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ORIGINAL ARTICLE

Factors associated with default in TB treatment outcomes in the Bole District of Ghana: A cross-sectional study

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Tuberculosis (TB) is of great public health concern affecting one-third of the world's population regardless of all the interventions put in place to control it. Non-adherence to TB treatment is a major barrier to effective TB control because incomplete treatment may lead to antibiotic resistance, which has the effect of keeping patients infectious for a longer period, relapsing, and dying as a result. The aim of this study was to determine the factors that affect default in TB treatment in the Bole District in the Savannah Region of Ghana. A cross-sectional study was conducted with 95 TB patients in Bole District Health TB Center, Savannah Region, Ghana from January to December 2014. A semi-structured questionnaire was used to collect data from the study participants to evaluate the patient and health-related factors associated with default in TB treatment. Default in TB treatment was defined as any interruption of treatment for at least 2 months following treatment initiation. Data analysis was done using SPSS (Version 20). For the determination of factors associated with default, binary logistic regression was used and $p<0.05$ was considered statistically significant. The default rate was 21%; while patient-related factors such as age (aOR [95%CI] 7.61 [1.85 – 31.40], p = 0.005), sex (aOR [95%CI], 4.39 [1.10 – 17.62], p = 0.037) and experiencing side effects from the drug (aOR [95%CI], 8.51 [2.17 – 33.36], p=0.002), and health systems related factors of not given enough information about TB on diagnosis (aOR [95%CI], 7.22 [1.40 – 37.27], p = 0.018) predicted default in treatment. Avoidance, backbiting, and isolation by family and community members were some of the negative attitudes that caused TB patients to default in treatment. In conclusion, treatment of TB among patients in the district is largely influenced by age, sex, side effect of drug, and whether patients have enough information about TB on diagnosis. To curb default in TB treatment enough education must be given on TB diagnosis and the focus must be on females and older ones.

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INTRODUCTION

Infection with tuberculosis (TB) continues to surge worldwide even with the availability of drugs for treatment. The World Health Organization (WHO) reported that there were almost 10.6 million new TB cases and 1.6 million people died from the disease the world over in 2021 [1]. Over eighty percent of the world's TB cases are concentrated in Africa and Asia; these areas are also characterized by inadequate health infrastructure, low level of education, high level of poverty and overcrowding [2]. Africa, which houses about 11% of the world population, contributes up to 23% of the global

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burden, which makes it the geographical region with the second highest disease burden when considering size of population [3]. The situation is worsening as a result of the high prevalence of Human Immunodeficiency Virus (HIV) and almost 80% of TB cases among people living with HIV reside in Africa [2]. About 212 per 100,000 persons are newly infected with TB in Africa each year [3], while WHO further revealed that 3.6% of all new cases and 18% of previously treated cases were found to have multi drug resistant TB (MDR-TB) worldwide [4].

The incidence of tuberculosis in Ghana was 143/100,000 persons in 2020 [5] while the mortality was estimated to be 5% [6]. A TB positivity rate of 13% was observed in a recent study in Northern Ghana [7] despite Ghana's TB control programme. Ghana's TB control programme adopted the global targets of detecting 70% of the estimated TB cases and curing 85% of the detected cases using the Directly Observed Treatment Short (DOTS) course strategy. This TB control approach adopted by Ghana was affected by a number of challenges such as clinical (concurrent infection of TB and HIV), socio-cultural/economic and institutional factors accelerate new infections and re-infections, leading to a lifetime risk ranging from 10-20% among individual's shelving dormant TB [8]. The consequences of TB on patients, families and communities through cost incurred on diagnosis, seeking for treatment, transport to and from health facilities or treatment centres and time lost from work cannot be underestimated. These factors are known to influence default in TB treatment but not well documented. The disease is considered a medico-social predicament, influenced by factors such as socio-economic and nutritional status, people's perceptions and beliefs about the disease, health-seeking behaviour and access to health care.

Low TB case detection and undesirable treatment outcomes (default, treatment failures and death) threaten the success of the TB control programme in Ghana and the world over. Also due to TB drug resistance, patients continue to spread the infection [9]. Northern Ghana has the highest number of persons living in extreme poverty [10, 11] and this could affect the treatment outcomes of TB infections. Moreover, there is paucity of research works on factors that affect the treatment outcomes of TB in Ghana hence the need to conduct this study in the Bole District of the Savannah Region of Ghana.

