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Original Research Article

Epidemiological Transition in Lagos, Nigeria: A Ten-Year Retrospective Analysis of the Patterns and Trends of Morbidity and Mortality at Nigeria's Premier General Hospital

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ABSTRACT

Introduction: The emergence of a new epidemic plague, HIV/AIDS (human immunodeficiency virus/acquired immunodeficiency syndrome) in the eighties has left many countries in Africa with a double burden of health problems - a new epidemic of infectious disease and unresolved infectious conditions, as well as a growing set of Non-communicable diseases (NCDs). NCDs are becoming increasingly important causes of morbidity and mortality especially in Africa, incurring costs both to the individual and national economies. While these diseases cause pain, disability, loss of income, disruption of family stability and impaired quality of life, the resources earmarked for NCDs are extremely low despite the obvious trends and few countries have implemented comprehensive policies for preventing and controlling NCDs. This study provides policy makers with information about the morbidity/mortality picture over a 10-year period at a premier General Hospital. It reflects the emergence of NCDs, and how this affects the adult population. It also responds to the urgent need for research to enable policy makers in Nigeria to respond effectively to rapidly changing health needs.

Method: Analysis of all new cases of diseases and all deaths registered over a period of 10 years from 2005 to 2014 with the 10th edition of The International Statistical Classification of Diseases and Related Health Problems (ICD-10). The data from monthly paper records for the study period were entered into excel spreadsheets and statistical analysis included time plots for trend analysis.

Results: The highest burden of diseases was from Infectious/Communicable diseases (43.61%). However, NCDs such as Stroke, Heart failure, Hypertensive heart disease and Diabetes mellitus were among the top 20 causes of deaths. They accounted for 36.2% of deaths among individuals aged 15 years and above. NCDs showed an increasing trend in the burden of diseases and deaths while the group of Infectious/Communicable diseases and that of Injury, Poisoning and External Causes (IPEC) showed downward trends over the study period.

Conclusion: Clear evidence to support the epidemiological transition called the "double burden" in developing countries is observed from the results of this study with the group of Non-communicable Diseases emerging behind Communicable Diseases and displaying an increasing trend. Epidemiological research of this nature is needed to understand the distribution in African settings of communicable and non-communicable diseases and to inform health planning. It is also expected to promote awareness among policy makers and the public about prevention and control of NCDs as well as Communicable diseases.

Key words: Stroke, HIV disease, Trends, Double burden, ICD-10.

INTRODUCTION

Non-communicable diseases (NCDs) are chronic conditions that do not result from an acute infectious process. They usually develop over relatively long periods first without symptoms but after disease manifestations develop, there may be a protracted period of impaired health. They cause death, dysfunction or impairment in the quality of life. [1]

Cardiovascular diseases, diabetes mellitus, cancer, chronic respiratory diseases, osteoarthritis and mental disorders are among the major NCDs in the Sub-Saharan Africa region. [2] Risk factors such as a person's lifestyle, genetics or environment are known to increase the likelihood of certain NCDs. [1] Of these three risk factors, 50% of all NCDs are a result of poor lifestyle choices such as drug use, alcohol and tobacco use, diet, lack of exercise or stress management.

Sixty three percent (63%) of the 57 million global deaths in 2008 were due to NCDs, majorly cardiovascular diseases, diabetes, cancers and chronic respiratory diseases. With the rising impact of NCDs and population ageing, annual NCD deaths are projected to continue to rise worldwide, and the greatest increase is expected to be seen in low- and middle-income regions. [3]

Globally, NCDs are increasingly recognized as a major cause of morbidity and mortality. The World Health Report 2001 had indicated that NCDs account for 60% of deaths and 46% of the global burden of disease. By 2020, it is expected to account for 73% of death based on current trends and 60% of the disease burden. Even in African nations, NCDs are rising rapidly and are projected to exceed communicable, maternal, perinatal, and nutritional diseases as the most common causes of death by 2030. [3]

