ARC Journal of Public Health and Community Medicine
Volume 3, Issue 3, 2018, PP 1-11
ISSN No. (Online) 2456-0596
DOI: http://dx.doi.org/10.20431/2456-0596.0303001
www.arcjournals.org

Treatment Outcomes of Pulmonary Tuberculosis: A Retrospective Cohort Study of Gomoa West District, Ghana

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Abstract

Background: *The study reviewed background characteristics of patients being treated for Pulmonary Tuberculosis in Ghana. The review indicated that the disease was endemic in deprived regions. Gomoa West District in the Central Region of Ghana, one such region, was chosen for the study.*

Methods: *A retrospective cohort study on all files of patients diagnosed of Pulmonary Tuberculosis either by smear or radiography in the district during the period January 2010 to December 2015 were studied. Socio-demographic and clinical variables of cases were extracted from case files as well as their treatment outcomes at the end of six months' therapy. Patients who were transferred out, re-treated, including resistance Tuberculosis and extra-pulmonary cases were excluded from the study. Chi-square and Fisher exact tests were used to analyze the data. A logistic regression analysis was used to calculate crude and adjusted ratio of successful treatment outcome at a 95% confidence interval.*

Results: *The Pulmonary Tuberculosis treatment success for the district in 2012, 2013, 2014 and 2015 were 94.2%, 87.59%, 94.4% and 92.1% respectively. Prevalent rate of Pulmonary Tuberculosis was highest amongst fisher folks and those in age group 65 years and above.*

Conclusions: *The study concluded that improving Pulmonary Tuberculosis treatment outcomes requires qualitative information on factors associated with treatment outcomes that quantitative data does not reveal; so as to develop specific interventional strategies since general intervention might not be suitable for all cases considering the diverse characteristics of Tuberculosis patients. Interventions among age group 65 years and above will potentially improve treatment outcomes by 22.2% in Gomoa Oguaa.*

Keywords: *Pulmonary Tuberculosis, Radiography, treatment outcomes, co-morbidities*

List of abbreviations: *DOT: Directly Observed Treatment, E: Ethambutol, EPTB: Extra-pulmonary Tuberculosis, H: Isoniazid, MDR: Multi-drug resistant, MoH: Ministry of Health, PTB: Pulmonary Tuberculosis, R: Rifampicin, SNPTB: Sputum Negative Pulmonary Tuberculosis, SPPTB: Sputum Positive Pulmonary Tuberculosis, TB: Tuberculosis, WHO: World Health Organization, Z: Pyrazinamide*

1. Introduction

Pulmonary Tuberculosis (PTB) is a communicable disease of public health interest around the world (WHO, 1994). In 2013, there was an estimated 9 million incidents of TB globally with 1.5 million deaths. The provision of standardized short course chemotherapy to sputum smear positive TB patients has been recognized as an effective treatment strategy which cures and prevents transmission and spread of the disease. The Global upsurge of TB is attributed to various factors such as HIV/AIDS, poverty, population growth, over-crowding, malnutrition, stress, drugs and alcohol abuse, consumption of contaminated meat and milk and multi-drug resistant (MDR) TB[1].

Epidemiologically, TB is mainly caused by a bacilli (*Mycobacterium tuberculosis)* of varying species and it's the second leading cause of death worldwide[2] mainly affecting young adults in their most productive years[3]. There are various species of the bacilli which comprises: *M. tuberculosis*, *M. bovis*, *M. bovis* Bacillus Calmette-Guérin (BCG), *M. africanum*, *M. microti*, *M. canetti* and *M. pinnipedii*[4]. The *M. tuberculosis* mainly causes TB in humans but can also infest animals that have contact with infected humans[5]. This organism is primarily associated with pulmonary TB but there are reported incidence of extra-pulmonary linked to it as well[6]. The *M. bovis* causes bovine TB and affects humans, sheep, cattle, pigs, goats, and other wild

and domestic animals. *M. bovis* BCG is usually referred to as the vaccine strain and can cause disseminated BCG infection in vaccinated children[7] The *M. africanum* is considered to be an intermediate species between *M. tuberculosis* and *M. bovis*, and it's closely related to *M. bovis*[8]. This organism causes TB in humans and sometimes in apes[9]. The *M. pinnipedii* is usually described as the seal bacillus for causing TB in fish-eating sea animals[4]. Whereas *M. microti* is attenuated in humans and termed the vole bacillus due to its effect of TB in voles *(Microtus agrestis)* and other small rodents such as hamsters, shrews, rats, mice, rabbits and guinea-pigs[10]. The *M. canetti* is rare but it also causes TB in humans[5].

