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Compliance to Tuberculosis Treatment Across Medical Institutions in Rivers State, South-South Nigeria

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ABSTRACT: *Tuberculosis (TB) is a very old infectious disease, caused by Mycobacterium tuberculosis. The disease affects the lung and it remains one of the most frequent causes of death universally reaching up to 10 million new cases every year. Poor patient compliance in tuberculosis (TB) treatment is considered to be one of the most serious challenges which replicate the reduction of treatment success compliance to tuberculosis treatment across some selected medical institutions in Rivers State, South-south Nigeria between 2010-2020. The study aimed at collecting data and examining some variable retrospectively without manipulating any of the variables. Data were obtained from the State Ministry of Health, Rivers State, covering a total of 525 (100%) healthcare facilities accounting for primary, secondary, tertiary health facilities and an irresistible 191 (36.38%) private healthcare facilities. Data were analyzed using frequency and simple percentage including graphs. Results indicate that compliance to TB treatment in Rivers State is not adequate generally (i.e., it very low). The rate of compliance to TB treatment among the confirmed cases of TB patients was averagely 40.70%. However, the level of compliance differed across each year investigated with the highest compliance rate recorded in 2019 and the lowest in 2010. There was a consistent increase in the compliance rate between 2013 and 2015 with a sharp drop in 2016 which may have explained the reason for the high prevalence of TB in the same year. Men compliance was better than females despite lesser prevalence. The result revealed further that out of 14,988 CC of TB among males, 1,363 (40.70%) complied with treatment while out of 13,073 mean CC of TB among females, 1,188(3.02%) rate of compliance was recorded. It was recommended among others that more comprehensive incentives programme be made available to improve the allure of TB patients for visiting the treatment centres.*

KEYWORDS: compliance, tuberculosis, treatment, DOTS, medical institution

INTRODUCTION

Tuberculosis (TB) worldwide has been adjudged has one of the fast-killing machinery that has threatened the human population. The consequences of TB go beyond individual health challenges where nonchalant attitude towards compliance to treatment and other preventive mechanisms is the order of the day. Such deficiencies could jeopardize the economic development of such local area, state or nation nothing that health for one is health for all. Epidemiologically, it is a significant socioeconomic global disease with high infection and mortality rate [1] Tuberculosis is a potentially serious contagious disease that principally affect the lungs [2]. It is caused by Mycobacterium tuberculosis, and remains one of the most frequent causes of death in most developing countries [3].

In 2015, the World Health Organization (WHO) reported that global prevalence (people infected) of TB was 10.4 million and 1.5 million deaths annually [4] [5]. Because of its nature and propensity with which it causes damage, it has been included in United Nations (UN) millennium goals to reduce the risk from this disease [6]. Accordingly, there are still needs for more improvement, particularly in the international coordinated plan to reduce the incidence of Multi-Drug Resistance Tuberculosis (MDR-TB) patients, risk, and the mortality rate from this disease generally [7]. Despite many achievements in the fight against TB, this disease is still challenging the human health [8] [9].

Tuberculosis complaint is spread when people who are sick of it expel bacteria into the air by coughing. Nigeria ranked fourth (4) among six (6) countries with the highest burden Tuberculosis. In 2015, Nigeria and five (5) other countries *vis-à-vis* India, China, Indonesia, South Africa and Pakistan accounted for 60% of the total Tuberculosis cases around the globe [10] [2]. Rivers State ranked fifth (5) high burden status among the 36 states and Abuja, with its current burden estimated at above 16,000 [11]. However, TB is a curable disease globally. It can be cured in all patients by the universal acclaimed strategy known as directly observed treatment short course (DOTS). These DOTS Centre's are all over the Primary Healthcare Centre(s) in the rural and urban areas of the state. DOTS is management package that guarantee effective diagnosis and treatment of infectious cases.

