



The Challenges of Directly Observed Treatment Shortcourse (DOTS) Implementation for Tuberculosis Management in Anambra State, Nigeria: A Comparative Analysis

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Authors' contributions

This work was carried out in collaboration among all authors. Authors MCO and CCI conceptualized and designed the study. Authors MCO, CCI, JNE, IGE and CA did the literature search, administered the research instruments and performed the statistical analysis. Authors MCO, CCI, SDE and IGE wrote the protocol and the first draft of the manuscript. All authors read and approved the final manuscript.

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ABSTRACT

Aim: Several challenges have been hampering the DOTS strategy ranging from a paucity of staff, laboratory consumables and drugs among others. This study, therefore, assessed the challenges facing TB-DOTS implementation in Anambra State, Nigeria.

Study Design: A cross-sectional analytic study was carried out.

Place and Duration of Study: TB-DOTS accredited facilities in Anambra State, South-East Nigeria, September 2017 - March 2018.

Methodology: Using questionnaires on 354 respondents, a checklist on 32 DOTS accredited facilities, and Key In-depth Interview (KII) guide which was administered on 14 focal persons in rural and urban facilities, including the State TBL coordinator, was employed. Data were analysed using Chi-square and Fisher's exact test with level of significance set at $p < 0.05$, while key themes from KII were thematically analysed.

Results: Both urban and rural respondents took nearly the same time to reach a DOTS centre, however, urban respondents spent more money to reach a TB centre and this was statistically significant $p \leq 0.002$. Patients stated that the DOTS strategy could be improved by attending to them early, home visiting, having more staff, providing pocket money among others in urban compared to rural areas and these were statistically significant $p \leq 0.003$. Checklist revealed that most patients in rural facilities 16/19(84.2%) compared to urban 11/13(84.6%) were not observed taking their medications while 11/19(57.9%) rural compared to 5/13(38.5%) urban had no functional microscope. Both rural and urban facilities specifically had challenges of Genexpert machines, needed more staff and laboratories as well as adequate funds and retraining.

Conclusion: Challenges of DOTS may be myriad, however, Focal persons and Health workers should ensure direct observation of patients while the STBL coordinator informs government and policymakers on the need to employ more workers in TB management to help reduce waiting time. Regular training and retraining of health workers are also recommended.

Keywords: Anambra State; challenges; implementation; TB-DOTS.

1. INTRODUCTION

The Directly Observed Treatment Shortcourse (DOTS) started around the 1980's when Styblo defined the model for the control of TB, at the International Union Against Tuberculosis and Lung Diseases (IUALTD) in the United Republic of Tanzania [1]. In 1991, the World Health Assembly also established the 70/85% targets that is, detection of 70% of all new sputum smear-positive cases arising and treating 85% of these cases successfully [2]. The World Health Organization (WHO), in 1993 also declared Tuberculosis (TB) a global emergency [3], while in 1994, the new TB control framework was drawn up. This framework involved the definition of terms such as New case, Relapse, Transferred in, Return after default, Failure case and 'Other case' for a patient who do not fit into any of the categories above [4].

In 1995 at the London committee, Stop TB Partnership was launched to help scale-up the fight against TB, HIV and Multi-Drug Resistant Tuberculosis (MDR-TB) [5]. DOTS is at the core of the STOP TB strategy which has these six components; 1) pursue high-quality DOTS expansion and enhancement, 2) addressing TB/HIV, MDR and the needs of the poor and vulnerable patients, 3) contribute to health system strengthening based on primary health care, 4) engage all care providers, 5) empower people with TB and communities through

partnership, 6) enable and promote research [6,7].

