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The Principles Of Epidemiologic Transition And The Experiences In Kenya

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ABSTRACT

Background

Throughout history, man has ignited dynamic changes in his ecosystem. In a cascading and feedback manner, these changes have, in return, significantly impacted on his probability of survival by exerting critical pressures that have shaped the population sizes, life styles, life expectancy and disease status. This position has been compounded further by climatic changes which have arisen as a consequence of man's activities that have disturbed the ecosystem balance. In deliberate efforts to place adequate food on the table, man has embarked on extensive land use thereby encroaching on new habitats and interrupting biodiversity balance. Within these new habitats, he has encountered new disease pathogens with expected consequences of wide oscillations in mortality rates. Migration as a result of conflicts, poverty, search for pastures and other forces have also thrown a critical spanner in these dynamics. In addition, the speed of mobility has become a key cog wheel in the process of change; in the 18th century, it took an average of six months to travel from one continent to another while today one can traverse three continents in twenty four hours. Industrialization coupled by global, regional and local socio-economic adjustments has also become a major pillar in the superstructure of these changes while government policies have had their influences on functionality of health systems. The ultimate consequence of these changes on health has been one of definite transitions across phases of disease scenarios over time at both local and global levels. Phases of pestilence, receding pandemics and upsurge of chronic diseases have become evident at varying levels in different countries.

Objectives

The main objective of this review is to demonstrate from literature the underlying principles of epidemiologic transition and to highlight the experiences in Kenya.

Methodology

Review literature from different countries including whatever is available in Kenya.

Expected output

To prepare a firm ground for a concept note aimed at conducting a comprehensive study of the scenario in Kenya. Armed with such information, the health system will be better placed to predict the next scenario to enable proactive preparation.

Results

Medical and public health factors still lag behind in many African countries Kenya included. We are however aware of the influence they have early in the accelerated and contemporary epidemiologic transitions.

The mortality decline currently being experienced in developing countries has been more recent and the effect of medical factors has been more direct and more salient.

In the African countries and in Kenya in particular, the tremendous impact of imported medical technologies on mortality has been magnified by massive public health programs. This is slowly leading to the transition from predominantly infectious diseases to chronic degenerative diseases.

Keywords: Epidemiology, transition, pandemics, chronic/degenerative diseases, demographics, ecosystems.

Introduction

Epidemiologic transition is the health phenomenon in which mortality and disease shift in intensity from a pattern of high mortality in the face of infectious syndromes to one of low mortality in the face of chronic syndromes. In 1971, Abdel

Omran postulated a theory which attempted to explain this phenomenon. He asserted that growth towards modernization traversed the stages of (1) Pestilence, (2) Receding pandemics and (3) Chronic diseases. In 1987, Richard Rogers and Robert Hackenberg added a fourth stage to account for the "cardiovascular revolution" of the 1970's

which embraced the achievements of the treatment of cardiovascular diseases and significantly raised the life expectancies in industrialized countries (Caselli, 1996). However, some countries including those in Eastern Europe and more prominently so in Africa are still struggling to enter this stage.

Omran's theory makes the proposition that (1) mortality was fundamental in determining the population dynamics and that (2) protracted shift occurred in disease and mortality patterns such that pandemics were replaced by chronic diseases as cause of morbidity and eventual death. During the pre-modern times (ie before the industrial revolution), countries in Europe experienced cyclic rises and falls in population growth where fertility was left to the maximum and mortality escalated as a result of epidemics, famines, wars and other disasters like perpetual malnutrition and endemic diseases (Angel and Pearson 1953; Landis and Hatt 1954; Russel, 1958). These factors of population depression were popularly branded as "Malthusian Positive Checks". As a result of this, life expectancy was pushed to low ebb as reported by these authors (18 years for Greece, 22 for Rome, 35 for Britain and 34 for Geneva). The implication of this was the creation of very young populations and a long duration to bring about any detectable increase in population size.