MATERIALS AND METHODS

Study site

The study was conducted in the Bole district, Savannah region of Ghana (Figure 1). It is bordered to the North by the Sawla-Tuna-Kalba District, to the West by Côte D`Ivoire with the Black Volta River as the boundary. It also shares boundaries with the West Gonja District to the East and to the South Wenchi municipal in the Bono region and Kintampo North municipal in the Bono East region. The Bole District covers an area of 6,239 square kilometers which is 17.93% of the total land area in the Savannah region, with a total population of 115,800 according to the 2021 National Population Census [12].

Study design and population

This cross-sectional study was undertaken in the study area between January and December 2014. The study population comprised of all 105 TB patients who were put on treatment during the period January 2009 to June 2013. The District TB register which records the patient's name, registration number, date of starting and completion of treatment or outcome, demographic details, address and treatment outcomes was used to develop the sampling frame. Study participants were purposively selected using the register of persons who had reported at the Bole District Hospital TB center. Any patient whose data points were incomplete from the register or spurious as a result of one reason or another were not included. Participants were classified into defaulters (unsuccessful); who were persons who started treatment but stopped within two months of commencement of treatment [Yone et al., 2011; 16] and completers (successful); who finished the TB treatment regimen and were declared cured of TB by a clinician after their sputum smear test produced negative results. Seventy (70) of the participants completed their TB treatment while 35 were defaulters. Categories of treatment outcomes that were used in this study were based on WHO recommended guidelines [16]. This is as follows: Cure:- a sputum smear positive TB patient who had completed full anti-tuberculosis treatment and was culture negative at the end of treatment; Treatment completed:- Patient who had completed the assigned treatment, but final sputum cultures were not obtained and

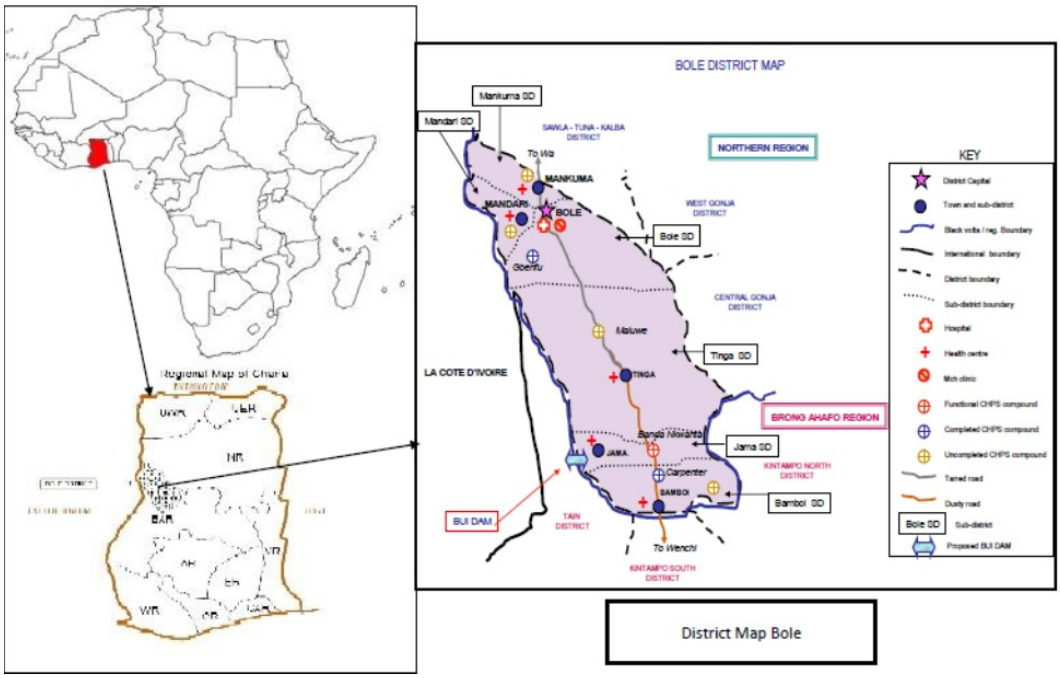

Figure 1: Map of Study area as indicated in the Bole District, Ghana and Africa Map [13–15]

the supervising health personnel decided that the patient required no further treatment; Default:- Patient who had taken anti-tuberculosis drugs for one or more months and interrupted treatment for two or more months; Treatment failure:- Patient in whom sputum culture remained or became positive at 5 and 6 months of anti-tuberculosis treatment; Death:- Patent who died for any reason during anti-tuberculosis treatment.