Rates of communicable diseases such as HIV/AIDS, tuberculosis and malaria in Africa are the highest in the world. [4] The African region faces a double burden of increasing NCDs and of continuing high morbidity and mortality from communicable diseases. [5-7] With an increasing trend in developing countries, this transition imposed more difficult problems, considering the double burden of the still existing infective diseases (such as malaria, gastroenteritis, pneumonia) coupled with the non-infective diseases, in a resource poor environment. [8] Implicated global forces in the shift in the disease burden include demographic ageing, rapid unplanned urbanization and the globalization of unhealthy lifestyles which are universal trends. This problem is further compounded by the emergence of the HIV/AIDS epidemic plague in the eighties. [8]

However, in general, the burden of chronic NCDs is not as well documented.[9]Information on prevalence of some NCDs are mostly more than 10years old and are limited to data from a very small fraction of the countries in Sub-Saharan Africa. [9]

Adult mortality remains a neglected public health issue in Sub-Saharan Africa largely due to a lack of empirical data about the levels of mortality experienced by adults in the region, combined with the focus on maternal and child health. It is now becoming recognized more widely. [10]

Health sector reforms have swept the continent during the last 20 years and given primary health care priority in attempts to provide accessible health care to rural communities and contain costs. The strategies of primary health care have however focused largely on mother and child health and provision of acute care. [10] These strategies have yet to overcome the challenges posed by the health needs of adults, such as the management of chronic conditions (NCDs). The impact of these challenges has been obscured by the lack of good data on the levels of adult mortality and its trends and causes. [10]

There is limited literature on disease trends in most parts of Africa. [2] This present study provides empirical data that will contribute to the knowledge about adult morbidity/mortality and highlight the burden of NCDs as reflected from a model,

utilitarian public hospital in the most populous city in Africa.

MATERIALS AND METHODS

Study design

Retrospective analysis of hospital records from January 2005 to December 2014. These are monthly records of all new cases of diseases and all deaths in the hospital registered with the 10th edition of the International Statistical Classification of Diseases and Related Health Problems (ICD-10).

The diseases/health problems were further categorised into three groups for critical analysis: Group I- Infectious/ Communicable Diseases (consisting of Certain Infectious and Parasitic Diseases), Group II- Injury, Poisoning and External Causes (consisting of Injury, Poisoning and Certain Other Consequences of External Causes and External Causes of Morbidity and Mortality) and Group III- Non-communicable Diseases (consisting of Cardiovascular Diseases, Diabetes mellitus, Cancer, Chronic Respiratory diseases, Osteoarthritis and Mental disorders). This grouping was based on prevalence and importance for policy. [2,11]

Study site

General hospital Lagos, Odan is the premier general hospital in Nigeria. It was founded in 1893 by the British government with over 120 years of existence. It serves as a model for other general hospitals in Lagos state. Located in the city with the largest population in Africa; projected population of 20.5 million with annual Population Growth Rate of 8% estimating 4,193 persons per square km, it serves a significant portion of the populace; providing primary care services through its General Out-patients Department and playing a referral role through various specialized clinics.

Data analysis

Data from paper records were entered into excel spread sheets and statistical analysis included descriptive statistics (frequency distribution) and trend analysis with the aid of the statistical software for social sciences (SPSS) version 19.0.

Ethical clearance

Ethical approval was obtained from the Health Research and Ethics Committee of the Lagos State University Teaching Hospital. Reference number: LREC/ 10/ 06/ 500; Date: March 10, 2015.

