Current Trends in Technology and Science
ISSN : 2279-0535. Volume : II, Issue : III

The Role of Demographics and Human Activities in the Spread of Diseases

P.H. Bamaiyi
Department of Pathology and Microbiology, FPV, Universiti Putra Malaysia, Serdang 43400 Malaysia,
phbamaiyi@gmail.com

Abstract — The population of the world is currently put at more than 7 billion humans on the planet. This is the highest number of humans at a particular point in time since man began to live on the planet. This population is not static but is rapidly increasing especially in developing countries already overburdened with endemic poverty and poor governance. By the year 2050 most of the most populous countries and cities in the world will be in the developing world which has less income power. With this rapidly growing population comes the challenge of different diseases plaguing man especially zoonoses. The human population plays a pivotal role in the maintenance and spread of diseases in the world. This role is usually played through many of the human activities such as global travel and tourism that promote the spread of disease from one location to another. In order to preserve humanity on the planet with the best possible public health, a holistic one health approach to disease control and prevention is advocated across the globe
Keywords — Activities, Demographics, Diseases, Human, Role, Spread.

1. INTRODUCTION

Many diseases have been here with man for thousands of years such as rabies but some others are just emerging and some are remerging after a short or long period of absence. [1–3]. The environment, human activity and exotic animals play significant roles in the epidemiology of disease worldwide especially infectious diseases [3–5]. For nearly 40 years there has been a celebrated decline in the death rate caused by infectious diseases and rightly so due to the many advances in preventive and curative medical science [6–8]. Some diseases such as small pox have been completely eradicated, some like polio have been drastically controlled and some diseases such as yellow fever have been eliminated from many regions of the world [2,5,9,10]. With this great victory over many diseases, many health professionals thought the era of infectious diseases would shortly be over [3,4,11] and indeed not a few mistakenly thought infectious diseases will no more be a concern for humanity [1]. But sadly this was not to be with the emergence of new diseases such as the Human Immuno-deficiency Virus (HIV) and the Severe Acute Respiratory Syndrome (SARS) and reemergence of previously controlled or eradicated infections such as tuberculosis and cholera [2–4,11–14]. With the emergence and reemergence of diseases around the globe have also come the increased incidences of drug resistance by different strains of bacteria and other organisms [15,16]. Dr. Mark Woolhouse and co-workers at University of Edinburgh suggested that there are about 1709 known pathogens (from viruses and bacteria to fungi, protozoa and worms) and that 49% of these are zoonotic with zoonoses been three times more likely to be emerging diseases than non-zoonotic diseases [17].

The world has witnessed rapid technological and scientific developments with drastic changes occurring all over the world in the past 50 years leading to significant changes in the lifestyle of a vast majority of humans due to the increasing pressure of urbanization and globalization orchestrated by many social and demographic changes. These developments have led to practices such as deforestation and increased intensive farming hence exerting tremendous pressure on the environment and its resources which are often depleted in an attempt for a more urban environment. These practices in turn exposes man to the risk of vector-borne infections such as dengue, plague and malaria as man keeps encroaching into the natural habitats of the vectors [18–20]. In addition to these, fast urbanization practices are sometimes associated with poor water treatment plants to cater for a vast growing urban population and poor sewage disposal systems which may give rise to water-borne infections such as cholera, leptospirosis and cryptosporidiosis [1,21–23].

2. THE IMPACT OF DEMOGRAPHICS

Population explosion and uncontrolled rural to urban movements especially in developing countries has led to the development of unplanned mega cities with heavy clusters of human population numbers conducive for sustaining and propagating zoonotic infections. About 63 years ago only 76 cities in the world had a population of one million people or more which later increased to 522 cities in 1975, 1,122 in 2000, and is predicted to exceed 1,600 by 2015 which also corresponds to a rapid increase in global infectious disease susceptibility [4,14,24,25].
The population of the world reached 7 billion humans upon the planet on 31st October, 2011 and more than 90% of future world increase in population will be in developing countries (Tables 1 and 2) where attempts at family planning have yielded little or no appreciable results [26,27]. Incidentally the fastest growing cities are in the developing countries with the highest urbanization rates and currently more than 50% of the population of

the world live in urban areas compared to years ago and by 2050 more than 6.3 billion will be living in cities [4]. This kind of population growths and urbanization comes at a high price as far as social amenities and other facilities are concerned since most of these countries are ill-prepared for the burden and demands of a rapidly urbanized population considering the poor economy and high poverty levels [26,28]. The result of all these is a population exposed to various water and food-borne infections due to overcrowded poorly sanitized environments.

The population in rural areas experiences a less direct route to emergence of disease as it is rural emigration that assists the urbanization of the cities. The deforestation of rural areas and the encroachment of the population to areas before now uninhabited by humans exposes the human population to vectors of disease and can lead to the cross transfer of animal diseases into the human population and a distortion of the balance of ecology of the environment [29,30].