Data Processing and Analysis

The study was in two stages, the first involved extracting patients' records from the TB register and patients' folders, while the second stage involved sampling patients. The semi-structured questionnaire was used to collect data on variables such as the socio-demographic characteristics and factors (patient-related, health-service related and socio-cultural) that may affect TB treatment outcome. The semi-structured questionnaire had options for the participants to choose from. Options given by the participants but were not listed was recorded as "others". Data was cleaned and analyzed using SPSS (Version 20, IBM, Illinois. USA). Frequencies and percentages have been summarized in tables. For predictive effects of factors, binary logistic regression was used and interpretations made based on odd ratios, with 95% confidence intervals and $p<0.05$ was considered statistically significant.

Ethics

Ethical clearance was obtained from the joint School of Allied Health Science and School of Medicine and Health Sciences Ethical Review Board (SAHS/SMHS), University for Development Studies, Tamale, Ghana. An introductory letter was obtained from the Head of Department of Public Health, University for Development Studies, Tamale, Ghana. Permission to access data at the Bole Health District Directorate was sought from the District Director of Health Services. Informed consent was sought from each participant. Confidentiality of information for each participant was maintained and respondents were informed and further assured that no person identifiers would be used for publication.

RESULTS

Socio-demographic characteristics of the study participants

A total of 95 patients were successfully recruited into the study (response rate= 90.5% [95/105]): with 70 patients in the successfully completed treatment group and 25 in the treatment default (unsuccessful completed) group (57 males and 38 females) as shown in Table 1. Those (10 defaulters) not recruited were due to change in location, contact phone not functional and not willing to be involved in the study. Of the 95 patients recruited, 2 (2.1%) were between the ages of 11 and 20 years whiles 24 (25.3%) were aged 51 years and above. Those below 40 years were in the majority (56.8%). The study also revealed that a total of 74 patients (77.9%) were married, 63 (66.3%) had no education, and 65 (68.4%) were from rural areas. Majority, (n=70, 73.7%) were employed with most (n=30, 31.6%) earning GHS 600 – 1000 (Ghana cedis) as annual income whilst a few earned more than GHS 2,000.00 (Ghana cedis) annually. Additionally, most (n=68, 71.6%) did not smoke and about half (n=50, 52.6%) took in alcohol (Table 1).

Patient-associated factors

Factors that were significantly related to the patient in affecting treatment outcome (with successful outcome as reference) are indicated in Table 2. In terms of age, patients <30 years were about 7.6 times more likely to be unsuccessful compared to patients >30 years (aOR=7.61, 95%CI [1.85 - 31.40], p = 0.005), Females were 4 times more likely to be unsuccessful compared to males (aOR=4.39, 95%CI [1.10 - 17.66], p = 0.037) and patients who experienced any side effect were 8.5 times more likely to be unsuccessful compared to those who did not experience any side effects (aOR=8.51, 95%CI [2.17 - 33.36], p = 0.002). Anti-TB drug side effects were reported by 30 (31.6%) of the patients. Most patients 36 (37.9%) reported headache, diarrhoea, nausea and vomiting among others as some of the side effects experienced. Employment status was initially significantly associated (crude OR=4.05, 95%CI [1.51 - 10.88], p = 0.006) with treatment outcome but this was lost with the adjustment (aOR=1.11, 95%CI [0.29 - 4.21], p = 0.882). However, patient related factors such as educational status, marital status, place of residence, level of annual income, place of treat-

ment center, smoking status and drinking of alcohol did not show any significant association with treatment outcome ($p > 0.05$) as shown in Table 2.

Health systems related factors

Of the health systems related factors considered in the analysis it was only 'giving of information about TB on diagnosis' that was significantly associated with the treatment outcome. This means that patients who were not giving information about TB on diagnosis were about 7 times more likely to be unsucessful (aOR=7.22 [95%CI] [1.4 - 37.27], p=0.018) as shown in Table 3. Regarding health education giving to patients about their condition, 87 (91.6%) thought they were given enough education including the cause, treatment and how to prevent close contacts from contracting the disease. Having a treatment supporter and having a form of supervision in the use of drugs were initially significantly associated with treatment outcome (crude OR=6.05 [95%CI] [2.07 – 17.93]; p=0.001), but this significant association was lost after adjusting for related factors (aOR=2.36 [95%CI] [2.36 (0.34 – 10.43; p=0.384). All other health systems factors considered did not show any significant association with the treatment outcome (Table 3). Furthermore, of the 95 patients, 83 (87.4%) thought the TB treatment center was convenient to them in terms of protecting their privacy, while some study participants 7 (77.8%) felt the treatment center was too far for them.

