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ORIGINAL ARTICLE

TRENDS IN CARDIOVASCULAR DISEASE OVER TIME: A 30-YEAR RETROSPECTIVE ANALYSIS OF MEDICAL-ICU ADMISSIONS IN ADDIS ABABA, ETHIOPIA

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ABSTRACT

Background: *Increased urbanization with change in lifestyle in many developing countries exposed them to the challenge of double disease burden, battling with the existing communicable infectious diseases as well as the emerging epidemic of NCDs*

Objective: *To describe trends of medical intensive care unit admission over thirty years in Ethiopia.*

Methods: *MICU registries at Tikur Anbessa Specialized Hospital over a thirty year period were examined for discharge diagnosis. Data included for analysis were selected at ten-year interval of equivalent six- months' period from December to May of 1981/82, 1991/92, 2001/02 and 2011/12. Variables included were age, gender, residence, discharge diagnosis, duration of stay in hospital, discharge status, admission date, and admission source. Obtained data were cleaned, coded, recoded and edited. The analysis was done using SPSS 15.0 statistical soft ware.*

Results: *A total of 500 cases are included for analysis. Among these 284 (57%) were male. The mean age was 40.2 ± 18 years ranging from 13 to 87 years. The aggregate cardiovascular disease, other non communicable disease and infectious disease as a cause of admission in the past thirty years were 213(42.6), 141(22.8), 105(20.0) respectively. Unlike the other disease category cardiovascular disease increased steeply over the past thirty years. Overall case fatality rate at MICU was 31.6% ranging from 24.8% of other-NCD to 46.7% of infectious diseases.*

Conclusion: *Cardiovascular disease has steeply increased till it became predominant in the last decade at MICU of TASH.*

Keywords: *Cardiovascular disease, Medical Intensive Care Unit*

INTRODUCTION

Non-communicable diseases (NCDs), including cardiovascular diseases, are the leading cause of death globally, and the burden of disease is rising fastest among lower-income countries (1). Increased urbanization with change in lifestyle in many developing countries made them to face with the challenge of double disease burden, battling with the existing communicable infectious diseases as well as the emerging epidemic of NCDs (2,3). Most national health policies in those low income countries are focused on infectious disease despite the epidemiologic transition (4,5).

Recently published large community based study found 57% of causes of death in Addis Ababa, Ethiopia, is NCDs and injuries (6). Analysis of intensive care unit data were done in Ethiopia previously to look at prevalence of disease at different time. Objectives of majority of those studies were to see proportion of infectious disease to NCDs in particular cardiovascular disease, trends over time, standard of management and prognosis of critical cases. In 2006 a study in Tikur Anbessa Specialized Hospital (TASH) medical intensive care unit (MICU) evaluate trends of admissions over the sixteen-year period showed steady increase in relative frequency of acute complications of NCDs consisting of diabetes, acute myocardial infarction and stroke while infectious diseases showed interspersed peaks of admissions coinciding with epidemics with overall dominance of infectious disease (7).

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Our study will describe trends of admission over the past three decades in the MICU of TASH in Ethiopia. This study is important to see the proportion of infectious to non communicable acute diseases. Reliable information on causes of intensive care unit admission and death is essential to the development of institutional guidelines and protocols. MICU data analysis will help to know group of disease to prioritize resources and facilities. It could also be an input for larger studies to aid national health policy formulation.

MATERIALS AND METHODS

This is a retrospective registry based study conducted at MICU of TASH. TASH is a public teaching university hospital. It is located in Addis Ababa, Ethiopia, and serves as the main referral center for the entire country. Admission to the MICU is governed by a general principle of acute and reversible medical condition in an adult (age> 13 years). We took our data from patients' registries over thirty years. Data included for analysis were selected at ten-year interval of equivalent six- months' period from December to May of 1981/82, 1991/92, 2001/02 and 2011/12. The study period was selected after screening for completeness of data.

Variables included were age, gender, residence, discharge diagnosis, duration of stay in hospital, discharge status, admission date, and admission source. Discharge diagnosis was defined as diagnosis of disease given for the patient at time of disposition from hospital. Discharge diagnosis included cardiovascular disease, renal disease, pulmonary disease, neurologic disease, gastoenterologic disease, poisoning, diabetic ketoacidosis, infectious disease and other. Other discharge diagnosis included electrolyte abnormalities, endocrine emergencies other than diabetic ketoacidosis and drug toxicity. Discharge status was the disposition of the patient at discharge from the hospital, and includes the following three categories: improved, transfer with same condition, or in-hospital death.

