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EFFECTIVENESS OF AN EDUCATIONAL INTERVENTION ON KNOWLEDGE LEVEL OF MULTIDRUG-RESISTANT TUBERCULOSIS PATIENTS AT INSTITUTE OF CHEST DISEASES

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ABSTRACT

Background: Multidrug-resistant Tuberculosis (MDR-TB) is a form of tuberculosis (TB), caused by Mycobacterium Tuberculosis that is resistant to at least isoniazid and rifampin, the two most potent TB drugs. These drugs are used to treat all persons with TB disease. TB experts should be consulted in the treatment of MDR-TB. Objectives: This study aimed to assess the effectiveness of an educational Intervention on Knowledge level of Multidrug-Resistant Tuberculosis Patients. Methodology: A quasi experimental, pre and posttest study was conducted at a public sector hospital, Institute of chest disease from March to August, 2024. The sample size was calculated by STATA Version 17. A total number of 30 participants were recruited through a purposive non-probability sampling technique. The patients attending chest OPD (diagnosed or suspected) were included and those who rule out for TB were excluded from the study. A self-structured questionnaire consisting of two components, demographic data and knowledge assessment questions of MDR-TB among patients was used. SPSS version 27 was used to analyze the data. Results: Results showed that knowledge level of MDR-TB patients increased from 33.3% to 55%, while familiarity with the term "MDR-TB" improved from 30% to 60%. Similarly, overall knowledge of MDR-TB raised from 43.3% to 68.3%, showing a 25% gained. Conclusion: According to study's findings, patients generally have low to moderate level of awareness about MDR-TB in TB patients. Therefore, there is a dire need to close this knowledge gap through focused educational session and training to provide care to MDR in TB patients.

Keywords: *Effectiveness, Educational Intervention, Knowledge, Multidrug-Resistant, Tuberculosis Patients*

INTRODUCTION

Multidrug-resistant tuberculosis (MDR-TB) is an atypical form of tuberculosis (TB) caused by Mycobacterium Tuberculosis that is resistant to at least two of the most powerful first-line anti-TB drugs, isoniazid and rifampicin. This resistance makes MDR-TB much harder to treat than regular TB, as the standard first-line drugs are less effective or ineffective against it (1). MDR-TB is a form of TB due to organisms which show high-level resistant 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 (2). Resistance to isoniazid is due to mutations at one of two main sites, in either the *kat*G or *inh*A genes. 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. The accurate diagnosis of MDR-TB requires a positive culture of *Mycobacterium tuberculosis* and drug susceptibility testing. However, genetic probes which detect drug resistance to rifampicin with >95% accuracy are very suggestive of MDR-TB, <10% of rifampicin resistance is mono resistant, and so rifampicin resistance is a marker for MDR-TB in >90% of cases (3). Because of its increasing prevalence MDR-TB is now subdivided into 'basic' MDR-TB, with resistance only to rifampicin and isoniazid, and 'MDR-TB-plus', with a similar resistance pattern but with resistance to one or more additional first- and/or second-line drugs (4). The extent of the problem of MDR-TB has been examined by the World Health Organization (WHO) in cross-sectional surveys of drug resistance in either clinical series or whole-country cohorts. Numerous Cross-sectional surveys almost certainly underestimate the burden and number of cases of MDR-TB because they do not take into account the numerical burden of TB in the high-burden countries. When the exercise is repeated with a mathematical modeling design using drug-resistance estimates and the number of cases of TB, a more accurate picture of the global MDR-TB burden is claimed (5). Managing MDR-TB is challenging and requires specialized care. Treatment often involves a combination of second-line drugs, which are less effective, more toxic, and more expensive than first-line drugs. The treatment duration is longer, lasting up to two years, and requires close monitoring to ensure the patient is responding to the medication (6). Preventing the spread of MDR-TB is crucial, as it can be transmitted to others through the air when an infected person coughs or sneezes. This can be achieved through early detection, prompt initiation of appropriate treatment, and infection control measures in healthcare settings (7). Efforts to combat MDR-TB include developing new drugs and treatment regimens, improving diagnostic tools, and strengthening healthcare systems to ensure proper management and follow-up of TB patients (8).The emergence of drug-resistant tuberculosis (TB), particularly multidrug-resistant (MDR) and extensively drug-resistant (XDR) TB, is a major public health problem. The most powerful predictor of the emergence of MDR-TB reported, is previous exposure to anti-TB drug treatment (9). Strengthening early case detection and proper treatment of drug-susceptible TB in accordance with World Health Organization (WHO) treatment guidelines to ensure adequate treatment success rates is crucial (10). Consequently, efforts have been made to a rapidly increase MDR-TB diagnosis as well as the number of treatment sites to implement a directly observed treatment, short-course (DOTS) plus strategy to interrupt transmission of MDR-TB (11). Concern over the rise of MDR-TB is widespread. In terms of the global high burden of MDR-TB, Pakistan is rated fifth (12). This study aimed to assess the effectiveness of an educational Intervention on Knowledge level of Multidrug-Resistant Tuberculosis Patients.

