Nosocomial bacteraemia & antimicrobial resistance in intensive care units

Specialised high technology units which care for critically ill patients have become integral part of health care facilities all over the world. Although these units account only for a small proportion of beds, they contribute significantly to nosocomial infection (NI) statistics of the hospital. The article by Mathur et al in this issue addresses some aspects of this problem.

NI are significant causes of mortality and morbidity in the hospital setting. In addition, the substantial costs associated with the management of these infections increases the economic burden to hospitals and patients. In developed countries, which have very efficient infection control systems, billions of dollars are estimated to be spent on managing NI. The cost associated with control of NI in India, although unknown, is likely to be extremely high. Added to all these, is the fact that these infections facilitate the growing problem of increasing antimicrobial resistance amongst microorganisms. In acute care facilities, the intensity of antimicrobial use together with a population highly susceptible to infection, creates an environment which facilitates both emergence and transmission of resistant organisms. Resistant organisms have repeatedly been described in such settings.

From the few published reports available from India, including the data from Mathur et al, the rates of multidrug resistant bacteria are so high in the hospital settings that effective drugs like fluoroquinolones, third generation cephalosporins, etc., are fast loosing their utility in covering hospital pathogens. Resistance to imipenem also has appeared among some bacterial species in hospitals in India. These developments have severely restricted the choice of antimicrobials for treating serious infections. In countries like ours, there are also the additional concerns like accessibility and high cost of newer drugs.

The organisms of great concern in the hospitals in India and elsewhere are the methicillin resistant Staphylococcus aureus (MRSA), high level aminoglycoside resistant (HLAR) enterococci, extended spectrum β lactamase (ESBL) producing enterobacteriaceae, Pseudomonas aeruginosa resistant to multiple antimicrobials including carbapenems, multidrug resistant Acinetobacter spp and increasingly in recent years, Candida spp. These agents also cause infection in patients on long term care and in the community. Hospitals can act as the source of multidrug resistant bacteria causing infections in the community.

Prevalence and relative distribution of these agents vary depending on the facility and the level of care taken to control nosocomial infections. In the study by Mathur et al, the occurrence of nosocomial bacteraemia in the intensive care units (ICU) is 11 per cent with P. aeruginosa being the most common agent. S. aureus was most common in the Neurosurgical ICU. ESBL production was observed in 89 per cent of Gram negative bacilli. MRSA and HLAR enterococci were also frequently isolated. This highlights the magnitude of the problem in a tertiary level hospital and the urgency for appropriate measures to control this trend. In a study from another tertiary level hospital in southern India blood stream infection occurred in 7.5 per cent patients admitted to the medical intensive care unit. ESBL production was observed in 89 per cent of Gram negative bacilli. MRSA and HLAR enterococci were also frequently isolated. This highlights the magnitude of the problem in a tertiary level hospital and the urgency for appropriate measures to control this trend. In a study from another tertiary level hospital in southern India blood stream infection occurred in 7.5 per cent patients admitted to the medical intensive care unit. In ICUs, prevalence of other life threatening NI like ventilator associated respiratory infections are usually much higher than blood stream infection. In one study, 47 per cent of Klebsiella spp. isolated from such infections produced ESBL. Scanty data available from other centres also
confirm the high prevalence of NI due to highly resistant bacteria in hospitals in India.

As regards data on NI from India, there is not only paucity of information from different parts of the country, but also lack of uniformity in the data presented making comparisons difficult. Diagnosing infections in an already very sick patient in the ICU can be difficult. Therefore, using standard definitions and criteria for diagnosing the presence of NI and the site of NI is a prerequisite for comparability of data from different centres and in understanding the trends in the country as a whole. Several reputed institutions follow the criteria developed by Centres for Disease Control for surveillance. These criteria are based on combinations of clinical and laboratory data. The criteria may be different in a newborn as compared to an adult. Mathur et al have utilised these criteria for defining infection. However, the data collection was retrospective with positive blood culture as the inclusion criteria for detailed analysis. In addition to the well known inherent problems of retrospective data collection, this also excluded all culture negative patients with ‘clinical sepsis’ receiving aggressive antimicrobial therapy. Data collected prospectively and systematically by designated staff who visits the clinical and laboratory areas on a frequent basis will be more useful in assessing the magnitude and trends. This kind of surveillance will help in early alert about outbreaks.

The other issue in NI data is the denominator. This could be number of patients at risk, patient days, days of indwelling catheters or ventilation. For device associated infections in the ICUs, ‘device days’ will be a better denominator for comparing between facilities. The methods for calculating these rates and ratios are available.

There is also limited data available from India on typing of nosocomial pathogens. Antibiogram is frequently used as a phenotypic marker for identifying the outbreak strain. This alone may not be able to sufficiently discriminate the strains prevalent, especially in the emerging scenario where most of these pathogens are resistant to most antimicrobials. By randomly amplified polymorphic DNA (RAPD) typing, Acinetobacter spp causing NI and with similar antibiograms were found to belong to several types with one type predominating. Several molecular methods for typing are now within reach of many tertiary level hospitals in India.

Timeliness of the information becoming available to those involved in patient care is another important aspect of NI data. Local and frequently updated data on the pattern of NI and resistance patterns of infecting organisms should be available to the clinicians in a facility. To be relevant to clinicians in India at large, it may be necessary to have nationally collated data published by a central agency on a regular basis. In the United States, the National Nosocomial Infections Surveillance (NNIS) Systems, which publishes frequently updated NI data, was established in 1970.

Collecting data on NI is only a prelude to interventions for controlling such infections and is also a tool for assessing effectiveness of such interventions. However, there are extremely few reports which discuss measures taken to control the infections and the effects of such interventions. Reports on experiences with infection control activities, in terms of cost, practicality and effectiveness, in different health facilities in India are virtually non existent. Several studies now show expensive infection control measures are no better than low cost ‘sensible’ measures in controlling infections especially those due to multidrug resistant bacteria. Strict adherence to conventional measures like hand hygiene, environmental cleanliness, aseptic precautions, appropriate sterilization and disinfection practices, and barrier practices as required can go a long way in reducing nosocomial infections.

The programme to control infection should work together with the programme to regulate antimicrobial usage. NI control is an essential part of multi faceted approaches to contain the problem of antimicrobial resistances. There are two very important requirements for regulating antimicrobial use. One is that the clinical microbiology laboratory provides summary data on antimicrobial resistance in a facility to concerned clinicians on a regular basis. This at present is being done only in a very few facilities in India. Second is to have locally relevant policies and guidelines on antimicrobial use. These guidelines are to be based on data generated locally and should be reviewed periodically. It is also necessary to measure the impact
of such programmes in terms of controlling NI and drug resistance.

NI control has not yet received the priority it deserves in most resource-poor countries. There is also a knowledge gap which affects our ability to choose the ideal infection control measure for a given centre in India. In addition, there are limitations on resources and expertise in infection control. Limited access to clinical microbiology laboratory also compromises infection control efforts. Infection control measures with high cost and those which cause disruption in patient care are non-sustainable in the long run. Our experiences show that maximum benefits may be obtained by concentrating our efforts towards implementing strict adherence to conventional infection control measures.

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References