Cardiovascular disease was defined as a cardiac disease presumed or confirmed including stable angina, unstable angina, myocardial infarction, heart failure, arrhythmia, stroke, pulmonary thromboembolism and others. Other cardiovascular were pericardial disease, hypertensive emergencies, rheumatic recurrence and post cardiac surgery cases. The dependent variables were discharge diagnosis and cardiovascular disease. The unit of analysis was the hospital discharge, not the patient (i.e. a person discharged more than one time in one year will be counted each time as a separate "discharge" from the hospital.)

Data were collected using format by the investigators. Data from the format were entered to an Excel template by the investigators. Obtained data was cleaned, coded, recoded and edited. The analysis was done using SPSS 15.0 statistical soft ware.

Data were presented as frequencies, percentages, mean, and standard deviation, and displayed using tables and appropriate figures. Categorical variables were expressed as proportions and continuous variables will be expressed as means and standard deviations. The proportion of discharge diagnosis with age and gender as well the trend over thirty years were expressed using table and graphs. Although this is a study from secondary data ethical clearance were obtained from the Research Ethics Committee, department of internal medicine, Addis Ababa University.

RESULT

A total of 500 cases are included for analysis. Among these 284 (57%) were male. The mean age was 40.2 ± 18 years ranging from 13 to 87 years. The aggregate cardiovascular disease, other non communicable disease and infectious disease as a cause of admission in the past thirty years were 213(42.6), 141(22.8), 105(20.0) respectively (Table 1).

Table1. Characteristics of MICU admission at Tikur Anbessa specialized Hospital, 1981/82-2011/12, Addis Ababa, Ethiopia (N=500)

Variable	Characteristics	Frequency	Percentage
Age	<30	196	39.4
	30-60	232	46.7
	≥60	69	13.9
Sex	Male	287	57.0
	Female	215	43.0
Admission date	1981/82	60	12
	1991/92	120	24
	2001/02	140	28
	2011/12	180	36
ICU admission cases	CVD	213	42.6
	Infectious disease	94	18.8
	DKA	55	11
	Renal	31	6.2
	Poisoning	29	5.8
	Pulmonary	25	5.0
	CNS	22	4.4
	GI	19	3.8
	Other §	12	2.4
Discharge status	Transfer	342	68.4
	Died	158	31.6

§ : electrolyte abnormalities(4), myxedema(1), adrenal crisis(1), drug toxicity(1), eclampsia (2), hematologic emergency(3)

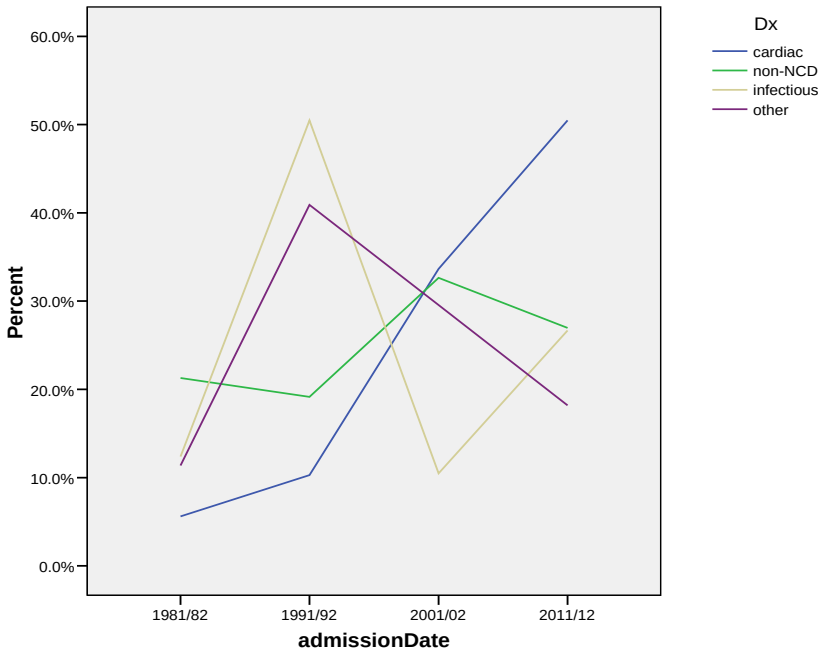

Figure 1. Trends of MICU admission at Tikur Anbessa specialized Hospital, 1981/82-2011/12, Addis Ababa, Ethiopia (N=500)

Cardiovascular diseases were peak in those with age group of 30-60years while infectious disease peak before the age of thirty. GI, CNS and renal disease in males and other, pulmonary and poisoning in females were leading causes of MICU admission (Fig 2).