METHODOLOGY

A quasi experimental pre and post-test study design was used among the tuberculosis suspected and diagnosed patients. This study had been conducted at the Institute of Chest Disease, a public sector hospital, Karachi. The purposive non-probability sampling technique was used. The study was completed within six months from March to August, 2024 after the approval from designated institute. The sample size was calculated by STATA Version 17

using one sample for mean formula with 95% CI, 90% power of test, and mean difference of 1.5 considering mean (SD) 6.54 (2.42) (13). The calculated sample size was 30. Tuberculosis patients (diagnosed or suspected) attending chest OPD who were able to read and understand the local language were included in the study while those who were reluctant to participate in the study were excluded from the study. Data was collected through a self-structured questionnaire, (pre and post) method was used to identify the demographic data and knowledge about the MDR-TB among patients. Followed by written informed consent, 10 to 15 minutes were provided to the participants to fill the questionnaire. The questionnaire comprised of socio demographic variables and awareness questions about MDR-TB patients. The data was analyzed through SPSS version 27.1 to find out the frequencies and percentage among MDR-TB patient knowledge. For maintaining ethical considerations, written informed consents were taken from the participants as well as they were asked that they have the right to withdraw from the study without any penalty. Local language was used, patient's literacy level was respected as well as cultural beliefs and gender dynamics were also considered. Ethical approval has been taken from the research committee of the institution. The research participants must voluntarily engage in order to avoid any sort of coercion or pressure.

STUDY TOOL

The study questionnaire was consisted of two sections demographic information and knowledge of MDR-TB including the subsections related to the causation, transmission of the TB, patient adherence to the medication, follow-up rate, treatment compliance and sources, challenges and community involvement in MDR-TB. The validity of the study tool was evaluated through expert review by three subject experts, yielding a Content Validity Index (CVI) of 0.89, indicating strong agreement on item relevance. The tool's usability and feasibility were confirmed during a pilot study, and necessary modifications were made based on participant and expert feedback. Cronbach's alpha (0.89) was calculated to assess the internal consistency of the questionnaire.

EDUCATIONAL INTERVENTION FOR TB PATIENTS ON MULTIDRUG-RESISTANT TB (MDR-TB)

PRE-INTERVENTION

Patients were approached in outpatients department (OPD) during clinic visits via leaflets and posters, after the informed written consent time schedule was defined to the patients and educational intervention taken place in OPD. A self-structured questionnaire was introduced to the patients before the intervention to assess pre-intervention knowledge.

INTERVENTION

Initial Session: 30–45 minutes at diagnosis or first visit. Follow-up mini-sessions: 10–15 minutes during regular clinic visits (e.g., weekly or biweekly). Total duration of the intervention was 4–6 weeks. Flipcharts, PowerPoint presentations, videos in local language as well as take-home brochures, pictorial booklets and educational posters in waiting areas were provided. The presentations included, introduction to the TB, Causes, transmission, symptoms, and treatment overview. Definition of MDR-TB, how it develops (e.g., poor adherence), and why it is dangerous, clarifying myths, promoting community support.

POST-INTERVENTIONS

Once the intervention phase has ended, pre- and post-session knowledge assessments were commenced through same questionnaire. Observation of patient behavior (i.e., medication adherence). Monitoring follow-up rates and treatment compliance.

RESULTS

The demographic characteristics of the participants were displayed in Table 1. The gender distribution was equal, with 15 males (50%) and 15 females (50%). In terms of marital status, half of the participants were married (50%), followed by single individuals (40%), while 6.7% were divorced, and 3.3% were separated. The age distribution showed that the majority of participants were between the ages of 20–29 years (43.3%) and 30–39 years (43.3%), indicating that most respondents were in their early to mid-adulthood. Smaller proportions were from the age groups 15–19 years (6.7%), 40–49 years (3.3%), and 50 years and above (3.3%).Regarding religion, the vast majority of

participants were Muslim (93.3%), with a minority identifying as Hindu (6.7%). In terms of family structure, 50% of participants belonged to extended families, while 30% lived in nuclear families, and 20% were single-person households.

