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Cause specific and trends of mortality in Nigeria: A six-year study of a tertiary hospital

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Mortality data necessary for proper healthcare planning, policy formulation, and implementation is hampered by a decline in hospital autopsy practice. Therefore, non-autopsy based death profile reviews provide a framework for the presentation and discussion of reliable mortality data. This study aims to present the general mortality profile of the University of Port Harcourt Teaching Hospital, Rivers State, Nigeria. This was a retrospective review of deaths recorded among patients admitted into various wards and emergency units of the University of Port Harcourt Teaching Hospital between 1st January, 2012 and 31st December, 2017. Decedent causes of death were eluted from case notes and death certificates, and were systemically classified using the ICD10 disease coding scheme. SPSS version 23 and Minitab version 16 were used for data and trend analysis respectively. A total of 1902 mortalities were recorded in the following order: Diseases of the cardiovascular system - 566 (29.8%), infectious diseases - 360 (18.9%), external causes of morbidity and mortality - 271 (14.2%), malignant neoplasms - 221 (11.6%) and diseases of the endocrine system - 112 deaths (5.9%). Males constituted 989 (52.1%) while females constituted 913 (47.9%). The overall mean age was 46.64± 0.42, range was 1 month to 98 years. Children and adolescents aged 0-19 years recorded 123 (6.5%) deaths while adults aged 20-59 years recorded 1245 (65.5%) and the elderly, aged 60 years and above constituted 556 (28.1%). With due consideration to the possible forces of general population evolution, it was observed that although the trend was undulating, there was an overall increase in mortality over the years, with an upward skew. The study thus showed that diseases of the cardiovascular system have overtaken infectious diseases as the commonest causes of deaths in Port Harcourt, Nigeria, hence the channeling of appropriate health resources towards combating this epidemiological shift is advocated.

Key words: Mortality, cardiovascular, diseases, infectious, Port Harcourt, Nigeria.

INTRODUCTION

Information on the causes of death in a population is pertinent to health planning, monitoring, surveillance, policy formulation and implementation (GBD Collaborators, 2017; Challe et al., 2018; Mboera et al.,

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2018). It is also essential for the allocation of health care resources and highlights the basic health care needs of people (Deepak et al., 2018). Planned, well-established, systematic and accessible registration centres are necessary for the generation of detailed mortality data (Mboera et al., 2018). However, such centres are largely non-existent or barely functional where they exist among developing nations, including Nigeria. This necessitates reliance on hospital-based reporting of mortalities and its associated causes (Rao et al., 2010; Adeolu et al., 2010). As autopsy practice continues to decline, reviews of clinical information and death certificate issued by doctors using the standards stipulated by the International Classification of Diseases (ICD-10) have sufficed (Rampatige et al., 2014; WHO, 2018). Nigeria is one of the other developing countries that have depended on non-autopsy, clinical diagnosis-based studies to evaluate mortality patterns (Mboera et al., 2018; Challe et al., 2018; Arodiwe et al., 2014; Godale and Mulaje, 2013).

WHO has recently reported an increase in mortalities from non-communicable diseases among developing countries, with deaths from infectious diseases being on the decline (WHO, 2017; Yusuf et al., 2001). A recent study in Nigeria showed that mortalities from non-communicable diseases were far higher than infectious diseases (Uchendu and Forae, 2013). This reported changing trend in mortality suggests epidemiological transition which has been attributed to changing demographic dynamics, affluence, and pattern of food consumption (Adedoyin and Adesoye, 2005; Maiyaki and Garbati, 2014). Unfortunately, the successive governments of Nigeria and even the supportive non-governmental agencies have failed to achieve the millennium development goals which would have substantially addressed issues of rising mortality. This failure is attributable to a multiplicity of health system-related, political and systemic challenges including high levels of corruption among the leadership echelon of Nigeria, incessant strikes in the health sector and interprofessional rivalry among the health workers as well as unabating high incidence of kidnapping and insurgency attacks. Previous mortality reports from UPTH were limited either in the time frame or scope especially given the cosmopolitan settlement pattern of Port Harcourt (George et al., 2009; Unachukwu et al., 2008; Ekeke et al., 2016; Onwuchekwa et al., 2008). This study obviates these limitations inherent in the previous local studies and presents the current pattern and trend of mortality at the University of Port Harcourt Teaching Hospital, Port Harcourt, Nigeria. It is hoped that the outcome of this study will not only add to the growing literature on epidemiological transition of mortalities in Nigeria but be a stimulant to government and supportive donor agencies to articulate and put effective mitigating measures in place.

