EDITORIAL

Epidemiology in the Era of Health Informatics: Opportunities & Challenges

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Abstract | Introduction | Methodology | Results | Conclusion | References | Citation | Tables / Figures

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Over the years, epidemiology has played a key role in improving our understanding about the determinants of health and disease. In the 19th century epidemiological observations led to the discovery of the modes of communication of cholera much before the discovery of the causative organism responsible for it. Similarly, in the 20th century, it led to the discovery of the risks of tobacco smoking, and the modes of transmission of AIDS. In the 21st century, advancement in the computation, visualization, communication, and m-health technologies are likely to expand the landscape of epidemiology which has now acquired the status of a core discipline of health sciences.

Epidemiologic thinking has also been shaping and sharpening global health strategies for prevention and control of not only communicable but also non-communicable diseases. The innovation of epidemiological surveillance and containment strategy led to the eradication of small pox in the 20th century. Epidemiologic studies have shaped tobacco control policies in the 21st century, leading to the adoption of the framework convention on tobacco control. Increasingly epidemiology is also being considered as the science of public health decision making.

Application of epidemiologic principles and methods to health program planning, implementing, monitoring and evaluation, i.e., the managerial epidemiology, has potential to improve the effectiveness and efficiency of the limited resources available for health in India which is home to more than one sixth of global population. All program planners, managers, and evaluators need to have basic understanding of the epidemiologic principles and methods in order to tackle the enormous challenges posed by the emerging and re-emerging communicable diseases, the rising burden of non-communicable diseases, and high maternal and child mortality.

In the last few decades, Information Technology (IT) has created new opportunities for application of epidemiology to myriad health problems. Google has created flu net using social media. Big data analytics, decision analysis, and modelling could provide new avenues to study complex problems. Cheaper data capture technologies such as tablets and smart phone could transform the landscape of administrative data analytics for decision making. Personal health records of visits to health centers/hospitals and electronic recording of drug intakes could be useful in assessment of adherence and outcomes. Conduct of large cohort studies with biomarkers and genome wide analysis could usher in the era of personalized medicine and pathologic epidemiology.

The focus of epidemiology, hitherto, had been largely on individuals as unit of analysis, but newer analytical methods such as multilevel modelling and geo-special analysis can uncover social and

geographical patterns bringing focus again on the social determinants of health or syndemics on the one hand, and the 'one health' movement on the other hand can bring renewed focus on the integrated investigation of plant-animals-humans leading to development of ecological epidemiology. Sub-specialties of epidemiology such as molecular/genetic epidemiology, environmental epidemiology, nutritional epidemiology, managerial epidemiology, social epidemiology and economic epidemiology should be developed by involving specialist scientist working in these areas.

With availability of powerful computing platforms, the interface of epidemiology with demography, statistics, and mathematics has resulted in novel models such as agent based modelling for simulation of various public health prevention and control strategies since it is not always possible to conduct randomized control trials on various public health policy options. Bio-informatics has greatly facilitated a systems approach in biology. High throughput laboratory analytics is adding new dimension to molecular and genetic epidemiology. However, easy availability of computing power could encourage data dredging by the new age analytics and over emphasis on this type of data driven quantitative evidence may lead to a circumscribed view of social reality.

In the last few decades, the health information systems have largely shifted on to the use of mobile phones/ tablets or are in the process of migrating to this technology. Large administrative data sets are in the electronic formats. However, the capacity for data management is limited. Computer scientists and epidemiologists need to work together to design health informatics systems that are user friendly, decentralized, and flexible. A team of epidemiologists and computer scientists need to be recruited for innovative programming and for development of curricula for training/capacity-building.

Health information generated from households or clinics used to be generally captured in the registers by the community level workers such as AWWs/ASHAs/ANMs, and only aggregated data used to be sent for entry into computers (monthly reports) which was of limited use for epidemiological purposes. Use of computers/ tablets/ smart phones at the most peripheral level with wireless connection would enhance the entry of individual data (without personal or community identifiers). This step would enhance the analytic value i.e. for identification of high risk geographic areas/ communities/ individuals.

The level of death registration systems are improving and in quite a few of Indian states about 90-95% deaths are now registered electronically but the cause of death registration is very weak. Cause of death reported by the family is entered in the death form. A simple symptom and sign (verbal autopsy)-based algorithm can be used by ASHA/ANMs to assign a probable cause using computers/smart phones. This type of system can of great help in planning and impact evaluation of several disease control programs at decentralized levels –block/ districts.

Large volumes of electronic data are now available in Integrated Disease Surveillance Program, National AIDS Control Program, Revised National Tuberculosis Control Program, and Reproductive and Child Health Program which require skilled staff to manage this administrative data, and epidemiologists are needed with health informatics capabilities to analyze these data sets. Research and development in computer science and technology would also be needed for taking care of these huge datasets. Surveillance systems for infectious diseases could also exploit big data for projecting high risk/ vulnerable areas/ communities on spatial maps using geographic information system (GIS) technology. Remote sensing technology could also identify risk exposures. Processed food sales, and other products could be used for public health surveillance. Telephone interviews and electronic email interviews make data capture much easier. Data archiving on cloud is much easier now which can be accessed from anywhere.

In view of the developments in health informatics, epidemiology has acquired new potential to empower academician-researchers and health program managers not only for the formulation of evidence-based policies, plans, and programs, but also for monitoring and evaluating the outcomes and impacts of the policies and programmes on various population groups and geographical areas to ensure that the principles of social justice are not compromised. However, large investments are needed to develop high quality epidemiology workforce to harness the emerging opportunities in view of the developments in information technology in India.

To encourage the large scale use of information technology in epidemiology, simple easy to understand short courses at basic, intermediate and advance level should be made available not only for the academicians or researchers but also for the health program implementers and health informatics workforce at various levels of health system. Field epidemiology training programs can fulfil this need.

A two year course for Epidemic Intelligence Officers (EIO) at National Centre for Disease Control is a good beginning but considering the larger number of EIOs required in the country capacity building on large scale is needed since each district in the country should have several epidemiologists to tackle the emerging public health threats. e-learning courses such as massive online open courses (MOOCs) are likely to be available free of cost to bridge this gap.

Frequent interaction of epidemiologists with computer scientists and data analytics are needed to harness the power of health informatics for developing surveillance platforms to monitor various aspects of population health without jeopardizing the privacy of citizens.

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The Head Quarter of IAPSM UP UK State Chapter is committed to provide all the benefits to the members of the association which they deserve as per our norms.

We all should come forward in a united manner to achieve the aim & objectives of our association.

IAPSM membership form can be downloaded from www.iapsm.org

I hope this membership drive in UP & UK will strengthen our association many fold. I look forward to have positive response all over.

LONG LIVE IAPSM!!!

With best wishes & warm regards,

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