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CHALLENGES EXPERIENCED BY LOW AND MIDDLE-INCOME COUNTRIES (LMICS) IN MONITORING AND REDUCING METHICILLIN RESISTANT STAPHYLOCOCCUS AUREUS (MRSA) PREVALENCE AND WAYS TO OVERCOME THEM

Introduction

The emergence and worldwide spread of MRSA represent some of the most important events in the epidemiology of infectious diseases. Although MRSA was first reported in the early 1960s, whole-genome sequencing (WGS) of 209 early MRSA isolates suggests that MRSA emerged in the mid-1940s that is, much earlier than the introduction of methicillin. In fact, it has been hypothesized that it was the extensive use of penicillin rather than the introduction of methicillin that drove the emergence of MRSA [1].

Infectious disease is the second leading cause of death worldwide and the third leading cause of death in developed countries.

Antibiotic resistance is a global problem putting current and future populations at substantial risk of injury, loss, and death and has been declared a substantial threat to public health and national security. Antibiotic use is the single most important factor leading to antibiotic resistance. The problem of antibiotic resistance could be reduced if antibiotics were prescribed more appropriately [2].

Aim

To confirm the increased prevalence of MRSA infections in Low and Middle-income (LMICs) countries compared to High-income countries (HICs) and how the prevalence of MRSA can be mitigated/prevented.

Material and Methods of research

The research article is based on 7 articles, systematic reviews, meta-analysis, and other forms of primary literature that were read and analyzed sourced from Publicly available websites and scientific journals from 2016 to 2020 such as Prime view, Hawaii Journal of medicine and public health, Nature Public health emergency collection and CDC guidelines etc.

Results of the Research

Nepal is a low-income country which has a hospital-based sentinel surveillance system in 82 hospitals covering all 75 districts for reporting of selected water-borne, and food borne

diseases in addition to a Health Management Information System (HIS). It focuses on weekly reporting of certain priority diseases. The traditional data collection methods are used where there is no HIS available.

National Surveillance Programmed for Communicable Diseases (NSPCD) was launched in India in 1997–98. Integrated Disease Surveillance Project (IDSP) which was formally launched in 2004 with the aid of World Bank has improved since then; this too reports on priority communicable diseases. Though the infectious disease surveillance has improved since the introduction of IDSP, in state and district level, the monitoring and evaluation have been weak, and there is a shortage of human resources.

Though Sri Lanka is categorized as an upper-middle-income country, the surveillance is still carried out in traditional paper-based system, complemented by a web-based system for certain diseases such as dengue. Though a web-based surveillance system was launched, most of the data is still sent through traditional paper-based method. However, the integrated surveillance of communicable diseases is not happening in timely manner, and GPS and other novel technology are not available [3].

Integrated Disease Surveillance and Response (IDSR) has been implemented successfully through most countries in Africa, though they belong to low or LMICs. IDSR was implemented in 44 countries by December 2017, and 70 % had electronic IDSR systems. However, the target of at least 90 % IDSR implementation coverage at the peripheral level was achieved only by 12 countries. Sixty-eight per cent of the countries have achieved timeliness and completeness threshold of at least 80 % of reporting units. WHO supported this project. Modern technology such as GPS has not been used. This is a good example of where surveillance of communicable diseases is implemented effectively, in LMICs [3].

Major setback for implementing Healthcare associated infections (HAI) surveillance in LMICs is not having adequate number of trained staff and a national program for infection prevention and control in healthcare setting, who should carry out the national surveillance and feedback. Manual method of data collection is not suitable with the high workload of the staff which makes data collection, especially the denominator data for calculating HAI rates, impractical. Limited laboratory facilities also make the HAI surveillance incomplete in these countries [3].

Limited laboratory capacity is a major challenge faced in antimicrobial resistance surveillance in LMICs. Not having facilities for identification of pathogens to species level, for performing reliable methods of minimum inhibitory concentrations and not having accredited laboratories, is a common problem in laboratories of LMICs.

Clinical microbiology laboratory services with blood culture facilities are available only at national and provincial level hospitals and the peripheral healthcare facilities (PHF) are poorly linked to these facilities in majority LMICs

Not having well planned Laboratory information management systems (LIMS) which will export AMR data to a software such as WHONET which can be used to create summary reports and alerts of importance routinely is another limitation in LMICs.[6]

In HICs for example Optimizing the use of antibiotics is critical to effectively treat infections, protect patients from harms caused by unnecessary antibiotic use, and combat antibiotic resistance. Antibiotic Stewardship Programs (ASPs) can help clinicians improve clinical outcomes and minimize harms by improving antibiotic prescribing. Hospital antibiotic stewardship programs can increase infection cure rates while reducing.

There is no single template for a program to optimise antibiotic prescribing in hospitals. Implementation of antibiotic stewardship programs requires flexibility due to the complexity of

medical decision-making surrounding antibiotic use and the variability in the size and types of care among U.S. hospitals. In some sections, CDC has identified priorities for implementation, based on the experiences of successful stewardship programs and published data. The Core Elements are intended to be an adaptable framework that hospitals can use to guide efforts to improve antibiotic prescribing. The assessment tool that accompanies this document can help hospitals identify gaps to address [4].

Hospital-based electronic health data systems in conjunction with spatial analyses can provide an effective surveillance system, which could be used to develop strategies for preventing CA-MRSA transmission. This study demonstrates how geocoded EHR data can be used to identify areas of excess risk for S. aureus infections which is important for developing interventions to prevent the spread of antibiotic resistant infectious conditions [5].

In the United States EIP population MRSA surveillance. MRSA bloodstream infection data were obtained from CDC's EIP active laboratory- and population-based surveillance for invasive MRSA in selected counties from six sites * reporting data continually from 2005 to 2016 (population in 2016 = 13 million).

EHR databases. The Premier Healthcare Database and Cerner Health Facts EMR data were used to identify S. aureus bloodstream infections among patients discharged from participating acute care hospitals reporting results of microbiologic cultures with antimicrobial susceptibility testing [6].

Conclusions

The prevalence of both community and healthcare associated MRSA in LMICs is considerably high compared to their HICs counterparts. None the less even HICs are experiencing sudden surges in MRSA considering the latest data sets but is majorly under control thanks to number of reasons such as robust health policies and methodologies, access to advanced surveillance and data management technologies, large amount of highly skilled human resources such as health professionals and data scientists at their disposal and importantly the added benefit of private, government and international funding that helps this process immensely.

While many LMICs have implemented solutions such as digitalization of health care data and developing policies and methodologies they are incapable to be as efficient and effective as HICs, thus rendering LMICs incapable of achieving the standards of monitoring and surveillance of MRSA unlike HICs.

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