RESULTS

Table 1: Top 20 Diseases/Health problems

DISEASES	Frequency (n = 462,333)	Percent
Malaria	180,525	39.05%
Fever of unknown origin	23,935	5.18%
Diarrhoea and Gastroenteritis of presumed infectious origin	16,828	3.64%
Essential hypertension	13,238	2.86%
Abdominal and pelvic pain	10,534	2.28%
Visual Disturbances	9,772	2.11%
Cough	9,199	1.99%
Pedestrian injured in collision with pedal cycle	9,166	1.98%
Pain in throat and chest	9,005	1.95%
Other road traffic accidents	7,828	1.69%
Human Immunodeficiency Virus (HIV)	6,754	1.46%
Stroke	6,391	1.38%
Fractures involving multiple body regions	6,366	1.38%
Senile Cataract	5,522	1.19%
Open wound of head / neck	5,345	1.16%
Motorcycle rider injured in collision with pedestrian, car, truck or van	4,793	1.04%
Conjunctivitis	4,525	0.98%
Open wounds involving multiple body regions	4,048	0.88%
Heart failure	3,715	0.80%
Foreign body in ear	3,284	0.71%

Over four hundred thousand new cases were recorded (462,333) at the General Hospital, Lagos over the 10-year period from January 2005 to December 2014. Out of these, 231,096 were males and 231,237 were females. The proportion of males to females was almost equal.

The diseases/health problems mostly recorded in the hospital over the 10-year study period are shown in Table 1. Topping the list was: Malaria (39.05%) followed by Fever of unknown origin (5.18%), Diarrhoea and Gastroenteritis of presumed infectious origin (3.64%), Essential hypertension (2.86%) and Abdominal and pelvic pain (2.28%). The top 10 chapters for diseases/health problems are shown in Figure 1.

Malaria (19.09%), Stroke (10.82%), Fractures involving multiple body regions (7.02%), Human Immunodeficiency Virus (5.20%) and Open wound of head / neck (4.95%) were the five leading causes of deaths shown in Table 2. The top 10 chapters for deaths are shown in Figure 2.

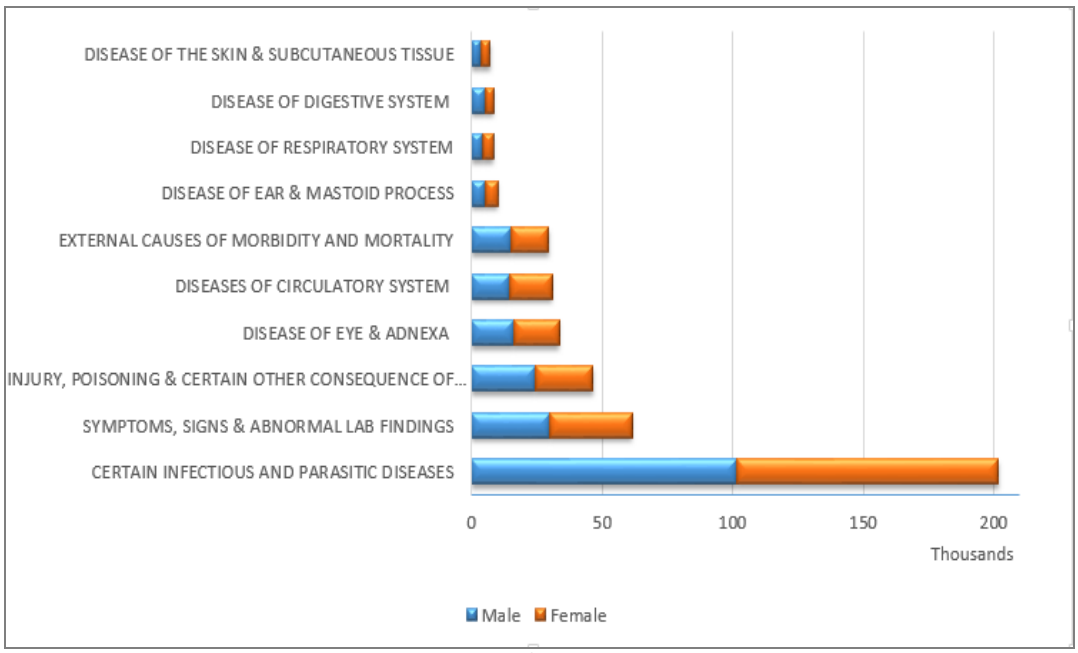

Figure 1: Top 10 Chapters for Diseases/Health problems.