A study in African countries shows that more people die from TB than from any other curable infectious disease in the world[11]. By established number of cases reported to WHO, Ghana is ranked 13th in the Africa region. In Ghana, although the national TB treatment success rate has been improving steadily, (an increase from 45.8% in 1997 to 85.3% in 2008), there remain pockets of unsuccessful treatment in some districts due to some patients remaining infectious for longer periods, increased likelihood to relapse and emergence of drug resistance TB among others[12]. To improve successful TB treatment outcomes, it is important to examine factors associated with unsuccessful treatment outcomes so as to develop specific interventions to overcome them.

This study therefore generally assessed treatment outcomes of pulmonary TB among patients in the Gomoa West District for the period 2010 to 2015. Specifically, the study examined the background characteristics of TB patients, distribution of the disease, trends and some predictors of unsuccessful and successful treatment outcomes at the end of therapy. The study is relevant for both policy and programme interventions. Effective programme and policy interventions depends on evidence and findings from this study are expected to provide the required evidence to drive programmes that will impact policy decisions for TB control in Ghana.

2. METHODS

2.1. Study Setting

The study was conducted in the Gomoa West District in the Central Region of Ghana. The district capital is Apam and it is almost equidistant from Cape Coast to Accra. The estimated district population is about 153,570 with a male to female ratio of 44.7% to 55.3%. The major occupation is fishing although a sizeable number of the population engage in crop farming and trading as well. Economically, Gomoa West District is one of the most deprived districts in the Central Region. It is divided into 6 sub-districts namely Oguaa, Osedze, Onyadze, Dago, Mumford and Apam. There is 1 district hospital, 5 Health Centers, 18 CHPS zones, 1 private Maternity Home, 1 Nutrition and Health Center. Malaria and enteritis are the commonest conditions reported to the health facilities[13].

The study population include all new pulmonary TB cases on first line treatment registered within the district between January 2010 and December 2015. A new case was defined as a patient who has never had treatment for tuberculosis or has taken anti-tuberculosis medicine for less than 4 weeks. Clinical factor independent variables considered include: Acid fast bacilli smear score for sputum, Orientation of infection upon chest examination and Co-morbidity-presence of another ailment co-existing with TB. Treatment outcomes were defined based on the WHO criteria of cured, completed treatment, treatment failure, default and death. Both 'cured' and 'completed treatment was categorized as successful treatment in the study whilst treatment failure, default, death and unknown outcome were categorized as unsuccessful treatment.

2.2. Research Design

A retrospective cohort study was carried out between January 2010 and December 2015. The medical charts of all persons diagnosed of Pulmonary TB either by smear (AFB), culture or radiography and captured in the district TB register over this period was desk reviewed. Socio–demographic and clinical variables of cases were extracted from case files as well as their treatment outcomes at the end of six month therapy. Patients who were transferred out, re-treatment, multidrug resistance (MDRTB) and extra-pulmonary TB cases were excluded from the study. Various ethical issues were considered during the study. Hence, ethical approval for the study was sought from the Ghana Health Service Ethical Review Committee. A written consent for data collection and publication was also sought from the District Director of Health Services. To ensure optimal patient privacy and confidentiality, the background characteristics of patients excluded any contact information that

could disclose the specific identity of patients. The records department and the district information team took oversight responsibility of the data extraction in the hospital premises to ensure that no patient folder got out of the facility.