MATERIALS AND METHODS

This was a retrospective study of deaths recorded at the University of Port Harcourt Teaching Hospital (UPTH) between 1st January, 2012 and 31st December, 2017. UPTH with a bed capacity of 882, is the foremost tertiary health institution in Rivers State and serves as the major referral center for residents of the State which is the epicenter of the oil-rich Niger Delta region of Nigeria. Because patients from some neighboring states of the region - Bayelsa, Abia, Imo, and Akwa Ibom are occasionally referred to UPTH, the hospital serves a population of not less than 10 million people. Nurses in the various wards and units abstracted hard copy data while general collation of the same onto excel software program was done by the author. Patients' admission registers in all the wards and emergency units of the hospital were scrutinized for deaths that occurred in the course of treatment. Further confirmation of the cases was undertaken through a review of death certificates issued by the respective medical/surgical/oncology teams that managed the deceased. Usually, following a death in the hospital, death certificate is issued by a representative of the doctors that managed the deceased. This documents showed the suspected primary cause of death and the underlying secondary cause. The latter is usually the clinical diagnosis that kept the deceased on admission. The primary and secondary causes of death are therefore not usually confirmed as autopsies are not conducted in almost all cases. This follows a low autopsy acceptance rate in our environment.

Information extracted for each case included: age, sex, the primary cause of death, secondary cause of death which is the clinical diagnosis that necessitated admission, occupation, and tribe. Cases with missing demographic parameters were excluded. The extracted information was classified into systems according to the 10th edition of the International Classification of Diseases (ICD10). Emphasis was placed on the working diagnosis - usually arrived at following clinical, laboratory and radiographic (as may be applicable) investigation outcomes.

The mortality causes after being matched with the ICD10, were inputted into Microsoft Excel 2010 and exported to IBM Statistical Package for Social Sciences (SPSS) version 23 (SPSS Inc., Chicago, IL, USA) for analysis. Proportions and percentages were used to summarize qualitative data while means, median, and standard deviation were for quantitative data. Student's t-test and Mann–Whitney U test, for skewed data, were used to test the significance of differences between different mean and median values, respectively. The significance of association for qualitative variables was investigated by the Chi−square test. P-value of < 0.05 at 95% confidence interval (CI) was considered significant. Age calculation was done in ten years interval for ease of tabulation and presentation as well as enablement of comparison with previous studies.

The University of Port Harcourt Teaching Hospital (UPTH) Ethics Committee granted approval for this study and assigned the ethical clearance number UPTH/ADM/90/S.II/VOL.XI/859.

RESULTS

For the period under review, there were 59,093 admissions (21,218 males and 37,875 females) with an annual mean admission rate of 3,536 for males and 6,312.5 for females. A total of 1902 mortalities composed of 989 males (52.1%) and 913 females (47.9%), were recorded during the period. The combined annual mortality rate was therefore 3.2%. The mean mortality

Table 1. Synopsis of UPTH admissions and mortality data 2012-2017.

Year	Admissions			Deaths			% Mortality		
	M	F	Total	M	F	Total	M	F	Total
2012	4685	8916	13601	109	89	198	2.33	0.99	1.46
2013	3260	8977	12237	233	233	466	7.15	2.60	3.81
2014	2261	3775	6036	154	89	243	6.81	2.36	4.03
2015	3572	5642	9214	155	129	284	4.34	2.29	3.08
2016	3353	4850	8203	169	210	379	5.04	4.33	4.62
2017	4087	5715	9802	169	163	332	4.14	2.85	3.39
Total	21,218	37,875	59,093	989	913	1902	29.81	15.42	20.39
Annual average	3,536.33	6,312.5	9,848.8	164.83	152.17	317	4.97	2.57	3.40

The values on the "Total" row represent the sum of all the annual values of the respective columns of parameters . These values divided by the study period of six years gives the respective annual averages on the row beneath – "annual average"

Table 2. Gender based distribution of systemic causes of mortality.