The DOTS strategy has been described as the most important public health breakthrough in TB management considering the lives that will be saved [12] [13] [14]. Eight (8) out of ten (10) patients from TB treated are cured by the DOTS approach and this account for its adoption by over 110 countries of the world [15] [16] [2]. One of the dynamic issues that safeguards the accomplishment of the treatment is the proportion of anti-TB drug patient's compliance. The poor patient compliance is well-thought-out to be one of the most serious challenges which mirrors the

decrease of treatment success and developing of the MDR-TB [17] [18] [19]. The DOT was outlined to support TB treatment compliance and completion which unquestionably, resulted in the reduction of the morbidity and mortality, and the restraining the TB drug resistance. Also, a global meta-analysis revealed that non-compliance to treatment is a risk factor for Multi-Drug Resistance Tuberculosis (MDR-TB) [2] [8]. Even though the implementation of DOTS strategy improves the treatment success of TB patients, there is evidence showing that direct observation is not implemented thoroughly and level of patient's compliance to TB treatment is not satisfying (from 4 = 50% in India, 88.5% in Ethiopia, and 88.8% in China) [20] [21] [22].

Poverty, ignorance and poor adherence to drug routine remain the major factors contributing to gross increase in TB case at all the Primary Healthcare Centre in the 23 LGAs of Rivers State whereit has been observed the per capita income is less than one dollar per day [16]. This reflection is alarming in a twenty first century and request a change in all perception to improve the public health status of the state at large [2]. A recent report by [23] specified that tuberculosis kills further women than any other single contagious complaint and is hotheadedly associated with poverty. However, the aim of this study is to find out the prevalence of tuberculosis and compliance to treatment from 2010-2020 in Rivers State, South-south Nigeria. Besides, there is scantiness of data about patients' compliance to anti-TB treatment in Rivers State. Therefore, the aim of this contemporary study was to examine the anti-TB treatment compliance rate in Rivers TB patients.

MATERIAL AND METHODS

Setting and Design

Rivers State is a multiethnic state with Port Harcourt as it's headquarter. Its geographical coordinate of latitude and longitude are 4.8396ºN4167 and 6.9112ºE respectively. It lies 9m above sea level with a tropical climate, and a significant rainfall pattern in most months of the year. It also has a short dry season with little effect. The average annual temperature is 26.4ºC or 79.5ºF with precipitation of about 2708 mm or 106.6 inches per year [24] [25].

The Ex-post factor design was employed for this study. It is intended at collecting data and analysing some variables retrospectively without manipulating any of the variables [26] [27]. Furthermore, relevant literatures on TB, it causes, prevalence and compliance were cited. Similarly, documents were obtained from Disease Control Unit of the State Ministry of Health and the Primary Healthcare Management Board.

Data collection

Data were obtained from the Rivers State Ministry of Health (Secretariat complex) and Primary Healthcare Management Board Data (Olu-obasanjo Road by Waterline Junction) by the researcher

with the help of the TBL Desk Officer in each local government area. Each official day of the week (Monday - Friday) was utilized for data collection.

Data Analysis

Statistical analyses were performed using IBM SPSS version 25.0. Percentage and Chi Square were used to analyze the research questions while Pearson's Product-Moment correlation was used to analyze the relationship between the prevalence and compliance to tuberculosis treatment over the graded period of study.

Ethical Issue

Legal authorization was written from the Department of Human Kinetics, Health and Safety Education of the Ignatius Ajuru University of Education, Rumuolumeni, Port Harcourt, Rivers State to the Rivers State Ministry of Health and Primary Healthcare Management Board to obtain permission for the release of all relevant data. The information obtained was made anonymous as to ensure utmost confidentiality.