2.3. Data Analysis

Data entry was done using Microsoft Excel and analyzed using Stata version 12.0. Descriptive statistics of numeric variables were presented with mean values and their standard deviations. For analytical statistics, a Chi-square test was used for categorical comparisons of the treatment -outcome parameter, while Fisher's exact test was used for cell values less than 5. For all statistical tests, the significance level (type I error, p) considered was 0.05 (5%). A logistic regression analysis was used to calculate crude and adjusted odds ratio (OR) of successful treatment outcome at a 95% confidence interval (CI).

3. RESULTS

3.1. Background Characteristics of Pulmonary TB Patients

Table 1 shows the background characteristics of the total number of new pulmonary TB cases in the district register from 2010 to 2015.

Table1. *Background characteristics of pulmonary TB patients*

Variables	N-154	Successful outcome	Unsuccessful outcome	P-value
Sex				
male	97	78(63.4%)	19(65.5%)	
female	55	45(36.6%)	10(34.5%)	0.832
Age Group				
0-20	22	17(14.2%)	5(16.7%)	
21-30	21	15(12.5%)	2(6.7%)	
31-40	41	34(28.3%)	7(23.3%)	
41-50	29	23(19.2%)	6(20.0%)	0.34
51-60	13	12(10.0%)	1(3.3)	
Above 60	28	19(15.8%)	9(30%)	
Educational status				
No education	10	6(4.8%)	4(13.8%)	
Primary education	16	12(9.7%)	4(13.8)	
Secondary education	13	12(9.7%)	1(3.4%)	0.095
Tertiary education	4	4(3.2%)	0(0)	
Don’t know **Table 1 continued**	110	90(72.6%)	20(68.9%)	
Sub-district Oguaa	26	16(12.9%)	10(33.3%)	
Osedze	15	12(9.7%)	3(10%)	
Onyadze	17	12(9.7%)	5(16.7%)	
Dago	28	24(19.3%)	4(13.3%)	0.072
Mumford	27	24(19.3%)	3(10%)	
Apam	41	36(29.0%)	5(16.7%)	
Employment status				
Employed	110	87(75.7%)	23(79.3%)	
Unemployed	34	28(24.3%)	6(20.7%)	0.674
Smoking status				
Smokes/history of smoking	17	11(24.4%)	6(37.5%)	
Don't smoke	44	34(75.6%)	10(62.5%)	0.124
Alcohol consumption status				
Drinks/Alcohol history History of drinking	38	30(51.7%)	8(72.7%)	
don’t drink	31	28(48.3%)	3(27.3%)	0.511
Health insurance status				
Has NHIS	84	69(55.6%)	15(50.0%)	
No NHIS	70	55(44.4%)	15(50.0%)	0.577

Source: Field data 2015

3.2. Distribution of PTB among category of workers

A cursory look at the employment status shows that majority of the patients (76%) were employed in various sectors predominantly fishing, farming and trading. The distribution of the TB cases among these professions per sub districts is illustrated in figures 1, 2 and 3 respectively. Although Apam recorded the highest PTB cases during the period under review, the distribution by occupation within the sub district appears to have been linked to the predominate livelihood of the patients. Thus whereas more fisher folks (14) were diagnosed of PTB in Apam and Mumford, significantly low PTB cases were observed among Farmers and Traders within the same sub district.

