information and awareness among the general public on this link of health actors. Other previous studies have shown similar results (53) .

➢ *Feeding Problems in Patients*

The collected testimonies clearly reflected that patients on anti-TB treatment, although receiving therapeutic advice, prioritize their food needs and perceive that hunger is a more urgent problem than medical recommendations. This would be linked by the fact that with the start of anti-TB treatment with the recovery of appetite. A systematic review conducted in 2018 by Stephanie Law in TBMR patients revealed little evidence of an association between the provision of food parcels and the management of patients on anti-TB treatments (61) .

B. Facilitators of Communication Between CHWs and Patients Treated for TB

➢ *Community Distribution of Anti-Tuberculosis Drugs*

Home-based delivery of anti-TB medications to patients was cited by our participants as a facilitator of communication between CHWs and TB patients. A study conducted in Ethiopia in 2024 by Abebaw Getachew demonstrated the role of community-based TB care in the acceptability of community-based intervention (14) . Beena Thomas et al. found in 2020, greater patient acceptance due to reduced need to visit health facilities (53) . Anna Leddy et al. noted that DOTS supported and encouraged people with TB to take their anti-TB medications, facilitated treatment adherence, and improved relationships between people with TB and health workers (52) . Indeed, this practice represents a pragmatic response to the challenges faced by patients, including isolation secondary to the fear of stigmatization, mitigating the risk for these patients of being exposed to the general public with their identity visible in the queue at the DTC while waiting to take their medication. It also highlights the human dimension of support, thus strengthening the relationship of trust between the parties.

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/25may2010

➢ *Nutritional Support*

As CHWs report, offering small gifts, such as food, to patients on TB treatment can be seen as an icebreaker and a way to facilitate communication with TB patients. This may be because the patient feels not only treated for their illness, but also cared for holistically in a context where access to nutrition is limited. A previous study highlighted the combination of drug distribution and small gifts as a way to create a supportive environment conducive to patient engagement (61) .

➢ *Visual Aids*

The interviews highlight the importance of visual aids in communication between CHWs and patients undergoing anti-TB treatment, facilitating the understanding of key messages. Indeed, several studies have shown that TB mainly affects people with little or no education, justifying more effective communication between the patient and CHWs. A recent study highlighted the use of picture boxes to explain the progression of the disease and its treatments, which contributed to improvements in patient understanding and their adherence to treatment.

➢ *Peer Support (Former Tuberculosis Patients)*

The involvement of former TB patients in therapeutic accompaniment and moral support of TB patients as a factor facilitating communication between the latter. This model of peer support was highlighted by Abebaw Getachew, to facilitate TB screening at the community level, CHWs organized community gatherings and used peer education who are better able to understand and guide patients through their personal experience (14) .

V. DATA TRIANGULATION

➢ *Distance and Accessibility Problem*

Results showed that CHWs face major barriers, including inadequate resources (transport and funding), which make it difficult to provide home-based follow-up to patients in remote areas. This is corroborated by quantitative results, where 95.8% of patients did not receive CHW follow-up, although 65.3% of patients expressed the need for community-based follow-up. Lack of CHW follow-up and the need for improved resources to facilitate follow-up are commonalities between qualitative and quantitative data.

➢ *Lack of Information on CHWs*

Qualitative results show that many patients are not informed about the existence of CHWs, which limits communication and engagement in treatment follow-up. In quantitative results, the low acceptability of CHWs by some patients could also be related to this lack of awareness and information, reducing patients' adherence to community follow-up. Regression analysis in quantitative data showed a significant relationship between poor adherence and lack of CHW follow-up, which supports the idea that information is crucial for treatment adherence.

➢ *Poor Working Conditions*

Inadequate training and resources for patient follow-up, coupled with delays in CHW bonus payments, are major barriers to the successful implementation of community-based TB interventions. As demonstrated by both qualitative interviews and quantitative data, lack of resources affects staff motivation and limits their ability to respond effectively and proactively to patient needs, making community-based interventions less relevant and effective.

➢ *Stigma*

The social stigma experienced by TB patients, both in the family and in the community, is a major obstacle to communication and treatment follow-up. Patients do not want their treatment to be disclosed, which leads them to refuse CHW visits. This phenomenon is reinforced by qualitative data where patients mention isolation due to the disease. At the same time, quantitative results show that a significant proportion of patients (13%) refuse CHW support, which can be explained by this stigma and social rejection. These results show that stigma has a direct impact on adherence, with patients being reluctant to accept CHW help for fear of being stigmatized.

➢ *Poor Financial Conditions of CHWs*

Results reveal that CHWs, faced with financial difficulties, cannot provide sufficient support to patients, particularly in terms of social support. These difficulties are reflected in the quantitative results by the low acceptability of CHWs, where 34.7% of patients would not accept their follow-up. The difficulty in providing social support due to financial constraints may thus contribute to poor adherence to anti-tuberculosis treatment, a factor that quantitative analyses highlight by the low adherence among patients with few resources.

VI. CONCLUSION

Poor adherence to TB treatment in Bangui is related to illiteracy and low acceptance of CHW home support. CHW interventions, although effective in theory, encounter obstacles in their practical implementation in the field, mainly related to the quality of follow-up and the low acceptability of these interventions. These results show that with the adaptation of community engagement strategies based on this evidence, it is possible to improve the interaction between CHWs and patients in order to contribute to better adherence to TB treatment in Bangui.

➢ *Recognitions*

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➢ *Conflict of Interest*

The financial partners of this study were not associated with the design of this study, nor in the process of data collection, nor in the analysis and interpretation of the results

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and nor in the process of dissemination of these results. We conducted it in the principle of ethics and medical deontology. Therefore, no conflict of interest was noted.

➢ *Ethical Approval*

We received approval from the Bangui Ethics and Scientific Committee and research authorizations from the Faculty of Health Sciences of the University of Bangui and the Ministry of Health and Population to conduct this study.

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