MORTALITY REVIEW — UNIVERSITY DEPARTMENT OF MEDICINE (II) and DEPARTMENT OF RENAL MEDICINE, SINGAPORE GENERAL HOSPITAL, 1974-75

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SYNOPSIS

The mortality pattern at the University Department of Medicine (II) and the Department of Renal Medicine, Singapore General Hospital, over the two-year period of 1974-75 was studied using data recorded during "death rounds" and a comparison made with a similar study made previously. This study comprised 886 deaths. 54 per cent of the deaths occurred between the ages of 60 and 79 years, while 12.4 per cent below the age of 40 years. The male to female ratio was 1.8 to 1. A lower proportion of Malay deaths than would be expected from the ethnic distribution in Singapore was noted. The post-mortem rate was 10.3 per cent. "Strokes", mostly with antecedent hypertension, again emerged as the single largest cause of death, accounting for 212 (23.9 per cent). Cancer deaths accounted for 111 (12.5 per cent). 107 (12.1 per cent) died of acute myocardial infarction and 85 (9.6 per cent) from chronic renal failure. 104 (11.7 per cent) had diabetes mellitus, mainly as a contributory cause. Major causes of young adult deaths included specific infections, "poisonings", hypertension, rheumatic and ischaemic heart diseases. These are considered potentially preventable and salvable. Compared with the study in 1972-73, there appears to be a decline in the necropsy rate, and a resurgence of malaria in recent years.

INTRODUCTION

This paper reviews all the deaths in the University Department of Medicine (II) and the Department of Renal Medicine, Singapore Genral Hospital, in the years 1974 and 1975, and may be regarded as an extension of a report made previously.[1] The mortality pattern would be recorded, and a comparison made, where relevant, with that found in the preceding 2 years. The group of "young adult" deaths and cancer deaths are examined in rather greater detail in this study.

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MATERIAL AND METHOD

Singapore General Hospital, formerly the Outram Road General Hospital, is the largest hospital in Singapore with a total of 1,521 beds. The University Department of Medicine (II), is one of 3 medical units in the hospital. It has 161 medical beds, comprising 3 male and 2 female general wards, a six-bed Coronary Care Unit, and a three-bed Metabolic Ward. The Department admits patients above the age of 10 years. In 1974 there was a total of 6,646 admissions, and in 1975 6,164 admissions. The Department of Renal Medicine, a separate government unit, has 10 "renal" beds. In addition to running a chronic dialysis programme, it handles patients with acute renal failure and "poisonings" necessitating dialysis.

All cases read at weekly lunch-time "Death Rounds" from 1st January, 1974 to 31st December, 1975 are included in this study. The cases were reviewed and discussed by the medical staff of the unit, with post-mortem reports whenever available.

The following items of information were recorded for each: name, unit registration number, date of death, age, sex, ethnic group, cause(s) of death (immediate, underlying and contributory), and whether a post-mortem was performed. 886 of the deaths were read and documented. The data so derived from these mortality records were compiled and analysed.

RESULTS

Table I. Age Distribution of Deaths.
Table II. Sex Distribution of Deaths.
Table III. Ethnic Distribution of Deaths.
Table IV. Post-mortem Examination.
Table V. Causes of Death for 886 Deaths Reviewed, Tabulated According to List of 50 Causes. (International List of Diseases and Causes of Death, World Health Organisation, 8th Revision, 1965).
Table VI. Cerebrovascular Deaths.
Table VII. Cancer Deaths : Distribution Pattern.
Table VIII. Deaths from Acute Myocardial Infarction : Immediate Complications.
Table IX. Diabetic Deaths.
Table X. Deaths from Chronic Renal Failure : Association with Hypertension.

DISCUSSION

Of the 886 cases analysed in detail, the following observations may be made:-

Age distribution of deaths (Table I)

488 deaths (i.e. 54 per cent) are between the ages of 60 and 79 years. This reflects the high life expectancy in Singapore, which is 65.1 years for males and 70.0 years for females at birth in 1970. In 14 instances the age at death could not be determined. Almost all of these are vagabonds, without family or friends, and brought in moribund by police.

