

Surveillance of multidrug-resistant organisms (MDROs); a quantitative study

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Abstract: The problem of multidrug-resistant organisms (MDROs) has affected a major portion of public health globally particularly those produced by multidrug-resistant gram-negative bacteria and, more importantly, the healthcare-associated MDRO infections. The study aimed to determine the occurrence of multidrug-resistant organisms (MDROs) at a tertiary care hospital in Lahore, Pakistan. A retrospective passive surveillance was performed to find out the incidence of multiple drug-resistant organisms in a tertiary care hospital in Lahore, Pakistan. A total of 799 culture & sensitivity tests performed between 1 January 2022 to 31, December 2022 were reviewed and examined to determine the bacterial infections and their sensitivity to different antibiotics. All the reports, positive for a microorganism were shortlisted and then analyzed to find the multidrug-resistant organism (MDRO). Any pathogen resistant to at least 1 antibiotic from 3 different classes of antibiotics was recorded as a multiple drug-resistant organism (MDRO). Out of 899 reports of culture & sensitivity performed in 2022, 585 (65%) were positive for any bacterial infections and 147 (25%) culture & sensitivity reports were positive for MDROs. Multidrug-resistant organisms can contribute a lot of burden for patients, their families, and healthcare institutions in terms of length, cost of stay at the hospital, frustration for the patients and families, and depletion of resources for the healthcare institutions. Therefore, allocating some resources to deal with this prevailing issue is very important.

Keywords: multidrug-resistant, gram-negative, bacteria, culture & sensitivity, antibiotics.

I. INTRODUCTION

Infections due to multidrug-resistant organisms (MDROs) are witnessed globally and have been linked with healthcare-associated infections (Teh et al., 2021). Particularly those produced by multidrug-resistant gram-negative bacteria, more importantly, healthcare-associated MDRO infections pose a substantial hazard to public health around the world (Alkofide et al., 2020). The development of multidrug resistance among gram-negative bacteria has become a therapeutic contest to treat communicable illnesses because of the restricted choice of antibiotics (Al Hamdan et al., 2022). Investigation of multidrug-resistant organisms in a healthcare setting is crucial for infection prevention, treatment, and control of contagious diseases caused by these pathogens (Aschbacher et al., 2020). Microorganisms can become resistant to antibiotics due to mutations caused by unattended use of antibiotics and this is happening more frequently in healthcare settings (Ziegler et al., 2022). The improvement of life expectancy resulted in a more elderly population which mandated for an increase in elderly healthcare services for example long-term care facilities (LTCFs), old age nursing homes, and such settings prove

to harbor these organisms by many folds requiring instantaneous actions (Tinelli, Tiseo & Falcone 2021). Many institutes deferred screening and implementation of contact precautions for multidrug-resistant organisms (MDROs) at the kickoff of the COVID-19 global sickness due to a deficiency of resources (Rathod et al., 2022). Active MDRO surveillance and preventive measures (e.g. seclusion of suspected patients colonized with MRDOs) are a must for all patients coming to the hospital for admission who were being admitted to a different hospital (less than 2 months ago for more than 24 hours) (Zwittink et al., 2022). Long-term care facilities (LTCFs), like nursing homes, have been recognized as vital sources of methicillin-resistant *Staphylococcus aureus* (MRSA) and extended-spectrum β -lactamase producing *Enterobacteriaceae* (ESBLE) by many studies conducted in different European countries (Latour et al., 2019).

The study aimed to determine the occurrence of multidrug-resistant organisms (MDROs) at a tertiary care hospital in Lahore, Pakistan.

II. METHODOLOGY

Study design: A retrospective passive surveillance was performed to find out the incidence of multiple drug resistant organisms in a tertiary care hospital of Lahore, Pakistan.

Study duration: The data related to the outcome of cultures & sensitivity inoculated between 1 January 2023 to 30 April 2023 was collected from the register of laboratory after obtaining permission from hospital directors.

Sample size: It took 1 month to review the data of 799 cultures & sensitivity performed over the mentioned period.

Data Collection: All the reports of culture & sensitivity performed between 1 January 2022 to 31, December 2022 were reviewed and examined to determine the bacterial infections and its sensitivity to different antibiotics. All the reports positive for a microorganism were shortlisted then analyzed to find out the multidrug resistant organism (MDRO). Any pathogen which was resistant to at least 1 antibiotic from 3 different classes of antibiotics was recorded as a multiple drug resistant organism (MDRO).

