MEDICAL CASES ADMITTED TO KENYATTA NATIONAL HOSPITAL I.C.U. AND THEIR OUTCOME. A FIVE YEAR RETROSPECTIVE STUDY JANUARY 1995-DECEMBER 1999.

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DECLARATION.

This dissertation is my original work and has not, to my knowledge, been presented for a degree in any other university.

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ABBREVIATION

APACHE II	-	Acute physiology and chronic health evaluation
A-aDO_2	-	Alveolar - arterial oxygen gradient
AIDS	-	Acquired Immune Deficiency Syndrome
Ca	-	Cancer
CCF	-	Congestive Cardiac Failure
CHS	-	Chronic health status
COPD	-	Chronic obstructive pulmonary disease
CPR	-	Cardiopulmonary resuscitation
CR	-	Creatinine
CVS	-	Cardiovascular system
DOA	-	Day of admission
DOD	-	Day of discharge/death
FIO_2	-	Fraction Inspired Oxygen
GCS	-	Glascow Coma Scale
GI	-	Gastrointestinal
GIT	-	Gastrointestinal tract
HBV	-	Hepatitis B. Virus
Hct	-	Hematocrit
HCO3	-	Bicarbonate
HDU	-	High Dependence Unit
HIV	-	Human Immune-deficiency Virus

ICU	-	Intensive Care Unit
K+	-	Serum potassium
KNH	-	Kenyatta National Hospital
MI	-	Myocardial Infarction
MOSF	-	Multiple organ system failure
MPM	-	Mortality prediction model
MS	-	Musculoskeletal system
Na+	-	Serum sodium
PAO_2	-	Partial pressure of oxygen in the alveoli
PaO_2	-	Partial pressure of oxygen in the arterial blood
PEM	-	Protein Energy Malnutrition
SAPS	-	Simplified Acute Physiological Status
TISS	-	Therapeutic Intervention scoring system
WBC	-	White Blood Cell

SUMMARY

This was a five year retrospective study on the outcome of intensive care medical admissions between January 1995 and December 1999: aiming at determining/examining correlates and predictors of outcome. Univariate predictors considered were age. duration of stay. disease category and number of organ systems affected and correlated against outcome grossly classified as either mortality or survival.

During this period, 4346 patients were admitted to ICU 9% of these were medical patients. Age bracket considered showed higher mortalities in the extremes of the groups, 83.7% being below 1 year and 82.0% mortality above 60 years age. Whereas majority of patients (96.9%) died within the first 24 hours of admission, the duration of stay on the other hand correlated directly well with survival rate.

The main disease mortality patterns were seen in respiratory disease (79.4%), neurological disorders (83.9%), malignancies (93.3%) and immunosuppression (85.7%). Higher mortality was seen with multiple organ system involvement with rates increasing between 73.4% for single organ involvement to 100% for more than 3 organ system.

INTRODUCTION AND LITERATURE REVIEW

The Intensive Care Unit (ICU) at Kenyatta National Hospital (KNH) is a multidisciplinary one admitting all types of cases including surgical post operation patients, acute medical illness, and life threatening surgical conditions. The intensive care unit (ICU) bed capacity is 11 in a 2000 bed hospital. With high demand and pressure on the unit, an additional 10 beds have been added to the ICU as HDU for close cardiorespiratory monitoring of border line critical patients, the selection of the patients depending on the prejudices of the referring physician, interests of the ICU and pressure of beds in the ICU.

Intensive Care Units have been in existence for over 40 years (4). The earliest intensive care units (ICU's) were developed as multidisciplinary medical-surgical Units (5). In the developed world there is a proliferation of organ specific units or subspeciality catering for respiratory care, cardiac and coronary care and paediatric intensive care units. Sometimes these specialized units are just glorified nursing care areas which result in costly duplication of expensive equipment and inefficient use of resources. Concentrating the critically ill but potentially salvageable patients, multidisplinary ICU's have both patient care and economic advantages over purely department speciality-organ oriented ICU's(32)

Despite the positive influence of intensive care on mortality, morbidity and costs, little is known about how its organisation affects outcome. However, as stated above, it appears

that interdisplinary ICU's have both patient care and economic advantages over segregated departmental or speciality organ oriented units (6).

Studies in adults undergoing intensive care have demonstrated no apparent relationship between patient numbers and outcome if staff and equipment ratios are maintained . This was after controlling for severity of illness (53).

Indices of severity of illness have potential importance on patient care utilization of resources and also satisfy the medical profession and society's need for quality assurance, utilization review, prediction of mortality and triage of patients to appropriate hospitals and within those hospitals to levels of care matched with their needs. Attempts to predict the outcome of intensive care from medical complications after 48 hours of ICU management have had some success (33) but such general considerations do not necessarily apply to an individual patient and do not take account of improvements in delivering of intensive care, understanding of disease process and new treatments that become available over a period of time.