TABLE I Age Distribution of Deaths

Age Group	Number of Deaths	Percentage of Total
0 — 9	0	0.0%
10 — 19	32	3.6%
20 — 29	32	3.6%
30 — 39	46	5.2%
40 — 49	71	8.0%
50 — 59	170	19.2%
60 — 69	261	29.5%
70 — 79	217	24.5%
80 — 89	42	4.7%
90 —	1	0 1%
Unknown	14	1.6%
Total	886	100.0%

Sex distribution of deaths (Table II)

There are 567 male deaths and 318 female deaths giving a ratio of 1.8 to 1. The first, and perhaps the most important, reason for this male preponderance is that there are many more male beds than female beds in the medical unit (96 and 62 respectively). Secondly, there are many more males among the older immigrant population in Singapore. Thirdly,

TABLE II Sex Distribution of Deaths

Sex	Number of Deaths	Percentage of Total
Male	567	64.0%
Female	318	35.9%
Unknown	1	0.1%
total Total	886	100.0%

the fact that males are more prone to myocardial infarction probably influences this ratio to some extent as well.

Ethnic distribution of deaths (Table III)

The distribution of deaths according to major racial groups is as follows: Chinese 732 (82.6 per cent), Malays 54 (6.1 per cent), and Indians 77 (8.7 per cent). It is interesting to compare these figures with the ethnic group distribution of the Singapore population of 1975 which is Chinese 76.1 per cent, Malays 15.1 per cent, and Indians 6.9 per cent.

The proportion of "Malay deaths" in these units is less than half that which might be expected from the ethnic group distribution in the general population. On the other hand, there appears to be a higher proportion of deaths among Indians than would be expected from the racial composition in the population. The various reasons for these discrepancies have been previously discussed and reported.[1]

TABLE III Ethnic Distribution of Deaths

Ethnic Group	Number of Deaths	Percentage of Total
Chinese	732	82.6%
Malay/Indonesian	54	6.1%
Indian/Pakistani/ Ceylonese	77	8.7%
Others	21	2.4%
Unknown	2	0.2%
Total	886	100.0%

Post-mortem rate (Table IV)

Of a total of 886 documented deaths, 91 post-mortems were performed. The autopsy rate is, therefore, 10.3 per cent. This is a very low rate when compared with University affiliated hospitals in United Kingdom and in America. For example, the necropsy rate in the United Birmingham Hospitals in U.K. in 1972 is 46.0 per cent and in the Duke University Medical Centre, U.S.A. in 1973 is 57 per cent. In Singapore, the objection against autopsies among the Muslims and the great majority of the Chinese population is difficult to overcome. The high necropsy rate in some American hospitals may be due to the fact that consent for autopsy examination is part of the admission policy in these hospitals.

TABLE IV Post-Mortems

Performed/Not Performed	Number	Percentage of Total
Performed	91	10.3%
Not Performed	795	89.7%
Total with Records	886	100.0%

There appears to be a decline in the post-mortem rate in the unit from 13.5 per cent in 1972-73 to 10.3 per cent in 1974-75. This trend has been noticed in some U.K. hospitals as well.[2] The necropsy has a role of play in the medical audit thereby maintaining a high standard of medical practice and in undergraduate and postgraduate training. Attempts to reverse the declining trend should be encouraged.

Underlying causes of death (Table V)

The 5 major causes of death over the years 1974 and 1975 are: (1) hypertensive disease — 147, (2) ischaemic heart disease — 128 (of which 107 had acute myocardial infarction), (3) malignant neoplasms — 111, (4) "symptoms and ill-defined conditions" (which includes uraemia) — 102, (5) cerebrovascular disease (without preceding hypertension) — 94. As can be seen the pattern of the major causes of death is quite similar to that in the West, and reflects comparable standards of urban living in Singapore.

The less common causes of death include (1) bronchitis, emphysema, and asthma — 62, (2) specific infections (list no. B1 to B18) — 48, (3) pneumonia — 41, (4) chronic rheumatic heart disease — 28 and (5) cirrhosis of liver — 26. Among the specific infections, there are 3 deaths from malaria (Plasmodium falciparum). 2 died of cerebral malaria, and 1 of acute renal failure. Most of the deaths due to "pneumonia" are bronchopneumonias in the old and debilitated. Chronic rheumatic heart disease is still a significant cause of cardiac deaths. Patients with cirrhosis of liver terminate in liver failure, with or without, bleeding oesophageal varices.