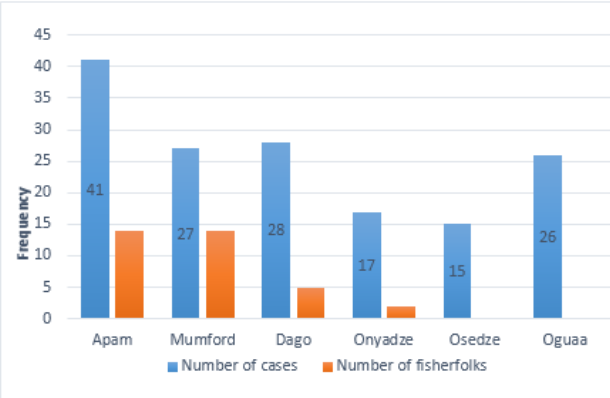

Figure1. *Pulmonary TB distribution among fisher folks per sub-district*

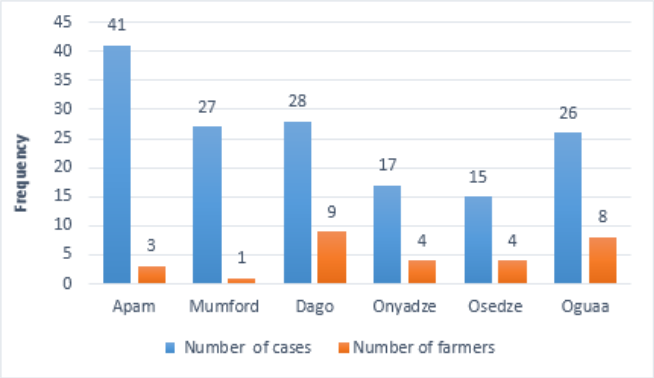

Figure2. *Pulmonary TB distribution among farmers per sub-district*

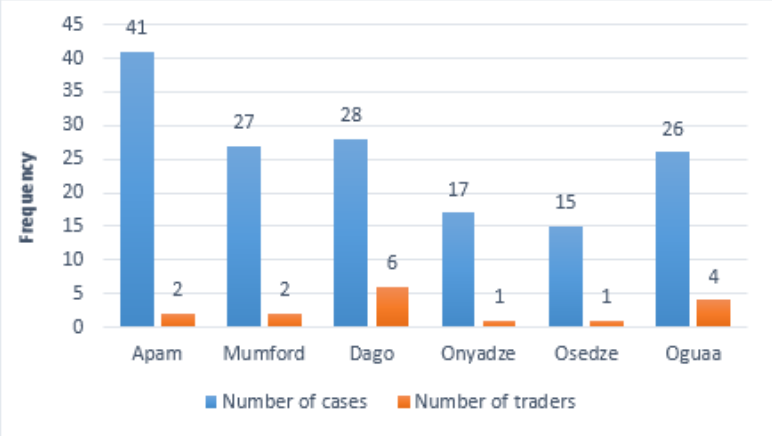

Figure3. *Pulmonary TB distribution among traders per sub-district*

3.3. Co-morbidities among PTB cases

Majority of the TB case (109 out of 154) did not show any form of co-morbidities. For the few cases that had various co-morbidities, it was challenging to ascertain which of the disease occurred first since the information was not available (Figure 4).

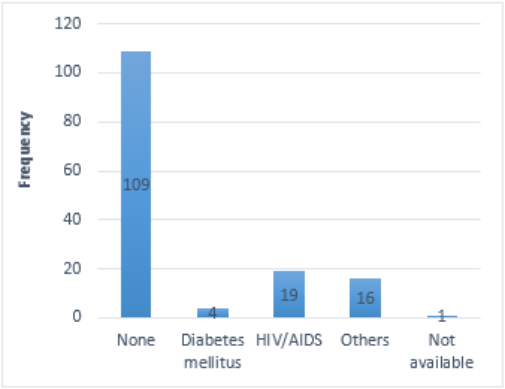

Figure4. *Co-morbidities among Pulmonary TB cases*

3.4. Treatment Outcome

Table 2 presents the various outcomes following the treatment given for PTB in the sub districts. The distribution follows outcomes of usual clinical treatment of communicable diseases (i.e cure or death). Whereas majority (53%) of the patients were cured of PTB, about 2.7% defaulted and 3.4% had treatment failure leading to a death rate of 4.7%

