STUDY OF FACTORS ASSOCIATED WITH NON-COMPLIANCE WITH MEASURES TO CONTROL TUBERCULOSIS TRANSMISSION AMONG PATIENTS TREATED AT THE EBOLOWA REGIONAL HOSPITAL TUBERCULOSIS SCREENING AND TREATMENT CENTER

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Abstract--- The aim of this study was to investigate the factors associated with non-compliance with tuberculosis transmission control measures among patients followed at the Ebolowa Regional Hospital Tuberculosis Screening and Treatment Center. Tuberculosis has been one of the most contagious diseases to be eradicated for decades, due to its chain of transmission, despite the existence of a vaccine administered from the very first days of life. Every day, more than 4,000 people die from tuberculosis, and 30,000 contract it despite the fact that it is preventable and treatable [1]. In the fight against the spread of tuberculosis, the current recommendations for preventing transmission are administrative, environmental and personal protection. The resurgence of tuberculosis in the Cameroonian population points to the difficulty of implementing measures to control transmission of this disease, despite the efforts of the government and its partners. It can therefore be said that tuberculosis remains a real public health problem in Cameroon. This qualitative-phenomenological study involved 25 participants: five staff working at the Ebolowa regional hospital's CDT, ten patients and ten patients' family carers. Data were collected using an interview guide. Our respondents' thematic transcriptions revealed that individual factors such as low financial income, overcrowding and inadequate household ventilation prevent tuberculosis control. In addition, socio-cultural factors such as negative beliefs and perceptions about tuberculosis, associated with a lack of knowledge about control measures, discrimination against the sick and inadequate respiratory hygiene. In addition, institutional factors such as inadequate in-service training, outdated technical facilities, inappropriate patient and visitor traffic, and poor patient follow-up in the community.

Keywords- Tuberculosis, associated factors, control measures.

I. INTRODUCTION

The world health organization [2], states that tuberculosis is caused by a bacterium (mycobacterium tuberculosis) which most often affects the lungs; it can be cured and prevented. In the world as a whole, and specifically in low-income countries, tuberculosis is one of the most deadly infectious diseases, accounting for over 95% of deaths. All age groups are at risk, but young adults are mainly affected during their most productive years. Epidemics of tuberculosis have been reported in congregate settings, including hospitals, prisons and homeless hostels. As a result, current recommendations to prevent its transmission include a hierarchy of control measures: administrative measures aimed at preventing exposure to infectious droplets. These include administrative measures to prevent exposure to infectious droplets, environmental measures to reduce the

concentration of airborne infectious droplets, and personal protective measures to minimize the risk of transmission by preventing inhalation or exhalation of infectious droplets [3].

It is recognized that these measures must be respected both in the care setting and at home. But to facilitate their adoption and prevent tuberculosis transmission, we asked ourselves: What factors explain the failure to comply with TB transmission control measures among patients treated at the Ebolowa Regional Hospital TB screening and treatment center? Indeed, 1.5 million people died of tuberculosis (214,000 of whom also had HIV infection) and 1.1 million children developed tuberculosis worldwide in 2020 [4]. In this vein, Beggs, C. B, et al [5] assert that "transmission of M. tuberculosis to an uninfected person is more likely if ventilation is of poor quality". The Global Fund [6] goes further, stating that people living in conditions of overcrowding, inadequate ventilation and poor nutrition are at greater risk of contracting tuberculosis infection and developing the disease. By 2021, Cameroon will have 174 new cases of tuberculosis and a mortality rate of 29 per 100,000 inhabitants [7]. This would be a major asset in the implementation of infection control with inadequate respiratory hygiene permanently exposing populations to the risk of BK transmission. Fox, G.J et al [8], for example, report that the use of surgical masks by patients reduced infections by 15% and the development of tuberculosis disease by between 0.5% and 29%. Personal respiratory protection using respirators reduced infections by between 0% and 15%. According to the GTR/TB-Sud regional annual report [9], the Southern Region reported an incidence rate equal to 108.72 per 100,000 inhabitants. In the same year, the incidence rate in the Ebolowa Health District was 116.55 per 100,000 inhabitants. In this context, the increase in incidence is the result of constant exposure to risk factors for the transmission of the bacterium responsible for tuberculosis, which seems to go hand in hand with the population's failure to comply with tuberculosis infection control measures. WHO [10] believes that the key interventions to minimize recurrence of tuberculosis are to ensure completion of initial anti-tuberculosis treatment, and to implement effective infection control measures in clinics and community centers. In order to limit or prevent the transmission of tuberculosis, these measures must be integrated into an integrated risk management approach, including administrative, environmental and individual measures [11]. As far as the present study is concerned, non-compliance with measures to control tuberculosis transmission is associated with low financial income, inadequate household ventilation, poor knowledge of control measures, inadequate in-service training, outdated technical facilities, poor patient follow-up in the community and inadequate respiratory hygiene. Given that infection control is a means of combating the spread of tuberculosis, and in view of the increasing incidence and mortality rates associated with tuberculosis in the aforementioned locality, it is important to improve the behavior not only of patients undergoing tuberculosis treatment and their families, but also of staff working in the HRE's tuberculosis services, in order to actively contribute to the implementation of anti-tuberculosis measures.