Further historical preview also showed that in the year 2000, the Amsterdam Declaration was made to effectively manage tuberculosis in adults and children as an integral part of primary health care. It also sought to improve the WHO-recommended DOTS strategy to combat tuberculosis by improving access to TB control programmes [7]. In the year 2001, Global Drug Facility was established to ensure uninterrupted access to high-quality anti-tuberculosis drugs for implementation of the DOTS strategy [8]. In that same year also, Global Funds to fight AIDS (Acquired Immune Deficiency Syndrome), Tuberculosis and Malaria, Millennium Development Goals and Washington Commitment were also started. Global Fund was developed as an innovative and integral financing mechanism that would attract additional financial resources for the global fight against these three diseases in developing countries [9,10,11]. In the year 2002, the expanded framework on DOTS was established with emphasis to enhance DOTS implementation without compromising the quality of case detection and treatment and also made it an integral part of primary health care [12]. This expanded framework reiterates the five essential elements of DOTS strategy while addressing HIV-TB co-infection and Drug-Resistant forms of TB(DR-TB) [12]. In 2015, the Sustainable

Development Goals also had the management of Tuberculosis in focus, alongside Malaria and AIDS in Goal 3 [13].

The National Tuberculosis, Buruli ulcer and Leprosy Control Programme (NTBLCP) treatment guidelines strongly recommended using a patient-centred case management approach, including DOTS, when treating patients with active Tuberculosis disease [10]. The DOTS is also specifically important for MDR-TB, HIV infected patients either for treatment as co-infection or those on intermittent regimens like Isoniazid preventive therapy [10,11]. The DOTS strategy is a very important strategy that ensures availability of drugs, supervision of drug supply and administration. This thus ensures adherence by patient's who take the medications and providers who render the services [12]. DOTS is administered basically by delivering the prescribed medications, checking for side effects, watching the patient swallow the medications, documenting visit, and answering questions among other things. These are all expected to be initiated at the beginning of treatment [10,11,13].

Having these approaches in mind, the following challenges to DOTS strategy [12] have been reported while prospective solutions are proffered: (a) The need for expansion of DOTS coverage. (b) Private sector involvement has not been adequate. (c) Inadequate publication of Information, Education and Communication (IEC) materials and health education (d) Multiplicity of control programmes which could lead to confusion in the mind of treatment providers (e) MDR-TB, hence DOTS - plus; a complementary DOTS based therapy is advocated.

Other challenges included (f) Migratory population as these may be hard to track (g) Social stigma as notions restricting the acceptance of TB patients are still prevalent. (h) Involvement of the medical colleges and allied health professionals on the need to integrate DOTS implementation.

In these views above McLean [14] therefore categorised reason for non-adherence into three factors as earlier stated i.e. Healthcare factors, Treatment factors and Patient factors which could pose a great challenge to DOTS implementation. A Ghanaian study [15] further noted that patients adherence to TB treatment was a complex behavioural issue involving several factors such as personal, social and health care. These factors, while buttressing the

foregoing points, reiterated that though patients' knowledge and perception contributed to default rate which could hamper DOTS strategy, a holistic view of these factors must be taken into consideration for a better DOTS implementation. Other factors on the side of healthcare providers include inadequate training and retraining as well as the paucity of knowledge of the DOTS strategy. Inappropriate combination and use of TB medications though this have now been handled by fixed-dose combination and inadequate supply of drugs, also play out as challenges to effective DOTS implementation. Poor surveillance on the part of health care providers cannot be overemphasized as well [14,15,16].

Another institutional based cross-sectional study [17], conducted in Ethiopia among 112 private practitioners showed that only 33% of the private practitioners were able to list the correct first-line treatment regimen for all categories as recommended by National Tuberculosis and Leprosy Control guidelines. This study went further to conclude that a significant proportion of the practitioners did not have adequate knowledge and practice about DOTS and therefore, needs regular DOTS refresher course to improve on TB management.

Concerning findings relating to health workers and health system, it was also deciphered that challenges such as lack of trained healthcare workers, poor management, weak healthcare systems and inadequately equipped hospital and laboratories all affect Tuberculosis outcome [17,18]. Important also is the fact that HIV patients are more susceptible to Tuberculosis but the DOTS strategy assumes that the patient must be smear-positive whereas HIV-TB patients are less likely to be smear positive [17,18,19]. This challenge made the authors to even state that DOTS is not sufficient to handle TB with HIV and advised less emphasis on smear-positive diagnosis.