The highest burden of diseases is from Infectious/Communicable diseases (43.61%). This also accounted for most deaths (37.01%). There is no statistically significant difference in sex distribution of diseases and deaths (P-value>0.05 for each group).

Age group 15-49 years experienced the highest burden of diseases: Infectious/ Communicable Diseases (71.31%), Injury, Poisoning, and External Causes (64.01%) and Non-communicable Diseases (48.93%). In addition, a significant proportion of deaths from Injury, Poisoning, and External Causes (46.56%) occurred among adults of age 50 years and above and the highest burden of deaths from Non-communicable Diseases (56.41%) was among this age group. The difference in age distribution across the three groups of diseases and related health problems is statistically significant (P-value <0.05) for both disease burden and death burden respectively.

Figure 3 shows the trend analysis of the yearly cases of the three groups of diseases (as a percentage of total cases per year) over the 10-year period. All except NCDs showed downward trends at rates of 5.09%for infectious/communicable diseases (CDs) and 8.07% for Injury, Poisoning and External causes (IPEC) while NCDs showed an upward trend at a rate of 14.40%over the 10-year study period.

Table 2: Top 20 Causes of Death

DISEASES/HEALTH PROBLEMS	Frequency (n = 5,342)	Percent	CSDR*
Malaria	1,020	19.09%	0.53
Stroke	578	10.82%	0.30
Fractures involving multiple body regions	375	7.02%	0.20
Human Immunodeficiency Virus (HIV)	278	5.20%	0.15
Open wound of head / neck	265	4.96%	0.14
Intentional self-harm	215	4.02%	0.11
Other road traffic accidents	200	3.74%	0.10
Heart failure	156	2.92%	0.08
Coma unspecified	145	2.71%	0.08
Septicemia unspecified	143	2.68%	0.08
Motorcycle rider injured in collision with pedestrian, car, truck or van	119	2.23%	0.06
Hypertensive heart disease	118	2.21%	0.06
Non-insulin dependent diabetes mellitus	101	1.89%	0.05
Diarrhoea and Gastroenteritis of presumed infectious origin	94	1.76%	0.05
Peritonitis / Intestinal Obstruction	68	1.27%	0.04
Syncope & collapse	63	1.18%	0.03
Pedestrian injured in collision with pedal cycle	61	1.14%	0.03
Poisoning by systemic antibiotics, narcotics & other psychotropic drugs	55	1.03%	0.03
Dizziness & Giddiness	54	1.01%	0.03
Foreign body entering into a natural orifice	52	0.97%	0.03