Indices to predict hospital survival, the need for intensive care, evaluation of quality care, stratification of patients for purposes of outcome comparisons have been developed based on physiologic indices or resource utilization. These indices are measured at hospital admission or after 24 hours of ICU care and they include (APACHE I, APACHE II, APACHE III) Acute Physiology and Chronic Health Evaluation (10), Therapeutic

Intervention Scoring System (TISS) (11) and Outcome Index among others.

The APACHE SCORING SYSTEM was developed by Knaus and colleagues (10) in 1981. Thirty four measurements covering seven major systems. were made on 805 patients. A weight of 0-4 was assigned for each recorded measurement. depending on the degree of abnormality of the measured value. The sum of the assigned weights for all the measurements noted was the Acute Physiological Score (APS). The chronic health evaluation based on assessment of patient's condition six months before admission was used to place the patient into four categories A-D. It was suggested that APACHE could be used to control for case mix, to compare outcomes between ICU's, to study utilization of ICU's and evaluation of therapy. In 1985, Knaus introduced a short version of APACHE with addition of a point system for age and severity of chronic illness (APACHE II). APACHE II score was used by Knaus to stratify each hospital's patients by diagnostic indication for treatment, APS value and chronic health. The scoring systems are useful for assessing when the patient may safely leave ICU, for estimation of nursing needs and for planning resource allocation and cost of care. Sage W.M. et al evaluated 337 mixed medical-surgical ICU patients using APACHE II for severity of illness and 16 to 20 months after discharge survival and life quality were related inversely to severity of illness and cost of treatment. Acute health on ICU admission predicted survival well; chronic health and age were better predictors of quality of life.

Some scoring systems require collection of masses of data that are not available at admission and exclude many conditions common to ICUs or depend on the trend of information that is collected over days.

Lemeshow and Associated (8) have studied the APACHE II. SAPS and MPM and compared their ability to predict mortality. It has been argued that the use of these broad scoring systems have limited application or relevance to the patient. Severity of scoring in the aftermath of prior treatment and cardiopulmonary resuscitation may be misleading since the physiological derangement will have been modified by drugs administered during resuscitation. The need to stratify patients on the basis of the severity of their illness was recognised early by physicians in order to assess results of different therapies on outcome. A number of univariate variables have been identified that influence the outcome of ICU patients including age, presence of cancer, haptic cirrhosis, malnutrition, steroid therapy, coma, myocardial failure, economic status and sepsis.

AGE

The influence of age on disease outcomes has been widely studied. Increasing age, while not the sole reason for determining admission, must be taken into account because of decreased physiological reserves and a worse prognosis for most conditions that require intensive care (33). In trauma burns, patients of different ages with comperable injuries, a higher mortality is noted in those older than 50 years (13,14). Similarly, elderly patients with surgical or medical illness have been shown to be at greater risk of death than those

younger than 50 years (15). The increased vulnerability of elderly patients is attributed to more co-existing disease, diminished physiological vigour, myocardial infarction and cardiopulmonary rescusitation (33). More resources including use of mechanical ventilation and pacemaker placements were required in patients older than 65 years (16).

MALNUTRITION

This is very common in hospitalized patients and is even more severe in patients sick enough to be admitted to ICU. Whereas malnutrition has been believed to influence outcome with regard to mortality and morbidity this has been difficult to prove (18). Measurement of what constitutes malnutrition has proved ellusive and for that matter, the predictive power of both biochemical and anatomic variations to assess malnutrition or death is limited (34). It has long been known that if a patient loses 30% of their initial body weight during an acute illness, his chance of survival is remote. Loss of the responses of delayed hypersensitivity skin test reactions to common antigens - anergy - has been found to correlate with weight loss and it is known that such anergic patients have an increased mortality from sepsis. Restoring the body weight to normal is usually followed by a return of skin reactivity (35). Other problems associated with poor nutrition include specific deficiency syndromes, poor healing of pressure sores and a weak and apathetic patient.