RESULTS

Demographic distribution of data relating to the gender of patients registered between 2010 and 2020

The demographic data reveals that there were 2, 874 (5.59%) females as against 2, 745 (5.89%) males in 2010. In 2011, there were 3, 005 (5.85%) females as against 2,945 (6.23%) males. A total of 3,542 (6.09%) females were notified in 2012 while males recorded a total of 3,352 (7.19%). The year 2013 had a total of 3,875 (7.54%) females as against 3, 538 (7.59%) males. In 2014, a total of 3,998 (7.79%) females were registered as against 3,734 (8.02%) who were males. A total of 4,129 (8.03%) females were registered in 2015 while males recorded a total of 3, 985 (8.56%). In 2016, females recorded a total of 4,443 (8.63%) while males were 4, 236 (9.10%). The total number of females in 2017 was 5,372 (10.45%) while the males were 4,654 (9.99%). In 2018, females recorded a total of 6, 325 (12.31%) while males were 5, 231 (11.23%). A total of 6,843 (13.31%) females were notified in 2019 while males recorded a total of 5, 984 (12.85%). And finally, in 2020, there were 6, 994 (13.61%) as against 6, 143 (13.19%) males (Table 1).

Table 1: Demographic distribution of data relating to the gender of patients registered between 2010 and 2020

Years	Female	% (females)	Male	% (males)
2010	2874	5.591439689	2745	5.893846352
2011	3005	5.846303502	2945	6.323270494
2012	3542	6.891050584	3352	7.197148624
2013	3875	7.538910506	3538	7.596513076
2014	3998	7.778210117	3734	8.017348735
2015	4129	8.03307393	3985	8.556276034
2016	4443	8.643968872	4236	9.095203332
2017	5372	10.45136187	4654	9.99269979
2018	6325	12.30544747	5231	11.23158844
2019	6843	13.31322957	5984	12.84837034
2020	6994	13.60700389	6143	13.18976253
Total	51400	100	46574	100

Distribution of TB treatment compliance among confirmed cases in Rivers State

The Primary Healthcare Centres recorded 309 (58.86%), while the Secondary Healthcare Centres had 23 (4.38%) and the Tertiary Health facilities had 2 (0.38%) whereas the Private sector had 191 (36.38%) respectively (Table 2).

Table 2: Distribution of DOTS Sites in Rivers State

Health Facility	Frequency	Percentage (%)
Primary Healthcare Centre	309	58.86
Secondary Healthcare Centre	23	4.38
Tertiary	2	0.38
Private	191	36.38
TOTAL	**525**	**100.00**

Influence of Gender on Tuberculosis Prevalence from (2010 -2020) in Rivers State

Table 3 showed the analysis of TB reported cases (RC), Confirmed cases (CC) and prevalence based on gender. The result revealed that females had a total of 51400 RC, 43550 CC and a prevalence of 84.73% while the male counterparts had a total of 46547 RC, 36830 CC and 79.12 prevalence of TB in Rivers State. This implies that TB was more prevalent in females by 5.61% than in males. Thus, females are more at risk of TB than the male.

Table 3: Influence of Gender on Tuberculosis Prevalence in Rivers State from (2010 -2020)

Year	Female			Male		
	No. of RC	No. of CC	Prevalence (%)	No. of RC	No. of CC	Prevalence (%)
2010	2874	2411	83.89	2745	1554	56.61
2011	3005	2556	85.06	2945	2321	78.81
2012	3542	3121	88.11	3352	2743	81.83
2013	3875	3376	87.12	3538	2875	81.26
2014	3998	3587	89.72	3734	3126	83.72
2015	4129	3876	93.87	3985	3421	85.85
2016	4443	4104	92.37	4236	4002	94.48
2017	5372	4984	92.78	4654	3987	85.67
2018	6325	4998	79.02	5231	4142	79.18
2019	6843	5006	73.16	5984	4335	72.44
2020	6994	5531	79.08	6143	4324	70.39
Sum	51400	43550	84.73	46547	36830	79.12
Mean	4673	3959	84.73	4232	3348	79.12

RC = Reported Case; CC = Confirmed Cases; Prevalence = (CC x 100)/RC

TB treatment compliance among confirmed cases in Rivers State

Table 4 and Figure 1 showed the confirmed cases and treated cases in Rivers State. The result revealed that in 2019, the highest treatment compliance rate of 48.82 was recorded while the lowest compliance rate of 25.80% was documented in 2010. On average, there was a 34.91% rate of compliance to TB treatment in Rivers State. Thus, there was a poor level of compliance to TB treatment in Rivers State between 2010 and 2020.