CSDR* = Cause-Specific death rate per 100,000 cases

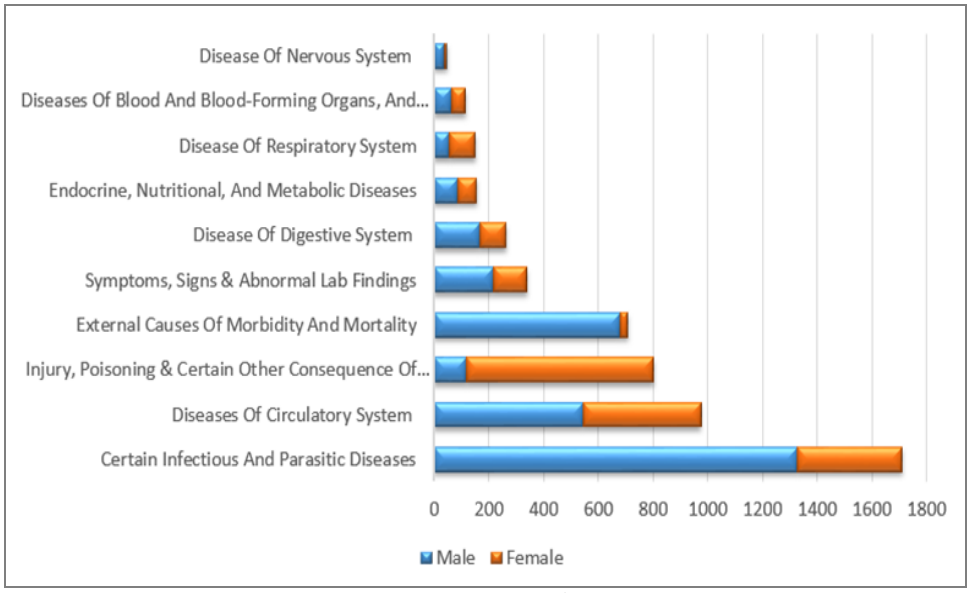

Figure 2: Top 10 chapters for deaths

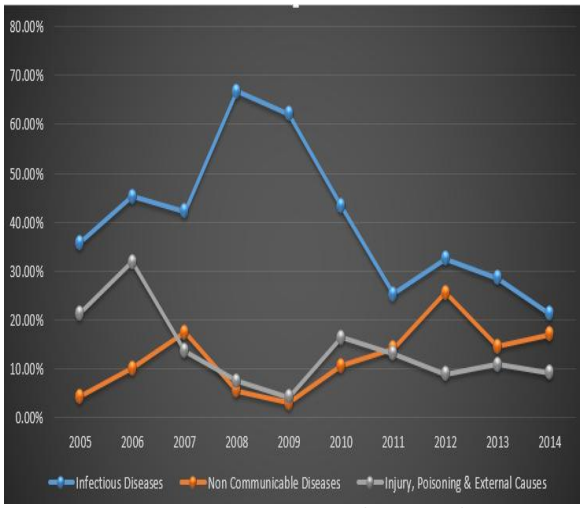

Figure 3: Time plot showing trends of diseases for the three groups

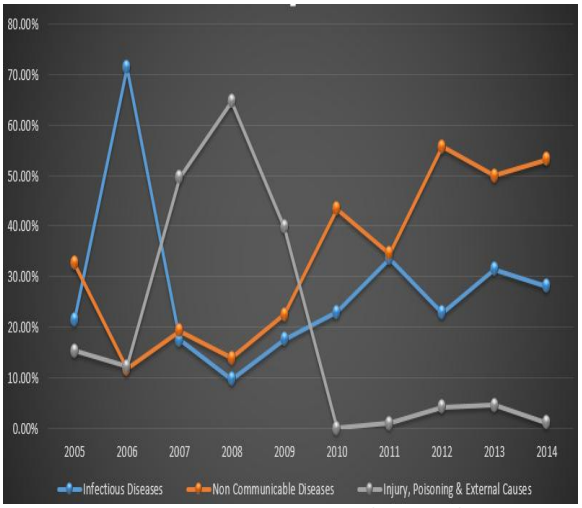

Figure 4: Time plot showing trends of deaths for the three groups

Figure 4 displays the trend analysis of the yearly deaths (as a percentage of total deaths recorded per year) from the three groups of diseases over the 10-year period. All except NCDs showed downward trends at rates of 2.74% and 23.28% respectively for infectious/communicable diseases and IPEC over the 10-yearstudy period. NCDs showed an upward trend at the rate of 5.03% over the period.

Figure 5 displays the trend analysis of the yearly deaths (as a percentage of total deaths recorded per year) for the top five causes of deaths reported over the 10-year period. There was a downward trend in deaths due to malaria, fractures, and open wounds at rates of 8.76%, 100% and 100% respectively. However, there was an upward trend for Stroke and HIV at rates of 15.18% and 14.79% respectively over the period.