S/N	ICD 10 Diseases	Gender		Total	
		Male	Female	Frequency	%
1	Disease of the cardiovascular system	301	265	566	29.8
2	Infectious disease	160	200	360	18.9
3	External causes of morbidity/mortality	199	72	271	14.2
4	Malignant neoplasms	103	118	221	11.6
5	Disease of the digestive system	51	56	107	5.6
6	Disease of genitourinary system	61	43	104	5.5
7	Disease of the Blood	15	26	41	2.2
8	Diseases of pregnancy/puerperium	0	26	26	1.4
9	Disease of the endocrine	51	61	112	5.9
10	Disease of respiratory system	22	7	29	1.5
11	Disease of the liver	8	17	25	1.3
12	Disease of the perinatal period	1	5	6	0.3
13	Disease of the nervous system	17	16	33	1.7
14	Disease of the skin	0	1	1	0.1
Total		989	913	1902	100

rate among females was 2.6%, and that of the males was 5%, as presented in Table 1.

In descending order, the systemic causes of mortality include: diseases of the cardiovascular system (DCVS) - 566 (29.8%); infectious diseases - 360 (18.9%); external causes of morbidity and mortality - 271 (14.2%); Malignant neoplasms - 221 (11.6%) and diseases of the endocrine system - 112 (5.6%). Diseases of the skin recorded only one (1) death. The distribution of the mortalities is shown in Table 2.

Although the overall gender distribution indicates marginal male predominance with male: female ratio of 1:0.9, infectious diseases, endocrine diseases, and malignant neoplasms predominated among females in ratios ranging between 1:1.2 and 1:1.3, while external causes of morbidity and mortality showed highest gender imbalance in favor of males with male: female ratio of 2.8: 1. This is shown in Table 2.

The overall mean age was 46.7±19.1 while the range was 1 month to 98 years. For males, the mean age was 48.4± 19.1 while that of females was 44.7± 18.9. Generally, the incidence increased with age till the peak age group of 30-39 years with 362 cases (19%), closely followed by 40-49 and 50-59 years with 336 (17.7%) and 309 (16.2%) respectively. Combined mortality of children and adolescents (10-19 years) was 123 cases (6.5%), while adults aged 20-59 years summed up to 1245 (65.5%) and the elderly 60 years and above accounted for 556 deaths (28.1%). Disease categories with the least mean ages were: diseases of the perinatal period and

Table 3. Overall age distribution of mortalities.

Age group (years)	Total															
	DIC	ID	DD	DG	DB	PP	DE	DR	DL	DP	DN	DS	NP	EM	F	%
0-9	14	9	3	2	1	1	0	3	1	6	3	0	4	19	66	3.5
10-19	7	9	2	3	3	4	0	1	0	0	2	0	6	20	57	3
20-29	25	61	8	8	11	10	4	5	0	0	10	0	17	79	238	12.5
30-39	66	115	11	20	6	11	12	4	6	0	9	0	31	71	362	19
40-49	83	79	23	28	8	0	17	4	9	0	4	1	42	38	336	17.7
50-59	120	48	25	13	2	0	33	3	3	0	3	0	41	18	309	16.2
60-69	119	18	27	15	5	0	24	3	3	0	2	0	39	12	267	14
70-79	92	10	4	11	3	0	20	5	2	0	0	0	29	9	185	9.8
80-89	33	10	4	3	2	0	1	0	1	0	0	0	12	5	71	3.7
90-99	7	1	0	1	0	0	1	1	0	0	0	0	0	0	11	0.6
Total	566	360	107	104	41	26	112	29	25	6	33	1	221	271	1902	100
Mean	54.7	40.5	50.4	47.9	41.3	26.6	55.9	44.7	47.7	2.5	32.3	40	51.3	34.2	46.64	

DIC: Disease of cardiovascular; ID: Infectious Diseases; DD: Disease of Digestive system; DG: Disease of Genitourinary system; DB: Disease of Blood; PP: Pregnancy and puerperium; DE: Disease of Endocrine; DR: Disease of Respiratory; DL: Disease of liver; DP: Disease of perinatal period; DN: Disease of Nervous System; DS: Disease of Skin; NP: Neoplasm; EM: External cause of morbidity and mortality.

diseases of pregnancy and puerperium (2.5 and 26.6 years respectively) while diseases of the cardiovascular system and those of endocrine system showed the highest mean ages of 54.7 and 55.9 years respectively. This is shown in Table 3.

The trend showed an overall increase over the years, although with slight inconsistency in the progression. The recorded combined male and female mortalities for 2012 and 2017 were 198 and 332 respectively; translating to 67.7% total increase over the period or 11.3% increase per year. For males only, the increment over the six-year period was 68.8 or 11.5% per year while for females, it was 95.5% for the years or 15.9% per year. This is shown in Table 4.