Table 4: Analysis of the TB treatment compliance among confirmed cases in Rivers State

Years	No of CC	No of TC	TCR %
2010	3965	1023	25.80
2011	4877	1333	27.33
2012	5864	1632	27.83
2013	6251	1961	31.37
2014	6713	2118	31.55
2015	7297	2484	29.04
2016	8106	2758	28.02
2017	8971	2962	33.02
2018	9140	3150	34.46
2019	9341	3829	48.99
2020	9855	4811	40.82
Sum	80380	28061	34.91

*__CC__ = Confirmed case; __TC__ = Treated Cases; __TCR__= Treatment Compliance Rate (%)
Source: *Rivers State Ministry of Health, Tuberculosis and Leprosy Unit (2021)*

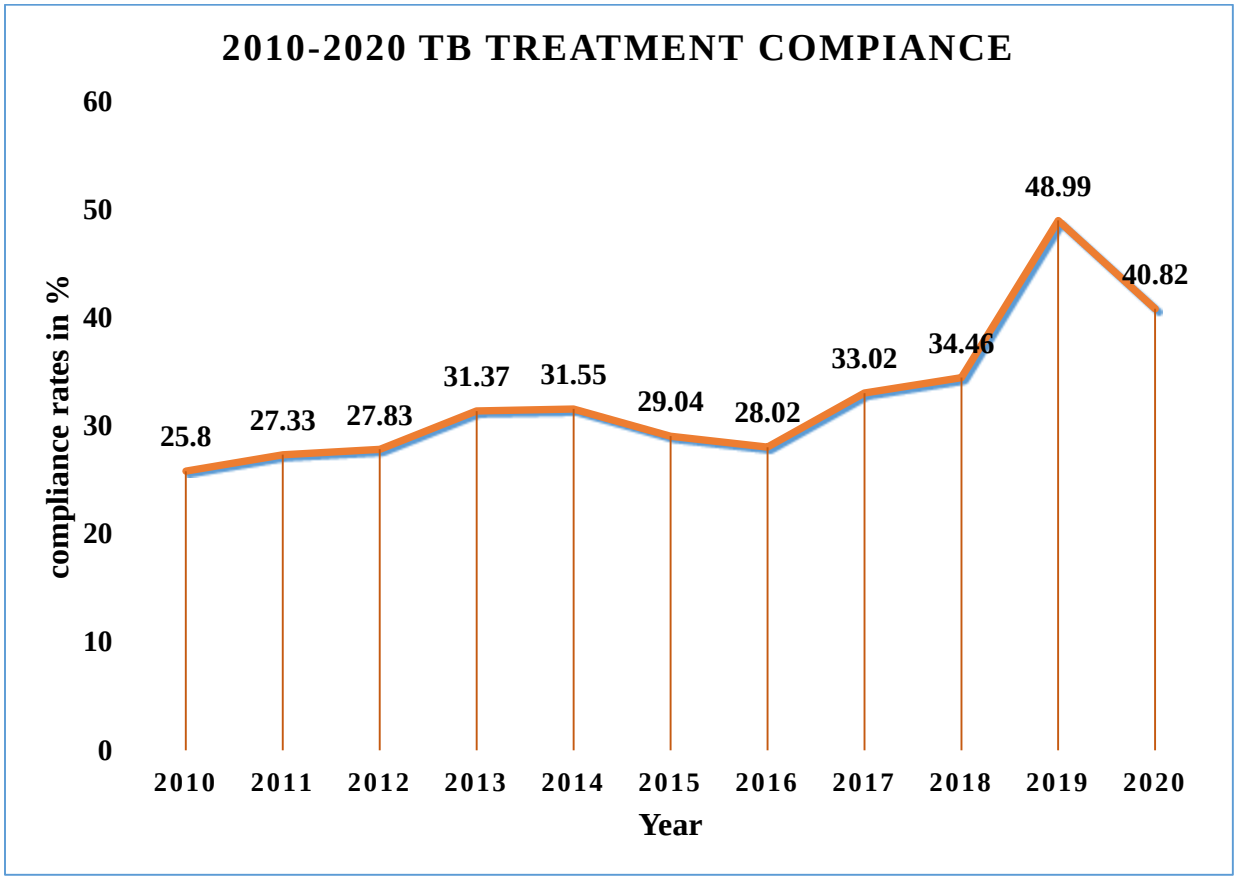

Figure 1: TB treatment compliance rate in Rivers State between 2010 and 2020

Treatment compliance rate among confirmed cases of TB by Age in Rivers State

Table 5 showed the analysis of the TB treatment compliance rate among confirmed cases of TB in Rivers State from 2010-2020. The result revealed out of 14988 CC of TB among males, 1363 (40.70%) complied with treatment while out of 13073 mean CC of TB among females, 1188(3.02%) rate of compliance was observed. This implies that male TB patients complied with the treatment more the females by 10.68%. Furthermore, Figure 2 revealed that the male compliance level commenced with 26.45 in 2010 and progressively moved up to 59.81 in 2020 while the female compliance level progressed form 25.38 in 2010 to 40.23 in 2020.

Table 5: Analysis of treatment compliance rate among confirmed cases of TB in Rivers State based on age

Years	Female			Male		
	CC	TC	'CR	CC	TC	TCR%
2010	2411	612	25.38	1554	411	26.45
2011	2556	721	28.21	2321	612	26.37
2012	3121	789	25.28	2743	843	30.73
2013	3376	976	28.91	2875	985	34.26
2014	3587	1004	27.99	3126	1114	35.64
2015	3876	1139	29.39	3421	1345	39.32
2016	4104	1176	28.65	4002	1582	39.53
2017	4984	1311	26.30	3987	1651	41.41
2018	4998	1401	28.03	4142	1749	42.23
2019	5006	1719	34.34	4335	2110	48.67
2020	5531	2225	40.23	4324	2586	59.81
sum	43550	13073	30.02	36830	14988	40.70
mean	3959	1188	30.02	3348	1363	40.70

