

Full Length Research Paper

Assessment of knowledge, attitude and practices of healthcare workers about prevention and control of multidrug-resistant tuberculosis at Infectious Diseases Hospital Kano, Nigeria

Ahmad Salisu Aliyu^{1*}, Hafsat Usman², Haruna Alhaji Bura², Auwalu Yahaya² and Nuru Yakubu Umar²

¹Medical Laboratory Department, Infectious Diseases Hospital (IDH), Kano State, Nigeria.

²College of Nursing and Midwifery, Bauchi State, Nigeria.

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Tuberculosis is one of the major public health problems in Kano. With the occurrence of multi-drug resistant tuberculosis, little is known about the views of health care workers on this disease. The aim of this study was to investigate the knowledge, attitudes, and practices of healthcare professionals about prevention and control of Multi-Drug Resistant Tuberculosis (MDR-TB) at Infectious Diseases Hospital (IDH), Kano, Nigeria. A cross-sectional study was conducted at Infectious Diseases Hospital (IDH), Kano, Nigeria from November, 2018 to December, 2018. Data was collected using a pretested structured questionnaire. The data obtained were analyzed using SPSS software package (SPSS 16.0). Descriptive analysis was performed to obtain the frequency distribution of the variables. The results of this study indicate that, overall, less than half (68%) of respondents had good level of knowledge of MDR-TB; but the overwhelming majority of them held negative attitude towards patients with MDR-TB. In conclusion, less than half of respondents had good level of knowledge about MDR-TB, but 28.7% of them held negative attitude towards patients suffering from MDR-TB. Although the level of knowledge of MDR-TB was found not to have influenced the attitude of respondents towards patients suffering from MDR-TB; and that their attitude did not influence practices, 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. An educational remedial intervention and in-service training on the MDR-TB is recommended for all professionals especially primary health care workers.

Key words: Multi drug- resistant, extensively drug-resistant, tuberculosis, health care workers

INTRODUCTION

Tuberculosis (TB) is an infectious disease caused by *Mycobacterium tuberculosis* (MTB), which is transmitted through the air or by ingesting infected milk or meat (Bovine TB) and it is both preventable and curable

(Caminero, 2003; WHO, 2006a). *M. tuberculosis* is carried in airborne particles, Infectious droplet nuclei are generated when persons who have pulmonary or laryngeal TB disease cough, sneeze, shout, or sing.

Depending on the environment, these tiny particles can remain suspended in the air for several hours. *M. tuberculosis* is transmitted through the air, not by surface contact. Transmission occurs when a person inhales droplet nuclei containing Mycobacterium. *Tuberculosis* and the droplet nuclei traverse the mouth or nasal passages, upper respiratory tract, and bronchi to reach the alveoli of the lungs (CDC, 2003).

Globally the World Health Organization (WHO) estimates that almost 9 million new patients develop TB each year, and that 1.8 million people died from TB globally in 2008 (WHO, 2009). TB has a huge impact on patients, families and their communities through spending on diagnosis, treatment, transport to and from the health facilities and time lost from work (WHO, 2006b). However, if TB is detected early and fully treated, people with the disease quickly become non-infectious and are eventually cured (Caminero, 2008).

Multidrug-resistant tuberculosis (MDR-TB) is tuberculosis due to organisms which show high-level resistance to both isoniazid and rifampicin, with or without resistance to other anti-TB drugs. The molecular basis of resistance to isoniazid and rifampicin (and some other drugs) is now largely understood (Table 1). Resistance to isoniazid is due to mutations at one of two main sites, in either the *katG* or *inhA* genes (Zhang et al., 1992; Piatek et al., 2000).

Resistance to rifampicin is nearly always due to point mutations in the *rpo* gene in the beta subunit of DNA-dependent RNA polymerase. These mutations are not directly connected, and so separate mutations are required for organisms to change from a drug-susceptible isolate to MDR-TB (Piatek et al., 2000).

Drug-resistant tuberculosis (DR-TB) threatens global TB control and is a major public health concern. In 2016, the World Health Organization (WHO) reported 10.4 million new TB cases worldwide; 3.9% were estimated to have had rifampicin- or multidrug-resistant tuberculosis (MDR/RR-TB) (Companion, 2014). Nigeria is one of the high TB burden countries and the national DR-TB survey reported the prevalence of MDR-TB in Nigeria as 2.9% of new TB cases and 14.3% of retreatment cases (Companion, 2014). There has been an increasing trend in MDR-TB in both new and retreatment cases in country (Companion, 2014).