II. METHODOLOGY

A- Site and participants

For the purposes of this study, we carried out a survey of 25 participants, i.e. five staff on duty at the Ebolowa regional hospital's CDT, ten patients followed up in the said CDT and ten family caregivers of these patients. Participants were selected using the non-probability convenience sampling technique. The average age of the patients ranged from 20 to 45 years.

B- Materials

The approach used to collect the data was based primarily on the completion of three (03) semi-structured interview guides, consisting on the one hand of sections devoted to characteristics of the study population and information on individual and socio-cultural explanatory factors for non-compliance with TB transmission control measures.

- **Individual factors**

In the present study, individual explanatory factors were investigated by asking about participants' monthly income, the number of people and bedrooms per house, including the household ventilation system.

- **Socio-cultural factors**

In this section, interviews focused on participants' knowledge and perceptions of tuberculosis, the frequency with which they wore protective masks, and their attitudes towards tuberculosis patients.

- **Institutional factors**

With regard to institutional factors, the investigation focused on the ongoing training of staff in TB infection control, the quality of patient

reception and care, the number of rooms available in isolation and the conditions of isolation, the circuit of TB+ patients, their companions and visitors, including the follow-up of patients in the community.

C- DATA PROCESSING

In this study, we proceeded with a content analysis of the speeches delivered by the participants for a thematic categorization, and we defined codes for each of them. All interviews were recorded using a Dictaphone. They were then transcribed from the verbatim, numbering the answers to the various questions asked.

III. RESULTS

Our results are structured around three main axes, namely: individual, sociocultural and institutional explanatory factors for non-compliance with measures to control tuberculosis transmission among patients followed up at the Ebolowa Regional Hospital Tuberculosis Screening and Treatment Centre. First, however, we present the profile of the participants.

- **Profile of participants**

The age range was between 20 and 45 years for patients undergoing treatment for pulmonary tuberculosis, and between 33 and 57 years for the staff of the Ebolowa Regional Hospital TSTC. Males predominate. Single people were in the majority in our study. The majority of informants were self-employed. Most informants have completed secondary school. More than half live in shantytowns. Care assistants are in the majority at the CDT. Professional experience varies from five (05) to thirty (30) years. Length of service varies from one (01) year to twenty-two (22) years.

- *Individual explanatory factors for non-compliance with TB transmission control measures*

This analysis shows that overcrowding in households is an individual factor. In the Ebolowa Health District, where the HRE CDT is located, we have houses with few bedrooms, but made up of several people; this is a non-negligible factor in tuberculosis transmission. As Inf N°1 points out: "Well, it's nine people, the mother has her room, and the children have their room, so there are two living rooms". Inf N°4 adds: "There are 11 of us and 03 living rooms, so we sleep 3 or 4 per room". Inf. N°10 in the same vein declares: "Wouuuuuuuu, 12 people is the African family, the grandmother, the grandfather, the children all; in short and there are 03 rooms four people per room when it's not the vacations heinn".

There is also inadequate ventilation in households. Some households don't have windows, and those that do don't open them; there's also little use of fans or air conditioners, which is one of the factors contributing to non-compliance with environmental control measures. Inf N°6 states: "There's no window, just the door; we don't open it enough, because the room is quite full, I have valuable things, I prefer to stay outside, there's plenty of air". Info N°9 adds: "There are too many flies, I open the door when I'm working outside, otherwise most of the time my door stays closed". Info N°10 adds: "We're hardly here during the day, so everything's closed, and in the evening, with the mosquitoes, there's no point in opening the door".

