HOSPITAL BUGS: ARE THEY SAME EVERYWHERE?

1 : 13

Bhaskar Narayan Chaudhuri, *Kolkata*

Microbes have been around longer than anything else on the earth! Microbes became so good at survival that they have continued to live on the planet till today and are present everywhere.

Microbes mainly comprise bacteria, fungi, viruses, protozoa and helminths. Very few microbes are always pathogenic, many microbes are potentially pathogenic, and most microbes are never pathogenic. However, the present global scenario shows that it is the drug resistant variants/ mutants of the microbes that now predominate in the health care set-up, and, to a lesser extent, in the community too.

For the past many decades, clinicians across the world are facing the challenge of the growing problem of antimicrobial resistance that is recognized globally as a major public health threat. That microbial resistance will be rampant one day was forecast long back in 1945 by Alexander Fleming who is credited with discovering the first antibiotic, penicillin.

Antimicrobial resistance may be:

I. Inherent/ intrinsic resistance:

This is a species characteristic, *viz.* resistance of:

- Gram-negative bacilli to glycopeptides
- Gram-positive cocci to monobactams
- *Proteaceae* to tetracyclines, polymixins, nitrofurantoin
- *Salmonellae and Shigellae* to 1st and 2nd generation cephalosporins and aminoglycosides
- Non-fermenting Gram-negative bacilli to ertapenem
- *Burkholderia sp.* to polymixins
- Anaerobes to aminoglycosides
- *Enterococci* to cephalosporins, low level aminoglycosides, cotrimoxazole, clindamycin
- MRSA, *Enterococcus faecium* and *Stenotrophomonas maltophilia* to carbapenems
- *Candida krusei* and *C. inconspicua* to fluconazole

II. Acquired resistance: By mutation in existing DNA or acquisition of new DNA from other drug-resistant microbes in the immediate environment.

Selection for antimicrobial-resistant strains occur depending on the environmental conditions, *viz.* resistant strains are rare in the community where antibiotic pressure is low, while they dominate in the hospital environment where the antimicrobial pressure is very high.

Established and emerging resistant strains include:

I. MRSA (Methicillin resistant *Staphylococcus aureus*), GISA (Glycopeptide intermediate sensitive *S. aureus*), hGISA (heterogeneous GISA), GRSA (Glycopeptide resistant *S. aureus*)

II. Methicillin – resistant Coagulase negative *Staphylococci*

Table 1 : Eastern India: Prevalent Bugs and their Resistance Pattern (%)

Criteria (%)	AMRI Kol.	Fortis Kol.	CMRI Kol.	Woodlands Kol.	Apollo Kol.	KPCMCH Kol.	GNRC Gwy.	Gitan-jali Gwy.	IHL Patna
MRSA	35	30	20	18	18	35	NA	NA	NA
VRE	5	2	5	2	5	0	NA	NA	NA
ESBL	60	50	68	70	65	50	72	45	68
AmpC/ Co-producer	15	18	20	NA	NA	18	NA	NA	12
Carba-penem-R *Entero-bact.*	20	18	18	>5	>5	0	<5	<5	0
Carba-penem-R *Pseudo.*	35	30	40	45	32	25	18	36	12
Carba-penem-R *Acineto.*	90	75	75	45	65	35	NA	NA	NA
Tigecycline-R *Acineto.*	1	<1	1	1	1	0	NA	NA	NA
Polymixin-R	<1	0	0	0	0	0	NA	NA	NA
Non-albicans *Candida*	40	50	25	NA	40	50	NA	NA	NA
Flucona-zole-R *Candida*	15	20	20	NA	20	0	NA	NA	NA

III. GRE (Glycopeptide resistant *Enterococci*)

IV. Penicillin-tolerant/ resistant *Pneumococci*

V. ß-lactamase producing *H. influenzae* and *M. catarrhalis*

VI. Gram-negative bacilli, mainly *Enterobacteriaceae* with ESBL's (extended spectrum beta-lactamases), OXA's, AmpC β lactamases; and co-producers of different β lactamases

VII. Carbapenem-resistant non-fermenting Gram-negative bacilli, e.g. *S. maltophilia, B. cepacia, Acinetobacter, Pseudomonas* strains

VIII. Carbapenem-resistant *Enterobacteriaceae*, e.g. KPC (*Klebsiella pneumoniae* carbapenemase) producers, NDM (New Delhi metallo-beta-lactamase)-1 and 2 producers

IX. Polymixin resistance emerging in Gram-negative bacilli

X. Fluconazole-resistant *Candida* spp. and other fungi

BUGS ARE NOT THE SAME EVERYWHERE

The global scenario shows that Gram-positive infections are more prevalent in the West, *viz.* infections with MRSA, VRE, Penicillin-R Pneumococcus, *C. difficile* colitis etc. However, Gram-negative bugs dominate in India and Asia-Pacific region, *viz.* ESBLs, AmpCs, co-producers and carbapenemases. Variations in regional scenario also occur, *viz.* different countries in the Asia-Pacific region have different resistant flora; prevalence of ESBLs is highest in India. There occur variations within the country, too - state to state, urban *vs.* rural, healthcare *vs.* community, government *vs.* corporate/ private hospitals, primary, secondary and tertiary care hospitals, etc. (Table 1). Local variations occur within a locality, community, different hospitals of a city, different wards of a hospital (ICU *vs.* general wards; and different ICUs like SICU, CCU, MICU, NICU, PICU, etc. have different infections and bugs).

Infection may be community acquired, hospital acquired (nosocomial) and healthcare associated infection. Nosocomial infection is prevalent in all hospitals of the globe and nosocomial infection (N. I) rate varies between <1 and 10% in different hospitals. However, the rate is higher in developing countries. And, in the hospitals, nosocomial sepsis and its complications are 3-4 times higher in critical care areas compared with the general wards. But, amongst the intensive care units, the coronary care units are the cleanest with infection rates of <1 to 7 % compared to rates as high as 35% in units like surgical ITU.

BUGS ARE THE SAME EVERYWHERE

On the other hand, similar pattern of flora and resistant bugs are seen in different countries, different states of a country, different hospitals of a state/ city, different wards of a hospital, and in the community. MRSA, VRE, ESBLs, AmpCs, Carbapenemases are seen in almost all hospitals and health care institutions. CA (community acquired)-MRSA, penicillin-resistant *Pneumococci* and ESBLs are now prevalent in the community of almost all the countries of the world.

EASTERN INDIA: RESISTANCE PATTERN

The author has compiled the data provided by the Consultant Microbiologists of different health institutions of East India, over the last two years. The institutions include five tertiary care corporate hospitals and one private medical college in Kolkata, two corporate hospitals in Guwahati and one private diagnostic centre of Patna. The data is as follows:

The SMART Study, 2007 (published in JAPI, May, 2011) and many other national and international studies show a similar pattern of prevalent bugs and antimicrobial resistance in the private and corporate hospitals of different cities of India. However, data is scarce from charitable, government and rural hospitals of India.

In conclusion, it may be stated that the microbes remain ahead of us as they are genetically better evolved than us. However, man, despite all his limitations, does not want to give up easily the war against the harmful microbes.