TABLE 1: DEMOGRAPHIC CHARACTERISTICS OF THE PARTICIPANTS (N=30)

Variable	f/%
Gender	
Male	15(50)
Female	15(50)
Marital Status	
Single	12(40.0)
Married	15(50.0)
Divorced	2(6.7)
Separated	1(3.3)
Age	
15-19	2(6.7)
20-29	13(43.3)
30-39	13(43.3)
40-49	1(3.3)
50 above	1(3.3)
Religion	
Muslim	28(93.3)
Hindu	2(6.7)
Types of Family	
Nuclear	9 (30.0)
Extended	15 (50)
Single	6 (30)

Table 2 showed knowledge and awareness regarding TB symptoms. Improved substantially from 33.3% to 43.3%, representing a 10% increase post-intervention. A notable improvement was observed in understanding of TB transmission, which increased from 83.3% to 96.7%, a 13.4% gained .Knowledge about the organ affected by TB was already high before the intervention (93.3%) and showed a slight increase to 96.3%, a 3% improvement. In contrast, knowledge regarding the duration of TB treatment increased significantly from 50% to 75%, indicating a 25% rise in awareness. Understanding of TB curability also improved markedly, from 46.7% pre-intervention to 73.3% post-intervention, reflecting a 26.6% increase. Knowledge about the age group most commonly affected by TB increased from 63.3% to 73.3%, a 10% improvement. Awareness about household history of TB showed a modest increase from 43.3% to 55%, resulting in an 11.7% gain. Likewise, participants' knowledge about the National TB Program (NTP) providing free medicines improved slightly from 36.7% to 43.4% (6.7% increase).

TABLE 2: GENERAL KNOWLEDGE AND AWARENESS ABOUT TB

Variables	Pre test	Post test	Effect size
TB Symptoms Knowledge	223.3%	33.3%%	10%
TB Transmission Knowledge	83.3%	96.7%	13.4%
TB Affected Organ	93.3%	96.3%	3%
TB Treatment Duration	50%	75%	25%
TB Curability Knowledge	46.7%	73.3%	26.6%
TB Age Group Pk	63.3%	73.3%	10%
TB History Household	43.3%	55%	11.7%
NTP Free Medicine Aware	36.7%	43.4%	6.7%
TB Diagnosis Sample	00%	35%	35%
MDR Community Awareness	33.3%	55%	21.7%
MDR Familiarity	30%	60%	30%
MDR Knowledge	43.3	68.3%	25%
MDR Treatment Duration	00%	35%	35%
XDR Curability Perception	60%	75%	15%
XDR Knowledge	00%	30%	30%
MDR Info Source	100%	100%	00%
MDR Treatment Challenges	30%	50%	20%
MDR Trusted Info Sources	73.3%	75%	1.7%
MDR Community Involvement	50%	73%	23%
MDR Affected Acquaintance	100%	100%	00%

The Table 3 showed the knowledge and perceptions about MDR-TB and XDR-TB .The educational intervention led to substantial improvements in participants' awareness and knowledge of multi-drug-resistant (MDR) and extensively drug-resistant (XDR) tuberculosis. Community awareness of MDR-TB increased from 33.3% to 55%, a 21.7% improvement, while familiarity with the term "MDR-TB" improved from 30% to 60%, reflecting a 30% increase. Similarly, overall knowledge of MDR-TB raised from 43.3% to 68.3%, showing a 25% gain. One of the most significant improvements was observed in understanding of MDR-TB treatment duration, which increased from 0% prior to the intervention to 35% afterward, a 35% increase, indicating a previously unaddressed knowledge gap. For XDR-TB, the perception that it is curable raised from 60% to 75%, a 15% improvement. Furthermore, knowledge about XDR-TB improved from 0% to 35%, again showing a 35% increase, suggesting the intervention was highly effective in raising awareness of this lesser-known but critical aspect of drug-resistant TB.