OUTLINE OF MEDICAL CONDITIONS ADMITTED TO ICU:

RESPIRATORY FAILURE

Respiratory failure (pulmonary insufficiency) exists when the patient has hypoxemia (i.e. arterial PO_2 below 50mmHg while breathing 50% of oxygen. with or without associated hypercapnea i.e. arterial PCO_2 > 50mmHg) (36)

Aetiology: Acute respiratory failure can be caused by many disorders:

1. Obstructive disorders causing respiratory insufficiency - can result from anomalies causing:
   a. Upper airway obstruction or
   b. Lower airway obstruction which include
      - Bronchopneumonia, lobar emphysema
      - Infection Pulmonary Tuberculosis (PTB), bronchiolitis, pneumonia
      - Inflammation and bronchospasms
2. Restrictive disorders causing acute respiratory insufficiency affecting
      - Lung parenchyma
      - Restrictive chest wall diseases
3. Disorders causing inefficient alveolar-capillary gas transfer.
4. Disorders that cause diffusion defects like pulmonary edema, interstitial fibrosis, collagen disorders, pneumocystis carinii, sarcoidosis. Adult Respiratory Distress Syndrome (ARDS) may be seen in patients with shock, sepsis and near drowning.

Management of the patients with respiratory failure depends on the degree of hypoxemia. arterial PCO_2 and PH values and the underlying pathology. Ultimate recovery requires correction of the underlying cause of respiratory failure. Intubation and positive pressure ventilation may be required for an elevated PCO_2 with respiratory acidosis. This is best done in intensive care unit.

Adult respiratory distress syndrome (ARDS) most often occurs in the presence of sepsis and as a result is associated with high mortality. Despite current supportive therapy and treatment modalities mortality is upto 90% when associated with sepsis (37). A predictive index to a group of patients has been applied including lung injury score but these indices have been primarily of value to quantitate acute respiratory failure rather than predict outcome (17).

CONGESTIVE CARDIAC FAILURE

Congestive heart failure has been associated with many diseases that directly severely impaired ventricular contraction. Indeed the cardiogenic shock that accompanies the end stage cardiac disease or as a catastrophic complication of acute myocardial infarction is a major cause of mortality 10% to 15%. Killip developed a four stage classification system to predict mortality based on the degree of congestive cardiac failure present at time of ICU admission. In the presence of class IV disease (cardiogenic shock) the mortality predictably exceeds 80% (19).

The diagnosis of myocardial infarction. congestive cardiac failure. coma hepatic dysfunction, cancer. sepsis and protein energy malnutrition and presence of unstable vital signs at time of hospital admission are univariate predictors that have also shown some correlation with hospital mortality and need for intensive care. Univariate predictors of survival on the other hand include: Age. severity of illness and presence of chronic illness especially cancer (9).

GULLIAN BARRE SYNDROME.

This condition presents with rapidly progressive, ascending paralysis. Cranial nerves. especially facial nerves may be affected. Patients are admitted to intensive care clinically before laboratory test to monitor them closely for respiratory functions, bulbar function, skeletal muscle function, intubation and ventilated if respiratory failure occurs. Management is usually supportive and it is expected that the disease to run a self-limiting course. Mortality in review of 10 reported series of 425 patients, was shown to be as high as 22% (38). With ventilation equipment the mortality has been shown to improve. 5% of patients with GBS have a significant neurological deficit after recovery. Other cases of similar polyneuropathy may follow a relapsing course.

TETANUS.

This disease process is characterised by generalized muscle spasms (especially trismus) resulting from an intoxication of the nervous system by the exotoxin (tetanospasmin) of

clostridium tetani. Patients are admitted to intensive care unit and managed with goal of:-

1. Removing the source of the toxin.
2. Neutralizing toxin not yet fixed to the nervous system.
3. Prevent respiratory compromise.
4. Treat muscle spasms.

Despite treatment and improved supportive care, mortality may be as high as 50-60% (38). Higher mortality rates are associated with autonomic dysfunction and extremes of ages (38). Patients who have had tetanus do not develop immunity and a full course of active immunization must be given to prevent recurrence.

ORGANOPHOSPHATE POISONING.

These are widely available insecticides involved in human poisoning. Most of the cases admitted to KNH ICU are accidental, suicidal or criminal intentions as per patients records. They present with toxic manifestations which are as a result of inhibition of acetylcholinesterase in the nervous system. Complications of ingestion include pulmonary edema, chemical pneumonitis and adult respiratory distress syndrome which may lead to respiratory failure and require ventilatory support.

- Atropine is drug of choice
- Pralidoxine is given to counteract weakness, muscle fasciculations, or respiratory depression.

HYPERTENSION AND CEREBROVASCULAR ACCIDENTS.

This is a common and dangerous condition in the elderly. The prevalence of hypertension is estimated at 50% or more in those 55 years and older (40). Hypertension is one of the most important risk factors for cardiovascular disease. Elderly patients with hypertension not only have a higher risk of cardiovascular complications than normotensive individuals their own age. but also have a higher absolute risk for every cardiovascular complication than younger individuals with same degree of hypertension: they also have higher mortality rates after myocardial infarction or cerebrovascular accident than do younger individuals (41). Because of increased prevalence and risk of hypertension in elderly patients, almost 60% of excess mortality attributable to hypertension occurs in older persons with mild hypertension, although individuals over the age of 60 years constitute only about 11% of the population (42).