Table I. MDRO

Isolate No.	Antibiotics Classification										Interpretation	Status	
	A	B	C	D	E	F	G	H	I	J			
1	■											Resistant to 1 antibiotic from 1 class only	Not MDR
2	■	■										Resistant to 1 antibiotic from 2 classes each	Not MDR
3	■	■	■									Resistant to 1 antibiotic from 3 classes each	MDR
4												Susceptible to all antibiotics tested for in each class	Not MDR
5	■	■										Resistant to 2 antibiotics from 2 classes each	Not MDR
	■	■	■									Resistant to 2 antibiotic from 3 classes each	MDR

Data Analysis: The number of multiple drug resistant organisms (MDROs) were listed and their percentages were calculated and presented in tables and graphs.

III. RESULTS

Reports positive with different pathogens were analyzed for their sensitivity and resistance to antibiotics belonging to different classes. MDRO was defined as a microorganism resistant to 1 or more antibiotic from 3 different classes of antibiotics. Out of 899 reports of culture & sensitivity performed in the year 2022, 585 (65%) were positive for any bacterial infections given in the table 2 below.

Table 2. Number of culture and sensitivity performed between 1 January 2022 to 31, December 2022.

	Frequency	Percentage
Number of cultures & sensitivity positive for bacterial infections	585	65%
Number of cultures & sensitivity negative for bacterial infections	314	35%
Multidrug resistant organisms (MDROs) identified	147	
Total cultures and sensitivity performed	899	

These culture & sensitivity reports which were positive for any bacterial infection were the examined to determine the multidrug resistant organisms (MDROs) by critically analysing for against the criteria of MDRO given in the table 1. Out of 585 cultures positive for different bacterial infections, 147 infections matched the criteria of multidrug resistant organism and recorded as cases of MRDOs. Figure 1 below illustrates the number of multidrug resistant organisms.

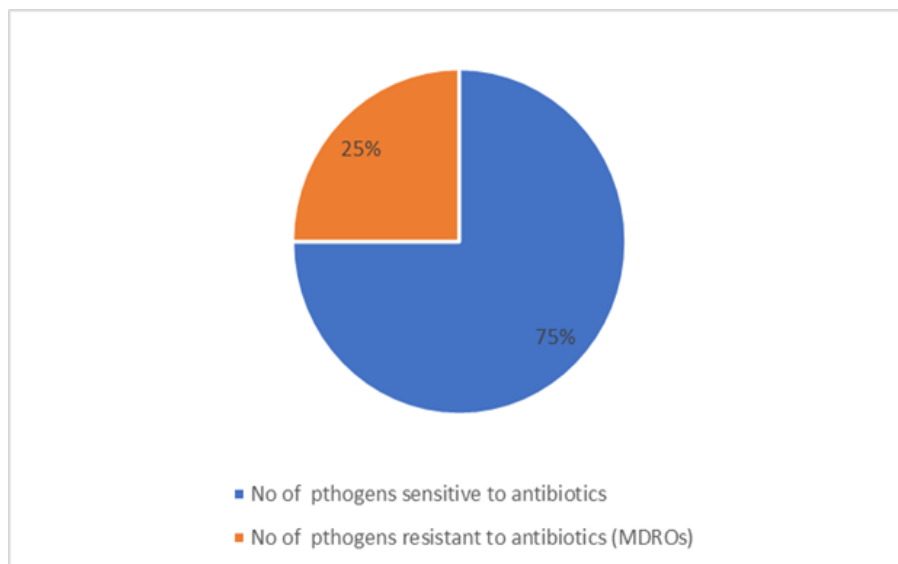


Fig. 1 - number of multidrug resistant organisms.

IV. CONCLUSION

The findings of this study are very significant to highlight the serious concern of multidrug-resistant organisms in healthcare settings (MDROs). MDROs can contribute a lot of burden for patients, their families, and healthcare institutions in terms of length, cost of stay at the hospital, frustration for the patients and families, and depletion of resources for the healthcare institutions. Therefore, allocating some resources to deal with this prevailing issue is very important. The infection Control department must devise some protocol to prevent the occurrence of MDROs and the healthcare staff must make sure compliance with these protocols. Additionally, more prospective studies should target different aspects of this global hazard to produce more evidence for the provision of quality care to patients.

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