The World Health Organization estimates that 480,000 new cases of multidrug-resistant tuberculosis (MDR-TB), tuberculosis resistant to at least isoniazid and rifampicin, occurred in 2014 (Global, 2015). Of these, an estimated 8.7% had extensively drug-resistant tuberculosis (XDR-

TB), defined as MDR-TB with additional drug resistance to at least one Fluoroquinolone and a second-line injectable drug. Effective management of drug-resistant tuberculosis requires prevention, case detection, care and treatment, surveillance, drug management, and monitoring and evaluation of program performance. These activities should be coordinated by national TB control programs, and are referred to collectively as the "programmatic management of drug-resistant tuberculosis" (PMDT) (GPMĐT, 2008).

Guidance from WHO on PMDT has been available since 2006, and updated guidance based on new research, technology, and expert opinion has become available over the past decade. (Guidelines for WHO TB, 2006, 2008) Unfortunately, progress on the scale up of PMDT has been decidedly slow. Despite an increase in the number of persons with MDR-TB detected, from 46,897 in 2009 to 122,618 in 2014, approximately 75% of TB patients estimated to have MDR-TB were still not detected in 2014 (Global Tuberculosis Report, 2013, 2015). Treatment scale up lags far behind the Stop TB Partnership's Global Plan targets to treat 1.6 million MDR-TB and XDR-TB patients by 2015, with only 110,803 (23.0%) of estimated incident cases of MDR-TB and 4,044 (8.7%) of estimated incident cases of XDR-TB reported to be enrolled on treatment during 2014 (WHO TB, 2011). The diagnostic and treatment "gaps" mean that many cases of MDR-TB are neither being identified nor treated, contributing to the further spread of MDR-TB. The consequences of these gaps can be seen in regions reporting increasing rates of MDR-TB among new TB patients (Global Tuberculosis Report, 2013). Although evidence from resource-limited settings on the effectiveness and feasibility of PMDT has provided a foundation for guidance, many knowledge gaps still remain. In 2016, the World Health Organization (WHO) reported 10.4 million new TB cases worldwide, 3.9% were estimated to have had rifampicin- or multidrug-resistant tuberculosis (MDR/RR-TB) (WHO, 2014).

The emergence of drug resistance in *M. tuberculosis* has been associated with a variety of management, health provider and patient related factors. These include (i) deficient or deteriorating TB control programmed resulting in inadequate administration of effective treatment; (ii) poor case holding, administration of sub-standard drugs, inadequate or irregular drug supply and lack of supervision; (iii) ignorance of health care workers in epidemiology, treatment and control; (iv) improper prescription of regimens; (v) interruption of chemotherapy due to side effects; (vi) non-adherence of patients to the

*Corresponding author. E-mail: salisuahmadaliyu@yahoo.com.

Table 1. Genetic site for drug resistance in tuberculosis.

Drug	Target	Gene
Isoniazid	Catalase-peroxidase enzyme	<i>KatG</i>
Isoniazid-ethionamide	Mycolic acid synthesis	<i>InhA</i>
Rifampicin	RNA polymerase	<i>RpoB</i>
Streptomycin	Ribosomal S12 protein	<i>RpsL</i>
	16S Rrna	<i>Rrs</i>
Quinolones	DNA gyrase	<i>GyrA</i>

prescribed drug therapy; (vii) availability of anti-TB drugs across the counter, without prescription; (viii) massive bacillary load; (ix) illiteracy and low socio economic status of the patients; (x) the epidemic of HIV infection; (xi) laboratory delays in identification and susceptibility testing of *M. tuberculosis* isolates; (xii) use of non-standardized laboratory techniques, poor quality drug powders and lack of quality control measures; and (xiii) use of anti-TB drugs for indications other than tuberculosis (Paramasivan and Venkataraman, 2004).

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 health care workers (HCWs) who treat them. Although it may be assumed that in general HCWs know about MDR-TB and its implications, several studies from around the globe have found that HCWs do not always exhibit sufficient knowledge, positive attitudes, and acceptable practices regarding preventing and treating MDR-TB (Moloi, 2003; Laserson et al., 2007; Al-Maniri et al., 2008; Loveday et al., 2008; Kiefer et al., 2009; Vandan et al., 2009). However, no study has been shown to be conducted and published about the knowledge, attitudes, and practices of health care workers who manage MDR-TB patients at Infectious Diseases Hospital (IDH), Kano, Nigeria. Therefore the aim of the study was to assess the knowledge, attitude, and practices of healthcare professionals about prevention and control of Multi-Drug Resistant Tuberculosis (MDR-TB) at Infectious Diseases Hospital Kano, Nigeria.