Young Adult Deaths (Table V)

We have defined a "young adult death" as any death above the age of 10 years and below the age of 40 years. So defined, there are 110 such deaths, or 12.4 per cent of the total deaths. The major underlying causes of death among the young adults are: (1) "symptoms and ill-defined conditions" (including uraemia) — 28, (2) hypertensive and heart diseases (list no. B26 to B28) — 18, (3) specific infections (list no. B1 to B18) — 16, (4) malignant neoplasms

TABLE V Causes of death for 886 deaths reviewed tabulated according to list of 50 causes (8th revision, 1965, International list of Diseases, W.H.O.)

List No.	Cause Group	Young Adult Deaths (age 10 — 40 yrs.)	All Deaths
B 1	Cholera	0	0
B 2	Typhoid fever	0	1
B 3	Bacillary dysentery and amoebiasis	0	0
B 4	Enteritis and other diarrhoeal disease	0	3
B 5	Tuberculosis of respiratory system	2	7
B 6	Other tuberculosis, including late effects	1	2
B 7	Plague	0	0
B 8	Diphtheria	0	0
B 9	Whooping cough	0	0
B10	Streptococcal sorethroat and scarlet fever	0	0
B11	Eningococcal infection	0	0
B12	Acute poliomyelitis	0	0
B13	Smallpox	0	0
B14	Measles	0	0
B15	Typhus and other rickettsioses	0	0
B16	Malaria	2	3
B17	Syphilis and its sequelae	0	0
B18	All other infective and parasitic		
B18	All other infective and parasitic diseases	11	32
B19	Malignant neoplasms, including neoplasms of lymphatic and haemopoietic tissues	15	111
B20	Benign neoplasms and neoplasms of unspecified nature	0	0
B21	Diabetes mellitus	0	10
B22	Avitaminosis and other nutritional deficiencies	1	15
B23	Anaemias	0	0
B24	Meningitis	0	5
B25	Active rheumatic fever	0	0
B26	Chronic rheumatic heart disease	9	28
B27	Hypertensive disease	4	147
B28	Ischaemic heart disease	5	128
B29	Other forms of heart disease	0	14
B30	Cerebrovascular disease	1	94
B31	Influenza	0	0
B32	Pneumonia	0	41
B33	Bronchitis, emphysema and asthma	0	62
B34	Peptic ulcer	1	4
B35	Appendicitis	0	0
B36	Intestinal obstruction and hernia	0	0
B37	Cirrhosis of liver	2	26

B38	Nephritis and nephrosis	7	8
B39	Hyperplasia of prostate	0	1
B40	Abortion	0	0
B41	Other complications of pregnancy, childbirth and puerperium	0	0
B42	Congenital anomalies	0	0
B43	Birth injury, difficult labour and other anoxic and hypoxic conditions	0	0
B44	Other causes of perinatal mortality	0	0
B45	Symptoms and ill-defined conditions	28	102
B46	All other diseases (residual)	8	26
B47	Motor vehicle accidents	0	0
B48	All other accidents	0	1
B49	Suicide and self-inflicted injuries	9	10
B50	All other external causes	4	5
	Grand Total	110	886

— 15, (5) "poisonings" and other external causes (list no. B49 and B50), and (6) "nephritis" and "nephrosis" — 7.

The potentially preventable and salvable groups towards which the attending physician should direct more attention to, are those deaths related to hypertensive and heart diseases, specific infections, and external causes (including "poisonings").

Deaths from hypertensive and heart diseases number 17. Nine suffered from chronic rheumatic heart disease, 5 were young infarcts, and 4 had underlying severe hypertension complicated by cerebral haemorrhage or acute pulmonary oedema.

Of the deaths from specific infections below the age of 40 years, there are 3 from tuberculosis, 3 from septicaemia, 2 from leptospirosis, 2 from dengue haemorrhagic fever, 2 from viral myocarditis, 1 from viral encephalitis, and 1 from tetanus.

Self-inflicted injuries, whether intentional or accidental, and other external causes are important causes of mortality in the young. 13 out of 15 of the total deaths from these groups are in patients below 40 years of age. Of the "poisonings", 3 died from organophosphates, 3 from "tranquillisers", 2 from paraquat and 2 from salicylates. 1 death resulted from an adverse drug reaction (toxic epidermal necrolysis from "Saridon"), 1 from drowning, and 1 from heat stroke.

Deaths from cerebrovascular disease (Table VI)

As in the previous study, "strokes" is by far the commonest cause of death in people over 60 years. The total number of deaths related to strokes is 212. It is the underlying cause in 94, often complicated by bronchopneumonia and bed sores. It is the immediate cause in 118, almost always with antecedent hypertension.