Having stated the challenges above, similar occurrences may be seen in Nigeria where programmatic changes are not usually stepped down to resource persons especially at the lower cadre or those on the field and the non-availability of current guidelines to healthcare providers and doctors in DOTS accredited facilities. Also, the issues of Internally Displaced Persons (IDPs) who may be likened to the migratory population as earlier stated and terrorist attacks are all challenges bedeviling the

DOTS implementation especially in war-torn areas and other hard to reach areas. The WHO reports that infection with HIV is another reason for failure to meet TB control targets [19]. However in Kwazulu, South Africa, it was shown that factors like political strife and war, lack of political commitment from government, lack of resources to effectively manage and deliver healthcare and poverty are all militating against DOTS strategy, similar conditions are indeed not far-fetched in Nigeria [20]. In furtherance of the above, it was shown that poverty and malnutrition are important factors leading to a fall in immunity and contributing to preventable infectious diseases such as Tuberculosis, Pneumonia, and HIV in Nigeria [21,22]. It was further stated that the interplay of several factors such as biological, environmental and behavioural could affect TB prevalence and even treatment as they noted that immunization coverage in Nigeria largely depends on political commitment, so also is the DOTS strategy implementation [21,22].

In 2016, the prevalence of TB in Nigeria was 25% in HIV negative persons, with an incidence rate of 158 per 100,000 people in the population; however, the DOTS programme was estimated to have coverage of 65% and case detection rate of 35%. This was indeed below the target of 70% coverage expected [23,24]. Furthermore, due to paucity of facilities for sputum culture and sensitivity, there is a scarcity of data on the prevalence of smear-negative TB [21,22,25], in addition to this lack of facilities, an Ibadan study [26] in a 10-year review showed that 6.9% of smear-negative sputum samples were eventually culture positive. This goes a long way to indeed show that facilities, equipment and man-power are not yet enough to tackle Tuberculosis and therefore calls for strengthening of the DOTS strategy implementation.

Nigeria has a comprehensive guideline/manual for TB management expected to be present in all DOTS facilities, which entails laboratory services and direct observation of patients. Health education such as cough etiquette, indecent spitting, alcohol and tobacco ingestion, balanced diet, adherence to medications, amongst others are usually given to patients and caregivers [27]. In the DOTS strategy, the healthcare worker or treatment supervisor is required to observe the patient swallow his/her medications to ensure adherence to prescribed medications [25]. Poor adherence could lead to the spread of the

disease and even lead to the emergence of resistant cases [25,26-29]. However, this practice may not be so in South-East Nigerian even though WHO stated that the type of healthcare staff involved in TB control varies between and within countries, and also government policies as well as institutional regulations determine the type of function performed by each cadre of staff. It is therefore important to state that there may be virtually no data available in the area of human resources which may be the reason for incomplete direct observation of patients [27,28,29].

This research in Anambra State, therefore deciphered the challenges facing TB-DOTS implementation bothering on structure, personnel and patients care in DOTS accredited facilities.

2. METHODOLOGY

2.1 Study Area

There are 14 rural and 7 urban LGA's, hence the ratio of 2:1 was used in selection. However, after selecting 2 urban and 4 rural LGA's, an extra LGA in each sub-population was added so that the calculated sample size was recruited for the study. Hence, Nnewi North, Idemili North, and Awka South designated as urban LGA's and Anaocha, Dunukofia, Ayamelum, Oyi and Njikoka known as rural LGA's were utilized. Anambra State located at coordinates 6°20'N 7°00'E and has 104 DOTS accredited facilities in the 21 Local Government Areas as at 2006 directory which is the only available directory in print till date but newer facilities in these LGA's was also utilized to complement closed or moribund facilities.

2.2 Study Design

This was a comparative cross-sectional study involving rural and urban areas implementing DOTS strategy in Anambra State.

2.3 Study Population

This comprised of 354 males and females that were aged 18 years to 60 years, who were receiving TB chemotherapy in DOTS accredited centres of the selected LGA's. The study population further includes personnel and facilities of these accredited DOTS facilities, as 19 and 13 DOTS centres in rural and urban areas respectively were studied.

