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ARTICLE

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Full Length Research Paper

Actual practice of healthcare providers towards prevention and control of Multidrug-resistant tuberculosis (MDR-TB) at Borumeda Hospital, Ethiopia

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Tuberculosis (TB) is the world's leading curable cause of infectious diseases mortality, with a disproportionate burden of the disease falling on low and middle income countries. In 2013, there was an estimated 9 million incident cases of TB globally and 1.5 million people died from the disease. The estimated number of cases occurred in Asia (56%) and Africa (25%), the incidence rates are highest, driven by high rates of HIV and malnutrition. Ethiopia is one of the high burden countries, reflected both in its TB incidence and the estimated rates of Multidrug-resistant tuberculosis (MDR-TB). With the occurrence of MDR-TB, little is known about the views of healthcare workers on this disease. The objective of this study was to assess the knowledge, attitudes and practices of healthcare professionals towards prevention and control of MDR-TB at Boru Meda General Hospital, South Wollo Zone, North central Ethiopia. A cross sectional study was conducted by means of a semi-structured, self-administered questionnaire that was sent to all healthcare workers. The questionnaires were collected at the study site from March 22 to April 23, 2014. In all, greater than half (80.85%) of the respondents had good level of knowledge about MDR-TB; and the overwhelming majority of them held positive attitude (76.60%) towards patients with MDR-TB. In totality, 31.91, 74.11 and 66.35% of the respondents reported that they had their own copy of MDR-TB management guidelines; they used the protective masks and they were individually involved in educating patients about MDR-TB, respectively. Greater than half of the respondents had good level of knowledge about MDR-TB, but some of them held negative attitude towards patients suffering from MDR-TB. The attitude did not influence practices, but having good level of knowledge was positively associated with safer practices such as using protective masks, educating patients on MDR-TB, and referring to the MDR-TB guidelines manual.

Key words: Tuberculosis, knowledge, healthcare provider, attitude, practice, disease control, tuberculosis program, multidrug-resistant tuberculosis (MDR-TB).

INTRODUCTION

Tuberculosis (TB) remains one of the world's deadliest communicable diseases. It causes illness among millions of people each year and is ranked as the second leading cause of death from an infectious disease worldwide

(Biadlegne et al., 2014). Multidrug-resistant tuberculosis (MDR-TB) is a form of drug-resistant TB in which *Mycobacterium tuberculosis* can no longer be killed by the two best antibiotics most commonly used to cure TB,

Isoniazid and Rifampicin. MDR-TB becomes an increasing threat to the global control of TB, as it complicates the management and control of the disease (Girma et al., 2015; Wondemagegn et al., 2015). Globally in 2013, an estimated 9.0 million people developed TB and 1.5 million died from the disease. Drug-resistant TB poses a major threat to control of TB worldwide and the proportion of new cases with MDR-TB was 3.5% in 2013. However, much higher levels of resistance and poor treatment outcomes are of major concern in some parts of the world (WHO, 2014). While most TB cases are in Asia, in Africa the incidence rates are highest, driven by high rates of HIV and malnutrition (Jain and Mondal, 2008).

Ethiopia is among the countries with the highest TB burden in the world (WHO, 2014). The annual TB incidence and prevalence of Ethiopia is estimated to be 247 and 470 cases per 100,000 (Biadglegne et al., 2014). These days, drug resistant TB has become a common problem and challenge in Ethiopia. Drug resistant TB is estimated as 1.6 and 12% among new and previously treated TB cases, respectively (WHO, 2014). The laboratory capacity in Ethiopia to diagnose MDR-TB is very limited. As a result, national estimates were based on incomplete data that suffer from representativeness since the reporting system is poorly developed, diagnostic criteria are usually non-standardized and many MDR cases go undetected (Abebe et al., 2012). Reports from different parts of Ethiopia suggest that the rate of drug resistant TB is highly variable across the country (Mitike et al., 1997; Asmamaw et al., 2008; Meskel et al., 2008; Agonafir et al., 2010). According to WHO, factors associated with the emergence of MDR-TB and their effects on the epidemiology of TB include inadequate treatment, irregular drug supply, inappropriate regimens and poor patient compliance. Primary resistance to anti-TB drugs occurs when a patient is infected with wild type *M. tuberculosis* which is resistant to anti-TB drugs. Acquired resistance to anti-TB drugs occurs when a patient is infected with susceptible forms of *M. tuberculosis*, which become resistant during treatment. Much higher rates of primary resistance have been observed in HIV-infected patients (WHO, 2014; Urassa et al., 2008).