METHODOLOGY

Study design

A cross-sectional study was adopted a self-administered questionnaire was used.

Study setting

Infectious Diseases Hospital is the only referral hospital for MDR-TB in Kano. It is a referral center located along France road in Kano

metropolis. The hospital offers the following services: taking care of in-patients in the wards, running out-patients clinics including the implementation of special programs such as tuberculosis and MDR-TB management. It also serves as training center for health care workers who are managing Multi-Drug Resistant Tuberculosis (MDR-TB) in Kano. Other health care workers from other African countries are being sent for training on MDR-TB also at this hospital.

Study population

The study population involved 248 Health Care Workers (HCWs) working at Infectious Diseases Hospital. It includes medical doctors, medical laboratory scientist, nurses, pharmacists, and primary health care (PHC). Hence making a total study population of 248 HCWs from which the sample was drawn.

Sample size determination

In this study, manual calculation of the sample size using Morgan and Krejcie (1970) formula was used for sample size determination as stated below:

$$S = \frac{X^2 NP (1-P)}{d^2 (N-1) + X^2 P (1-P)}$$

Where, S = required sample size, X^2 = the table value of the chi-square at desired confidence (3.841), N = study population size (248), P = population proportion assumed to be 0.50 since this would provide maximum sample size, d^2 = degree of accuracy of the result expressed as proportion:

Data collection and quality control techniques

Quantitative research methods were employed to assess the knowledge, attitude and practices of Health Care Workers (HCWs) on Multi-Drug Resistant Tuberculosis (MDR-TB) at infectious disease hospital (IDH). A structured questionnaire was also used to collect the quantitative data from HCWs, who were enrolled from November to December, 2018. The quantitative questionnaire was pretested for validity and reliability and appropriate modifications were made to ensure that quality data are collected as in completeness before data entry. Moreover, there was no sampling, so the risk of selection bias was eliminated. In order to minimize information bias and social desirability bias, the self-administered

Table 2. Socio demographic characteristics of the study population.

Characteristics	Number (n=150)	Percent (%)
Sex		
Male	110	73.3
Female	40	26.7
Age (years)		
18-25	37	24.7
26-33	38	25.3
34-41	36	24
42-49	34	22.7
50+	5	3.3
Marital status		
Married	95	63.3
Single	40	26.7
Divorce/separated	10	6.7
Widowed	5	3.3
Profession		
Medical doctors	5	3.3
Medical lab scientist	34	22.7
Nurses	38	25.3
Pharmacist	36	24
Primary health care	37	24.7
Working experience		
Five years or less	35	23.3
Over 5 years	115	76.7

questionnaire was anonymous.

Data analysis

Data were analyzed using Statistical Package for Social Science (SPSS) software version (16.0) at that time with the help of the Statistician. The descriptive statistical method was used to analyze frequencies and percentages.

Ethical considerations

This study was conducted only after obtaining approval from Infectious Diseases Hospital (IDH) Kano, Research Ethics Committee.

RESULTS

A total of 150 healthcare workers (HCW) were

interviewed, giving 100% response rate. Of the study subjects, 110 (73.3%) and 40 (26.7%) were males and females respectively. Among all, 38 (25.3%) of healthcare workers were 26-33 years of age. 95 (63.3%) of healthcare workers were married, 40 (26.7%) were currently single, 10 (6.7%) divorced, and 5 (3.3%) healthcare workers were widowed (Table 2). The socio-economic characteristics of the study showed that, among all healthcare workers, nurses constituted the majority of participants 38 (25.3%) and 115(76.7%) of respondents had over five years working experience (Table 2).

Knowledge of healthcare workers related to MDR-TB was examined. Accordingly, it was shown that the majority (18.7%) of Medical Laboratory Scientist had significantly good knowledge about MDR-TB as compared to less than half of respondents among nurses, pharmacists and primary health care. The areas where incorrect answers were given by respondents were about

Table 3. Knowledge level of respondents about MDR-TB (n=150).

Characteristics	Number (n=150)	Percent (%)
Good knowledge		
Medical doctors	3	2
Medical lab scientist	28	18.7
Nurses	25	16.7
Pharmacist	26	17.3
Primary health care	20	13.3
Insufficient knowledge		
Medical doctors	2	1.3
Medical lab scientist	6	4
Nurses	13	8.7
Pharmacist	10	6.7
Primary health care	17	11.3

Table 4. Attitude of respondents about MDR-TB (n=150).