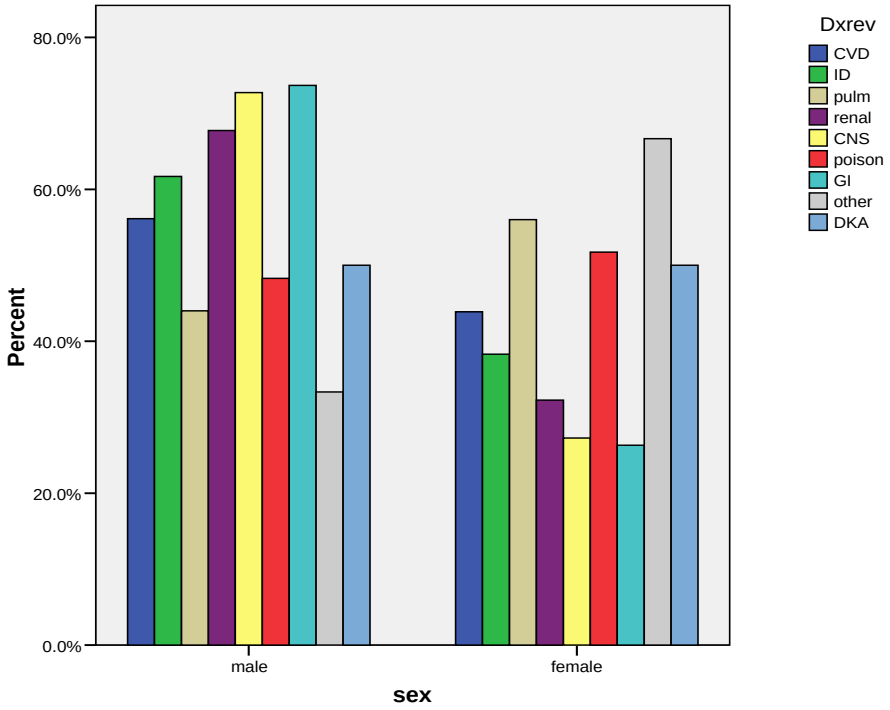

Figure 2. Distribution of diagnosis among each sex category at MICU of Tikur Anbessa specialized Hospital, 1981/82-2011/12, Addis Ababa, Ethiopia (N=500)

***Cardiovascular related characteristics of the study participants*:** out of 213 cases of cardiovascular disease 76(35.7%) were designated to have acute coronary syndrome followed by 62(29.1) of heart failure; 37(17.4%) of stroke; 13(6.1%) of PTE; 10(4.7%) of arrhythmia and 15(7.0%) other cardiovascular cases. Other cardiovascular diseases include pericardial diseases, hypertensive emergencies, postcardiac surgery cases and rheumatic recurrence.

Trends of cardiovascular diseases admission:
Unlike the other disease category cardiovascular disease increased steeply over the past thirty years (Figure 1). The proportion of cardiovascular diseases to total admission of 1981/82, 1991/92, 2001/02 and 2011/12 accounts 21.7%, 19%, 52% and 58% respectively. Acute coronary syndrome, heart failure and stroke cases increased progressively from 1981/82 to 2011/12 admission dates but not PTE, arrhythmia and other cardiovascular diseases. The contribution of acute coronary syndrome increased from 10.9% in those below age 30years to 45.7% above 60years, stroke from 6.5% to 23.9% and arrhythmia from 2.2% to 8.7 % of cardiovascular diseases in specified age groups. However, heart failure cases account 63% of cardiovascular disease below 30 years of age group and only 21.7% of contribution to those above age 60years (Table 2).

Table 2. Distribution of different cardiovascular diseases among age groups and admission date categories at Tikur Anbessa Hospital, Addis Ababa, Ethiopia, 1981/82-2011/12

		ACS	CHF	Stroke	PTE	arrhyth-mia	Other ¶	Total
Age	<30years	5 (10.9)¥	29(63)	3(6.5)	3(6.5)	1(2.2)	5(10.9)	46(21.8)
	30-60years	49(41.2)	22(18.5)	23(19.3)	10(8.4)	5(4.2)	10(8.4)	119(56.4)
	>60years	21(45.7)	10(21.7)	11(23.9)	0(0)	4(8.7)	0(0)	46(21.8)
Total		76(35.7)	62(29.1)	37(17.4)	13(6.1)	10(4.7)	15(7.0)	213(100)
Admis-sion Date	1981/82	1(7.7)	5(38.5)	6(46.1)	0(0)	0(0)	1(7.7)	13(6.1)
	1991/92	12(52.2)	3(13)	4(17.4)	2(8.7)	0(0)	2(8.7)	23(10.8)
	2001/02	30(41)	14(19,2)	9(12.3)	8(11)	5(6.9)	7(9.6)	73(34.3)
	2011/12	33(31.7)	40(38.5)	18(17.3)	3(2.9)	5(4.8)	5(4.8)	104(48.8)
Total		76(35.7)	62(29.1)	37(17.4)	13(6.1)	10(4.7)	15(7.0)	213(100)