Prevention of tuberculosis infection among healthcare workers (HCWs) lost attention after the introduction of chemotherapy. Important contributing factors to nosocomial tuberculosis transmission includes delayed diagnosis and ineffective treatment of patients with infectious tuberculosis, poor ventilation and air recirculation, inadequate infection-control and isolation

practices, and unrecognized multiple- drug resistance (Frank et al., 2007). Studies from varied settings indicate that the level of knowledge about TB is influenced by many factors including their areas of work, whether public or private sector (Al-Maniri et al., 2008; Vandan et al., 2009), identification of patients at high risk of TB, assessment for treatment outcome and consequences of treatment failure (Kiefer et al., 2009).

Studies reported that inadequate knowledge and understanding by clinicians of effective TB diagnosis and treatment actually led to an increase in MDR-TB (Loveday et al., 2008; Vandan et al. 2009). The practices implemented by HCWs in order to prevent cross-infection as well as prescribing practices vary from settings to settings. Studies conducted in USA and Britain showed that recent outbreaks of MDR-TB were due to bad clinical practices and therefore advocated for good clinical practices to minimize the impact of MDR-TB in the HIV era (Havward et al., 1995; Richardson, 2000). Moreover, studies show that gross lack of good practices of TB management (Ahmed et al., 2009), poor access to TB/MDR-TB information which includes the procedures that protect them from TB infection (Ronveaux et al., 1997).

Because MDR-TB is highly infectious and contagious, it poses a serious risk to people who came in contact with the patients suffering from it as well as to HCWs who treat them. It may be assumed that in general, healthcare workers know about MDR-TB and its implications, but there are very few studies that have looked beyond patient factors into the holistic organization and processes of MDR-TB service delivery. Hence, MDR-TB can be transmitted from patients to HCWs and vice versa. It is important to establish their opinions on what they are doing to control the transmission. As yet, healthcare workers are very important stakeholder in healthcare delivery and their opinion should be sought on important health issues affecting them and decision-makers consider the expressed opinions and the results of the assessment in order to design and implement relevant interventions. Hence, the aim of the study is to investigate the knowledge, attitude, and practices of healthcare professionals toward prevention and control of MDR-TB at Boru Meda general Hospital in north central Ethiopia.

METHODS

Study area and period

A cross sectional study was conducted from March to April 2014 at

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Table 1. Socio-demographic characteristics of HCWs at Boru Meda General Hospital (n=47).

Socio demographic variable		Frequency	Percent
Age category (years)	Less than 32	27	57.4
	32 and over	20	42.6
Gender	Male	29	61.7
	Female	18	38.3
Professional category	Nurses	21	44.7
	Pharmacists	9	19.1
	MLT*	5	10.6
	Midwives	3	36.4
	EHP**	3	6.4
	Medical doctors	2	4.
	Radiologists	2	4.3
	Optalmologists	1	2.1
Work experience category	Health officers	1	2.1
	Seven years or less	35	74.5
	Over 7 years	12	25.5
	Marital status	Single	24
Married		22	46.8
Divorced		-	-
Widowed		1	2.1

*MLT: Medical laboratory technologist; **EHP: Environmental health professional.

Boru Meda General Hospital. Boru Meda General Hospital is located approximately 411 km north part of Addis Ababa, the capital city of Ethiopia. Dessie town have 6 health posts, 8 health centers, one specialized referral hospital, one primary hospital, 3 general hospital and 56 drug retail outlets. As to be governmental health facilities, Boru Meda general Hospital serves ophthalmic care and MDR-TB treatment and care.