Socio-cultural beliefs, perceptions and attitudes of participants on causes and management of TB

To further determine what might have strengthened the cause of the default, the socio-cultural beliefs, perceptions and attitudes of the study subjects on the causes and management of TB was investigated. Causes of TB as reported by patients included witchcraft 6 (6.3%), transmission from an infected person 7 (7.4%) and acquired from place of work 13 (13.7%). There were, however, majority of patients 69 (72.6%) who did not know the cause of the illness at the early stages and could therefore not attribute the cause to anything else. Further investigation to assess participants' knowledge on type of illness they were suffering from revealed that 36 (37.9%) considered the condition as just an ordinary cough at the onset, 33 (34.7%) did not know exactly what was wrong with them whiles 9 (9.5%) thought they were suffering from malaria or fever. Six (6.3%) indicated they thought they were infected with HIV, 5 (5.3%) or suffering from a spiritual illness, and just 6 (6.3%) suspected TB (Table 4). To establish the relationship between patients' perception on the cause and type of illness and the management options, participants were asked what kind of remedy they sought after. Before reporting at the hospital to be diagnosed and treated of TB, majority 74 (77.9%) had visited Over-The–Counter (OTC) medicine sellers and other traditional healers to seek treatment. Of the 21 (22.1%) who first sought treatment at the health facility, only 2.0% were diagnosed during their first visit. When probed further, varied reasons were given for seeking treatment elsewhere; including no money for transportation to the health facility; believing that illness was due to spiritual attack; believe in the effectiveness of alternative medicine; influence of relatives and lack of knowledge about their illness. Patients' knowledge about their illness and its causes could also influence how quickly they sought remedies for their condition or default in treatment. It was observed that majority of the study participants 63 (66.3%) reported within 4 weeks of illness. Of these, 27/63 (66.3%) had successfully completed the TB treatment.

DISCUSSION

The control of TB largely depends on the successful treatment of patients. Evidence from many studies confirms that efforts to fight TB can be overwhelmed by socio-cultural/economic, clinical and institutional challenges. The study therefore sought to identify factors that affect TB treatment outcomes in the Bole District in the Savannah Region of Ghana. The study revealed that age, sex, side effect of the TB and information on the TB disease upon diagnosis are factors that affect the treatment outcomes in the study area.

Patient related factors

Females in this study were more likely to default in treatment (p=0. 037) which can be explained partly by the roles they play and the socio-cultural circumstances in which they find themselves. The women, who were mostly dis-empowered housewives helped their husbands on their farm, and for

Table 1: Socio-Demographic Characteristics of Respondents

Variable	Sub-group	Number of respondents (percentage), n (%)
Sex	Male	57 (60.0)
	Female	38 (40.0)
Age groups	11-20	2 (2.1)
	21-30	16 (16.8)
	31-40	36 (37.9)
	41-50	17 (17.9)
	51+	24 (25.3)
Educational status	No education	63 (66.3)
	Some formal education	32 (33.7)
Marital status	Single	21 (22.1)
	Married	74 (77.9)
Location of habitation	Rural	65 (68.4)
	Urban	30 (31.6)
Employment status	Unemployed	25 (26.3)
	Employed	70 (73.7)
Level of annual income (Ghana cedis)	Don't know	14 (14.7)
	<500	22 (23.2)
	600-1000	30 (31.6)
	1100-2000	22 (23.2)
	>2000	7 (7.4)
Do you smoke tobacco?	No	68 (71.6)
	Yes	27 (28.4)
Do you drink alcohol?	No	45 (47.4)
	Yes	50 (52.6)

Table 2: Patient Related Factors and their Associations with Pulmonary Tuberculosis Treatment Outcomes

