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Full Length Research Paper

Factors contributing to non-compliance with treatment among tuberculosis patients-Kassala State- Sudan-2016

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Tuberculosis is a global health problem. Sudan shoulders 8% of tuberculosis burden in the Eastern Mediterranean Region. Kassala State, in Eastern Sudan, is one of the most affected states with annual TB risk of 120 new cases per 100,000 of populations. Non-compliance to tuberculosis treatment is common, and is the most important cause of failure of initial therapy, relapse and emergence of multidrug resistant tuberculosis cases. The overall objective of this study was to determine the risk factors associated with non-compliance with TB treatment among TB patients in Kassala State. A cross-sectional study was conducted in Kassala State. The sample size mounted to 366 participants who were selected using simple random sampling technique. A standardized administered pre-tested, pre-coded questionnaire was used to collect the data. The questionnaire consisted of 10 sections with a total of 80 questions. A multivariate logistic regression analysis model was built using the enter method for the statistically significant variables at univariate analysis level taking P-value of 0.25 to determine the association between non-compliance and the study outcomes. 366 TB patients were included in this study, of whom 60 were treatment defaulters. TB patients aged 40 years and above, and those living in rural areas were found to be at higher risk of default with P-value 0.023 and 0.013 respectively. Lower education level and low income were also found to be significantly associated with treatment default with P-value 0.024 and 0.045 respectively. The study revealed that discontinuing treatment after feeling better (and wrongly perceiving it as cure) at the start of continuation phase was the most important predictor of treatment default with P-value 0.004. Non-compliance was found to be influenced by multiple factors including lack of patient knowledge and awareness about TB and its treatment (stopping treatment after feeling better), low education level, low income level and age and residence of the patient. It is necessary to educate patients about various aspects of tuberculosis and its treatment as it is the key intervention to lower the default rate. Moreover, effective supervision, close follow up and support for TB patients is crucial, particularly for those aged 40 years and above, living in rural areas and those of low education and income level.

Keywords: Tuberculosis, non-compliance, cross-sectional, Kassala State, Sudan.

INTRODUCTION

Tuberculosis (TB) is an infectious disease caused by Mycobacterium tuberculosis. The disease primarily affects lungs and causes Pulmonary Tuberculosis (PTB) (WHO, 2016a). It can also affect intestine, meninges, bones and joints, lymph glands, skin and other tissues of the body. The disease is usually chronic with cardinal features like persistent cough with or without expectoration, intermittent fever, loss of appetite, loss of weight, chest pain and hemoptysis (Park K, 2015).

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TB is one of the three primary diseases of poverty along with AIDS and malaria (Singh, A. R., & Singh, S. A, 2008 and Bhutta, Z. A., 2014). A third of the world's population is thought to be infected with M. tuberculosis, and new infections occur at a rate of about one per second (WHO, 2016b). When left untreated, each person with active TB disease will infect an average of 10 and 15 people every year and this will continue the TB transmission (WHO, 2004).

TB is a public health priority in Sudan (WHO, 2016c). Although the Sudan National Tuberculosis Control Programme (NTP) was established in 1993 (WHO, 2016c) and the directly observed short treatment strategy (DOTS) was declared all over the country in 2002, still the magnitude of TB is enormous (WHO, 2016c). The estimated prevalence of TB in Sudan in 2009 was 209 cases per 100,000 of the population and the incidence was 50,000 cases per year (WHO, 2010).

In 2010, Sudan was one of nine countries that contributed 95% of the TB burden in the Eastern Mediterranean Region, along with Pakistan, Afghanistan, Morocco, Somalia, Iraq, Egypt, Islamic Republic of Iran and Yemen (WHO, 2016d). Sudan alone carried 15% of the TB burden in the WHO Eastern Mediterranean Region (WHO, 2011). In 2011 the indicators of case detection rate and successful treatment rate in Sudan were 79.5% and 85% respectively (WHO, 2016c). In 2010, Sudan carried an estimated 8% of the total TB burden in the region, with around 119 per 10,000 cases detected (PHI, 2014). In same year, the estimated proportion of MDR-TB cases in Sudan among the new cases was 0.9%, and in previously-treated TB cases was 13.9% (WHO, 2016d). The estimated prevalence of HIV among new TB patients in Sudan ranged from 8%–14% (49). Recent research suggests that HIV/AIDS continues to spread in Sudan with the prevalence of HIV/AIDS likely to reach 1.2 per cent of the population by 2015, almost double what it was in 2009 (UNDP in Sudan, 2014).

