The challenge of emerging infectious diseases; high time for integrated global response

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World Health Organization defined emerging infectious diseases (EID) as diseases of infectious origin whose incidence in humans has increased in the recent past or is threatened to increase in near future.[1] These also include those infections which appear in new geographic areas or increase abruptly.

During the past 30years more than 30 new organisms have been detected including

Ebola virus, HIV/AIDS, Hepatitis C,highly pathogenic strains of Influenza virus H5N1, H1N1, Legionella, E.Coli O:157 H7 (1982), Vibriocholera O139, Borrelia burdugferi, Creudtz-felt Jacob disease, hand foot and mouth disease (caused by enterovirus 71), dengue, yellow fever, Japanese encephalitis (caused by westnile virus).

Emerging infectious diseases (EID) cause a heavy toll on mortalities morbidities and economy, particularly in the developing and underdeveloped regions. These lead to 12 million deaths globally and account for seven out of ten top most causes of death in children.[1]

Changes in human behaviours and customs provide opportunity to microbes to produce epidemics. Another important reason for emergence of these infectious diseases is the ability of microbes to attain genetic versatility to escape detection by human immune system. Changes in working, living and travel habits, as well as climate change, contribute to a changing global disease burden.

Migration within and between countries because of search for employment, resulting from insurgence, disasters and many other reasons, is also increasing. These migrations increase the opportunity for diseases to spread rapidly between populations, and may result in the re-introduction of infectious diseases or may hasten the spread of pandemics. The most currently documented pandemics are H5N1 (Avian influenza), and H1N1 (swine flu) in year 2009.[2]

Increased human and animal interaction, food and environmental safety issues are the other strong contributors to zoonotic and foodborne infectious diseases. More than 60% of emerging infectious diseases are caused by zoonotic pathogens. Of these >71% are from wildlife origin.[3] Often insidious onset and delayed development of clinical signs hinder appropriate diagnosis and management. Besides, movements of animals used for agricultural trade, sport, and as companions also offer opportunities for further dissemination of infections. Animals removed from the food supply due to infection or suspected infection can adversely affect global economy. The impact of zoonotic epidemics from 1995 to 2008, many of them preventable, exceeded $120 billion globally.[4] Animal based surveillance prior to dissemination of Zoonotic pathogens is a consideration, but it is challenging and its cost effectiveness is not yet ascertained.[5]

Rapid globalization of food production and trade has increased the likelihood of international incidents involving contaminated food. Sustaining food safety standards will depend on constant vigilance maintained by monitoring and surveillance.[6]

Southeast Asian region is home to 25% of world population and 30% of world's poor.[7] In Southeast Asian region, though 86% of the population is claimed to have access to improved water supply, the quality and safety of water is often under-rated.[1]

In Southeast Asia, biological, social, ecological, and technological processes interconnect and pave the way for microbes to exploit new ecological niches. These processes include population growth and movement, urbanisation, changes in food production, agriculture and land use, water and sanitation, and the effect of health systems through generation of drug resistance.[8]

Recently there have been outbreaks of severe Acute Respiratory syndrome (SARS), Avian Influenza, Nipah virus, and dengue fever in the Southeast Asia Region.[1] With regard to control of respiratory viral emerging infectious diseases, there is a need to evaluate new technologies and automation beyond conventional or real-time amplification and detection methods to address broad-spectrum diagnosis and for pandemic preparedness.[9] Besides protection of poultry workers by protected clothing, clean and decontaminated work place, antiviral medication and immunization with seasonal influenza vaccine should be employed to limit transmission.[10]

According to WHO, diarrhoea accounts for 19% of global deaths in children under 5 years of age and in

Southeast Asian region it has highest proportionate mortality (25%).[11] Rota-virus is the major killer in both developed and developing countries, causing approximately 352,000-592,000 deaths in children <5 years of age and 40% of diarrhoea associated hospitalization in children <5 years of age worldwide.[12,13] Children in poorest countries account for 82% of rotavirus associated deaths.G12, G8 and P(6) antigenic types emerging in developing countries are increasing in prevalence and may share worldwide circulation with the other five more common serotypes.[13,14] A number of vaccines have been developed but their cost is unaffordable for developing countries. Forty percent of world population at risk of malaria lives in southeast Asia More than 80percent population in Southeast Asian region lives in malaria prone geographical areas of which 178 million are high risk. On average 2-2.5 million cases and 27000 deaths are reported annually in SEA region.[1]

The economic consequences of emerging infectious diseases (EID) are experienced by many areas of industry including employment, trade, travel, tourism, transport, social gatherings, and health care.

Among 14 million global deaths in children under 5 years of age, 95% occur in developing countries and 70% of their proportion results from vaccine preventable diseases. In developed world though vaccine preventable infectious diseases have been controlled yet reemergence of these diseases may result from importing them from developing countries.[15] A changed and humanistic approach of world superpowers can go a long way to protect their own population besides mitigating the burden of disease from underdeveloped and developing parts of the world. Rotavirus vaccine is well tolerated and effective in low, middle and high income countries. Promotion of vaccine use in developing countries can be facilitated by partnership between government, industry and funding agencies.[13]

Antimicrobial resistance is another challenge in coping with infectious diseases in South Asia. It emerged due to irrational drug prescription and lack of standardized protocols. Tuberculosis is the main killer of young adult population. Its control has become more difficult due to HIV and multidrug resistant strains (MDR). MDR tuberculosis results in 100 times higher cost of treatment as compared to non MDR tuberculosis.[16] Building core national capacity for monitoring antimicrobial use and resistance through national surveillance networks, rational use of antimicrobials by the prescribers, and undertaking appropriate operational research is critical.[17] The need for educating communities for promoting adherence to recommended regimen cannot be underestimated.