DISCUSSION

This study which examined the mortality pattern in UPTH Port Harcourt and systemically analyzed their causes has presented a framework for assessing changes in morbidity and mortality in Port Harcourt which is a cosmopolitan town and epicenter of the oil-rich Niger Delta region of Nigeria. Although this work is hospital-based, it provides a tool for health care planners and policymakers to re-order priority in keeping with current realities noted in the work (Arodiwe et al., 2013). UPTH by the reason of being the foremost and biggest tertiary healthcare facility in Rivers State (with a projected population of 7,303,900 as of 2016) is patronized by a significant proportion of the populace in search of expert secondary and tertiary care provided by the hospital. Thus the findings of this study arguably show the mortality and morbidity pattern of the state. Accurate

mortality data in Nigeria is scarce in spite of its importance in health policymaking and allocation of vital infrastructure in a resource-poor economy faced with many choices (World Health Organization (WHO), 2008).

This study revealed that 29.8% of the mortalities were from diseases of the cardiovascular system which was the most commonly recorded systemic cause of mortality. This aligns with the previous autopsy study of natural deaths in Port Harcourt by Obiorah and Amachree (2014).

Similarly, a study carried out at Irrua Specialist Hospital Delta State (within the same South-South geopolitical zone as Rivers) showed that non-communicable diseases particularly diseases of the cardiovascular system contributed to the highest cause of mortality (Bamgboye and Familusi, 1990). The predominance of cardiovascular system diseases was also reported in Lagos and Ekiti States, both in the South-Western geopolitical zone of Nigeria (Maiyaki and Garbati, 2014; Bamgboye and Familusi, 1990) as well as Benue and Kano States (North Central and North-Western zones of Nigeria). However, this discovery is at variance with the reports from the Centre for Disease Control (CDC) which still identifies cardiovascular diseases as the 5th cause of death in Nigeria (CDC, 2019). However, previous reports by the WHO predicted such overtaking of infectious diseases by diseases of the cardiovascular system as the most common cause of mortality in Nigeria (Offiong, 2012). This paradigm shift may be due to changes in lifestyle of Nigerians who have largely adopted western-type diets and inclined to sedentary lifestyles, in addition to smoking. Technological advancement and globalization have also been suggested as being the key reasons behind the shift (Maiyaki and Garbati, 2014).

Table 4. Annual trend of mortality in UPTH (2012-2017).

S/N	ICD 10 disease	2012	2013	2014	2015	2016	2017	Total
1	Diseases of the cardiovascular system	56	143	68	88	101	110	566
2	Infectious diseases	35	87	38	35	96	69	360
3	Neoplasm	22	46	24	39	41	49	221
4	External cause of morbidity mortality	31	61	51	35	50	43	271
5	Disease of the digestive system	6	6	24	19	30	22	107
6	Disease of the genitourinary system	17	35	11	12	15	14	104
7	Disease of the blood	4	15	3	8	7	4	41
8	Diseases of pregnancy/puerperium	5	6	0	2	8	5	26
9	Disease of the endocrine	17	22	18	25	17	12	111
10	Disease of the respiratory system	5	7	3	7	5	3	30
12	Disease of the liver	0	23	0	2	0	0	25
13	Disease of the perinatal period	0	4	0	1	1	0	6
14	Disease of the nervous system	0	11	3	10	8	1	33
15	Disease of the skin	0	0	0	1	0	0	1
Total		198	466	243	284	379	332	1902

Infectious diseases accounted for 18.9% of the recorded deaths and constituted the second most common cause of mortality. This is at variance with earlier reports by Adeolu et al. (2010) in Ile-Ife and Bamgboye and Familusi (1990) in Ibadan (both in the Southwest, region of Nigeria) who showed predominance of infectious causes in their respective studies. The observed decline in infectious diseases in this study may be attributable to the improvement in the timely diagnosis and treatment of cases as well as workable preventive measures like the use of vaccination. There is also a strong likelihood of under reportage of infectious diseases as a number of cases may not have been seen in the hospital owing to no presentation by the patients.