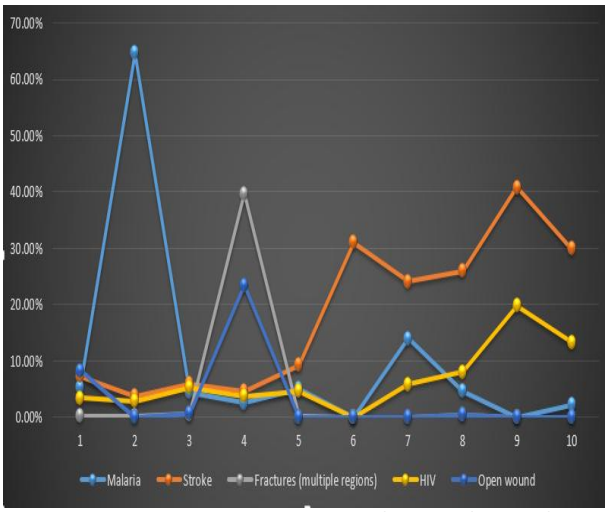

Figure 5: Time plots showing trends of deaths for the five leading causes of death

Table 3: Leading causes of diseases and deaths among adults

Diseases (15 - 49 years)			Diseases (50 Years and above)		
Rank	**Cause**	**Frequency**	**Rank**	**Cause**	**Frequency**
1	Malaria	127,994	1	Malaria	42,481
2	Fever of unknown origin	13,572	2	Fever of unknown origin	9,484
3	Diarrhoea and Gastroenteritis of presumed infectious origin	10,506	3	Essential hypertension	7,920
4	Human Immunodeficiency Virus (HIV)	5,677	4	Diarrhoea and Gastroenteritis of presumed infectious origin	4,636
5	Visual Disturbances	5,595	5	Stroke	3,569
6	Abdominal and pelvic pain	5,565	6	Visual Disturbances	3,414
7	Pedestrian injured in collision with pedal cycle	5,506	7	Senile Cataract	3,343
8	Hypertensive heart disease	5,311	8	Abdominal and pelvic pain	3,099
9	Cough	5,258	9	Cough	2,656
10	Pain in throat and chest	5,080	10	Pedestrian injured in collision with pedal cycle	2,581
Mortality (15 - 49 years)			**Mortality (50 Years and above)**		
Rank	**Cause**	**Frequency**	**Rank**	**Cause**	**Frequency**
1	Human Immunodeficiency Virus (HIV)	228	1	Stroke	368
2	Stroke	164	2	Fractures involving multiple body regions	368
3	Malaria	143	3	Open wound of head / neck	234
4	Septicemia unspecified	91	4	Heart failure	101
5	Coma unspecified	79	5	Non-insulin dependent diabetes mellitus	67
6	Diarrhoea and Gastroenteritis of presumed infectious origin	57	6	Coma unspecified	66
7	Heart failure	44	7	Hypertensive heart disease	65
8	Hypertensive heart disease	38	8	Human Immunodeficiency Virus (HIV)	45
9	Non-insulin dependent diabetes mellitus	34	9	Malaria	45
10	Peritonitis / Intestinal Obstruction	32	10	Septicemia unspecified	45

DISCUSSION

Contrary to popular belief that NCDs affect mostly high-income populations, the findings from this study support the epidemiological transition called the "double burden" in developing countries. [5-7] Non-communicable Diseases (Hypertension, Stroke, Heart failure and non-insulin dependent Diabetes Mellitus) accounted for 17.84% of the top 20 diseases/health problems, emerging behind the persisting threats of Communicable

Diseases [8] which is supported by the high disease burden of Malaria and Diarrhoeal diseases (42.69%) and death burden of Malaria and HIV disease (24.29%) in this study.