With the inception of the modern times, populations experienced exponential growth but mortality still remained as the most important check of population growth (Chambers, 1957; Utterstrom, 1965; Vielrose, 1965). Pandemics were gradually replaced with chronic diseases at varying speeds in different countries thereby leading to the categorization of this change as "classical, accelerated or contemporary".

Determinants of epidemiologic transition

Epidemiologic transition is a reflection of a complex interplay of a wide array of factors programmed to elicit changes in health and disease in human populations over time. Such factors are entrenched within demographic, socio-economic, technological, cultural, environmental and biologic confines. It is important to recognize that epidemiological transition is not unidirectional and that the changes can assume reverse directions. The transition is therefore a continuous transformation process. This is already happening in developed and industrialized countries where drug resistance by disease pathogens thought to have been eradicated is giving way to re-emergence of long forgotten diseases. In Sub-Saharan Africa and other poor developing countries, an overlap of pandemics and degenerative diseases is gradually creating a new and unique scenario arising from non-functional health systems, unstable governments, civil wars, chronic famines and the unrelenting HIV, TB and Malaria infections. The combination of these factors has plummeted the life expectancy to a paltry 45 years.

i). Ecological and biological determinants

A delicate balance exists between disease pathogens, the environment and man. In his struggle for survival, man initiates activities that culminate in disturbing this balance. A chain reaction is triggered by the resulting imbalance and this

impinges on health and disease patterns thereby influencing mortality, morbidity and life expectancy. In an effort to sustain food security, man is constantly encroaching on new habitats for farming activities. This undertaking erodes the buffer zone in the interface between man and wildlife thereby bringing him into contact with new pathogens previously confined in these habitats. This creates a precursor for emergence of new zoonotic diseases. Further, in the long term, residual damages become evident in terms of environmental degradation, the disturbance of the biodiversity balance and climatic changes.

ii). Socio-economic determinants

Health and disease are largely influenced by the standard of living, behavior and nutrition. Different diseases are experienced in different patterns by populations living under either poverty or affluence. Poor hygiene, malnutrition and lack of adequate water are experienced by populations living below poverty line and these are reflected in the nature and frequency of diseases in such populations. Sedentary lifestyles and consumption of junk foods also manifest themselves in different types and frequencies of diseases. Similarly, changes in behavior and cultural values strongly impact on disease trends across time and place. Changes in sexual behavior prompted either by cultural liberalization by the youth or by pressures arising from congestions in urbanized settlements have been reflected in upsurges of sexually transmitted diseases.

iii). Advancement in medicine and public health

Technological advances in both medicine and public health across time and place have significantly impacted disease patterns thereby altering both mortality and morbidity. Advances in pharmaceutical sectors have come up with inventions of new efficacious drugs that have been used to treat diseases that previously caused high mortalities and morbidities. Likewise, advances in vaccine developments have drastically reduced mortality due to many infectious diseases through expanded immunization of vulnerable populations. These curative and preventive interventions have influenced the transitions of disease and health in populations of interest.

Stages Of The Epidemiologic Transition

It has been advanced that, all societies experience three "ages" in the process of modernization: the "age of pestilence and famine", during which mortality is high and fluctuating.

The "age of receding pandemics", during which life expectancy rises considerably and the "age of degenerative and man-made diseases", during which the visibility of degenerative diseases and man-made diseases become more frequent.

Some experts have been seeing life expectancies as generally converging towards a maximum age. The point of convergence has been 75 years (United Nations, 1975). Notably, in the most advanced countries, the increase in life expectancy has slowed down since the 1960s and in some countries has even halted, in particular for men.

A new theory of the epidemiologic transition introduced the idea of a "fourth stage". The maximum point of convergence

of life expectancies increases due to achievements in the treatment of cardiovascular diseases.

This 4th stage is marked by stabilization and a decrease of cardiovascular diseases as a cause of death. It is also characterized by the emergence of new diseases (HIV, Ebola etc) and a revival of former diseases (cholera, malaria, dengue, Tuberculosis, etc).

There are however, numerous exceptions observed to this trend. Many countries (in particular Eastern European countries did not experience the "cardiovascular revolution" (Graziella Caselli *et al*, 1995).