2.4 Study Instrument

Pretested semi-structured, interviewer-administered, composite questionnaires were used for this study. The questionnaire originally developed by some authors [28,29] was adapted [29]. It assessed providers and patients challenges to the practice of DOTS as a strategy for management of Tuberculosis.

Also a Key Informant Interview guide was utilized for the focal persons and the State Tuberculosis, Buruli ulcer and Leprosy coordinator.

A checklist obtained from the Anambra State Ministry of Health was utilized in each of the DOTS facilities and assessed the structure, personnel, and services provided.

2.5 Sample Size Determination

The minimum sample size for this study was determined using the formula for comparing two proportions [30]:

$$n = \frac{\{u \sqrt{[\pi_1(1-\pi_1) + \pi_0(1-\pi_0)]} + v \sqrt{[2\bar{\pi}(1-\bar{\pi})]}\}^2}{(\pi_0 - \pi_1)^2}$$

Where

n = minimum sample size

u = one sided percentage point of the normal distribution corresponding to 100% - power (ie $1-\beta$). For power of 90%, $u = 1.28$

v = percentage point of the normal distribution corresponding to the two sided significance level. For $\alpha = 5\%$ or 0.05,

$v = 1.96$

$$\bar{\pi} = \frac{\pi_1 + \pi_0}{2}$$

π_0 = proportion in urban setting implementing a selected aspect of DOTS (66.7%)

π_1 = proportion in rural setting implementing a selected aspect of DOTS strategy (48.9%)

A total of 177 respondents per sub population was arrived at and the total sample size of 354 was therefore utilized for this study.

2.6 Method of Data Collection

A concurrent mixed method of data collection was used thus; the questionnaires for the

respondents, the supervisory check list for the DOTS facilities and the Key Informant Interview which was conducted in the offices of the State Coordinator and focal persons respectively.

2.7 Data Management

The data were collated, cleaned, coded and checked for any data collection and coding errors thereafter entered into International Business Machines-Statistical Package for Social Sciences (IBM-SPSS) version 21.0. Means, SD and Pearson's Chi Square was employed for statistical significance, $p < 0.05$.

Data from the checklist was analysed and the frequency table with proportions of both subpopulations generated and compared. The qualitative data from KII were thematically analysed.

3. RESULTS

3.1 Challenges of DOTS Implementation

Table 1 showed that the mean distance to a rural DOTS facility was 28.2 minutes compared to 29.2 minutes in urban areas, while the mean amount to get to a rural facility was 129 naira compared to 158 naira and this was statistically significant, $p < 0.002$. Though most respondents were observed swallowing their medications by their family members, siblings and others and not necessarily healthcare providers, however, 4(2.26%) was not observed at all and this was statistically significant in urban compared to rural areas, $p < 0.002$. It further showed that no health worker in both rural and urban facilities was seen to observe the patients other than parents, siblings, friends or neighbours. Further challenges faced by patients which could help improve DOTS strategy if handled included; more respondents in rural 8(4.5%) compared to urban 4(2.3%) wanted to be attended to early in the facilities. Also the need to make all services available in urban 1(0.6%) compared to rural 0(0.0%), more doctors needed in rural 15(8.5%) compared to urban 8(4.5%) and the provision of food, pocket money, and transport which was needed more in rural 44(24.9%), 4(2.3%), 18(10.2%) compared to urban 29(16.4%), 2(1.1%) and 15(8.5%) respectively. These suggested challenges occurring more in rural areas compared to urban was statistically significant, $p < 0.003$.

Table 2 showed the frequency distributions of findings from the checklist. It was found that in rural facilities 11/19(57.9%) of the laboratories were not appropriately located compared to urban 6/13(46.2%). Of note also is the fact that only 3/15(15.8) rural and 2/13(15.4) urban facilities observed patients on the spot taking their medications. There was inadequate space, personnel and equipment more in the rural facilities 11/19(57.9%) compared to urban 6/13(46.2%). Also more rural facilities did not have neat laboratories 11/19(57.9%) as well as poorly ventilated 12/19(63.2%) compared to urban 5/13(38.5%) and 7/13(53.8%) respectively. Further results showed that in rural facilities 11/19(57.9%) and 17/19(89.5%) lacked functional microscope and GeneXpert machines compared to urban facilities 5/13(38.5%) and 10/13(76.9%) respectively. However, commodities availability was inadequate in rural 14/19(73.3%) compared to urban 11/13(84.6%) while urban facilities had better commodity supply 13/13(100%) compared to rural 16/19(84.2%).