- **Socio-cultural explanatory factors for non-compliance with measures to control tuberculosis transmission**

We note that respiratory hygiene is inadequate in this population. For the majority, we deplore the insufficient wearing of masks by patients undergoing home treatment, which once again justifies exposure to infected droplets and the high transmission of TB in the community. This is confirmed by the words of nurse N°2: "I sometimes wear a muffler, because it suffocates and heats up too". In the same vein, nurse N°5 declares: "My health is fragile, I'm a known asthmatic, I don't wear the thing they call a muffler, I'm not even obliged to wear one, because the doctor told us that if the patient takes the medicine well, it's fine". Inf N°7 illustrates the point: "They ask you to wear a single-use mask, but who's going to give me the money to replace it all the time? I avoid that. Madam, even the good mask is expensive! It's called N-something, the one that takes the whole noseful of cloth things, and the 100, 100f blue and white ones you find out there don't protect at all". Knowledge of measures to control tuberculosis transmission is approximate. Only environmental and personal protection measures are widely known. Yet administrative measures are the most effective. This is illustrated by the words of Inf N°1: "The patient must have his handkerchief to spit, he can use the ventilator to flush out the microbes, and he must wear his mask during treatment". Inf N°5 adds: "Wash all the patient's things with bleach, no sexual intercourse, keep the openings in the house. The bacteria will have no place to hide". Inf N°8 states: "To avoid tuberculosis, wearing a mask is the best measure; the patient should use a spit box".

- ***Institutional explanatory factors for non-compliance with measures to control tuberculosis transmission***

Outdated technical facilities are an institutional factor. The Ebolowa referral hospital has no waiting room for TB patients, no pharmacy, and no individual isolation rooms. Inf N°3 illustrates this with these words: "We receive them in the office, sometimes we consult, but the CDT is reserved for dispensing medication and advice. Added to this, not all the rooms are the same size, nor are they adequately lit or ventilated; this lack of comfort means that some patients flee, preferring to spend the whole day in the street and only returning to isolation in the evening to sleep, having already been in contact with a multitude of people". Inf N°4 adds : "We receive them right here in this room in our office. If there are a lot of them, they wait outside on the bench and we call them in one by one, reassuring ourselves that there's a gap between them...TPB+ are alone in isolation, we don't mix new patients with old ones, but when there are too many patients, we sometimes mix men and women. This increases the risk of transmission to close relatives.

In addition, there is inappropriate patient traffic. Tuberculosis patients and other users move around a lot, receiving visitors in their rooms and on hospital beds, which increases the prevalence of tuberculosis in the Ebolowa Health District. With this in mind, Inf N°3 asserts: "Some are stubborn and even go to sell doughnuts and serve at the bar, and others go right into the rooms to chat with their relatives, and then we have positive contacts". As Inf N°4 puts it: "They talk and eat on the beds with their visitors, while others go out into the street to look for odd jobs such as selling doughnuts, serving at the bar or cleaning plantations to earn money and eat, because they say anti-tuberculosis drugs stimulate the appetite, and many will pass on the disease". Furthermore, there is little follow-up care for patients in the community. All patients should be monitored on an outpatient basis until the end of their treatment, but staff lacking the means of transport and financial resources reduce home visits. This increases the chain of transmission of TB. This is confirmed by the words of Inf N°1: "I never go into the community because of the distance, the state of the roads, I make my patients aware of the need for isolation when they're here. If they have a problem, they'll come back". Inf N°4 declares: "Our patients are well looked after in isolation, but in the neighborhoods I don't leave. I'm head of the CDT, the APS is there to do it, and she's paid for it, unless they give me the same money". Inf N°5 adds: "I go into the community from time to time for educational talks on HIV prevention, but not for TB, because I'm not trained in TB, the PNLT can't pay me and I assure you the villages are far apart".

IV- DISCUSSION

The discussion, in the light of the literature, revolves around the individual and sociocultural explanatory factors of non-compliance with TB transmission control measures among patients treated at the Ebolowa Regional Hospital TB Screening and Treatment Centre.

- **Individual explanatory factors for non-compliance with TB transmission control measures**

Overcrowding, characterized here by insufficient bedrooms in households in relation to the number of people. The high number of people in the house and the small surface area of the rooms encourage the intra-domestic spread of tuberculosis. This is the result, on the one hand, of their low monthly income, which prevents them from living in spacious homes, and, on the other hand, of the fact that there is a large number of people in the households. There are more extended families than nuclear families, with 6, 10 or even 14 people in a house. Indeed, it has been documented that overcrowding is a risk factor for infection, and increases the risk of the infection progressing to disease [12]. In the same vein, Buil, C.M [13] states that overcrowding is an index of social precariousness, since overcrowding is linked to the social conditions of individuals, while also being an element that worsens their social and health situation.