Table (1) The Most populous countries in 2012

2012	
Country	**Population(Millions)**
China	1,350
India	1,260
United States	314
Indonesia	241
Brazil	194
Pakistan	180
Nigeria	170
Bangladesh	153
Russia	143
Japan	128

Source: USAID 2012
World Population Reference Bureau

Table 2: The Most populous countries by 2050

2050	
Country	**Population(Millions)**
India	1,691
China	1,311
United States	423
Nigeria	402
Pakistan	314
Indonesia	309
Bangladesh	226
Brazil	213
Congo, Dem. Rep.	194
Ethiopia	166

Source: USAID 2012
World Population Reference Bureau

3. HUMAN ACTIVITIES

The activities of humans play a role in the spread of zoonotic infectious diseases. Some of the human activities include the following:

3.1 Global Travel and tourism

A very important hall mark of the 21st century is the ability to travel around the world at a faster speed and within relatively shorter period of time compared to previous generations when travel was difficult and extremely time consuming. In medieval times man travelled from one location to another using such transport means as horses, donkeys, camels and mules or just trekked on foot. Such journeys could take many days and weeks to accomplish and so it took also a long time to be able to transport infection from one location to another and in fact many agents of such infections may not survive the harsh conditions of travel in some countries such as desert areas and many tropical countries with extreme heat. In modern times travel has been made extremely easy and it is possible for one man to go round the whole world in just a few days using air travel which is perhaps the commonest means of transport now. With increase ease of travel came increase frequency of travel and movement which has made the world become a "global village". Unfortunately, this development has also made it much easier for infectious diseases to also move round the world rapidly with maximum ease [4,31,32]. Infectious diseases such as influenza can be moved easily from one location to another through travel [33,34] and infected air travelers are now a major source of transmission of infectious diseases worldwide as they travel [35,36]. For example, in a medical investigation 5 Japanese were found to be infected with Schistosomiasis which is not found in Japan but which they got after a trip to East Africa and 2 other Japanese travelers were infected with trichinellosis from a trip to Taiwan [37]. Many other infections such as leptospirosis, brucellosis, chikungunya have been found to be easily carried by infected individuals from one country to the other [38–41]. Similar reports are found around the world of such travel related diseases and already some nations are taking steps to control and prevent such travel related infections [42,43].

3.2 Desertification and deforestation

The process of removing trees without planting new ones to replace them by man destabilizes the ecosystem and exposes man to vectors and agents of infectious and non-infectious diseases such as Vitamin A deficiency that results from a destroyed natural environment [44].

3.3 Genetic engineering and other scientific research

Though research in genes and DNA of humans and animals has led to the development of many new

curative drugs and new surgical procedures and the development of vaccines to prevent certain infections, there is a growing fear of the misuse of this advancement in medical science for the development of potentially destructive pathogens by modification of their genes [45,46]. There is also the growing fear that some scientists may work in consonance with terrorists to make available bioweapons of terror [47,48].

3.4 Trade in exotic animals

With the spread of humanity all over the globe people want to modify their environment and bring with them certain animals they are used to in their previous environments. In order to achieve this, exotic animals are brought into countries non-native to them and forced to adapt. With the importation of exotic animals comes also the importation of exotic diseases many of which are zoonotic in nature and easily transmitted to man [49–51]. Sometimes humans enter into forests and jungles to dislodge wild animals for the gratification of man's pleasure which leads to encounter with diseases that hitherto had been silently maintained in the sylvatic cycle but due to human interference some vectors may now be transmitted to man just like it was recently hypothesized concerning the medieval age plague [52].

3.5 Rapid urbanization

A rapid urbanization project which is a human activity at the detriment of the environment and economic empowerment in developing countries has led to the spread of diseases among the population. This is usually due to sanitation related factors as a result of people living in slums in many developing countries and the felling of trees to make room for gigantic buildings exposing people to vectors and pathogens of disease [53]. In developed economies and rapidly developing countries urbanization may lead to the so-called "diseases of affluence" such as hypertension and obesity [54]. The demographics of urban areas may favour rapid spread of infectious diseases [55].

3.6 War and conflicts

The unfortunate inevitable consequence of war and conflicts around the world is the displacement of people from their homes to places which were not initially made for human habitation such as jungles, make-shift refugee camps and other transient points which make humans more exposed to agents and vectors of disease in addition to disabilities and cases of poisoning by lethal chemicals of war [56,57]. There are many cases of rape during wars and conflicts which invariably are associated with transmission of HIV and other venereal diseases [58]. Such deleterious impacts upon humanity may last long even after the war is over causing untold hardships upon victims and the society. Another dimension of war is the use of disease agents as weapons of war on human populations. This is known as biowarfare and bioterrorism when used by terrorists. Bioweapons have been used to fight enemies for centuries with devastating consequences resulting in the death of millions like in Europe between 1347 and 1352 about a third of Europe was wiped out by plague (*Yersinia pestis*) [59]. The Japanese used bioweapons of cholera, plague, typhoid and anthrax against opponents especially the Chinese during the Second World War resulting in the death of hundreds of thousands of people [60,61]. Another potent bioweapon is anthrax which caused a lot of scares some years back in the United States and some other nations around the world [47,48].

3.7 Poverty

Poverty is largely man-made due to unequal distribution of wealth and creation of classes among humans. Wars, conflicts, illiteracy, bad leadership and other hydra-headed factors may lead to poverty in many communities of people around the world [28]. Certain diseases like cholera are associated with endemic poverty in victims [62,63] and are usually largely a problem of the developing world.

4. Conclusion

With the fast rate at which the world is undergoing industrialization and urbanization, demographics and human activities will continue to play a prominent role in the spread of many diseases in the world. Control and preventive measures must be put in place to ensure the survival of the human race and species upon the earth in the midst of many opposing factors mainly man-made. Medical science must continue to advance especially in the area of preventive medicine at a faster rate than the fast moving and evolving pathogens humanity has to contain with on a daily basis. Government policies properly implemented enforcing vaccinations, travel bans and quarantine of people especially travelers when infection is suspected may be helpful but is limited by challenges of implementation and breaching fundamental human rights of individuals. For best results in controlling and preventing diseases the one health concept and approach involving all medical, veterinary and allied professionals should be utilized because most diseases are zoonotic in nature and a holistic approach will be needed for effective combating of such infections.

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