Diseases of the circulatory system (mainly cardiovascular diseases; Stroke and Heart disease) were the second leading cause of deaths in this study as is the case in Sub-Saharan Africa, [12] also consistent with the World Health Report (WHR) 2003. However, this study reports a cardiovascular disease-related death burden of one-fifth of all deaths, slightly lower than the report of a death burden that was one-third of all deaths, [11] possibly because of the global scale of the WHR. Stroke accounted for 7.19% of deaths in this study, in consonance with a report of 4-9%of deaths in Africa.

The registration of Symptoms, Signs and Abnormal Findings (e.g. Dizziness and Giddiness, Syncope and Collapse, Coma unspecified) as causes of diseases and deaths possibly reflects a remarkable tendency towards symptom diagnoses by clinicians particularly during the first consultation. While these have been shown to account for one-fifth of deaths in some developing countries, [2] they accounted for one-eighth of deaths in this study. Continuing medical education to optimise diagnostic skills and promotion of awareness about the role of clinicians in ensuring accuracy of clinically coded data is essential. Registration bias on the part of coders may also be responsible for this. Good quality registration holds more benefits for health planners and this may be achieved at the primary care level by using a simpler classification such as the International Classification of Primary Care (ICPC), [13] which accommodates symptom diagnoses and can be mapped to the International Statistical Classification of Diseases and Related Health Problems (ICD).

The variation observed in the 2006 time plot of CDs' burden was due to influx of referral of cases of HIV disease at various stages to the study site following the establishment of HIV/Anti-retroviral services by Medecin Sans Frontier in 2004. Subsequently, other HIV/ARV service points were established across Lagos state.

The downward trends in the groups of Communicable Diseases and Injury, Poisoning and External Causes are commendable and may be attributed to the implementation of the Roll Back Malaria Strategy and the strict enforcement of road safety rules and regulations in Lagos State respectively. The later will not be unconnected to the decline in road transport accidents/injuries. Riding on the back of these positive outcomes, suffice it to say that introduction and implementation of disease-specific, feasible, comprehensive state/ national policies for the prevention and control of NCDs will yield the much desired results.

In keeping with research finding that more than one-third of NCD deaths occur in middle aged adults [2,11] and that premature mortality rates from NCDs were higher in population with high mortality and low income than in industrialized world, this study reports its highest death burden from NCDs among the age group of 15-49 years (25.9%) and the age group of 50 years and above (42.8%); majority of whom were below 70 years.

Limitations

The study setting may not be fully representative of the children population and it is devoid of obstetric cases because of the presence of a public children hospital and maternity hospital in the vicinity. However, it sufficiently represents the general adult population which is the main focus of this study. Findings may also not be generalizable to the whole Nigerian population.

The data was not corrected for the possibility of miscoding causes of death; particularly cases coded under the chapter of Symptoms, Signs and Abnormal Findings. However, the frequency of registration of codes in this chapter is about half of what is reported in some developing countries. [2]

CONCLUSION

As populations age and survive Communicable Diseases, it is expected that more people will become vulnerable to NCDs due to lifestyle and other factors. It is therefore becoming more important to focus on preventive measures such as: lifestyle modification, prevention of accidents/crime, screening programmes, rapid tests; periodic medical examination of well persons to include age-appropriate periodic mammographic screening and immunization for vaccine-preventable cancers, as well as introduction of public health regulations that make the community environment more conducive to personal behaviours that decrease the risk of chronic diseases. Summarily, the continuous health education and improvement of awareness about NCDs and their prevention/control is of utmost importance.

A structured approach to prevention and control of NCDs at the primary care level will curb this increasing burden on the health sector and on individuals. This can be achieved through the implementation of a structured development of primary care services beyond the conventional Communicable Diseases focus and through standardization of primary care services to improve primary care delivery. [2]

The need for good quality comparable data on disease burden and risks to aid planning and implementation of prevention and control strategies for NCDs is urgent and is greatest among low- and middle- income countries. [14] The improvement of infrastructures and man-power for health information management will greatly improve the quality of data.

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