Deaths from cancer (Table VII)

In this unit survey, there are altogether 111 cancer deaths. This is likely an underestimate of cancer mortality when compared with Singapore figures, as many cancer patients die at home. The 3 big killer cancers in our unit are (1) bronchogenic carcinoma — 33 deaths, (2) primary hepatoma — 24 deaths, and (3) leukaemia/lymphoma/multiple myeloma — 21 deaths. The pattern of cancer deaths here must necessarily differ from that seen in a surgical unit, for example, or from autopsy figures.

15 of the 111 deaths from cancer occur in patients below the age of 40 years. 9 had acute leukaemia (mostly complicated by septicaemia), 2 lymphoma, 2 hepatoma, 1 bronchogenic carcinoma, and 1 carcinoma of the breast.

Deaths from acute myocardial infarction (Table VIII)

Deaths from acute myocardial infarction totalled 107. Fatal complications include cardiogenic shock, "pump" failure, and ventricular septal rupture. Arrhythmias are often correctable and "electrical" deaths minimised while patients are on monitor.

TABLE VI Cerebrovascular Deaths

As underlying cause of death	94
As immediate cause with antecedent disease	118
Total deaths involving cerebrovascular disorder	212

TABLE VII Cancer Deaths: Distribution Pattern

Types of Cancer	Young Adult Cancer Deaths	All Cancer Deaths
Bronchogenic carcinoma	1	33
Carcinoma of the liver (Primary hepatoma)	2	24
Leukaemia/lymphoma/ multiple myeloma	11	21
Carcinoma of the stomach	0	6
Carcinoma of the breast	1	4
Carcinoma of the rectum	0	4
Nasopharyngeal carcinoma	0	3
Carcinoma of the kidney (Hypernephroma)	0	2
Thymoma	0	2
Carcinoma of the oesophagus	0	1
Carcinoma of the tongue	0	1
Brain tumour	0	1
Carcinoma of the larynx	0	1
Rhabdomyosarcoma	0	1
Carcinoma of the skin (squamous cell) with liver metastases	0	1
Secondary carcinomatosis	0	6
Total Number of Cancer Deaths	15	111

TABLE VIII Deaths from Acute Myocardial Infarction : Immediate Complications

Congestive cardiac failure/Arrhythmias	30
Cardiogenic shock	31
Ventricular septal rupture	1
Unrecorded	45
Total Infarct Deaths	107

Deaths associated with diabetes mellitus (Table IX)

Diabetes mellitus is the underlying cause in 10 deaths, and the contributory cause in 94. Of these, 5 died of "diabetic coma", 3 with diabetic ketoacidosis and 2 with hyperosmolar syndrome. 2 of these patients had known precipitating infections.

TABLE IX Diabetic Deaths

As underlying cause of death	10
As contributory cause of death	94
Total diabetic deaths	104

Deaths from chronic renal failure (Table X)

There are 85 deaths from "uraemia". Most are end-stage kidney disease where the cause could not be determined. 31 of these cases have associated hypertension. In addition, there are 10 with "nephritis" or "nephrosis", i.e. with known preceding glomerulo-nephritis. All in all, 35 patients who died of chronic renal failure are below 40 years old. This figure gives a rough idea of the number of potential candidates for the chronic dialysis/renal transplantation programme.

TABLE X Deaths from Chronic Renal Failure: association with Hypertension

Chronic renal failure with hypertension	31
Chronic renal failure without hypertension	54
Total deaths due to chronic renal failure	85

Some final comments are worth making. Owing to the limited items of information available only very general conclusions may be drawn. It is difficult to assess the significance of the undocumented cases. Closer supervision is necessary in future to improve documentation. As there are special facilities for renal and coronary care in these units, there will be an obvious bias towards a larger proportion of renal and cardiac deaths.

The necropsy rate appears to be on the decline.

The are 3 malarial deaths in these 2 years compared with none in the preceding 2. In recent years, occasional malaria outbreaks[3] are seen. As a result of increasing traffic between neighbouring countries, many "imported" cases are found. An awareness of this situation and constant vigilance is necessary to reduce and eliminate deaths from malaria.

"Strokes" is again seen as a major problem.

Many stroke victims require long stay and accommodating such patients in "acute" medical beds is highly cost-ineffective. There is a need for additional rehabilitation and terminal care facilities and these provision should be made in the overall planning of future medical care.

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