Data collection process

All the healthcare workers who work in Boru Meda General Hospital during the study period were included in the study. Data was collected by using semi-structured questionnaire which was designed to collect demographic variables as well as Knowledge, attitude and practice of healthcare workers towards the control of MDR-TB. All data collected were then coded, edited and entered to Statistical Package for the Social Sciences (SPSS), version 17.0 software and analyzed. Descriptive statics and Chi-Square tests were used to meet the stated objective.

Operational definition

- Good knowledge: Is the score of 7 and above out of 10 questions asked for assessing knowledge.
- Insufficient knowledge: Is the score below 7 out of 10 questions asked for assessing knowledge.

- Positive attitude: Is a good perception of HCPs for MDR-TB patients, its scored 3 and above out of 6 questions asked for assessing their perceptions.

- Negative attitude: Is untoward perception of HCPs for MDR-TB patients, its scored below 3 out of 6 questions asked to fill.

RESULTS

Socio-demographic characteristics

A total of 47 HCWs were included in the study of which 21 (44.7%) were nurse followed by Pharmacists and Medical laboratory technologist (MLT) which accounted for 9 (19.1%) and 5 (10.6%), respectively. The majority of the participants (51.1%) were single, while 46.8% were married, few were widowed and none were divorced (Table 1).

Knowledge

Half of the respondents aged less than 32 years had good level of knowledge about MDR-TB than their older counterparts, though the difference was not statistically

Table 2. Knowledge level of respondents about MDR-TB at Boru Meda General Hospital (n = 47).

Variable	Good knowledge	Insufficient knowledge	Total	Chi-square	p-value
	Frequency (%)	Frequency (%)	Frequency (%)		
Age category (years)					
Less than 32	24 (88.89)	3 (11.11)	27 (100)	1.57	0.21
32 and above	15 (75)	5 (25)	20 (100)		
Gender					
Male	27 (93.1)	2 (6.9)	29 (100)	5.50	0.019
Female	12 (66.67)	6 (33.33)	18 (100)		
Professional category					
Nurses	5 (23.81)	16 (76.19)	21 (100)	5.87	0.01
MLT	5 (100)	0	5 (100)		
Pharmacists	3 (33.33)	6 (66.67)	9 (100)		
Medical doctors	2 (100)	0	2 (100)		
EHP	3 (100)	0	3 (100)		
Health officers	1 (100)	0	1 (100)		
Midwives	3 (100)	0	3 (100)		
Optometrists	1 (100)	0	1 (100)		
Radiologists	2 (100)	0	2 (100)		
Work experience category					
7 years or less	11 (91.67)	1 (8.33)	12 (100)	0.86	0.035
Over 7 years	28 (80)	7 (20)	35 (100)		

significant. In contrast, females and those with over 7 years experience had insufficient level of knowledge than their counterparts ($P < 0.05$).

Similarly, all (100%) of medical doctors, MLT, midwives, optometrists, radiologists, and health officer had significantly good knowledge about MDR-TB as compared to less than half of the respondents among nurses, and pharmacists. In all, 80.85% of the respondents had good knowledge about MDR-TB. The mean knowledge score of the participants was 7.48 ± 1.43 out of 10 (Table 2).

Attitude toward MDR-TB patients

Majority of the respondents had positive attitude towards MDR-TB infected patients, only 23.40% having negative attitude. Although it is not significant, it can be seen that there was difference with regard to age category. Female respondents held more negative attitude than males (38.89 and 13.79%, respectively) ($P = 0.048$). In contrast based on the professional category, more doctors, optometrists, EHP, health officers, and midwives (100%) held positive attitude than nurses, pharmacists and MLTs but the difference was also not statistically significant. (Table 3)

Practices relating to MDR-TB infection control

Generally, 72.34% of the respondents reported that they used the protective masks when they are in contact with MDR-TB patients. This practice was influenced by the profession and work experience as well as the level of knowledge and attitude of respondents. Respondents with negative attitude practiced the use of masks more significantly than those with positive attitude ($p = 0.0274$). Similarly, respondents who had good knowledge about MDR-TB significantly wore their protective masks than those with insufficient knowledge ($p = 0.0395$) (Table 4).

