The application of GIS to illustrate distribution of notifiable diseases in KSA, during the 1990s

Geographical Information Systems (GIS) are valuable in strengthening the whole process of epidemiological surveillance information management and analyses. GIS provides an excellent means of collecting, updating and managing epidemiological surveillance and related information. GIS provides visualization and analysis of epidemiological data, thus revealing trends, dependencies and interrelationships that would be more difficult to discover in other formats.[1,2]

This study was conducted to investigate the application of the Geographic Information System "GIS" to illustrate the geographical distribution of some of the notifiable diseases in the Kingdom of Saudi Arabia during the period from 1990 to 1999.

The source of data was a spatially referenced database for surveillance data of 15 notifiable diseases in Saudi Arabia for the period from 1990 to 1999; measles, mumps, diphtheria, chicken pox, whooping cough, Hepatitis A, B, C, Brucellosis, meningococcal meningitis, syphilis, Amoebic dysentery, tetanus and tetanus neonatorum. Spatial data is a coverage shape file for Saudi Arabia, scale 1:2,000,000 were provided from ministry of health, Saudi Arabia. The epidemiological geographic information system (EPI-GIS) for these diseases was established using the health mapper GIS software. We used a suitable indicator of the diseases investigated, which was the total number of reported cases yearly for all health regions, or we created a new indicator if this was not available. The pattern of spatial analysis used was point and area pattern. Digitized data from existing maps provided base layers (topography, land use, roads, rivers, surface water) on which other data could be overlaid. The distribution of cases was displayed as data locations through Health-Mapper using the command overlay indicator. Each layer was related to one year or sum of years according to that requested. A sequence of maps was produced comparing density of reported cases in all health regions in the kingdom during the 1990s. Dots in each health region on the maps mean presence of this number of cases in this health region but does not specify the real location of the cases in each health region. Maps were produced for the 15 notifiable diseases.

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Editorial notes: This computer-based technology has been available for a number of years but it is only recently that it has been widely appreciated as a powerful new tool that supports health situation analysis, operations research, and surveillance for the prevention and control of health problems.

Health Geographic Information System (HGIS) has proven to be a potent tool for risk assessment, decision-making, intervention evaluation and health planning.[3] The use of this technology can be tailored to suit a wide range of applications. Some recent applications include vector-borne diseases, water-borne diseases and environmental health. One of the best examples is application of GIS in malaria control programs, which is worthwhile in many countries. In the Kingdom of Saudi Arabia, effort has been made to implement GIS in malaria control, particularly in malarious areas such as Jizan and Asir.

GIS was also very efficient when it was used for planning of Jeddah health care facilities. Murad applied GIS to analyze accessibility to hospitals in Jeddah, Saudi Arabia in 2001.[4] That application identified the parts of the city which require more attention regarding their health care supply. Identifying health care needs is one of the important tasks, which health authorities frequently do. Information technology in general and GIS in particular can help the health authorities in decision making.

GIS and remote sensing have been also used to study the transmission and outbreak of Rift Valley Fever (RVF) in Jizan region, Saudi Arabia. Geographical databases and disease epidemiology have been integrated into decision support system.

The present study demonstrates use of GIS and spatial analysis to 15 notifiable diseases, comparing the density of reported cases from all health regions over time every year or every two years, which provides quick and reliable information for discussion, planning, assessment, analysis and decision making.

Mapping of the incidence/prevalence of notifiable diseases over geographic areas is the basic application but this information was not available. Reported cases of notifiable diseases in the annual health report, Ministry of Health was therefore used. GIS could generate hundreds of maps and charts of the reported diseases and this study illustrates examples of them. Each layer represented data of one year, moving from one layer to another by activating layer or more reveal the aggregation or density of reported cases and what has changed during that period. Comparing maps of different years can provide excellent means of visualizing trends.

Quick response by activation of one layer or more was very informative when data was displayed. Comparing maps and charts by using GIS technology has provided immediate visualization of the density difference of reported cases between the health regions during 1990s and was extremely effective in understanding the data.

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