Formidable challenges in the control of emerging infectious diseases in Southeast Asia, range from influencing the factors causing disease emergence to strengthening well fitted surveillance systems.[8]

The recent outbreaks of severe acute respiratory syndrome (SARS) and the influenza A (H1N1) pandemic provide evidence of the benefits of the global monitoring and importance of the role of the World Health Organization coordinating multilateral response of the global public health community.[18]

Regional and global collaboration is of paramount importance, the effectiveness of future policies to deal with the burden of communicable diseases in the region will only be assured if these policies are based on evidence and designed by policy-makers having thorough understanding of each country's needs and priorities.[19]

Control of emerging infectious diseases requires diversified approach, strong public health infrastructure, strong epidemiological, behavioral, statistical approach, global networking and strong political commitment. A well functioning public health infrastructure can avert many food and waterborne infections, quickly detect faults in health system which may lead to epidemics, respond to epidemics and is also sensitive to detect a novel infection.

Thus, public-health system should be efficient enough to deal with the challenges of newly emerging infectious diseases and at the same time to control existing diseases.

References

1. WHO. Combating emerging infectious diseases in the South east Asian region. (Online) (Cited 2011 Mar 20). Available from URL: http://www.searo.who.int/LinkFiles/Publication_139-combating-emerging.pdf. 2005.
2. Tang JW, Shetty N, Lam TT, Hon KL. Emerging, novel, and known influenza virus infections in humans. Infect Dis Clin North Am 2010; 24: 603-17.
3. Cutler SJ, Fooks AR, van der Poel WH. Public health threat of new, reemerging, and neglected zoonoses in the industrialized world. Emerg Infect Dis 2010; 16: 1-7.
4. Marsh.INCThe economic & social impact of emerging infectious disease:Mitigations though detection, research & response. (Online) (Cited 2011 Mar 20). Available from URL: http://www.healthcare.philips.com/main/shared/assets/documents/bioshield/ecoandsocialimpactofemerginginfectiousdisease_111208.pdf.
5. Childs JE, Gordon ER. Surveillance and control of zoonotic agents prior to disease detection in humans. Mt Sinai J Med 2009; 76: 421-8.
6. Newell DG, Koopmans M, Verhoef L, Duizer E, Aidara-Kane A, Sprong H, et al. Food-borne diseases - the challenges of 20 years ago still persist while new ones continue to emerge. Int J Food Microbiol 2010; 139 Suppl 1: S3-15.
7. Narain JP, Bhatia R. The challenge of communicable diseases in the WHO South-East Asia Region. Bull World Health Organ 2010; 88: 162.
8. Coker RJ, Hunter BM, Rudge JW, Liverani M, Hanvoravongchai P. Emerging infectious diseases in southeast Asia: regional challenges to control. Lancet 2011; 377: 599-609.
9. Fox JD. Nucleic acid amplification tests for the detection and analysis of respiratory viruses: the future for diagnostics? Future Microbiol 2007; 2: 199-211.
10. MacMahon KL, Delaney LJ, Kullman G, Gibbins JD, Decker J, Kiefer MJ. Protecting poultry workers from exposure to avian influenza viruses. Public Health Rep 2008; 123: 316-22.
11. Boschi-Pinto C, Velebit L, Shibuya K. Estimating child mortality due to diarrhoea in developing countries. (Online) (Cited 2011 Apr 17). Available from

URL: http://www.who.int/bulletin/volumes/86/9/07-050054.pdf.

12. Parashar UD, Hummelman EG, Bresee JS, Miller MA, Glass RI. Global illness and deaths caused by rotavirus disease in children. Emerg Infect Dis 2003; 9: 565-72.
13. O'Ryan ML, Hermosilla G, Osorio G. Rotavirus vaccines for the developing world. Curr Opin Infect Dis 2009; 22: 483-9.
14. Alam MM, Malik SA, Shaukat S, Naeem A, Sharif S, Angez M, et al. Genetic characterization of rotavirus subtypes in Pakistan-first report of G12 genotype from Pakistan under WHO-Eastern Mediterranean region. Virus Res 2009; 144: 280-4.
15. Obaro SK, Palmer A. Vaccines for children: policies, politics and poverty. Vaccine 2003; 21: 1423-31.
16. WHO. Tuberculosis.Global Health Observatory (GHO). (Online) (Cited 2011 Mar 24). Available from URL: http://www.who.int/gho/mdg/diseases/tuberculosis/situation_trends_prevalence/en/index.html.
17. Bhatia R, Narain JP. The growing challenge of antimicrobial resistance in the South-East Asia Region--are we losing the battle? Indian J Med Res 2010; 132: 482-6.
18. Castillo-Salgado C. Trends and directions of global public health surveillance. Epidemiol Rev 2010; 32: 93-109.
19. Gupta I, Guin P. Communicable diseases in the South-East Asia Region of the World Health Organization: towards a more effective response. Bull World Health Organ 2010; 88: 199-205.