*TCR = Treatment Compliance Rate

Source: *Rivers State Ministry of Health Tuberculosis and Leprosy Unit (2021)*

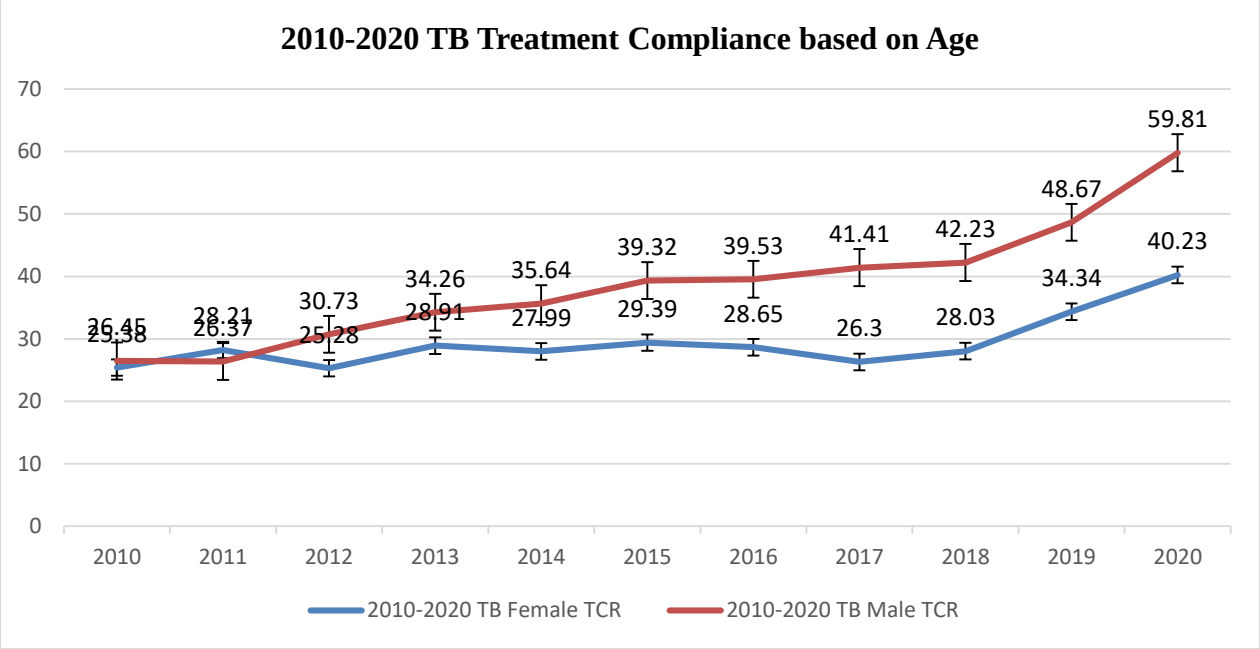

Figure 2: TB treatment compliance in Rivers State based on age

Analysis of the relationship between TB treatment compliance and prevalence in Rivers State from 2010-2020

Table 6 showed the relationship between TB treatment compliance and TB prevalence. The result revealed that as the treatment compliance decreased between 2015 and 2017 (from 0ver31% – 28%), the prevalence of TB increased (86% to 93%) and dropped again to 72% as the treatment compliance increased from 33%-48%. In 2020, as the treatment compliance dropped to 40, the prevalence rose from 72% to 75%. This implies that there is a relationship between TB compliance and TB prevalence in Rivers State.

Table 6: Analysis of the relationship between TB treatment compliance and prevalence in Rivers State from 2010-2020

Year	TCR	Prevalence %
2010	25.8	70.56
2011	27.33	81.97
2012	27.83	85.06
2013	31.37	84.32
2014	31.55	86.82
2015	29.04	89.93
2016	28.02	93.4
2017	33.02	89.48
2018	34.46	79.09
2019	49.99	72.82
2020	40.82	75.02

*TCR = Treatment Compliance Rate; **Source:** *Rivers State Ministry of Health Tuberculosis and Leprosy Unit (2021)*

DISCUSSION

Tuberculosis treatment compliance has been one of the major noticeable set-back that influences the complete recovery regime of patients. In a typical African setting, the negligence resulting from this action has culminated to the incessant drug resistance TB, which in the past, was christened spiritual attack in some quarter ignorantly. However, in Rivers State, government proactiveness to WHO policy guidelines on TB by way of fashioning more DOTS centers to combating TB scourge has created some reasonable level of leverage. This study revealed that 309 (58.86%) of the total 525 (100%) healthcare facilities (DOTS) were government based