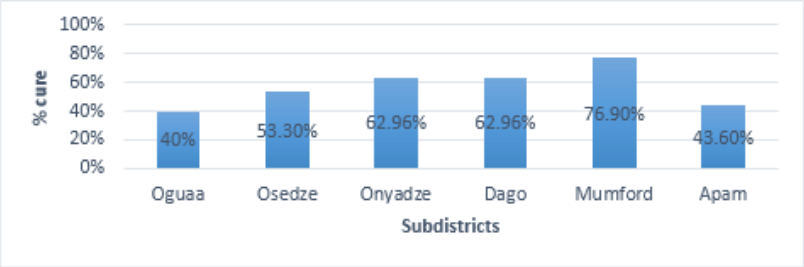

Figure5. *Cure rate per sub district*

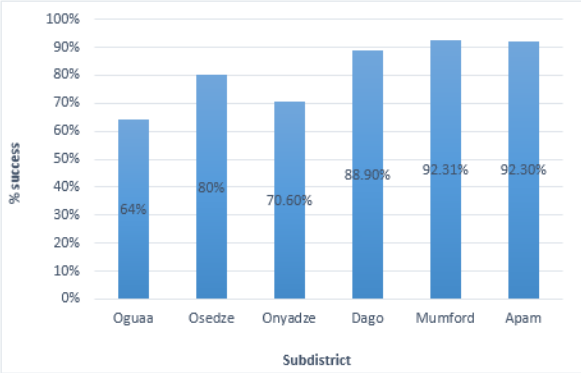

Figure6. *Successful treatment rate per sub district*

The cure rate and successful treatment outcome per sub district is illustrated in figures 5 and 6 respectively. Apam being the district capital recorded the highest successful treatment rate of 92%. However this did not reflect the cure rate per sub district as the corresponding indicator in Apam was relatively low compared to other sub districts.

Table2. *Pulmonary Tuberculosis Treatment Outcomes in the sub-districts*

PTB Treatment outcome	Frequency	percentage	cumulative percentage
Cured	76	53.02	53.02
Treatment completed	45	30.2	83.22
Treatment failure	5	3.36	86.85
Default	4	2.68	89.26
Death	7	4.7	93.96
Unknown	9	6.04	100

Source: Field data 2015

Treatment outcomes of the PTB patients was linked to the background characteristics of the patients using the odds ratios for unsuccessful treatment outcomes (Table 3).

Table3. *Odds ratios for unsuccessful treatment outcomes*

Characteristic	Crude OR (CI)	P Value	Adjusted OR(CI)	P Value
Sex				
Female	1			
Male	0.87(0.36-2.10)	0.75	1.74(0.40-7.40)	0.46
Age group(years)				
0-20	0.56(0.14-2.19)	0.4	45.7(0.71-2940)	0.072
21-30	0.25(0.04-1.33)	0.11	6.81(0.14-331.1)	0.33
31-40	0.42(0.13-1.39)	0.16	3.25(0.14-78.1)	0.47
41-50	0.41(0.11-1.59)	0.2	7.24(0.20-260.3)	0.28
51-60	0.20(0.02-1.79)	0.15	0.54(0.01-22.00)	0.75
Above 60	1			
Employment				
Other	1			
Employed	1.97(0.23-16.5	0.53	75.00(1.26-4468.04)	0.4
Unemployed	1.61(0.16-15.6)	0.68	18.6(0.47-746.71)	0.12
Education				
No education	2.25(0.52-9.77)	0.28	5.91(0.58-60.40)	0.13
Primary Education	0.38(0.46-3.05)	0.36	0.16(0.01-2.50)	0.19
Secondary education	0.38(0.46-3.05)	0.36	0.39(0.18-746.71)	0.55
Tertiary education	1			
NHIS status				
NHIS	0.63(0.26-1.49)	0.29	0.26(0.67-1.01)	0.52
No NHIS	1			
Sub-district				
Oguaa	6.75(1.61-28.30)	0.009	5.45(0.79-37.57)	0.085
Osedze	3.00(0.53-16.90)	0.21	2.37(0.23-24.74)	0.47
Onyadze	5.00(1.03-24.1)	0.45	19.10(0.60-229.1)	0.20
Dago	1.5(0.28-8.06)	0.64	0.38(0.34-4.23)	0.43
Mumford	1.00(0.96-6.44)	1	0.234(0.20-2.81)	0.25
Apam	1			
Sub district group				
Oguaa	3.80(1.40-10.02)	0.007	4.34(1.32-14.24)	0.034
All others	1	1		
Smoking status				
Smokes	1.54(0.38-6.22)	0.6	86.4(0.88-8436)	0.056
Don't smoke	1.33(0.31-3.45)	0.58	19.8(0.24-1623)	0.184
Other	1			
Alcohol status				
Past or current use of alcohol	0.84(0.28-2.56)	0.77	0.22(0.0003-1.71)	0.86
No alcohol	1.32(046-3.84)	0.61	0.89(0.01-7.13)	0.28
Other	1			
AFB Score				
None	0.76(0.21-2.79	0.68	0.2(0.2-1.51)	0.12
Scanty	1.9(0.47-7.60)	0.36	4.5(0.61-34.2)	0.14
One plus	0.95(0.30-3.03)	0.93	1.5(0.30-7.8)	0.61
Two plus	0.75(0.18-3.15)	0.7	0.18(0.02-1.63)	0.13
Three plus	1			
Comorbidities				
No comorbidities	0.72(0.28-1.82)	0.48	-	-
Commodities combined	1			
Age group 65(years)				
65 and below	0.31(0.10-0.93)	0.03	0.018(0.0005-0.73)	0.034
Above 65	1			