Ventilation is also an environmental control measure, defined as the renewal of air in a space. Ventilation can be natural or mechanical. To combat TB, you need to renew the air by opening household doors and windows, or by using fans or air conditioners. Natural ventilation should therefore be maximized. Inadequate ventilation in the households covered in this study is likely to encourage the persistence of tuberculosis. This is justified by the poor quality of housing, which is sometimes overcrowded, with insufficient openings, houses with doors and windows always closed, and a low level of hygiene. Escombe.R et al [14] mention that opening windows and doors maximizes natural

ventilation, so that the risk of airborne contagion is much lower than with expensive and maintenance-intensive mechanical ventilation systems. Similarly, Beggs et al [5] state that transmission of M. tuberculosis to an uninfected person is more likely if ventilation is of poor quality. The Global Fund [6] reports that people living in conditions of overcrowding, inadequate ventilation and poor nutrition are at greater risk of contracting tuberculosis infection and developing TB. In the same vein, Kirkendale. S et al [15] state that a person with tuberculosis who coughs in a room with closed windows is more likely to transmit the bacteria to others than when the same person coughs outside. Fox G.J et al [8] expand on these findings, stating that mechanical ventilation has been associated with a reduction in infections of between 3% and 14%. In the same vein, Escombe. R et al [14] believe that natural ventilation, such as opening windows, may be sufficient to ensure adequate ventilation, even if mechanical ventilation is not available.

- **Socio-cultural explanatory factors for non-compliance with TB transmission control measures**

Wearing a mask is a real problem for most people. Yet it is one of the most important personal protection measures. People justify not wearing a mask by the lack of financial means and, for some, insufficient motivation. For this category, the mask suffocates, heats up and is useless. Or else, the mask is expensive and has to be changed every day. For those who can afford it, the lack of willpower is based on the fact that not only do you have to wear it, but you also have to change it every day. Others, however, doubt the mask's effectiveness. Rogers [16] believes that the intention to protect oneself is a multidisciplinary function of judgment, the likelihood of the threat or vulnerability occurring, the severity of the threat and the effectiveness of the proposed recommendations. Similarly, Floyd, Prentice-Dunn and Rogers [17] show that the effectiveness of recommendations and self-efficacy are good predictors of intention to adhere to recommendations and motivate individuals to protect themselves. Varaine. F and Rich, M.L. [3], go in the same direction, stressing that smear-positive or unresponsive patients should wear a surgical mask when in contact with others in poorly ventilated areas. Also, they say, the person should be trained in the correct use of the mask and a trial fit should be carried out. Once the patient is smear-negative, the protective mask no longer needs to be worn. Fox

et al [8] similarly report that the use of surgical masks by patients reduced infections by 15% and the development of tuberculosis disease by between 0.5% and 29%. Individual respiratory protection using respirators reduced infections by between 0% and 15%. Knowledge of administrative control measures is lower, while environmental and individual protection measures are known, but less respected by our informants; this justifies the high incidence of TB in the Ebolowa Health District. This lack of knowledge is the result of low awareness of tuberculosis by health professionals, precarious housing, lack of motivation, negative social perceptions of TB and low income. This corroborates the view of Fox et al [8] that a combination of infection control measures designed to reinforce respiratory hygiene, environmental controls and personal respiratory protection is the most effective way of reducing transmission of mycobacterium tuberculosis to healthcare workers in medical environments where the bacterium circulates little or a lot. On the other hand, Da Costa et al [18] argue that administrative infection control measures can significantly reduce LTI among healthcare workers in high-burden countries, and should be implemented even when resources are not available to design infection control measures. Poulin et al [11] similarly assert that it remains necessary to integrate any measures into an integrated risk management approach, including administrative, environmental and individual measures, in order to limit or prevent the transmission of tuberculosis. In the same vein, Kirkendale et al [15] emphasize that measures to control tuberculosis are usually considered to be of three levels: administrative measures, environmental measures and personal protective equipment. Of these three levels, administrative measures are the first and most important. They should be clearly set out in a tuberculosis control plan, including standard operating procedures and measures to be taken at household or community level.

- **Institutional explanatory factors for non-compliance with TB transmission control measures**

Outdated technical facilities influence compliance with TB transmission control measures at Ebolowa Regional Hospital. Here, we note insufficient rehabilitation of equipment marked by old buildings, a high number of patients with few less ventilated rooms. In addition, patients are not divided according to sex, date of admission

or type of TB. We note the existence of shared isolation rooms, the absence of a waiting room and a pharmacy reserved for TB patients, yet patients admitted in isolation must occupy individual rooms and be separated from other patients. Helbling et al [19] state that for hospital isolation of patients with a suspected or confirmed diagnosis of infectious tuberculosis, organizational, technical and personal protective measures must be taken. These measures should be implemented in all hospitals treating patients with tuberculosis. Isolation must take place in an individual room equipped with toilet, shower and closed doors.