According to WHO report 2014, Sudan is one of the seven countries with generalized HIV epidemics: Angola, Cameroon, Central African Republic, Chad, Congo, the Democratic Republic of Congo and Sudan, which in turn lead to an increase in TB cases (WHO, 2014). In the year 2015, the total number of notified TB cases in Sudan was 20,006. Incidence rate was 88 per 100,000. A round 640 TB patients died in the year 2015 (mortality rate was 1.6 per 100,000). Estimated MDR/RR-TB cases among notified pulmonary TB cases was 780 (WHO, 2016a).

In Eastern Sudan, particularly in Kassala State, tuberculosis is a major cause of morbidity and mortality. In 2012, the National Tuberculosis Programme (NTP), has revealed that Kassala was one of the most affected states in the country by the burden of TB, with annual risk of TB infection 120 new cases per 100,000 populations (Sudan National Tuberculosis Program, 2012). In this state, TB is fueled by the longstanding wars that erupted between Ethiopia and Eretria and exacerbated further by the huge influx of refugees from these two neighboring countries. This situation was further aggravated by the internally displaced people as a result of the Eastern Front conflict.

Non-compliance to treatment remains a major obstacle in the global fight against tuberculosis (WHO, 2003). The main barrier for achieving the desired TB treatment success rate is the high default rate; which has increased from 10% in the 2008 to 11.9 in 2010 (Zumla et al., 2013). In Sudan the treatment success rate remains static at a rate of 80% to 82%. In Kassala State the default rate is estimated by 11 and 16% if adding the transfers (National Tuberculosis Program, 2012). This figure is relatively high in comparison to the other countries in the region, which have default rates of 1%-13% that include transfers.

Reasons for non-compliance are complex and multifaceted involving more than the patients' personal characteristics, knowledge and attitude. Factors such as chronic nature of the disease, the socio-cultural context and poverty and interacting with physicians, nurses and other health care workers all affect access to and compliance to treatment (Sumartojo E, 1993).

Default is one of the unfavorable outcomes for TB patients and represents an important challenge for the control programme. Defaulter is a patient who has not taken anti-TB drugs for two months or more consecutively after starting treatment (India, RNTCP, 2005). Inadequate treatment compliance is considered as a potential cause of drug resistance (Sharma SK and Mohan A, 2006). In 2002, in the World Health Organization Africa Region, 11% of the new smear-positive pulmonary TB cases diagnosed were reported to have defaulted from treatment (WHO, 2004).

Studies in India and other developing countries have focused on various causes and risk factors for default. Gender, alcoholism, treatment after default, poor knowledge of tuberculosis, irregular treatment and socioeconomic status are some of the factors that were found to be associated with higher default rates (Jaiswal A et al., 2003 and Balasubramanian R et al., 2004).

Other factors related to the disease severity, chronicity and its long-time period of treatment, drugs side effects, and also patient's age, sex, residence, education, income, and along with service accessibility, provision, and quality have also been identified as reasons for non-compliance to TB treatment (Mishra P et al., 2006 and Gopi PG et al., 2007).

Several countries have surpassed the global target for TB treatment success rate of 85%. In 2010 the target for success has been raised by WHO to be 90% (WHO, 2016e). In Sudan, the success rate is still far below the target, mainly attributed to the high default rate, particularly in Kassala State (National Tuberculosis Program, 2012). Few studies were carried out in Sudan to investigate factors contributing to high default rate particularly among communities in eastern part. This

Table 1. Backgroundcharacteristics of the study participants.