Source: Field Data 2015

None of the background characteristics investigated in (table 2) was significantly associated with the treatment outcomes. Following a further analysis however, there appeared to have been potentially improve treatment outcomes among age group above 65 years when adjusted. Putting together an intervention among age group > 65 years will potentially improve outcomes by 22.2% in Oguaa (Table 4).

Table4. *Impact of intervention in age group >65*

		95% confidence interval
Risk Difference	0.15	-0.23-0.32
Attributable fraction in exposed	0.63	0.093-0.85
Attributable fraction in population	0.22	

Source: Field Data 2015

Likewise, at the district level, a successful intervention at G. Oguaa will potentially improve outcomes by 26.5% in the district. (Table 5).

Table5. *Impact of intervention at G. Oguaa*

Exposed	**Unexposed**	**Total**	**Exposed**	**P-Value**
Cases	9	16	25	0.3600
Control	16	108	124	0.1290
Total	25	124	149	0.1678
Point estimate				[95% Conf. Interval]
odds ratio	3.8		1.25-10.97	
Attributable fraction in exposed	0.74		0.20-0.91	
Attributable fraction in population	0.27			

Source: Field Data 2015

4. DISCUSSION

In Ghana Pulmonary Tuberculosis (PTB) treatment success rate has been improving steadily, being up from 45.8% in 1997 to 85.3% in 2008 (MOH 2010) In the Gomoa West district, 60 cases of PTB were recorded in 2010. Forty-eight cases were however recorded in 2013. PTB treatment outcome data from the district showed a 94.2 % treatment success in 2012.Treatment success rate was 87.5% in 2013 and 94.4% in 2014 GHS 2015

As per the Ghanaian MoH Guidelines for PTB treatment, a newly diagnosed PTB patient goes on chemotherapy for 6 months. This involves an initial 2 months intensive phase which involves receiving a combination of isoniazid (H), rifampicin(R), pyrazinamide (Z), and ethambutol (E). This is followed by a 4-month continuation phase of receiving isoniazid and rifampicin. Extra pulmonary TB patients also receive 2 months of HRZE followed by 7 months HR. Re-treatment TB patients receive HRZE for 3 months together with 2 months streptomycin for the intensive phase. This is followed by HRE for 5 months as continuation phase. All patients receive medicines under Directly Observed Treatment (DOT) [14].

Despite national interventions to control PTB, the current study showed that there are varying trends and treatment outcomes of PTB in Ghana as depicted by this retrospective cohort study of Gomoa West District in Central Region which generally assessed trends and treatment outcomes of PTB among patients in the district for the period 2010 to 2015. Specifically, the study examined the background characteristics of PTB patients, distribution of the disease, trends, and predictors of unsuccessful and successful treatment outcomes at the end of therapy. Overall, the case load was found to be 154, of which 63.4% (n=78) were males and 36.6% (n=45) were females. In the employment category, PTB was most prevalent among fisher folks, farmers and traders in the district. PTB cure rate for the district over the period was found to be 53% whiles successful treatment outcome was 83%. Mumford sub district had the best cure rate at 76.9% whiles the worst was Oguaa sub district with 40%. Apam sub district had the highest 'treatment completed' at 49%. Although patients with tertiary level education recorded zero rate of unsuccessful treatment outcome, educational status, sex, employment, commodities, AFB smear score and NHIS were significantly associated with treatment outcomes. High age (above 65years) and cases from Gomoa Oguaa were significantly associated with unsuccessful treatment outcomes. Intervention in age group above 65 years and in Gomoa Oguaa could significantly improve the district's treatment outcomes.