TABLE 3: KNOWLEDGE AND PERCEPTIONS ABOUT MDR-TB AND XDR-TB

Variables	Pretest	Posttest	Effect size
MDR Community Awareness	33.3%	55%	21.7%
MDR Familiarity	30%	60%	30%
MDR Knowledge	43.3	68.3%	25%
MDR Treatment Duration	00%	35%	35%
XDR Curability Perception	60%	75%	15%
XDR Knowledge	00%	35%	35%

Table 4 displayed sources, challenges, and community involvement in MDR-TB**.** Knowledge of information sources about MDR-TB remained consistently high, with 100% of participants reporting awareness both before and after the intervention, indicating no change. Similarly, awareness of having an acquaintance affected by MDR-TB was also 100% pre- and post-intervention, suggesting prior exposure to the disease in their social environment. Understanding of the

challenges associated with MDR-TB treatment showed a significant increase from 30% to 50%, reflecting a 20% improvement, which indicates the intervention helped clarify the complexity and burden of MDR treatment regimens. Awareness of trusted sources of MDR-TB information improved slightly, from 73.3% to 75%, a 1.7% increase, suggesting that trust in information sources was already relatively high. The most notable improvement in this section was observed in perceptions of community involvement in MDR-TB, which raised from 50% to 73%, representing a 23% increase. This implies the educational session effectively emphasized the importance of community support in TB control and management.

TABLE 4: SOURCES, CHALLENGES, AND COMMUNITY INVOLVEMENT IN MDR-TB

Variables	Pretest	Posttest	Effect size
MDR Info Source	100%	100%	00%
MDR Treatment Challenges	30%	50%	20%
MDR Trusted Info Sources	73.3%	75%	1.7%
MDR Community Involvement	50%	73%	23%
MDR Affected Acquaintance	100%	100%	00%

DISCUSSION

Multidrug resistant in tuberculosis (MDR-TB) is a significant public health concern with global implications. Tuberculosis is one of the top infectious disease killers worldwide, and the emergence of multidrug-resistant strains complicates efforts to control and eliminate the disease (14). In the current study, the knowledge of tuberculosis patients regarding MDR was assessed before the intervention the study participants reported low level of knowledge which were increased after the intervention. In pretest assessment the participants given 52% wrong and 48% right answer to the questions they were asked. After the intervention the participants given 39.9% wrong and 65.1% right answer to the same questions. Another study conducted by Rosnani Zakaria in 2020 in Mainland reported that the pretest and posttest difference among TB patients in knowledge score was $P = 0.277$(15). In the present study 50% participants were male and 50 % were female moreover 50% of the participants belonged to extended families and rest of the participants were from nuclear and single family. Similarly, another study conducted in Pakistan by Yasir Ali where 51.9% male and 48.9% female were participated in the study (16). The fact that half of the participants belonged to extended families suggests that living in larger household settings may contribute to increased exposure and susceptibility to TB (17). In this study pretest knowledge regarding TB rout of transmission was 83.3% which increased to 96.7% after the intervention. Another study conducted in Nigeria in 2022 by Patrick Aboh Akande, reported the rarely similar results were the pretest knowledge 79.1% and posttest score was 85.9% among TB patients after the educational intervention (18). A Health Belief Model study conducted in Iran assessed how an educational program affected patients with smear-positive pulmonary tuberculosis. Cognitive abilities, perceived advantages, and perceived severity all significantly increased as a result of the intervention, whereas perceived barriers declined (19). Patients who get educational interventions are given accurate, fact-based information regarding tuberculosis (TB) and its causes, symptoms, transmission, treatment, and prevention. Structured education helps patients who may have little prior knowledge or who may believe in myths or false information (20). Another study shown how well interactive teaching materials can raise pulmonary tuberculosis patients' sense of self-efficacy. Videos and multimedia presentations are examples of interactive aids that actively engage patients in the learning process, improving comprehension and memory of the material (21). As nurses spent more time with the patients than the other health care professionals they must have the capability to educate the patients order to increase their knowledge regarding the disease process (22-24). By giving patients accurate, interesting, and culturally appropriate information, educational interventions are essential in improving their

understanding of tuberculosis and improving disease management and health outcomes.

RECOMMENDATIONS

Eliminating multidrug-resistant tuberculosis (MDR-TB), patients requires a comprehensive and multi-pronged approach that addresses various aspects of TB prevention, diagnosis, treatment, and control. Several recommendations have been proposed which include strengthen TB control programs, ensure universal access to quality-assured treatment and promote treatment adherence Invest in research and development.

CONCLUSION

It is concluded from this study that the interventional session had a positive impact on participants' knowledge related to MDR-TB. Based on the observation, this suggests that targeted educational interventions can be an effective strategy in addressing gaps in awareness and promoting responsible antimicrobial use among healthcare professionals.

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