Many others, especially in Africa, have not yet completed the second phase of the epidemiologic transition and are now hard hit by the arrival of new epidemics such as AIDS, together with the re-emergence of older diseases. These African countries including Kenya now face a double burden - of communicable diseases such as HIV and AIDS, TB and malaria; as well as CVD.

The Health transition process in developing countries started at a later stage and after World War II, most countries made huge progress that seemed to join the general trend of convergence.

The struggle against infectious diseases, especially tropical diseases, was at first successful with some countries, mainly in Africa, able to reach a pace of progress sufficient to reduce the gap separating them from developed countries. During the 1980s and 1990s, this pace began to slacken with the arrival of AIDS. This caused severe reversals and towards the end of the 1980s and life expectancy levels suddenly dropped.

Countries with the highest life expectancies in 1970-75, especially those of Eastern Europe (Central Europe and European republics of the former USSR) embarked on a period of stagnation and even declined (Graziella Caselli *et al*, 1995). They share phenomenon which clearly sets them apart from other industrialized countries.

Re-Emerging Infections

Centers for Disease Control and Prevention (CDC) have compiled a list of 29 newly emerging pathogens since 1973 (Satcher 1995) the overall size of which is more a function of increased detection than the actual emergence of new pathogens in human populations.

Outbreaks of Ebola hemorrhagic fever have received much attention in the popular press. This has focused on the gory aspects of its clinical manifestations and high mortality rates.

In 2013, a sudden outbreak of a virulent Ebola hemorrhagic fever hit the West African Region with its epicenter in the Central African Republic (CAR).

There have been 800 confirmed or suspected cases of the hemorrhagic fever in Guinea, Liberia and Sierra Leone with 470 people dead (WHO 2014).

The ongoing Ebola outbreak is the largest in terms of the number of cases and deaths as well as Geographical spread.

WHO describes the epidemic as one of the most challenging since the virus was first identified in 1976 in DR Congo.

The change in climate and Ecology has also been cited as a major factor in re-emerging infectious diseases as well. Warmer climates have led to increased coastal overgrowth of algae. This creates a favorable environment for the proliferation of *Vibrio cholera*. Inland changes in temperature and humidity have increased the reproduction of malaria vectors (Martens *et al* 1995; Patz *et al* 2000). Most of these ecological changes are as a result of human activities.

Of the re-emerging infectious diseases, tuberculosis (TB) is the greatest contributor to human mortality especially in developing countries where 95% of all cases occur (Raviglione *et al* 1995). These diseases have led to the unfinished transition of Most Sub-Saharan African countries including Kenya from the 2nd stage hence now the double burden of infectious and non communicable diseases.

Conclusion

The determinants of the transition from infectious to degenerative disease predominance are by no means simple.

Three major categories of disease determinants emerge. Eco-biologic determinants of mortality indicate the complex balance between disease agents, the level of hostility in the environment and the resistance of the host. More often than not even these determinants cannot be categorically specified.

Socioeconomic, political and cultural determinants including standards of living, health habits, hygiene and nutrition play a key role.

Medical and public health advances have been specific preventive and curative measures used to combat diseases.

They have included improved public sanitation, immunization and the development of decisive therapies.

Medical and public health factors still lag behind in many African countries but we are aware of the influence they have early in the accelerated and contemporary transitions.

The mortality decline currently being experienced in developing countries has been more recent and the effect of medical factors has been more direct and more salient.

In the Afro-Asian countries in particular, the tremendous impact of imported medical technologies on mortality has been magnified by massive public health programs.

Although it would be naive to attempt precise identification of the complex determinants in each case, it does seem apparent that the transition in the now developed countries was predominantly socially determined, whereas the transition in the less developed countries is being significantly influenced by medical technology.

Recommendations

- There is urgent need to reduce the human suffering caused by malaria, Aids, TB and other neglected tropical diseases.
- There is urgent need to reduce the human suffering caused by malaria, Aids, TB and other neglected tropical diseases.
- Infectious diseases should receive the attention they merit in the effort to lift African nations from poverty by firmly linking disease burden to economic development.

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