Table 3 showed the specific challenges faced by DOTS facilities in rural and urban areas. More rural facilities required GeneXpert machines 5/19(26.3%) and laboratory facilities with laboratory scientists 8/19(42.1%) compared to

the urban areas 1/13(7.7%) and 5/13(38.5%) respectively. Other challenges included funding and retraining which was grossly inadequate in as only 2/19(10.5%) rural facilities stated that they had enough fund and had attended retraining courses. The result also showed that 2/19(10.5%) rural facilities had no AFB diagnostic centres.

3.2 Qualitative Data: Key Informant Interview (Providers Challenges)

The key informant interviews was conducted with the 7 focal persons in 7 DOTS accredited facilities, 7 TBL supervisors and 1 State TBL coordinator at their respective offices. Key themes were elucidated as follows:

Concerning coordination and collaboration between government and stakeholders in TB management, positively affecting services provided and patient follow up, are there challenges you know?: The key informants in rural and urban facilities all opined that the coordination and collaboration between government and stakeholders in TB management have positively affected patient's outcome. The focal person in one rural centre said "there have been good treatment outcomes especially cure and completed treatment,"

Table 1. Challenges of DOTS implementation (Patients view)

Variable	Rural: N=177(%)	Urban: N=177(%)	Total: 354N(%)	p-value
Distance to facility (mins)				
Mean (SD)	28.2 (13.9)	29.2 (15.3)	354	0.430
Amount spent to reach the facility(naira)				
Mean (SD)	129.4 (126.3)	158.1 (203.6)	340	0.002*
How to improve DOTS strategy				
Attend to patient early.	8 (4.5)	4 (2.3)	12 (3.4)	*0.003**
Make all services available.	0 (0.0)	1 (0.6)	1 (0.3)	
Do not know.	40 (22.6)	47 (26.6)	87 (24.6)	
Home visiting.	2 (1.1)	15 (8.5)	17 (4.8)	
Everything is okay	3 (1.7)	4 (2.3)	7 (1.9)	
Information about the disease.	0 (0.0)	1 (0.6)	1 (0.3)	
More doctors.	15 (8.5)	8 (4.5)	23 (6.5)	
More workers.	8 (4.5)	9 (5.1)	17 (4.8)	
Privacy for patients.	3 (1.7)	5 (2.8)	8 (2.3)	
Provision of food.	44 (24.9)	29 (16.4)	73 (20.6)	
Provide pocket money.	4 (2.3)	2 (1.1)	6 (1.7)	
Provide multivitamins.	25 (14.1)	31 (17.5)	56 (15.8)	
Provide transport	18 (10.2)	15 (8.5)	33 (9.3)	
Provide water for drugs.	7 (3.9)	6 (3.4)	13 (3.7)	

*Statistically significant, p≤0.05

**Pearson Chi square test

Table 2. Checklist data on laboratory structure, consumables and services (Providers challenges)

Variable	Rural: N=19 (%)	Urban: N=13 (%)	Total = 32
Laboratory appropriately located			
Yes	8 (42.1)	7 (53.8)	15 (46.9)
No	11 (57.9)	6 (46.2)	17 (53.1)
GHW observe patients swallow drugs daily?			
Yes	3 (15.8)	2 (15.4)	5 (15.6)
No	16 (84.2)	11 (84.6)	27 (84.4)
Laboratory is neat			
Yes	8 (42.1)	8 (61.5)	16 (50.0)
No	11 (57.9)	5 (38.5)	16 (50.0)
Laboratory is well ventilated			
Yes	7 (36.8)	6 (46.2)	13 (40.6)
No	12 (63.2)	7 (53.8)	19 (59.4)
Functional microscope			
Yes	8 (42.1)	8 (61.5)	16 (50.0)
No	11 (57.9)	5 (38.5)	16 (50.0)
Any GeneXpert machine?			
Yes	2 (10.5)	3 (23.1)	5 (15.6)
No	17 (89.5)	10 (76.9)	27 (84.4)
TB microscopist present			
Yes	7 (36.9)	7 (53.9)	14 (43.8)
No	12 (63.2)	6 (46.2)	18 (56.3)
Commodities in adequate quantity			
Yes	14 (73.7)	11 (84.6)	25 (78.1)
No	5 (26.3)	2 (15.4)	7 (21.9)
Commodities promptly supplied			
Yes	16 (84.2)	13 (100.0)	29 (90.6)
No	3 (15.8)	0 (0.0)	3 (9.4)