Analysis of the Ghana Health Service reports on PTB[15] have shown that high mortality and morbidity associated with PTB is often due to the inadequate control measures and neglect of the disease. The provision of standardized short course chemotherapy to at least all sputum smear positive PTB patients in the study district as directed by the Ghanaian PTB control programme has been recognized as an effective treatment strategy which cures and prevents the future transmission of the disease within this study area. Overall treatment success was 83% in the current study, being slightly lower than the WHO target of 90% [16].

Though WHO in 2014 set an international target value for successful treatment outcome at 85%, there is a need to assess trends and treatment outcomes of pulmonary PTB among patients to develop intervention tailored specifically at the background characteristics of PTB patients in any geographical setting to ascertain the predictors of successful and unsuccessful treatment outcomes at the end of therapy. One other finding in this study is the significant relationship between advanced age and the likelihood for unsuccessful treatment. Other studies [17,18] have also reported similar findings. Possible reasons to this observation could be the presence of comorbidities, overall physical deterioration, immunosuppression and the greater likelihood of unfavourable drug reactions preventing adherence to treatment regimen.

Helping to assess the adequacy of treatment regimen and quality of case management of the overall TB programme using rigorous treatment outcome monitoring measures is a key component of TB surveillance.

Findings from this study also supports those of those which observed that several factors are associated with PTB treatment outcomes[18]. For instance in a PTB treatment outcome study in Turkey, young age, no previous TB treatment, no co-morbidity, no drug resistance and high education level were factors significantly associated with successful pulmonary TB treatment outcome ($p<0.05\%$ for all) In a cohort study that sought to identify risk factors for poor tuberculosis treatment outcomes in Finland, male sex, high age and non-HIV-related immune suppression were all found to be significantly associated with the unfavourable outcome; death[19].

In a prospective cohort study on the predictors of pulmonary tuberculosis treatment outcomes in South Korea, multivariate analysis showed that diabetes is significantly associated with unfavorable outcomes (OR=2.52;95% C.I=1.27-5.01).The same study also showed that age 35-49 years or ≥50 years to be associated with unfavourable outcomes (OR = 2.14; 95% CI = 1.11-4.14 and OR = 2.97; 95% CI = 1.51-5.86 respectively, compared to those age 20-34) [20].

Some studies [18,19,21] have found an association between demographic and clinical characteristics of patients (male gender, lack of health insurance, alcoholism, smoking, unemployment, comorbidity and AFB smear score) and poor outcomes. About 12.3% of the TB cases in the study had co-infection with HIV/AIDS. Since HIV/AIDS is known to fuel the TB epidemic, current WHO policy guidelines stipulates collaborative efforts between the 2 control programs, with HIV surveillance among TB patients a key aspect of this collaboration[1]. The finding in this study further enhances the need for active case detection through screening for HIV among TB patients.

Linking treatment outcomes of PTB patients with background characteristics of the patients in Gomoa West District using the odds ratios for unsuccessful treatment outcomes, it was noted that, none of the background characteristics investigated was significantly associated with the treatment outcomes. However, there appeared to have been potentially improve treatment outcomes among age group above 65 years when adjusted. Gomoa Oguaa had significantly higher odds of unsuccessful treatment outcome when compared to the other sub-districts. Provincial or sub-district differences have been identified in previous studies[17]. Possible reasons could be performance of local program in terms of DOT management at the sub-district (ie poor supervision at Gomoa Oguaa) and Patient characteristics such as migration and population mobility. Putting together an intervention among age group > 65 years will therefore potentially improve outcomes by 22.2% in Gomoa Oguaa. A qualitative research carried out at Gomoa Oguaa may provide additional information that quantitative data does not reveal.

