



WHONET Use in Indian Set-Up

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INTRODUCTION

Antimicrobial Resistance (AMR) occurs when bacteria, viruses, fungi, and parasites no longer respond to antimicrobial agents. As a result of drug resistance, antibiotics, and other antimicrobial drugs become ineffective, and infections become difficult or impossible to treat.

AMR is a natural process that happens over time through genetic changes in pathogens. Human activity accelerates its emergence and spread, mainly due to the misuse and overuse of antimicrobials to treat, prevent, or control infections in humans, animals, and plants.¹ It has become a growing global public health challenge, with approximately 4.95 million deaths in 2019 and an estimated 10 million deaths per year by 2050 in the absence of a well-planned, coordinated approach to contain this menace.² To have a solution to this impending catastrophe, we need to measure the problem adequately. AMR surveillance is such a measurement tool as it defines the problem of drug resistance and identifies interventions to enhance the appropriate use of antimicrobials.³ The AMR is usually detected by measuring bacterial growth in the presence of the antibiotic being tested, and subsequently, all these individual data are combined to form an antibiogram. The antibiogram is defined as the report generated by analysis of collective AST results, usually from a single healthcare facility.⁴ Local antibiograms, in general, and hospital antibiograms, in particular, are prerequisites for formulating the antibiotic policy of

that particular hospital. WHONET can immensely help each set generate its own antibiogram in this regard.

WHONET (www.whonet.org) system is a Windows-based open-access software that curates information on antimicrobial surveillance results. It is developed and supported by the WHO Collaborating Centre for Surveillance of Antimicrobial Resistance at the Brigham and Women's Hospital in Boston, Massachusetts, and is available in 44 languages, supports local, national, regional, and global surveillance efforts in over 2,300 hospitals, public health, animal health, and food laboratories in over 130 countries worldwide.⁵

WHONET SOFTWARE

The software can be installed easily on a personal computer (Windows). If any laboratory already has a computerized reporting system, data can be converted by BacLink software, which is also available free of charge from the WHO. The data structure is compatible with major databases, spreadsheets, and statistical software programs.⁵

The software has three main parts. First is a laboratory configuration file, which can be customized to the laboratory, an interface for data entry and a part for analyzing and reporting resistance data.⁶

Laboratory configuration file

This program permits the user to enter and modify laboratory-specific information such as patient care

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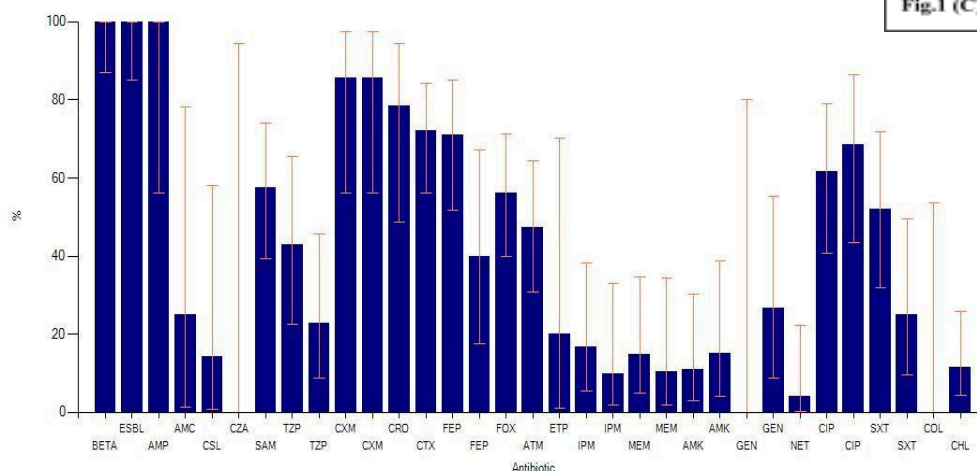
areas (outpatient department, inpatient ward, or intensive care unit), antibiotic panel selection, and interpretive breakpoints for various antibiotics according to standard guidelines. In addition, one can indicate what data fields one wants included in the data files. This configuration can be modified subsequently (Figure 1A).

Data entry

Data entry files can be configured separately based on specimen type, month-wise, year-wise, etc.