Table 3. Specific challenges of facilities (Providers challenges)

Variable	Rural: N=19 (%)	Urban: N=13 (%)	Total = 32
No GeneXpert	5 (26.3)	1 (7.7)	6 (18.8)
Need more laboratories & Scientists	8 (42.1)	5 (38.5)	13 (40.6)
Need more staff	1 (5.3)	5 (38.5)	6 (18.8)
Have adequate funds & retraining attended	2 (10.5)	0 (0.0)	2 (6.2)
Nil specific challenges	1 (5.3)	2 (15.4)	3 (9.4)
No AFB diagnostic centres	2 (10.5)	0 (0.0)	2 (6.2)

while the State Tuberculosis and Leprosy Coordinator (STBLC) said *"it is going on well with General Medical Practitioners and Faith-Based Organizations (FBOs) and the cure rate is high."* The key informants in both rural and urban DOTS facilities also posited that "challenges with the DOTS implementation included "government not meeting the financial obligations, poor political will, the need to institute appropriate sites and not mix TB patients and MDR." One of the rural focal persons stated that *"...if donors withdraw, the programme will die,"* this consolidated the fact from the STBLC who buttressed that *"...if donor fatigue sets in the*

programme will suffer". Other challenges include low GeneXpert coverage especially in rural areas and frequent out of stock for drugs like Rifabutin, and consumable that warrants need to source from other facilities.

Enough Human resource for DOTS implementation: The key informants in some rural areas stated that there are enough human resources for now but there might be need for more because they are engaged in other duties, however, the urban respondents and a few other rural persons stated that *"there are not enough human resources at all as they are saddled with*

many responsibilities.” The STBL also stated that *“there is a high rate of staff attrition and transfer of workers which affects the programme”*.

Provided funds for transport, procurement (logistics, phone calls etc). Any challenges:

The key informant in both rural and urban facilities stated that funds are provided but are not enough. One urban key informant said *“that funds are grossly inadequate and donors provide for logistics.”* The STBL also said *“there is provision for logistics but it is inadequate”*. A rural key informant also said that *“no fund is provided at all I do the tracking on my own personal cash”* while another rural informant stated that *“no funds for logistics, transport, nor even call, in fact we use our money sometimes”*.

Do you attend training for TB case management and how often? Any challenge:

The key informants in the urban facilities have all attended training varying from 1-2yrs ago, however, among the rural key informants, some have not attended recently and those that went was about 2-3yrs ago. A rural key informant stated that *“I attend once in 2years but update is supposed to be yearly and some people are chosen on my behalf to go for training without my notice”*. An urban key informant stated that *“trainings are well attended depending on the available fund and it is diversified, while a rural key informant said “he attends but not regular, however, it is the NGO that pays all”*. Both rural and urban key informants stated the need for retraining.

Socio-economic status of patients affecting TB managements:

All the key informants except in one rural facility agreed that the socio-economic status of patients affects TB management. One rural key informant stated that *“it does affect the outcome because of transport as they sometimes miss medications”*. Another urban key informant buttressed the fact that it affects outcome as *“most come and beg for transport and money for feeding, this might make them avoid or take less dose”*. Another urban key informant stated that *“even ‘well to do’ people will not like to take treatment where they will be known, for fear of stigmatization”*. The rural key informant also said *“some don’t have transport and also beg for food when they come”*.