With regard to educating patients about MDR-TB, 66.31% of the respondents stated that they were individually involved in educating patients about MDR-TB. Few pharmacists (33.33%) and none of the optometrists were involved in educating patient about MDR-TB (Table 5). Respondents referring to the MDR-TB management guidelines manual, 32.51% of them reported that they referred to it. This practice varied with some other characteristics of the respondents (Table 6).

DISCUSSION

Generally, more than half of the respondents had good

Table 3. Attitude of respondents about MDR-TB at Boru Meda General Hospital (n=47).

Variable	Positive attitude	Negative attitude	Total	Chi-square	p-value
	Frequency (%)	Frequency (%)	Frequency (%)		
Age category (years)					
Less than 32	21 (77.78)	6 (22.22)	27 (100)	0.49	0.824
32 and over	15 (75)	5 (25)	20 (100)		
Gender					
Male	25 (86.21)	4 (13.79)	29 (100)	3.902	0.048
Female	11 (61.11)	7 (38.89)	18 (100)		
Professional category					
Nurses	16 (76.19)	5 (23.81)	21 (100)	7.589	0.475
Pharmacists	7 (77.78)	2 (22.22)	9 (100)		
EHP	3 (100)	0	3 (100)		
Medical doctors	2 (100)	0	2 (100)		
MLT	2 (40)	3 (60)	5 (100)		
Optometrists	1 (100)	0	1 (100)		
Midwives	3 (100)	0	3 (100)		
Health officers	1 (100)	0	1 (100)		
Radiologists	1 (50)	1 (50)	2 (100)		
Work experience category					
7 years or less	29 (82.86)	6 (17.14)	35 (100)	2.998	0.083
Over 7 years	7 (58.33)	5 (41.67)	12 (100)		

knowledge about tuberculosis. Some deficiencies in knowledge were found with regard to questions about what constitutes MDR-TB, how it diagnosed and the duration of its treatment. This finding on the knowledge gaps is similar to the reports of the studies conducted by other investigators (Al-Maniri et al., 2008; Ahmed et al., 2009; Savicević, 2009; Vandan et al., 2009). Based on personal characteristics such as age, this study did not find any statistically significant difference among respondents with regard to their knowledge of MDR-TB. About 88.89% of participants aged less than 32 years had good knowledge about MDR-TB; since young age group professional mostly updating themselves with current situation and more familiar with the technology than the older counterpart. The corresponding figure in those over 32 years old was 75%. This suggests that increasing age did not contribute to increased knowledge. This was in contrast to Hashim et al. (2003) findings where age was significantly associated with good knowledge. Regarding the professional category, the majority of nurses and pharmacists had less level of knowledge as compared to medical doctors, laboratorists, optometrists, radiologists, health officers, environmentalists and midwives. Because the majority of nurses were under diploma level and did not get training about MDR-TB.

Regarding with the pharmacist, most of them did not give concern to learn more on MDR-TB, since they are not in contact with these patients most of the time. These findings concur with reports by other investigators (Hashim et al., 2003; Kiefer et al., 2009). Other important findings are that there was significant difference in the level of knowledge based on gender or number of years of experience. As stated earlier, although one would have expected that many years of work experience would translate in higher knowledge level; this was not the case in this study. It might be that the participants with longer years of experience did not see the need to update themselves about new developments on TB/MDR-TB, while their counterparts with less number of years of working experience were still eager to learn about the disease.

Findings from this study suggest that there were too much positive attitude towards patients with MDR-TB, as patients were not blamed for having brought this to themselves. This was in contrast to Yu et al. (2002) as well as Holtz et al. (2006) findings. It seems that the negative attitude was significantly influenced by personal characteristics of respondents. Female respondents held more negative attitude than males (38.89 vs. 13.79%, $p=0.048$). Moreover, respondents with more years of work experience held slightly more negative attitude

Table 4. Use of protective masks by respondents at Boru Meda General Hospital (n=47).