primary healthcare centers and 23 (4.38%) secondary healthcare across the State with the private sector having 191 (36.86%). This underscores the commitment between the government and private sector collaboration as it affects TB management. The 309 (58.86%) indicates that the rural centres are well captured as there are 23 local Government Areas in the State with only Phalga and Obio/Akpor respectively as the epic center of being urban (Port Harcourt). This is in line with the [2] [28] on global Tuberculosis Report.

Furthermore, this study revealed that females had a total of 51,400 RC; 43,550 CC and a prevalence of 84.73% while the male counterparts had a total of 46,547 RC; 36,830 CC and 79.12 prevalence of TB in Rivers State. This implies that TB was more prevalent in females by 5.61% than in males. Thus, females are more at risk of TB than the male. In terms of compliance, men complied better than females despite lesser prevalence. The result revealed further that out of 14,988 CC of TB among males, 1,363 (40.70%) complied with treatment while out of 13,073 mean CC of TB among females, 1,188(3.02%) rate of compliance was recorded. This means and include that male TB patients complied with the treatment more than females by 10.68%. Contrary to this finding, [29] (found among TB patients in China that women (79.2%) were more likely to seek health care than men (58.6%) did. Nevertheless, a large part of women preferred to visit the lower-level non-hospital health facilities at first instance (e.g., village clinics and drugstores). The continuous patronization of local healthcare givers and chemist as a poor health-seeking behaviour may have contributed to this gender disequilibrium as it affects TB compliance in this study. According to [30], gender issues should be considered to reduce the diagnostic delay of TB and improve both men and women's access to a qualified health facility for TB care.