Characteristics		Non-compliant		Compliant	
		No.	**%**	**No.**	**%**
Gender	**Male**	46	76.7	209	68.3
	Female	14	23.3	97	31.7
	Total	60	100	306	100
Residence	**Urban**	10	16.7	108	36.1
	Peri-urban	5	8.3	29	9.7
	Rural	45	75.0	162	54.2
	Total	60	100	306	100
Age in years	**10-20**	4	6.7	50	16.3
	21-29	4	6.7	47	15.4
	30-39	15	25.0	69	22.5
	40-49	16	26.7	55	18.0
	50-59	14	23.3	37	12.1
	60+	7	11.7	48	15.7
	Total	60	100	306	100
Educational level	**Illiterate**	28	46.7	112	37.1
	Khalwah	9	15.0	75	24.8
	Basic	18	30.0	94	31.1
	Secondary	5	8.3	18	6.0
	University & above	0	0.0	3	1.0
	Total	60	100	306	100
Current occupation	**Not working**	0	0.0	3	1.0
	Employee	0	0.0	1	0.3
	Skilled Laborer	1	1.7	3	1.0
	Unskilled laborer	23	38.3	23	8.0
	Professional	0	0.0	3	1.0
	Pensioned	0	0.0	3	1.0
	Merchant	0	0.0	2	.7
	Unemployed	13	21.7	36	12.6
	Housewife	12	20.0	69	24.1
	Casual work	8	13.3	56	19.6
	Student	1	1.7	22	7.7
	Shepherd/Farmer	1	1.7	33	11.5
	Other	1	1.7	32	11.2
	Total	60	100%	306	100%
Marital status	**Single**	7	11.7	106	34.6
	Married	46	76.7	194	63.4
	Divorced	3	5.0	0	0.0
	Widowed	4	6.7	6	2.0
	Total	60	100	306	100
Income	**Enough, plus saving**	0	0.0	4	1.7
	Enough, no saving	9	15.3	15	6.3
	Sometimes in debt	22	37.3	91	38.1
	Always in debt	28	47.5	129	54.0
	Total	59	100	239	100

study aimed to identify the most important factors influencing TB treatment default in Kassala state in eastern Sudan. The findings of this study could increase the body of knowledge on how to promote compliance with TB treatment and prevent default among TB patients. Moreover, the findings of this study will help TB control program in designing more effective policy that is directed specifically to mitigate the most important factors contributing to non-compliance and the overall result of treatment.

METHODS

The study design was a cross-sectional study with total number of participants mounted to 366 TB patients, registered in Kassala State during 2015 to 2016. The state lies in eastern part of Sudan, and includes 11 localities. A standardized administered pre-tested, pre-coded questionnaire was used to collect the data. Epi-info statistical package software was used to estimate the minimum required sample size with confidence interval

Table 2. Distribution of Logistic Regression Multivariate analysis of the factors associated with non-compliance with treatment.

Variable	P-value	OR	95% CI	
			Lower	**Upper**
Age of participants				
< 40 years	0.023	1.91	0.96	3.91
≥ 40 years				
Living in rural areas				
Yes	0.013	1.981	1.332	4.582
No				
Education level				
< secondary	0.024	2.41	1.16	4.69
≥ secondary				
Income is enough for living				
Yes	0.045	4.309	2.891	7.012
No				
Discontinued treatment after feeling better				
Yes	0.004	5.278	3.981	9.36
No				

level of 95%, at the power of 80%, p-value less than 0.05, and odds ratio 1.5. Data analysis was conducted using SPSS version 19.0.A multivariate logistic regression analysis model was used taking P-value of 0.25 at the univariate level as a cut-off point for inclusion in the main effect logistic regression model as proposed by senior statisticians (Hosmer J et al, 2013). The logistic regression model was used to calculate adjusted odds ratio.

RESULTS

Total number of participants included in this study was 366, of whom 60 were defaulters. Majority of them were males 255 (69.7%). Age of participants ranged from 10 to 80 years, with mean 39.27 and STD ± 16.34. More than half of the study population (51.7%) had their age below 40 years (Table 1).

After adjusting for other variables feeling better after medication at the start of continuation phase (and wrongly perceiving it as cure) was found to be the most strongly associated factor with the outcome (P-value 0.004). TB patients aged 40 years and above, and those living in rural areas were found to be at higher risk of default. Lower education and low income levels were found to be associated with the default (Table 2).