Variables	Used masks	Did not use masks	Total	Chi-square	p-value
	Frequency (%)	Frequency (%)	Frequency (%)		
Professional category					
Nurses	13 (61.9)	8 (38.1)	21 (100)	7.145	0.521
Pharmacists	7 (77.78)	2 (22.22)	9 (100)		
MLT	4 (80)	1 (20)	5 (100)		
Medical doctors	2 (100)	0.0	2 (100)		
Optometrists	1 (100)	0.0	1 (100)		
Radiologists	2 (100)	0.0	2 (100)		
Health officers	1 (100)	0.0	1 (100)		
Midwives	1 (33.33)	2 (66.67)	3 (100)		
EHP	3 (100)	0.0	3 (100)		
Work experience category					
7 years or less	26 (74.29)	9 (25.71)	35 (100)	0.259	0.611
Over 7 years	8 (66.67)	4 (33.33)	12 (100)		
Knowledge category					
Good knowledge	29 (74.36)	10 (25.64)	39 (100)	0.467	0.0395
Insufficient knowledge	5 (62.5)	3 (37.5)	8 (100)		
Attitude category					
Positive attitude	26 (72.22)	10 (27.78)	36 (100)	0.001	0.0274
Negative attitude	8 (72.72)	3 (27.27)	11 (100)		

($P>0.05$). The professional category of respondents had some influence on their attitude since more doctors, optometrists, environmentalists, health officers, and midwives (100%) held positive attitude than nurses, pharmacists, radiologists and medical laboratorists ($P=0.475$).

The guidelines in any country are supposed to guide the users in discharging their duties adequately. From this study, majority (96%) of the participants agreed that having MDR-TB guidelines assists them in managing MDR-TB patients. This finding is consistent with reports by other investigators (Hayward et al., 1995; Richardson, 2000; Hoa and Thorson, 2005; Gai et al., 2008; Ahmed et al., 2009). However, 61.5% of respondents reported having their own copy of the guidelines. This situation is alarming because guidelines are documents that every healthcare worker should possess in order to ensure quality services. This situation needs to be remedied by making the guidelines available to all healthcare workers in Ethiopia. With regard to the practice of using protective masks, 74.11% of respondents reported that they used the protective masks (N95) when they are in contact with MDR-TB patients. This level of practice is acceptable but it would have been better that all healthcare workers used the protective masks when dealing with MDR-TB

patients. This is particularly necessary for pharmacists, medical laboratorists, radiologists, and optometrists who traditionally are not provided with protective masks because they are not in longer contact with MDR-TB patients. Respondents with seven and less year experience (74.29%) wore protective mask when in contact with MDR-TB patients than their counterparts did. The findings from this study are in agreement with reports by Parmeggiani and co-workers who reported that HCWs who were with older than 7 year experience reported low compliance concerning standard precautions regarding hospital acquired infections including MDR-TB (Parmeggiani et al., 2010) since experience, makes careless mostly.

With regard to educating patients about MDR-TB, 66.4% of respondents stated that they were individually involved in educating patients about MDR-TB. This was partially similar to the report by Kiefer et al. (2009). In contrast, health officers, environmentalists and radiologists were the most involved in educating patients as well as more than 50% of medical laboratorists and nurses and those with insufficient knowledge were less likely to be involved in educating patients about MDR-TB since at least 35% of them reported not being involved. 32.51% of respondents reported that they referred to the

Table 5. Respondents' involvement in educating patients about MDR-TB at Boru Meda general Hospital (n=47).

Variable	Involved in education	Not involved in education	Total	Chi-square	p-value
	Frequency (%)	Frequency (%)	Frequency (%)		
Professional category					
Nurses	15 (71.43)	6 (28.57)	21 (100)	12.474	0.131
MLT	4 (80)	1 (20)	5 (100)		
Pharmacists	3 (33.33)	6 (66.67)	9 (100)		
EHP	3 (100)	0	3 (100)		
Health officers	1 (100)	0	1(100)		
Radiologists	2 (100)	0	2 (100)		
Medical doctors	2 (100)	0	2 (100)		
Midwives	1 (33,33)	2 (66.67)	3 (100)		
Optometrists	0	1 (100)	1 (100)		
Work experience category					
7 years or less	21 (60)	14 (40)	35 (100)	2.167	0.141
Over 7 years	10 (83.33)	2 (16.67)	12 (100)		
Knowledge category					
Good knowledge	28 (71.8)	11 (28.2)	39 (100)	3.477	0.062
Insufficient knowledge	3 (37.5)	5 (62.5)	8 (100)		
Attitude category					
Positive attitude	24 (66.67)	12 (33.33)	36 (100)	0.034	0.853
Negative attitude	7 (63.64)	4 (36.36)	11 (100)		