Malignant neoplasms constituted the fourth most common cause of deaths (11.6%), having accounted for 11.6% of the overall mortality. This is higher than 3.5% reported by Charles et al. (2014) in South Eastern Nigeria and 8.6% in Ile-Ife, (South Western Nigeria) (Adeolu et al., 2010) but lower than 1 5.2% reported in Irrua, Edo State (South-South Nigeria) (Uchendu and Forae, 2013). According to the Global Cancer Observatory, the number of deaths from Cancer in Nigeria in 2018 was 70,327 with approximately 115,950 new cases. Most deaths from malignant neoplastic conditions in Nigeria and sub-Saharan Africa are reportedly due to breast, liver, prostate, uterine and cervical cancers (Challe et al., 2018). There is an indication, however, that the cancer incidence and death in Nigeria may not reflect the definite burden of the disease. This is likely due to poor reportage of cancers based on traditional/religious beliefs, weak country-wide cancer monitoring/registry services and poor health policies on cancer management.

Notably, 10 deaths were caused by malignant neoplasms among children and adolescents aged 0-19 years. This figure likely represents the under-reporting of malignancies among people of the age bracket. Remarkably, of the 46 cases documented in a 5-year report of childhood malignancies recorded in the university of Abuja Teaching Hospital Nigeria, only 29 mortalities were recorded (Offiong, 2012). The under reportage of cancers among children can be attributed to very few studies conducted, the low interest of doctors in pediatric oncology, little attractive scope and lack of training (Latha et al., 2015). Globally, about 10% of cancers occur among children (Ferlay et al., 2010) with about 20000 children being diagnosed with cancers annually. Of this, 80% are said to be from developing countries like Nigeria (Kaatsch, 2010). Reduced access to early detection/screening and treatment facilities generally increases mortalities among cancer patients in Nigeria.

External causes of mortality and morbidity (injuries) accounted for 14.2% of the total mortalities and constituted the third most common cause of mortality. This result favorably compares with the report by Charles et al. (2014) in Enugu, south-eastern Nigeria. In another local study, injuries accounted for 42.4% of mortalities in surgical wards in UPTH (Ekeke and Okonta, 2017). Such injuries resulted from road traffic accidents, burns, falls, gunshots, electrical currents, etc. Also in Enugu, road traffic accidents accounted for 53.3% of injuries/trauma while fall, gunshot, burns and sports injuries contributed less (Onyemaechi et al., 2018). The burden of injuries worldwide is disproportionately concentrated in low- and middle-income countries (LMIC) (Chandran et al., 2010).

Although there was gender disparity, it was mild as males constituted 52.1% and females constituted 47.9%.

Furthermore, this study indicated that while the average number of females that sought medical attention and were admitted into various wards and emergency units of UPTH was about double the number of males - 6,312.50 vs 3,536.33, the average mortality rate of males was about double that of females - 4.97 vs 2.57 Table 1. This is in spite of the fact that census figures of Rivers State does not show clear-cut predominance of females. Thus this goes to show that females take care of their medical needs more than males, possibly because the males are often engaged in economic activities as family breadwinners, even at the detriment of their health and well being. It is plausible also that the key reason behind the relatively high mortality rate of males is their presentation to hospitals late with advanced medical or surgical conditions which often yield poor treatment outcomes. The gender disparity can also be associated with differences in biological risks, risk acquired through social roles and behavior, in-health promoting behavior and in-differential health care access, treatment and use (Singh-Manoux et al., 2008). Intensification of health awareness campaigns to engender improved health-seeking behavior and a reduction in violent, aggressive and risky behaviors sometimes associated with the quest for daily living among males is advocated.

This study was limited by the generally poor record-keeping attitude of the staff of the hospital, worsened by the absence of an electronic information storage system. Also, the general apathy to autopsy by the public in our environment that makes it practically impossible to routinely carry out autopsies on decedent patients of the hospital makes reliance on clinically established causes of death the only reliable tool to be used for this work.

Conclusion

Diseases of the cardiovascular system constituted the most common systemic cause of mortality followed by infectious diseases and external causes of morbidity/mortality. The average number of females that sought medical attention and were admitted into various wards and emergency units of UPTH was about double the number of males while the average mortality rate of males was about double that of females. With the noted dominance of diseases of the cardiovascular system in mortality, it is expedient that appropriate health resources be channeled towards reducing risk factors for such diseases and providing adequate diagnostic and treatment infrastructure, including expert manpower training to mitigate the rising trend of the diseases.

CONFLICT OF INTERESTS

The author has not declared any conflict of interests.

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