Variable	Subgroup	Outcomes of treatment n (%)		Unadjusted Odds Ratio (95% CI)	p value	Adjusted Odds ratio [c]	p value
		Unsuccessful	Successful				
Age	>30 years	11 (61.2%)	7 (38.9%)	7.07 (2.33 - 21.47)	0.001*	7.61 (1.85 - 31.40)	0.005*
	<30 years	14 (18.2%)	63 (81.8%)	1		1	
Sex	Female	15 (39.5%)	23 (60.5%)	3,07 (1.19 - 7.87)	0.02*	4.39 (1.10 - 17.62)	0.037*
	Male	10 (17.5%)	47 (82.5%)	1		-	-
Educational status	None	20 (31.7%)	43 (68.3%)	2.51 (0.84 - 7.48)	0.098	-	-
	Some formal	5 (15.6%)	27 (84.4%)	1		-	-
Marital status[a]	Single	7 (33.3%)	14 (66.7%)	1.56 (0.54 - 4.45)	0.41	-	-
	Married	18 (24.3%)	56 (75.7%)	1		-	-
Place of residence	Rural	18 (27.7%)	47 (72.3%)	1.25 (0.46 - 3.44)	0.654	-	-
	Urban	7 (23.3%)	23 (76.7%)	1		-	-
Employment status	Unemployed	12 (48.0%)	13 (52.0%)	4.05 (1.51 - 10.88)	0.006*	1.11 (0.29 - 4.21)	0.882
	Employed	13 (18.6%)	57 (81.4%)	1		-	-
Level of annual income	<2000 cedis	16 (21.6%)	58 (78.4%)	0.69 (0.12 - 3.89)	0.674	-	-
	>2000 cedis	2 (28.6%)	5 (71.4%)	1		-	-
Where did you first go for treatment [b]	Inappropriate	21 (28.4%)	53 (71.6%)	0.59 (0.18 - 1.97)	0.395	-	-
	Appropriate	4 (19.0%)	17 (81.0%)	1		-	-
Experienced any side effect?	Yes	13 (43.3%)	17 (56.7%)	3.38 (1.30 - 8.29)	0.013	8.51 (2.17 - 33.36)	0.002*
	No	12 (18.5%)	53 (81.5%)	1		-	-
Ever smoked?	Yes	6 (22.2%)	21 (77.8%)	0.74 (0.26 - 2.11)	0.569	-	-
	No	19 (27.9%)	49 (72.1%)	1		-	-
Drinks alcohol?	Yes	11 (22.0%)	39 (78.1%)	0.63 (0.25 - 1.57)	0.316	-	-
	No	14 (31.1%)	31 (68.9%)	1		-	-

**Statistically significant; 1 indicates reference. n = number, % = percent, and CI = confidence interval. a Single respondent included those who have no partners, the widows and widowers as well as divorcees. b All health facilities apart from orthodox ones such as clinics and hospitals were considered as inappropriate. c Only independent variables that have p values < 0.05 were considered for the determination of the adjusted Odds ratios.*

Table 3: Health systems related factors and their associations with pulmonary tuberculosis treatment outcomes

Variable	Subgroup	Outcomes of treatment n (%)		Unadjusted Odds Ratio (95% CI)	p value	Adjusted Odds ratio	p value
		Unsuccessful	Successful				
Transportation cost to Health facility	> 6 cedis	14 (26.4%)	39 (73.6%)	1.01 (0.40 - 2.54)	0.98		
	< 6 cedis	11 (26.2%)	31 (73.3%)	1#			
Have a treatment supporter?	No	11 (57.9%)	8 (42.1%)	6.05 (2.07 - 17.93)	0.001 *	2.36 (0.34 - 16.43)	0.384
	Yes	14 (18.4%)	62 (81.6%)	1#			
Time spent at the Health facility	> 1 hour	4 (40.0%)	6 (60.0%)	2.03 (0.52 - 7.90)	0.306		
	< 1 hour	21 (24.7%)	64 (75.3%)	1#			
Form of supervision in the use of drugs	None	13 (52.0%)	12 (48.0%)	5.24 (1.92 -1 4.25)	0.001 *	3.14 (0.5 - 19.73)	0.222
	Someone [c]	12 (17.1%)	58 (82.9%)	1#			
Informed of disease on diagnosis?	No	3 (42.9%)	4 (57.1%)	2.25 (0.47 -10.85)	0.312		
	Yes	22 (25.0%)	66 (75.0%)	1#			
Given enough information about TB on diagnosis?	No	5 (62.5%)	3 (37.5%)	5.58 (1.23 - 25.43)	0.026 *	7.22 (1.4 - 37.27)	0.018*
	Yes	20 (23.0%)	67 (77.0%)	1#			
Do your community members know of your TB condition?	No	11 (26.8%)	30 (73.2%)	1.05 (0.42 - 2.63)	0.921		
	Yes	14 (25.9%)	40 (74.1%)	1#			
Was the TB treatment centre convenient for you	No	1 (10.0%)	9 (90.0%)	0.27 (0.03 - 2.28)	0.23		
	Yes	24 (28.9%)	59 (71.1%)	1#			

*[c] Such persons are relatives, friends and health care professionals. *Statistically significant ($p < 0.05$). 1# refers to the reference group.*