MDR-TB management guidelines. This was in contrast to the report of Richardson (2000). With regard to assessed knowledge, respondents with good level of knowledge reported that they referred to the manual not significantly than those with insufficient level (28.21 vs. 25%, $P=0.854$). In contrast, those with negative attitude referred more to the guidelines manual than those with positive attitude though the difference was not statistically significant ($P>0.05$). This is worrying because the majority of these respondents had stated that guidelines were needed for them to perform adequately. This finding is consistent with reports by Cabana and colleagues who reported that a good number of practitioners fail to comply with clinical practice guidelines. However, it could be that because they did not have their own copy of the guidelines that is why they could not refer to them (Cabana et al., 1999).

The findings from this study show two scenarios: The first is that, having good level of knowledge about MDR-TB was associated with good practices such as the use of protective masks ($P=0.0395$) and MDR-TB guidelines and involvement in educating patients about MDR-TB, though not statistical. The second scenario is that the

attitude of respondents towards patients suffering from MDR-TB did not influence their practices. On one hand, respondents with negative attitude practiced the use of protective masks ($P=0.0274$) and referred to the MDR-TB guidelines a little more than those with positive attitude, although the difference was not statistically significant. On the other hand, respondents with positive attitude were slightly more involved in educating patients about MDR-TB than those with negative attitude but the difference was also not statistically significant. These findings from this study are similar with reports that hold the view that knowledge shapes attitude and attitude influences behaviour (Moloi, 2003).

Limitations of the study

Despite a high response rate of over 90%, the sample size of respondents is still small in order to ascertain whether some of the differences reported as not statistically significant could have been significant if the sample was bigger. Moreover, the questionnaires were given to HCPs to fill it in their homes, they might have

Table 6. Reference to MDR-TB Management guidelines by respondents at Boru Meda General Hospital (n=47).

Variable	Refer to guidelines	Do not refer to guidelines	Total	Chi-square	p-value
	Frequency (%)	Frequency (%)	Frequency (%)		
Professional category					
Nurses	5 (23.81)	16 (76.19)	21 (100)	12.857	0,117
Pharmacists	2 (22.22)	7 (77.78)	9 (100)		
MLT	1 (20)	4 (80)	5 (100)		
Medical doctors	0	2 (100)	2 (100)		
EHP	2 (66.67)	1 (33.33)	3 (100)		
Radiologists	2 (100)	0	2 (100)		
Health officers	1 (100)	0	1 (100)		
Midwives	0	3 (100)	3 (100)		
Optometrists	0	1 (100)	1 (100)		
Work experience category					
7 years or less	11 (31.43)	24 (68.57)	35 (100)	0.973	0.324
Over 7 years	2 (16.67)	10 (83.33)	12 (100)		
Knowledge category					
Good knowledge	11 (28.21)	28 (71.79)	39 (100)	0.034	0.854
Insufficient knowledge	2 (25)	6 (75)	8 (100)		
Attitude category					
Positive attitude	9 (25)	27 (75)	36 (100)	0.544	0.461
Negative attitude	4 (36.36)	7 (63.64)	11 (100)		

used reference and over estimation of knowledge, attitude and practices were expected. Beyond this, given the cross-sectional design employed, it is not possible to establish causal relationships due to the lack of a temporal link.

At last, the study was undertaken in Borumeda General Hospital that is selected to give tuberculosis control service in the country, and the result may not be representative of the whole country.

Conclusion

In conclusion, the results of this study indicate that generally, greater than half of the respondents had good level of knowledge about MDR-TB; and the overwhelming majority of them held positive attitude towards patients with MDR-TB. The level of knowledge influenced their practices, having good level of knowledge about MDR-TB was associated with good practices such as the use of protective masks and MDR-TB guidelines and involvement in educating patients about MDR-TB. Moreover, the finding also showed that the attitude of respondents towards patients suffering from MDR-TB did not influence their practices.

Conflict of interests

The authors have not declared any conflict of interests.

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