¶: pericardial disease (6); hypertensive emergency (4); post-cardiac surgery (3); rheumatic recurrence (2)
¥: represent number and percentage within parenthesis

Outcome of admission cases during MICU stay: Overall case fatality rate at MICU was 31.6% ranging from 24.8% of NCD other than cardiovascular disease to 46.7% of infectious diseases. The case fatality rate difference among infectious disease and non-communicable disease is statistically significant (p-value=0.003; OR 1.24, 95%CI 1.06-1.44). Case fatality rate for acute coronary syndrome, heart failure and stroke were 15.8%, 37.1% and 45.9% respectively with significant difference among them (p value of 0.012). Mortality rate among age group, gender and year of admission had no statistically significant difference.

DISCUSSION

Cardiovascular disease increased steeply over the past thirty years particularly in the last one decade contributing 22% in 1981/82 to 58% in 2011/12 of all MICU admission specifically seen with acute coronary syndrome, heart failure and stroke. This is consistent with some studies done recently in Addis Ababa at the community level and hospital based to identify the burden of non communicable diseases (8). WHO also estimated by 2020 non-communicable diseases including ischemic heart disease, cancer and chronic respiratory disease to be the leading cause of morbidity and mortality in developing countries (9). This could also be the reflection of the national life expectancy, which is 56 years by 2012 increased by more than 10years in the last one decade. The progressive economic growth of the country could also expose the population to more sedentary and heart unhealthy lifestyle (10).

Cardiovascular disease peaked after age group of 30years except heart failure but infectious diseases before age thirty. Acute coronary syndrome and stroke increased as age increased but not heart failure. Heart failure is mainly disease of younger in our study unlike other major studies (11). This finding can be explained by most cases of heart failure are caused by rheumatic heart disease as stated by a study done in the same hospital (12). Acute coronary syndrome was accounted for 35.7% of all cardiovascular cases followed by heart failure and stroke. Getting priority for admission in MICU could be a reason for the boost of acute coronary syndrome cases.

Acute coronary syndrome is more common in male and heart failure is common in female. Other study also showed acute coronary syndrome is more common in male than female but usually diagnosed in older individuals than our finding (13). Heart failure was found commonly in female but different studies showed heart failure with preserved ejection fraction is common in females while heart failure with depressed ejection fraction is common in males (14).

Higher rate of mortality was observed among those admitted with infectious disease than non communicable diseases. Most admitted cases of infectious disease to MICU were likely to be those with septic shock and pulmonary infections requiring either mechanical ventilator or inotropics support, which have mortality rate of 40-60% within 30days of hospitalization (15).

Among cardiovascular diseases higher rate of mortality was seen in those with stroke and heart failure but less with acute coronary syndrome. The data from several recent acute heart failure registries and surveys such as the ADHERE registry in the USA, and the national surveys from Italy, France, and Finland have been published. In-hospital mortality is especially high in patients with evidence of cardiogenic shock ranging from 40 to 60% (16-20). The 30-day mortality is higher in deep hemorrhages and increases with increasing volume of bleeding. Hemorrhagic stroke with deep coma and a large middle cerebral artery infarction with brain edema have a mortality rate of up to 80% and usually presents within 2–5 days of stroke onset (21, 22).

Unlike many other studies this study did not show difference in mortality of cases in relation with age, gender and the past thirty years of period. This difference may not be seen because of small number of cases above age sixty and heterogeneous cases at different period of years, which is difficult to compare.

The strength of this study is that it showed trends of diseases at MICU over longer period of time. The weakness of the study is that it is a retrospective registry based study, the inherent nature of the study cannot generalize to other institution or the nation. We suggest to do further prospective study at multicenter including public and private institution.

In conclusion non communicable disease particularly cardiovascular disease steeply increased till it became predominant in the last decade at MICU of TASH. Acute coronary syndrome, heart failure and stroke are leading causes of cardiovascular MICU admission. This study showed the impact of cardiovascular disease is significant and need focus at community to prevent as in the institution to improve treatment.

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