Table 4: Perception and management attitude by participants on TB disease

Variables	Treatment defaults N	Completed treatment n	TOTAL n (%)
Patients perception of the type of illness they were suffering			
Cough	9	27	36 (37.9)
Did not know	10	23	33 (34.7)
Fever/malaria	2	7	9 (9.5)
HIV	0	6	6 (6.3)
Others (spiritual problem)	2	3	5 (5.3)
TB	2	4	6 (6.3)
TOTAL	25	70	95 (100.0)
Places patients first sought health care			
Chemical shop	8	26	34 (35.8)
Health facility	4	17	21 (22.1)
Herbalist/traditional	6	7	13 (13.7)
Others	7	20	27 (28.4)
TOTAL	25	70	95 (100.0)

that matter were not financially sound to sustain the cost-burden of frequent transportation to the health facility. Moreover, the distances that had to be covered were quite long as they live in remote communities several kilometers away. In a male-dominated culture like the study setting, most women seek permission from their male partners who mostly are family heads before they seek health which includes visiting the facilities for medication or treatment. The finding, however, is in contrast with similar studies conducted elsewhere, where males rather than females were more likely to default treatment [17 - 20].

Other studies have shown that distance to treatment centers increases the odds in TB treatment default rate [21, 22], which was not observed in this study. Although some study participants reside outside the Bole district and had to travel long distances to the treatment center for their medication that did not affect the treatment outcome significantly. Our study indicated that employment status was initially significantly associated with default in treatment ($p = 0.006$) but this was no more when considered for the determination of the adjusted odds ratio ($p = 0.882$, table 2). Most of the patients were poor and unemployed which also adversely affected them in meeting the high cost of the long-distance transportation; hence delay in seeking treatment and/or defaulting. Meanwhile, a few studies have demonstrated the negative effect of poor socio-economic conditions of patients to treatment outcomes. For example, studies conducted in Georgia and Kenya found that low household income linked to unemployment was associated with poor treatment outcomes and a risk factor for TB treatment default [20, 23].

Older persons were observed to default in treatment, which was also observed in other studies [19, 24]. Access to health care is a main challenge to older persons for the fact that, most are not empowered financially, have no jobs, thus likely to be dependent on others. And considering the low economic status of the study subjects and the study area, they may not have enough resources to embark on the long distances to the treatment center, even though cost of treatment is free.

Side effects from the medications were observed to have some significant effect on the default rate in the treatment outcome. TB treatment involves burdening patients with several pills per day for the entire duration of treatment. This high pill burden may adversely affect patients' compliance to treatment. Medication side effects such as nausea and vomiting, painful legs, headache, skin rashes, numbness in the feet and diarrhoea were commonly experienced by patients, which probably, accounted for the significant association ($p=0.002$) with treatment default. The influence of side effect on treatment compliance has also been confirmed by some studies in countries like Kenya, Indonesia and South Africa [20, 25, 26]. What is more worrying is that some patients who experienced side effects from medications were silent about it but continued to go for their medication to give the impression that they were taking them. This docile attitude of patients receiving treatment may be attributed to inadequate education offered on the possible side effects of the TB medications including how to manage them.

The severity and unabated experience of side effects led some patients to stop taking the medication with the belief that it was not working. Others stopped because they felt better after a period, which was also reported in another study [25]. Ironically, it is expected that a patient feeling better after a period on medications should be a motivator to successfully complete their treatment, as feeling better reflects the effective working of the medications. Possibly, lack of adequate health education, especially, emphasizing the need for patients to take their medication for the stipulated period could be a reason.

Although substance use (i.e., alcohol and cigarette) was not a significant factor for unsuccessful treatment outcome in this study, there are several concerns or implications for a patient taking alcohol or smoking whiles on medicament. Alcohol use may lead to cell mediated immunosuppressive effects by reducing the T cell numbers, hence their function and also results in profound defects in Poly-Morpho Nuclear (PMN) leucocytes function [27]. For example, alcohol suppresses tissue recruitment of PMNs during infection and inflam-

mation, which can lead to increased susceptibility to bacterial infections. According to Ignaszewski [28], tobacco smoking is associated with many drug reactions; the same can be attributed to alcohol. Smoking and alcoholism also puts financial burden on substance abusers, which further contributes to the poverty cycle [27]. This is against the background that TB is a poverty related disease, and most patients are usually poor. Such patients may worsen their financial situation as they continue to smoke or drink alcohol. The poverty-stricken patients in this study were probably not consuming alcohol and smoking in high quantities, which may explain the lack of association between substance abuse and unsuccessful completion of treatment. Nevertheless, in one study alcohol abuse was identified as a risk factor for TB treatment interruption [29].

Health systems related factors

This study examined several health systems related factors including transportation cost to health facility, having a treatment supporter, time spent at the health facility, informed of disease on diagnosis, given enough information about TB on diagnosis and whether TB treatment center was convenient for the study participants, Table 3. Study participants not adequately informed about their TB diagnosis are seven (7) times more likely to default as compared to their counterparts who have had enough information (aOR [95%CI], 7.22 [1.40 – 37.27], p = 0.018). Clearly having adequate knowledge about a condition empowers the individual to take action to seek health or comply with a health intervention. This could be point for discussion in TB control programmes worldwide, to encourage or empower patients to report timely to a health care facility when one coughs for at least two weeks. TB control programmes further require that every patient under treatment have a treatment supporter to assist him or her take the medication.