A study on the adherence to anti-tuberculosis treatment and treatment outcomes among TB patients in Almata district in Ethiopia found that the odds of unsuccessful treatment was significantly higher among sputum positive pulmonary TB (SPPTB) and sputum negative pulmonary TB (SNPTB) compared to extra-pulmonary TB (EPTB) cases and also among

HIV sero-positive patients compared to HIV sero-negative cases [22]. A similar study on Pulmonary TB among 'Kayayei' (Female head porters) in Ghana shows that they are a source of serious public health threat especially to clientele of head porterage. Pulmonary TB prevalence found in this study is 120 per 100,000 Kayayei compared to the national prevalence 92 per 100,000 in the general population. In this study, poor knowledge about the mode of PTB transmission, signs and symptoms, and inappropriate health care seeking behavior among study participants were [23]. Relating this to the current study, there appear to be occupational link to trends and outcomes of PTB management. In the Gomoa West District where the predominant occupation is fishing, PTB prevalence was high among fisher folks in the Apam and Mumford sub-districts. Similar findings were observed in the USAID ASSIST Project Experience Report in fishing communities in Northern Uganda [24]. These observations could be due to the high HIV prevalence among the fishing population which predisposes then to PTB and the residing in congested environments which are known risk factors for developing tuberculosis. In current study, it was noted that the fisher folks routinely go to sea and spend long periods in confined fishing vessels sometimes defaulting on treatment coupled with gross lack of knowledge about the mode of PTB transmission, signs and symptoms, and inappropriate health care seeking behaviors which also exposed to them other infections that facilitates the spread of PTB widely to others. This finding could possibly lead to an adverse effect on household incomes since a significant proportion of those affected could be breadwinners. Loss of income during the symptomatic and intensive phases of treatment and its potential impact on household incomes has also been identified in previous studies[25]. In this regard, TB treatment outcome monitoring is a key part of surveillance in helping to assess the adequacy of treatment regimen and quality of case management.

The current study had some limitations. Key among these was that because it was conducted retrospectively using secondary data from patient folders, some important variables such as educational status, alcohol consumption and smoking status which could have enhanced the inference of the study findings were missing in the patient folders.

5. Conclusion

To improve successful TB treatment outcomes among any population, it is important to qualitatively explore and become familiar with the background characteristics of the TB patients and factors associated with unsuccessful treatment outcomes so as to develop specific strategies for successful treatment outcomes since one intervention might not be suitable for all cases considering the huge diversity of the background characteristics of TB patients.

Declarations

Ethics Approval and Consent to Participate

Ethical approval for the study was sought from the Ghana Health Service Ethical Review Committee. A written consent for data collection was also sought from the District Director of Health Services in Gomoa. To ensure optimal patient privacy and confidentiality, the background characteristics of patients excluded any contact information that could disclose the specific identity of patients.

Consent to Publish

Although the manuscript does not contain data from any individual person, hence consent for publication is "Not applicable", all patients whose data were used in any form during the study were verbally informed during their first visit in the hospital that their records will be made available for confidential analysis and studies of which they verbally consented. A written consent for publication was also sought from the Gomoa District Director of Health Services.

Authors' Contributions

CTA conceptualized and designed the study. EKO participated in the design and conceptualization. CTA extracted the data from the case files. FYG analysed the data and drafted the manuscript. FYG and EKO reviewed the draft for critical intellectual content. All authors approved the final submission.

Acknowledgments

The authors are grateful to the Gomoa West District Health Directorate and all of the participants for sharing with us the data.

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Citation: *C. T. Ayin1, F. Y. Gbagbo & E. K. Oppong, Treatment Outcomes of Pulmonary Tuberculosis: A Retrospective Cohort Study of Gomoa West District, Ghana. ARC Journal of Public Health and Community Medicine.2018; 3(3):1-11. DOI: dx.doi.org/ 10.20431/2456-0596.0303001.*