Characteristics	Number (n=150)	Percent (%)
Positive attitude		
Medical doctors	4	2.7
Medical lab scientist	32	21.3
Nurses	26	17.3
Pharmacist	23	15.3
Primary health care	22	14.7
Negative attitude		
Medical doctors	1	0.7
Medical lab scientist	3	2
Nurses	13	8.7
Pharmacist	12	8
Primary health care	14	9.3

what constitutes MDR-TB, how it is diagnosed, and the duration of treatment (Table 3).

Majority (71.3%) of respondents had positive attitude towards MDR-TB infected patients; only 28.7% had a negative attitude (Table 4).

Overall, 89.9% of health workers reported that they used the protective masks (95), when they are in contact with MDR-TB patients. This practice was influenced by the age, gender, the professional category as well as the knowledge level and attitude of respondents (Table 5).

With regard to educating patients about MDR-TB, overall, 66.4% of respondents stated that they were individually involved in educating patients about MDR-TB (Table 6). This involvement differed with age, gender,

and other characteristics. In contrast, Medical Lab Scientists were most (21.3%) involved in educating patients. Respondents with good knowledge about MDR-TB were more involved in educating patients about the disease as compared to those with insufficient knowledge.

With regard to referring to the MDR-TB management guidelines manual, few of the primary health care referred to the MDR-TB guidelines, but majority (68%) of medical doctors, medical laboratory scientist nurses and pharmacists reported doing so.

This practice varied with some other characteristics of the respondents. Based on the assessed level of knowledge, respondents with good level of knowledge

Table 5. Use of protective masks by respondents (n=150)

Characteristics	Number (n=150)	Percent (%)
Used mask		
Medical doctors	5	3.3
Medical lab scientist	33	22
Nurses	35	23.3
Pharmacist	32	21.3
Primary health care	30	20
Did not used mask		
Medical doctors	0	0
Medical lab scientist	1	0.7
Nurses	3	2
Pharmacist	4	4.07
Primary health care	7	

Table 6. Respondents' involvement in educating patients about MDR-TB (n=150).

Characteristics	Number (n=150)	Percent (%)
Involved in educating		
Medical doctors	4	2.7
Medical lab scientist	32	21.3
Nurses	28	18.7
Pharmacist	26	17.3
Primary health care	23	15.3
Did not involved		
Medical doctors	1	0.7
Medical lab scientist	2	1.3
Nurses	10	6.7
Pharmacist	10	6.7
Primary health care	14	9.3

reported that they referred to the manual more significantly than those with insufficient level. With regard to other characteristics, respondents with more than 5 years of work experience referred more to the guidelines than their counterparts (Table 7).

DISCUSSION

Demographic distribution

Majority of participants were young adults (26-33 years old); only three respondents were over 50 years old. These characteristics were slightly similar to the findings by Ahmed et al. (2009) in their own study. Pertaining to the gender participants, as shown in Table 2, 73.3% of

the participants were male compared to female participants of 26.7%. Nurses constituted majority of participants (25.3%). This was similar to the report by Kiefer et al. (2009), in which majority of the participants in their study were also female. The other professional categories were medical doctors (3.3%), medical laboratory scientists (22.7%), pharmacists (24%) and the primary health care (24.7%). The finding that the majority of participants was female and nurses is consistent with the distribution of healthcare professionals based on the gender within Kano.

Knowledge about MDR-TB

Overall, less than half of respondents had good

Table 7. Reference to MDR-TB Management guidelines by respondents (n=150).

Characteristics	Number (n=150)	Percent (%)
Refer to guidelines		
Medical doctors	5	3.3
Medical lab scientist	33	22
Nurses	30	20
Pharmacist	27	18
Primary health care	7	4.7
Did not refer to guidelines		
Medical doctors	0	0
Medical lab scientist	1	0.7
Nurses	8	5.3
Pharmacist	9	6
Primary health care	30	20

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; Kiefer et al., 2009; Savicević, 2009; Vandan et al., 2009).

Based on the professional category, majority of nurses, and pharmacists had less level of knowledge as compared to medical doctors. This disparity was even more pronounced amongst primary health care as 11.3% of them had insufficient knowledge about MDR-TB. These findings concur with reports by other investigators (Hashim et al., 2003; Kiefer et al., 2009); but they raise some concerns in that primary health care who were involved in educating patients about tuberculosis were themselves not so much knowledgeable. Clearly, there is a need for them to be educated on tuberculosis and MDR-TB. Other important findings are that there was no significant difference in the level of knowledge based on gender or number of years of experience as shown in Table 3. 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.

Attitudes of health care workers (HCWs) toward MDR-TB patients

Findings from this study suggest that there is still

negative attitude towards patients with MDR-TB, as patients are blamed for having brought this to themselves; 28.7% of respondents had this negative attitude. Yu et al. (2002) as well as Holtz et al. (2006) reported similar findings.