The use of treatment supporters as DOT observers at home to patients, who remind and observe the patient take their medication and help to collect medication from the health facility for patients whenever the patient is unable to go to the health facility in person is recommended. This study has shown that patients without treatment supporters were not at risk of defaulting TB treatment (aOR = 2.36, p=0.384). Meanwhile, a study conducted in China found supervision of patient treatment by health workers contributed to treatment success [30]. In our study, some patients reported that their supporters played little or no role in their treatment because they (the supporters) had travelled or were living outside the home of the patient. Patients who did not have treatment supporters said they were not told by care providers to select a treatment supporter whiles others said that nobody agreed to be their treatment supporter. Refusing to be a treatment supporter for TB patients or staying outside the patient's home may be because of the stigma associated with the condition.

Majority of patients in the study were generally happy with how care providers received and treated them at the treatment center. Unfriendly attitude or harassment of patients by health care providers might make patients feel threatened and unwelcomed and could lead to default in treatment. TB treatment centers in Ghana have earlier been reported to be friendly as corroborated by a study conducted in the Central Region of Ghana, where patients rated as satisfactory the attitude of health workers at the TB clinic and reported that they were comfortable with the health staff and the services at the health facilities [22]. This motivated patients to comply with treatment. In contrast another study showed that patients thought health care providers were unfriendly, unsympathetic and showed no dignity to them [31].

Patients were generally comfortable with the Bole treatment center. They did not think their privacy was compromised in terms of where they collected their medication whenever they came for the drugs. Though they collected their medicines at the Bole District Hospital's pharmacy, they were not made to join the queue with other patients to collect drugs. Majority of the patients reported a less than an hour waiting time at the facility before being attended to. Although TB treatment is provided free to patients with the aim of reducing cost to them, most of the patients had to pay a substantial amount of money for transportation to the hospital to collect their drugs. They would have preferred to go to the nearest health facility in their various communities for their medication. This could have helped to save the money and time they use to

transport themselves to Bole for their medication. Therefore, stocking of TB medicines at all health facilities in the district may be necessary. The travel distance was not observed to be associated with default treatment, however, other studies report that defaulters attributed their status to the longer travelling distance and high cost involved in transportation to the health facilities for their medication [20, 25, 32].

Patients reported that medicines were generally available each time they visited the facility to collect their monthly stock. It can be said that the logistics supply system for medicines under the TB control programme was therefore satisfactory in the district. When asked about receipt of information about the disease and how to take the medicines and related side effects of the drug, majority of patients said they were given some form of education. However, it was significantly observed in our study that a number of the patients felt they were not given adequate education on the disease and drug side effects, as they would have wished to know. The adverse effects of not informing patients about drug side effects on treatment adherence have been widely reported [33]. It is therefore prudent to encourage more health education to patients at the point of putting them on treatment, so that they anticipate these side effects. It is also important that patients are told to report immediately to the health care provider any side effects were experienced, so that they can be managed appropriately as soon as they occur.

Socio-cultural beliefs, perception, and attitude by participants on causes and management of TB in relation to treatment default

It is suspected that socio-cultural beliefs, perception and attitude of individuals may influence default in TB treatment, hence the motivation in investigating this further and the impact it has on the default in TB treatment. About 60% of the patients studied reported to the health facility to seek for care within one month of onset of cough. Prior to attending an institutional health facility majority of the patients had either bought cough medicines at the chemical shop or visited a herbalist whiles others combined multiple sources including institutional health facilities. Seeking treatment from herbalists is a common practice throughout Ghana, and financial and cultural beliefs could account for this habit. This finding is consistent with the findings of other studies [5, 34], that patients went to herbalist when their condition started and only decided to go to the hospital upon the advice of relatives or friends. Other patients reportedly went to the health facility on several occasions before they were finally referred for laboratory test for TB. The finding means that the suspicion rate of health professionals for TB was low. This also accounts for the low TB case detection in the district and delays in the diagnosis of cases. This can cause frustrations in the suspected TB subjects and will not comply with the treatment regimen that may be suggested. The health culture may be implicated in the default in TB treatment. People's attitude towards the nature of a health problem, its cause and its implication has been a learned habit from their family, friends and neighbours. As observed by Rubel and Garro [35], sick people use their health culture to assign disease severity, organize sick subjects into a named syndrome, decide with whom to consult and for how long to remain in treatment. It is therefore not surprising that in this study high proportion (66.3%) went seeking for health care at least a month after onset of illness. The place of first visit by clients to seek for help was also influenced by the patient's perception about the type of illness and the cause of the illness.

