EDITORIAL

Epidemiological Polarization in Sudan

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Paul Farmer has coined the term Epidemiological Polarization (EP) to describe two groups of people in the world based on what makes them sick and what kills them. Better income urban group live longer, have high risks of cardiovascular disease (CVD), die from non-communicable disease and road traffic accidents. Rural and peri-urban group die from violence, hunger, and infectious diseases that medical science knows how to prevent and to treat (if not cure)[1].

Sudan sets typical example of where EP prevails. In 1955 the total population of Sudan was 10.3 million with urban population accounting for 854,000 (8.8% of the total population). Farming was the main source of revenue and cotton and gum Arabic are exported sufficiently to cover the fiscal needs of the whole country. People lived contently, growing their cash crops for the local market and seeds for home use. Sugar, purified starch, saturated fats and canned food were minimally used. Smoking and mouth tobacco were considered by religious and social beliefs to be obnoxious. The prevalent diseases were malaria, bilharzia and infections and rheumatic heart disease (RHD). Rates of non-communicable disease such as cancer, coronary heart disease (CHD) were very low and did not constitute a health problem.

By the beginning of the nineteen eighties the economic and health situation started to show significant transformation when two major events dominated the country's profile.

Drought struck the country and persisted throughout the early eighties resulting in desertification of arable fertile land and the consequent famine lead to massive population movement to the towns and cities of the country. The displaced people created shanty towns round most of urban and peri-urban localities. These settlements lacked minimal environmental and health service and some of them became the seat of disease and crime.

By the late nineteen eighties and beginning of the 1990s civil wars broke in the south of the Sudan and continued to act as serious displacement factor until the early 2014. More unrest disrupted rural stability when paramilitary groups attacked government troops in the west and Nuba Mountains. The consequent population movement contributed immensely to increase in inhabitants of cities and small town. In 2014, urban population reached 13, 230743 accounting for 33.8% of the total population of Sudan (36,729,501; 2016 estimate (Figure 1)[2].

	1955	1973	1983	1993	2002
Total population	10,300	14,500	21,590	42,900	31,341
Urban population	854	2,606	4,154	6,275	10,074
Urban %	8.8	18.5	20.5	25.2	33.1

Figure 1: Urban growth during the period 1955-2002. Source: World Bank, World Development Report 1993

Urban growth has led to the appearance of new metropolitan areas largely in Khartoum, but has extended to involve some of the states capitals especially Obied, Medani, Kassala and Port Sudan. Khartoum, Omdurman and Khartoum North (The Capital Triangle) harbored more than 12 million of inhabitants (2016 est), becoming the largest Metropolitan area in Sudan (Figure 2).

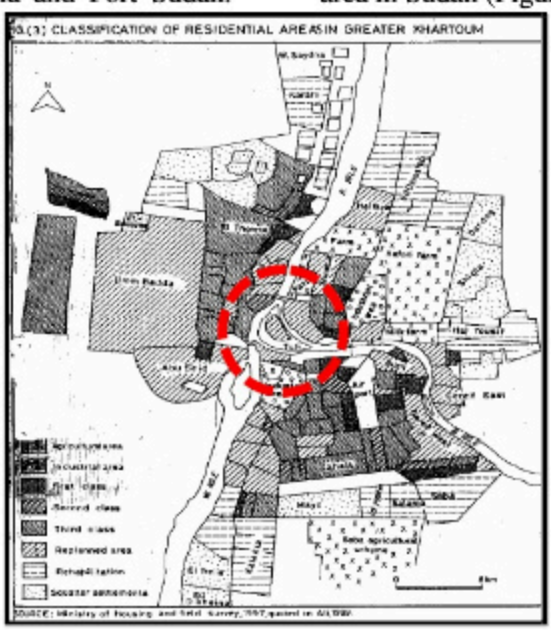

Figure 2: Growth in size of Khartoum from 1955 (encircled red) to its present size in 2016.

Because of the population movement, cities and towns swelled with rural people and shantytowns emerged on the outskirts of the major cities. The rapid increase in population has disrupted the existing health and environmental structure of the towns and affected the health of the new inhabitants as they try to coup with a new and increasingly demanding life. Consequently a group of people formed of rural inhabitants, peri-urban dwellers, slums and squatters settlements, constituted a distinct pole of deprived population. This group share

several characteristic features among them are malnutrition, infectious disease, malaria and overcrowding at homes and schools (Figure 3).

Disease	Outer Slums	Squatter settlement
Malnutrition	50%	55%
Malaria	20	20
Diarrhea	15	17
Respiratory disease	10	5
Non communicable diseases	0.5	0.7

Figure 3 Common diseases in outer slums and squatter settlement in major cities.

In inner cities the improvement of economy, transport, telecommunications and access to media has noticeably affected the lifestyle of people during the last three decades (1990-2016). Better incomes, living standard and health care lead to increased life expectance, from 48 years in 1980 to: 64.1 years for total population (male: 62 years; female: 66.3 years. 2016 est.). Khartoum metropolis emerged as the seat of urban economy with high concentration of services (Figure 3).[3,4]

Percentage	Economic parameters
▪ 73 %	industries
▪ 75 %	industrial labor force
▪ 67 %	electrical power from the national grid
▪ 85 %	commercial enterprises
▪ 80 %	banking services
▪ 85 %	industrial bank loans
▪ 71 %	real estate bank loans
▪ 70 %	tax payers; 81 per cent of taxes collected;
▪ 70 %	hospitals and health centers
▪ 65 %	medical doctors
▪ 80 %	nurses

Figure 3: Urban economy as featured by Khartoum Metropolis

Urban dwellers, on the other hand have, experienced serious changes in lifestyle. Eating has changed as refined carbohydrates, fast foods and saturated fats replaced the traditional high fiber native Sudanese food. Additionally high rates of smoking and obesity became features of the new affluent lifestyle. The burden of communicable disease was, thus, compounded by the appearance of a new wave of high rates of CVS risk factors and consequently high rates of non-communicable disease headed by coronary heart disease and cancer (Figure 4).[5,6] By

contrast the rural group or pole remained the victim of malnutrition, infectious and rheumatic heart disease, the so called unfinished agenda. Consequently the general population became epidemiologically polarized into these two groups. The wave of epidemiological transition has thus afflicted Sudan as it did with other sub-Saharan African countries.[7]

CVD Risk	Urban	Rural	p-Value
Obesity	17.1	3.0	0.001
Hypertension	11.4	6.6	0.001
Diabetes	More	…….	0.05

Figure 4: Urban versus rural disease trends

As the two poles of the population are now defined solutions to resolve the problems of the urban, peri-urban, outer slums and squatter settlements should be structured. Political and administrative decentralization together with socio-economic adjustments and protection of the poor should be sought and balance between the two categories should be achieved. It is therefore important to reduce communicable disease socio-economic burden by combating HIV, tuberculosis, malaria, infections and rheumatic fever characteristic of the poor urban dwellers.

The greater challenge to health authorities in Sudan and others sub-Saharan countries is to reduce the burden of infections and rheumatic fever, the unfinished agenda, and contain the new epidemic of coronary heart disease. As the average level of critical risk factors for CVD, in the rural communities, is still favorable it becomes mandatory to prevent the emergence of unhealthy lifestyles and retain the health promoting aspects of the traditional Sudanese way of life.

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