Current TB guidelines and difficulty in using them:

The key informants in both rural and urban setting mostly said they did not have enough guidelines. One copy was sighted in some rural

facilities while some cannot find where they kept theirs. The rural key informant posited no challenges in using the guideline manual. Another urban informant stated emphatically *“that we do not have enough at all, Maybe 2016 is under review that is why it is not in circulation”*. The STBL coordinator also said the guidelines are not enough to go round though no challenges in using them like the other key informants opined.

Problems encountered with drugs and laboratory supplies and challenges:

The informants in some rural facilities stated that *“sometimes we encounter stock-out or expired drugs but we place emergency order, or borrow from nearby DOTS clinic”*. However, they also stated that poor storage and management of consumables make their drugs spoil. The urban key informants also stated that sometimes they *“have expired drugs but inform logistics and destroy them and then request made to replenish stocks”*. They, however, stated that poor storage also affects their drugs.

Patient’s adherence to care and affectation of outcome:

All the key informants in both rural and urban agreed that patients adhere but not completely. A rural key informant said that *“they may take the drug home and not swallow it or may not store it well”*. Another rural key informant also said *“that DOTS is working through supporters at home that monitor these patients”*. However, an urban key informant reiterated that *“some patients are trying but a few about 1 in 10 defaults and MDR is increasing but by contact tracing we reach them”*. The STBL coordinator buttressed that *“there is loss to follow-up and Adverse Drug Reaction (ADR) occurs which may make patients not adhere hence MDR. Defaulters occur too but we call them to complete treatment, however, the DOTS strategy is working”*.

Government committed to eradicating TB given the structure, process and outcome:

The key informants in the rural facilities all opined that though the government seems to be trying they are not doing enough. One rural key informants frankly stated *“no, they don’t contribute much at all”*, while another rural informant also concurred that *“no, I don’t think so, they should provide ventilated waiting for area for patients, food, supplement and multivitamins to help patients just like the HIV clients”*. The urban key informant did not differ but stated that *“they are not doing enough for*

logistics, procurement for staff and patients care are poor" while the STBL stated, "government provide manpower and facilities but other funding are from donor agencies, government believes they pay salaries and provide structure but still need to do more."

Challenges of TB-DOTS implementation: The rural key informants outlined the following challenges, discrimination of patients by health-workers and relatives, no diagnostics centre as the patient has to travel or sputum transported in some instances, difficulty in producing sputum by patients for diagnosis, no waiting area, not enough personnel, and no trackers. Other challenges included no seats for counselling patients in some facilities as they borrow seats from elsewhere, a patient needs water dispenser to take drugs on sight, poor awareness/sensitization on TB and as well as no GeneXpert machines. The urban key informants in addition to some of the rural challenges also stated that there are poor or dilapidated structures, poor funding or remuneration, no audio-visual awareness about TB, no community TB programme, no transport for returns, no recharge cards for calls, not enough staff and equipment, as well as inadequate orientation and seminar for workers. The STBL coordinator buttressed these facts by saying *"training, for now, is for new DOTS facilities but old sites need a refresher, staff attrition is high, no fund for sensitization and awareness creation for the control activity, no fund for defaulter tracking, and not enough IEC materials to the public."*

4. DISCUSSION

In this study, clinic accessibility, space, neatness and cross-ventilation of most facilities were good. Also case classification and sputum follow-up was also done in line with national guidelines. However, only 3 (15.8%) rural and 2 (15.4%) urban facilities observe patients directly swallow medications on the spot. Also from the respondents' views, though many were observed, none of the patients mentioned a health worker, rather, only family members and friends. These findings contradict various studies [31,32,33] which emphasized health worker supervised DOTS and stated it was better than family member supervised DOTS because these family members may not know the importance of the disease and the need for medication adherence. This important variable on direct observation has also been stressed to handle especially MDR and TB-HIV co-infection

[2,33,34,35,36] but this study shows that no continuous direct observation was actually done by health workers in most facilities as the ones that gave patients their drugs only witnessed the swallowing of the first pill while the patient left with the remaining doses of the medication spanning about 2 weeks. This may be due to inadequate staffing, training, poor remuneration and allowances.