Patients had varied perceptions about the illness they were suffering from. Spiritual problem, HIV, ordinary cough and malaria were some of the conditions that the patients perceived they had (Table 4). This made patients to visit the nearest chemical shop to buy cough medicine to treat their condition or to resort to traditional medicines including herbal concoctions or spiritual remedies to cure their illness whiles others visited health facilities. For many the tendency was to resort to health shopping,

seeking for remedies to their illness anywhere they thought they could get help [5]. This has been confirmed by other studies, where patients recognized their condition as ordinary cough, spiritual, malaria and so on, rather than TB [20, 34].

Social support and the role the community plays have remained important factors in patients' treatment. Some studies have established that family and other social support systems play a significant role in treatment adherence [5, 33, 35]. The negative attitudes toward TB patients by friends, family and community members were reported by patients, which made some patients unwilling to disclose their TB status. Fear of being isolated or stigmatized by friends and relatives as well as lack of trust for such people to maintain confidentiality about their TB status were some of the reasons given for not disclosing their status to them, and likely to influence their default rate. Several studies including this one have observed that patients were likely to hide their condition from others because TB is considered a dangerous disease, and people are reluctant to associate with sufferers. There has also been the negative impact of HIV related stigma on TB patients. All these contribute to high default rate in the TB treatment.

The issue of stigma even extends to the health care professional, where health workers did not want to work in TB clinics, thus consider posting to the TB clinic as a punishment [36]. This assertion partly can be blamed on the health authorities who in the past usually used posting of staff to the TB clinic as a disciplinary measure for supposed stubborn nurses or health workers. According to Amo-Ajei and Awusabo-Asare [36], colleagues of staff who worked at the TB clinic did not want to get closer to them, thinking they will be infected with the disease when they associated with them.

Despite these barriers a number of patients still managed to successfully complete their treatment course because they had support from their relatives and friends in the form of encouragement and sometimes financial in the form of bearing transportation costs. This study found that patients who successfully completed treatment were more likely to have family members or friends who provided them support including decision to go for treatment and discouraging non adherence. Same is reported by other studies [36, 37] where support were in the form of encouragement, financial and provision of food to TB patients as well as relatives going to collect medicines at the treatment center on their behalf.

In as much as factors associated with treatment outcome were demonstrated in this study, there were some limitations. Relatively low sample size, timing and duration of study were some limitation that might have affected the study output. Approximately 1/3 of the defaulters (10 out of 35) did not participate in the study because they could not be contacted, or did not agree to participate. Information from these 10 defaulters who did not participate in the study will have had an enormous impact on our findings but this is difficult to determine since we do not know the values of their factors (i.e. age, smoking status etc.). Nevertheless, the data generated in the current study can be useful for policy directives. The major challenges facing the National TB Control Program (NTP) in Ghana are low case detection due partly to under reporting from health facilities [7] and the issue of treatment non adherence. Many people with TB do not report to health facilities for treatment whilst those who even report to health facilities are not diagnosed as having TB and above all contact tracing and investigations are not routinely conducted.

CONCLUSION

This study has shown that the factors associated with non-compliance to TB treatment in the Bole District are age, sex, side effect of drug and whether patients have enough information about TB on diagnosis. The major area in the fight against TB is to enhance treatment compliance. This study, therefore suggests adequate health education to patients especially the older

ones and the females. Further studies are also recommended on larger sample size to substantiate the findings in the current study.

List of abbreviation
TB: Tuberculosis; WHO: World Health Organization; WHA: World Health Assembly; MDR-TB: Multi drug Resistant TB; HIV: Human Immunodeficiency Virus; DOT: Direct Observation Treatment; NTP: National Tuberculosis Control Programme.

Declaration
Availability of data and materials
All datasets on which the conclusions of the manuscript rely are deposited at the District Health Directorate, Health Information Unit, Bole, Savannah Region, Ghana.

Consent for Publication
Not Applicable

Competing Interest
The authors declare that they have no competing interests

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Authors' contribution
YE, RK participated in the design of the study, collected the data, performed the statistical analysis and drafted the manuscript. PAA participated in the design of the study, participated in the statistical analysis and helped to draft the manuscript. EPKA, MBS, RK, ABY, BEM and SAL contributed to data analysis and helped to draft the manuscript.

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