It seems that the negative attitude was not significantly influenced by personal characteristics of respondents. There was no difference with regard to age category, but female respondents held more negative attitude than males. Moreover, respondents with more years of work experience held slightly more negative attitude as well as those who had good level of knowledge about MDR-TB but in both cases, these differences were not statistically significant.

Health care workers (HCWs) practices relating to MDR-TB infection control

The guidelines in any country are supposed to guide the users in discharging their duties adequately. From this study, the majority (68%) of the participants agreed that having MDR-TB guidelines will assist them in managing MDR-TB patients.

This finding is consistent with reports by other investigators (Havward et al., 1995; Richardson, 2000; Hoa et al., 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. Although no comparative figures on MDR-TB guidelines were found, Zungu et al. (2009) reported that 16.5% of Nigerian health care professionals reported owning a copy of the antiretroviral treatment guidelines. This situation needs to be remedied by making the guidelines available to all healthcare workers in Kano.

With regard to the practice of using protective masks, overall, 89.9% of respondents reported that they used the protective masks (N95 or N100) when they are in contact with MDR-TB patients. This level of practice is acceptable but it would have been better if all health care workers used the protective masks when dealing with MDR-TB patients. This is particularly necessary for pharmacists who traditionally are not provided with protective masks. The use of masks was influenced by some personal characteristics. Respondents younger than 30 years old, males, and those with negative attitude wore protective masks slightly more than their counterparts did, but the difference was not statistically significant. Similarly, respondents with negative attitude practiced the use of masks more than those with positive attitude but the difference was not statistically significant. An important finding from this study is that respondents who had good knowledge about MDR-TB significantly wore their protective masks than those with insufficient knowledge.

With regard to educating patients about MDR-TB, overall, 75.3% 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). The findings showed that respondents less than 30 years old, with less than 5 years of work experience, and those with insufficient knowledge were less likely to be involved in educating patients about MDR-TB since at least 24.7% of them reported not being involved. With regard to the professional category, primary health care were the least involved as the majority of them (9.3%) reported that they were not involved. It seems that the attitude had some influence in the personal involvement in the education of patients about MDR-TB since 28.7% of those with negative attitude reported not being involved in the education as opposed to 71.3% of those with positive attitude.

Overall, 68% of respondents reported that they referred to the MDR-TB management guidelines. This was similar to the report of Richardson (2000). However, this practice varied with some other characteristics of the respondents. About 32% of respondents were likely not to refer to the guidelines. These include respondents who were less than 30 years old, (females) those with less than 5 years of work experience, as well as those with insufficient knowledge and positive attitude. Based on the professional category, only few of the primary health care stated that they referred to the guidelines, while 11.3% of nurses and pharmacists stated that they did not refer to the guidelines.

Association between knowledge, attitude and practices relating to MDR-TB

The findings from this study show two scenarios: The first

is that the level of knowledge about MDR-TB did not affect the attitude of respondents towards patients with MDR-TB since both those with good and insufficient level of knowledge held negative attitude. On the contrary, 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.

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 and referred to the MDR-TB guidelines a little more than those with positive attitude, although the difference was not statistically significant in both cases. 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 in stark contrast with reports that hold the view that knowledge shapes attitude, and attitude influences behavior (Cabana et al., 1999). In this study, knowledge did not seem to have affected significantly the attitude of respondents; and it appears that the attitude did not influence the practices of respondents relating to MDR-TB.

Limitation of the study

Firstly, the assessment of knowledge level was limited to few questions and did not cover all aspects about tuberculosis and MDR-TB. Similarly, only attitude towards patients with MDR-TB and few practices were assessed.

Secondly, despite a 100% response rate, 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.

Thirdly, given the cross-sectional design employed, it is not possible to establish causal relationships due to the lack of a temporal link.

Conclusion

The aim of the study was to assess the knowledge, attitudes, and practices of healthcare professionals about prevention and control of MDR-TB at Infectious Diseases hospital, situated in Kano, Nigeria. The results of this study indicate that, overall, less than half (68%) of respondents had good level of knowledge about MDR-TB; but the overwhelming majority of them held negative attitude towards patients with MDR-TB. Further analysis showed that the level of knowledge did not affect the

attitude towards patients suffering from MDR-TB but it 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 findings of this study showed also that the attitude of respondents towards patients suffering from MDR-TB did not influence their practices.

Recommendations

Given the low level of knowledge about MDR-TB among certain categories of health care professionals, in-service training on the MDR-TB must be provided to all professionals including primary health care workers.

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CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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