This study also found out that patients travel more than 20 minutes to get to the facility and also urban respondents spend about 29:00 naira (twenty-nine naira) more to get to a DOTS facility compared to rural. This amount spent and travel time may be a challenge to some patients' who finds it difficult to afford adequate meal per day. In the KII, it was also stressed that the socio-economic status of patients affects their disease outcomes, furthermore, the respondents monthly income were less than the national minimum wage of 18,000 naira. Considering these challenges, the patients may miss or discontinue medication intake and that is why Erakene et al. [37] stated that poverty, ignorance, and defective health care infrastructure as important factors that affect TB prevalence and outcomes. Also travel cost, lack of resources, illiteracy, and health beliefs are also challenges noted by McLean to compliment findings in this study [14,36,38].

While a good percentage in rural (87.57) compared to urban (84.18) never missed their drugs because they want to be better, cured, and alive. Some other respondents, however, missed medications because their drugs finished at home, or they travelled and forgot their drugs. Patients' who travelled or went for prayers in this study could be liken to migratory population on treatment [15] hence it will be better than the DOTS strategy employ easy accessibility for patients' to walk into a facility, show their card and get their drugs rather than running out of stock because the DOTS programme is Nationally controlled like immunization programmes for TB and others.

Others reasons for missing drugs include misplaced their drugs, took herbal medications and pill burden. Findings from some studies [14,15] have also buttressed some challenges like large pills, and large number of pills, long duration of treatment, disruption of daily routines, health beliefs including cultural beliefs and attitude of patients may make them miss medications hence a challenge to effective

DOTS implementation. These patient-centred factors were also found to compliment the checklist findings about the neatness of laboratory, staff and consumables around the facilities being defective hence making patients not have confidence in the system. These findings thus corroborate the fact that defective health system can even worsen patients' ignorance because if they were well educated and counselled on the treatment and outcome, they will adhere to medications. Even while going for prayers they would take their medications and not missing their drugs hence being ignorant of negative outcomes [34-38]. However, the information given to patients may not be stressed enough as stated in this study and this is why IEC materials and health education checklist has been emphasized [12,14] because this will reinforce knowledge and serve as reminder to help patients adhere to drugs while also reminding health workers to follow a guided protocol.

Furthermore if patient had swallowed their medications in front of the health worker as is expected of DOTS, or a health worker goes to the community to directly administer drugs, these patients` would not have to be stating these reasons, rather DOTS is not only initiated at the beginning of therapy but followed up till end of therapy [10]. DOTS, therefore, is a strategy in tandem with the findings of this study that should not only include proper education of patients but further stipulates delivering medications, checking side effects, answering questions from patients of which some clients in this study were not satisfied with completeness of information, and documenting regular visits [10,11]. Also, these reasons could further be curtailed if there were enough treatment supervisors and adequate health education [12,14,37].

From the respondents` side also, this study shows that DOTS strategy in rural and urban areas could be improved by addressing some challenges like attending to patients early, making all services available in one facility to reduce running around of patients. Some facilities and KII views also pointed out poor management and poor political will as challenges. This is in tandem with the fact that weak health systems, inadequately equipped hospitals and poor government interventions outplay as factors that hamper DOTS implementation [18]. Though this study found out that all TB patients were screened for HIV, it further noted the paucity of consumables with

inadequate staffing for these procedures. This is not far from factors stated as challenges [12,14,18] where poor facility structure, commodities, consumables and staffing affect DOTS implementation.

5. CONCLUSIONS

This study shows that the DOTS strategy is very important in TB management, however, it is still faced with challenges ranging from paucity of staff and poor supervision, lack of equipment, drugs, and laboratory consumables among other needs. Hence, the need for government and stakeholders to strengthen the weak health system through proper interventional funding, operational research and development partnering by ensuring it contributes to the desired quota to ameliorate these challenges.

CONSENT AND ETHICAL APPROVAL

Ethical approval for this study was sought and obtained from the Nnamdi Azikiwe University Teaching Hospital Ethics committee with reference number NAUTH/CS/66/VOL.9/144. Informed consent was also obtained from the participants.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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