It supports routine entry of susceptibility test results performed by disk diffusion, MIC, and E-test. It has inbuilt Interpretation guidelines for most standardized testing methodologies. It also has pre-defined "Alert rules" to alert microbiologists and infection control staff of unlikely, unusual, and important findings and ensure quality and gross mistakes in result entry (Figure 1B). Currently, the WHONET has 354 pre-defined "Alert rules."

E.coli



For laboratories using third-party LIS systems: For those laboratories with their own LIS in place, data can be exported to the WHONET by converting it to a comma-separated value (.csv) format and using BacLink.

For laboratories using automated ID/AST systems: Many manufacturers have built-in software to convert the data to a WHONET/BacLink compatible file.

Care should be taken that the WHONET configuration file and the BacLink files have the same variables; otherwise, there is a chance of data loss during the conversion. Also, it is of paramount importance that the data shall be entered in numerical form against each antibiotic and not "S, I & R" for susceptible, intermediate, and resistant, respectively. The data entry can be done weekly or monthly based on the sample load of that laboratory.

Making the antibiogram

An antibiogram is a periodic profile demonstrating microorganisms' antimicrobial susceptibility within an institution/hospital. It aids clinicians in selecting the most appropriate empiric antibiotic therapy, monitoring the changes in resistance patterns of microorganisms and maintaining yearly records.¹²

Once the data is entered, the antibiogram can be made using the software's data analysis tab following the steps mentioned below.

- To launch the app, double-click the WHONET icon on the desktop.
- Click "Open laboratory" after selecting the lab labelled "WHO Test Hospital."
- Click on the "Data analysis" button from the home screen of WHONET. A list will be generated.
- Select "Data analysis" from this list. Once clicked on the button, the primary screen for WHONET analysis will appear. From this screen, command WHONET to perform the analysis of your choice.
- Respond to the questions in the three areas on the left of the main analysis screen: analysis type, organisms, and data files.
- Double-click on "Analysis type" and select "% RIS and test measurements." Click on the "OK" button in the lower right corner.
- Double-click on the "Organisms" key and select the major organism(s) needed for your analysis report. To select the organisms, double-click on its name. Using the search bar, analysis of individual microbes or whole species can also be done.

- Double-click on "Data Files" – a window will open. Select "WHO-TST-2020, WHO-TST-2021," and click "OK." Make sure all required data files are filled before proceeding. Finally, click on "Begin Analysis."

After the beginning of analysis, results will be generated in a new window.

LIMITATIONS OF WHONET

The far and foremost limiting factor of this amazing utility tool is that it works only on the Windows operating system. It also does not have a mobile application and is inoperable on mobile phones. While the WHONET is excellent for entry, analysis and reporting of resistant data, the software does not solve the purpose of a complete patient management system. In hospitals with existing patient management systems, the WHONET cannot be integrated, and the susceptibility data must be entered separately into WHONET either manually or through a BacLink. This would require an additional trained workforce for data entry and analysis. Although the program performs its task very well, in the long term, a surveillance system integrated with a patient management system might be more sustainable.

CONCLUSIONS

Indian laboratories should use WHONET. It does not have any financial burden. The only requirements for WHONET are a Windows computer system and basic computer knowledge. As most laboratories have at least one computer, installing the WHONET software is no longer an arduous job. It allows data to be entered in a real-time or staggered manner. The small laboratories can use it as a report-generating tool, while all the hospitals can use this software for generating their annual antibiogram. It helps in routine microbiology laboratory data management. It generates valuable information about antimicrobial susceptibility patterns over a place or time to provide the basis for and assess the effectiveness of prevention programs and policy decisions. If, on the national level, it is made compulsory to upload the data of WHONET monthly to all the hospitals and stand-alone laboratories to a repository (like it was done for tuberculosis), a true picture of antimicrobial resistance in the country would emerge. We need not extrapolate the data generated by a few tertiary care hospitals to the whole country as big and diverse as India.

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CONFLICTS OF INTEREST STATEMENT

The authors declare no conflict of interest

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ETHICS STATEMENT INCLUDING PATIENT CONSENT

Not applicable

AUTHOR'S CONTRIBUTION

All authors are qualified for authorship as per ICMJE criteria. They approved the manuscript.

AI DECLARATION

No AI tool was used to generate research data, perform data analysis, interpret findings, formulate scientific conclusions, or make editorial decisions. All AI-assisted content was critically reviewed, verified, and revised by the authors. The authors take full responsibility for the accuracy, originality, integrity, and final content of the manuscript.

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