The rate of compliance to TB treatment among the confirmed cases of TB patients was averagely 40.70%. However, the level of compliance differed across each year investigated with the highest compliance rate recorded in 2019 and the lowest in 2010. There was a consistent increase in the compliance rate between 2013 and 2015 with a sharp drop in 2016 which may have explained the reason for the high prevalence of TB in the same year. Between 2017 and 2019, a remarkable increase was also recorded which perhaps could have led to a consistent decrease in TB confirmed cases in Rivers State with a slight drop of about 8% in 2020. This shows that the compliance to TB treatment in Rivers State is not adequate. There is a need to further sensitize people especially patients' relatives on the negative impacts of non-compliance to treatment on disease outcome to assist in guiding their patients to complete compliance to treatment. This corroborate with [30] while exploring factors associated with non-adherence to TB treatment observed that over 56% of the respondents did not adhere to their treatment prescriptions which suggests that the level of compliance was less than 46%. Similarly, [31] found 67% non-adherence to TB treatment among TB Patients attending TB Clinics in Arba Minch Governmental Health Institutions, Southern Ethiopia which connotes less than 40% compliance to TB treatment. This current work contrasts the work of [32] who found out 56% level of compliance and that of [33] who also 77% level of compliance respectively. Majority of the patients who quit their treatment did so because of a lack of proper guidance and drug contraindications [33].

SUMMARY OF FINDINDS

1. The women did not only record higher prevalence (i.e., more prevalent in females by 5.61% than in males), but they also recorded lower compliance.
2. The compliance to TB treatment in Rivers State is not adequate generally (i.e., it very low).

3. The rate of compliance to TB treatment among the confirmed cases of TB patients was averagely 40.70%.
4. However, the level of compliance differed across each year investigated with the highest compliance rate recorded in 2019 and the lowest in 2010.
5. There was a consistent increase in the compliance rate between 2013 and 2015 with a sharp drop in 2016 which may have explained the reason for the high prevalence of TB in the same year.
6. Between 2017 and 2019, a remarkable increase was also recorded which perhaps could have led to a consistent decrease in TB confirmed cases in Rivers State with a slight drop of about 8% in 2020.
7. Furthermore, this study revealed that females had a total of 51,400 RC; 43,550 CC and a prevalence of 84.73% while the male counterparts had a total of 46,547 RC; 36,830 CC and 79.12 prevalence of TB in Rivers State.
8. Females are more at risk of TB than the male.
9. In terms of compliance, men complied better than females despite lesser prevalence. The result revealed further that out of 14,988 CC of TB among males, 1,363 (40.70%) complied with treatment while out of 13,073 mean CC of TB among females, 1,188(3.02%) rate of compliance was recorded.

CONCLUSION

The poor patient compliance in tuberculosis (TB) treatment have been considered to be one of the greatest challenges which influences the decrease of treatment success and the emerging of Multidrug Resistance-TB (MDR-TB). Data have indicated that patients' compliance to anti-TB treatment in State is missing. The overall compliance for TB patient is too poor, however, age and place of residence including poor awareness and sensitization exert negative effect on treatment compliance.

RECOMMENDATION

1. There should be more energy geared towards women in a bid to sensitize and create awareness on the need for an effective compliance with the TB DOTS application. This does not connote that men should be abandoned.
2. Strengthening awareness of TB and improving the accessibility of healthcare services is essential in TB control strategy, especially under the current vertical TB control system.
3. There is a need to further sensitize people especially patients' relatives on the negative impacts of non-compliance to treatment on disease outcome to assist in guiding their patients to complete compliance to treatment.

4. Consideration for the organization of modality for peer assistance TB patients working group, establishment of different social communication networks to facilitate the TB treatment adherence.
5. There should be more comprehensive incentives programme to improve the allure of TB patients for visiting the treatment centres.

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