If possible, the room should be equipped with a ventilation system. The Ministry of Health [20], in its decree of October 15, 1968 laying down the structural organization and organic functioning of hospital and health facilities in Cameroon, reminds us that regional hospitals should be equipped with phthisiology wards. This is in line with ANS (1956) quoted by Vidal. L and Kuaban .C [21], who states that a phthisiology center should have a central hall with a reception desk and two blocks reserved for diagnosis and treatment respectively. The diagnostic section comprises two consultation rooms equipped with an X-ray machine and a bacteriology laboratory. Patients are referred to two subsequent wards, whether they are consulting for the first time or coming for a check-up. Each ward is equipped with a dressing table, a pharmacy and a stock of medicines. Zwama et al [22] are in line with the above authors in stating that the prevention and control of tuberculosis infection depends essentially on health system factors such as the availability, knowledge and educational development of staff, and the speed of service deliveryThese include the availability of equipment such as respirators and masks, space for patient separation and funding. Fischer et al [23] pointed out that the architectural features of a healthcare building influence clinical outcomes or the health of individuals.

Furthermore, the inappropriate circulation of patients admitted to isolation at Ebolowa regional hospital is explained by the fact that some patients make multiple trips. They return to their homes to get food, go to the market to buy food and make other purchases. Others, on the other hand, take to the streets to find odd jobs such as selling doughnuts, serving in the bar, or cleaning plantations to earn money and eat, as they say anti-tuberculosis drugs stimulate the appetite. Some of them receive visitors in their rooms and on their hospital beds, which hampers compliance with administrative control measures and has an impact on the prevalence and morbidity of tuberculosis. This is the result of inadequate awareness-raising, poor patient monitoring and low use of health education strategies for patients and their visitors concerning the circulation of patients within the hospital. To achieve this, CDT staff are required to strengthen patient and visitor surveillance strategies and redirect their intra-hospital pathways with a view to breaking the chain of tuberculosis transmission in the hospital and in the community via patients, visitors and healthcare staff. Varaine and Le Rich [3]. state that in the TB ward, the circulation of patients, carers and visitors is controlled, encourage patients/carers to spend as much time as possible in the open air, weather permitting, or under shelters open on 3 or 4 sides, encourage visits outside the building, particularly for contagious patients. Clearly mark areas reserved for visits. Prevent TB patients, suspected or confirmed cases, from passing through areas where they could infect other patients, and conversely, prevent patients who do not have TB from passing through areas where they are exposed to the bacillus.

In addition, the poor follow-up of patients in the community is not optimal, as some say that their intervention zone is limited to the hospital, and that it is the APS-TB who is supposed to go into the community to follow up patients. Others, on the other hand, cite workload as an obstacle to community follow-up, as well as distance and lack of financial means and transport. However, the inadequacy of staff trained in infection control, the understaffing of the department (only one APS-TB), the lack of logistics to make regular visits to communities far from their jurisdiction and the increasing number of patients explain this state of affairs from another angle. Therefore, in order to reduce the extent of the disease, health professionals are obliged to ensure effective follow-up of patients and their relatives (index cases and contact cases) by going out into the community for early mass screening. Screening for LTIs in vaccinated people, particularly during household or contact investigations; raising public awareness of tuberculosis and linking all positive cases to treatment reduce the bacterial load and therefore contagiousness. Glaser. E and IRD [24] recommend screening all household contacts for TB, and offering preventive treatment to eligible contacts. Screening enables early detection and treatment of those already ill, and combined with

preventive treatment, limits the spread of tuberculosis to other contacts. Despite convincing evidence of the effectiveness of these interventions, they are rarely implemented in countries with the highest prevalence of tuberculosis. Contact tracing is an important first step, both for active case detection and for TPT [10]. Home visits also provide an opportunity to identify the need for social support, nutritional advice and training in infection control measures. During the home visit, the healthcare provider should carry out an assessment of the home, and provide advice and training to family members on the symptoms of tuberculosis. If necessary, rapid medical examinations and transfers should be carried out, particularly for contact children and people living with HIV, in whom tuberculosis could progress rapidly. Responsible persons or health care workers should then ensure systematic follow-up with the index case or therapist, and refer all relevant contacts to the health care facility for symptom identification, testing for tuberculosis or tuberculosis infection as indicated, and assessment of the subject's eligibility for tuberculosis preventive treatment.

V. LIMITATIONS

This study has its limitations, notably the low representativeness of the sample, which makes the results of our analysis transferable but not generalizable. We therefore suggest that a mixed-method study be carried out, one that would both describe and measure the opinions of our target population on the subject of infection control, the implementation of which is still problematic in the Ebolowa Health District.

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