DISCUSSION

The study findings indicated that multiple factors contributed to non-compliance with TB treatment in Kassala State including; age, residence, inadequate knowledge about TB (wrongly perceiving feeling better as cure) and low socioeconomic status (particularly education level and income). In this study, the majority of the defaulters were males, and only 23.3% were females. This might be because females have less opportunities to access TB treatment centers, due to restriction in movement. Also, stigma might have a role in this; as females may hide their disease from husband and local communities to avoid divorce or isolation. This result is consistent with many studies; including study conducted in Malaysia in 1999, where 66% of defaulters were males, and in Hong Kong in 2003, where 75.6%of defaulters were males (Naing NN et al., 2001 and Chan-Yeung M et al., 2003). Also, the majority of defaulters were living in rural areas, and this finding tallies with a study conducted in India in 2015 (Shringarpure K. S et al 2015).

After adjusting for the other study variables, the age of study population was found to be significantly associated with non-compliance with TB treatment. Older patients aged 40 and above were found to have higher default rate. Similar result was observed in a study conducted in India, 2015, where most of the defaulters were adults aged 35 to 60 years (Gorityala S. B et al 2015).This might be because the older generation are less educated than the younger ones; thus they are less aware about TB and its treatment and the consequences of non-compliance.

Educational level of the participants was found to be significantly associated with the default rate. Participants with educational level lower than secondary school tended to default more frequently compared to those having educational level of secondary school and above. Education is a key factor in communicating the needed health information to TB patient. Patients with low level of education are more likely do not understand the details of health information pertaining to TB infection and its treatment and the consequences of non-compliance with the management protocol. Illiteracy was predominant among defaulters in Kassala State (46.7%). The result tally with studies conducted in 2010 and 2015 in India (Bhagat VM, Gattani PL 2010 and Gorityala S. B et al., 2015). Also, similar finding was observed in a study

conducted in 2007 in six Russian regions (Jakubowiak WM et al., 2007).

Having no enough income was strongly associated with non-compliance. As in many other developing countries, majority of the study population in this study were of low socioeconomic status and that may put patients in the position of having to choose between competing basic needs, and thus directing his/her limited available resources to meet the urgent ones, like provision of food to his extended family, or children or supporting their education. So, the chances for saving money to meet other cost like transportation to TB treatment centers would be very limited. Despite the fact that diagnostic services and drugs are free for patients in Kassala State, still the government support to TB patients to meet such types of hidden cost is crucial in the control of TB, and in reducing default rate in this state. The Kassala State Ministry of Health budget is overstretched to cover many competing priorities, and the resources for social support are scarce or unavailable. Similar findings connecting socioeconomic factors such as low income and low education levels to default from TB treatment were reported in some Sub-Saharan African countries (Demissie M, Kabede D 1994 and Dodor EA, Afenyandu GY 2005).

A considerably high number of patients discontinued treatment at the start of continuation phase soon after feeling better (wrongly perceiving it as cure). This finding might be related to lack of awareness or inadequate knowledge about TB infection and its treatment. Effective early TB patient education, close supervision and counselling are crucial measures to correct such misperception. These measures should be carefully considered at the start of continuation phase, because patients who are unaware might discontinue treatment when feeling improved. This finding was also observed in several studies conducted from 1994 to 2015 in Ethiopia (Demissie M, Kabede D 1994), Kenya (Muture BN et al., 2011), Ghana (Dodor EA, Godwin A 2005), Nigeria (Daniel OJ et al., 2006), India (Gupta S et al., 2011 and Gorityala S. B et al., 2015), Pakistan (Khan A, et al., 2000), Mexico (Menegoni L 1996) and Morocco (Slama K 2013).

Improving access to quality healthcare services should be enhanced through improving the system-wide strategies, building the capacity of human resources, strengthening budget, proper management, effective and efficient service delivery and information systems (WHO, 2006). A substantially high number of defaulters attributed their default to inadequate knowledge about TB, similar to findings reported in Madagascar (Comolet TM, 1998). Education is the key for transferring health information to TB patient.

CONCLUSION

Non-compliance was found to be mainly due to lack of patient knowledge and awareness about TB and its treatment (wrongly, perceiving feeling better after starting treatment as cure). TB patient education at the start of TB treatment is a crucial step in the management and will enhance patients' knowledge and awareness about TB and its treatment, and mitigate drugs side effects and minimize early default. Also, TB patients aged 40 years and above, and those living in rural areas who were at higher risk of default, should have more focused activities to keep their compliance to the treatment. TB patients of low socioeconomic status (i.e. those with education level below secondary school and low income) should be provided with more focused supervision, health education and support to enhance their compliance.

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