CEREBRAL HAEMORRHAGE.

Cerebral haemorrhage presents clinically with sudden onset of neurologic impairment, usually with hemiparesis or hemiplegia, headache, progressive decrease in level of consciousness and hypertension. It is generally agreed that cerebellar haemorrhage should be treated surgically. Proper management of cerebral haemorrhage is less certain. Overall mortality is 40-50% in patients with intracerebral haemorrhage and severe neurologic impairment is common in majority of survivors (43).

MULTIPLE ORGAN SYSTEM FAILURE.

The association of multiple organ system failure with outcome has also been studied widely by Wilkson et al. Their study showed that the incidence of MOSF in paediatric ICU was 27% of the 831 consecutive ICU admissions to paediatric ICU. Of the 62 non survivors, 60(97%) had MOSF. The mortality for patients with MOSF was 54% compared to a mortality of 0.3% in patients without MOSF. Mortaltiy was also shown to increase with increasing number of Organ System Failure (OSF) ($P<0.0001$). Mortality was 1% for one OSF; 11% for two OSF, 50% for 3 OSF, 75% for 4 OSF. Although MOSF is significantly associated with mortality in paediatric patients, it is not sufficiently discriminating to determine continuation or withdrawal from ICU support (23).

Either renal failure or pulmonary failure in conjunction with liver failure has been associated with increased mortality; patients with coma and renal and pulmonary failure have a mortality of more than 85% (17).

Four factors are universally acceptable/or universally influence ICU outcome; these are age, previous health status, severity of disease and diagnosis. A study by French Multicentre Group of ICU Research showed that each of the above four factors influences the immediate outcome. It is thus possible to describe and classify patients by this method although individual prognosis remains imprecise (24).

PATIENT TRIAGE.

There is need to select wisely patients admitted to ICU wisely since the facility is very expensive. For instance, the cost of a bed in an ICU is about four times that of a bed in the general ward. Hence there is need for triage of patients with critical illness to appropriate facilities matched to their requirements and based on severity of illness as recommended by Institute of Health Consensus Panel on Critical Care Medicine (20). It is not certain that ICU care is of value to those patients being observed for potential complications or for deteriorating existing conditions (21). However, it is well established that ICUs are of value in management of 30-35% of patients admitted who require mechanical ventilation or invasive monitoring while receiving vasoactive drugs.

The problem of triaging patients was found challenging by Melish et al (22) In their study using APS' and TISS, 28-30% of patients in medical ICU were found not to require ICU care, whereas 11% of ward patients did.

The problem of selecting patients therefore remains poorly defined and will among others, reflect the prejudices of the referring physician, the interests of the ICU management including bed availability, adequate staffing and equipment rather than a purely medical criteria.

AIMS AND OBJECTIVES

The purpose of this study undertaken at Kenyatta National Hospital was;

General objective.

1. To conduct a review of records of medical cases admitted to KNH ICU in the period 1995-1999.

Specific objectives.

1. To determine patterns of medical admissions to ICU

2. To assess the APACHE II score of medical patients admitted to ICU.

3. To determine general outcome, survival and mortality patterns of medical patients admitted to ICU.

4. To correlate ICU outcome with age, diagnosis, severity of illness and duration of hospital stay.

MATERIALS AND METHODS

Patient's data was obtained from the KNH Medical Records Department. All patients with medical conditions admitted to KNH ICU in the period December 1994 to December 1999 were studied retrospectively. A review of individual record in the prescribed period was done by evaluation of their index cards and record files in the Records Department of KNH. The relevant information was consequently extracted from each file and entered in a serially numbered data form (appendix). The annual statistics were tallied and tabulated.

Collected data was cleaned, verified and analysed using the Statistical Programme for Social Sciences PC+ package. Comparison of different variables was then made. Descriptive statistics, namely, mean, median, mode, standard deviation, correlation statistics and point estimates with 95% confidence interval around them determined. Specific patterns where applicable were deduced from tables, bar charts, histograms and simple graphs.

RESULTS.

In the 5 years under study January 1995 - December 1999. a total of 394 medical cases fulfilled all requirements for inclusion in the study.

Table 1: Yearly distribution of medical cases admitted to KNH-ICU 1995-1999

Year	1995	1996	1997	1998	1999	Cummulative total
Number of patients	23	61	102	63	145	394

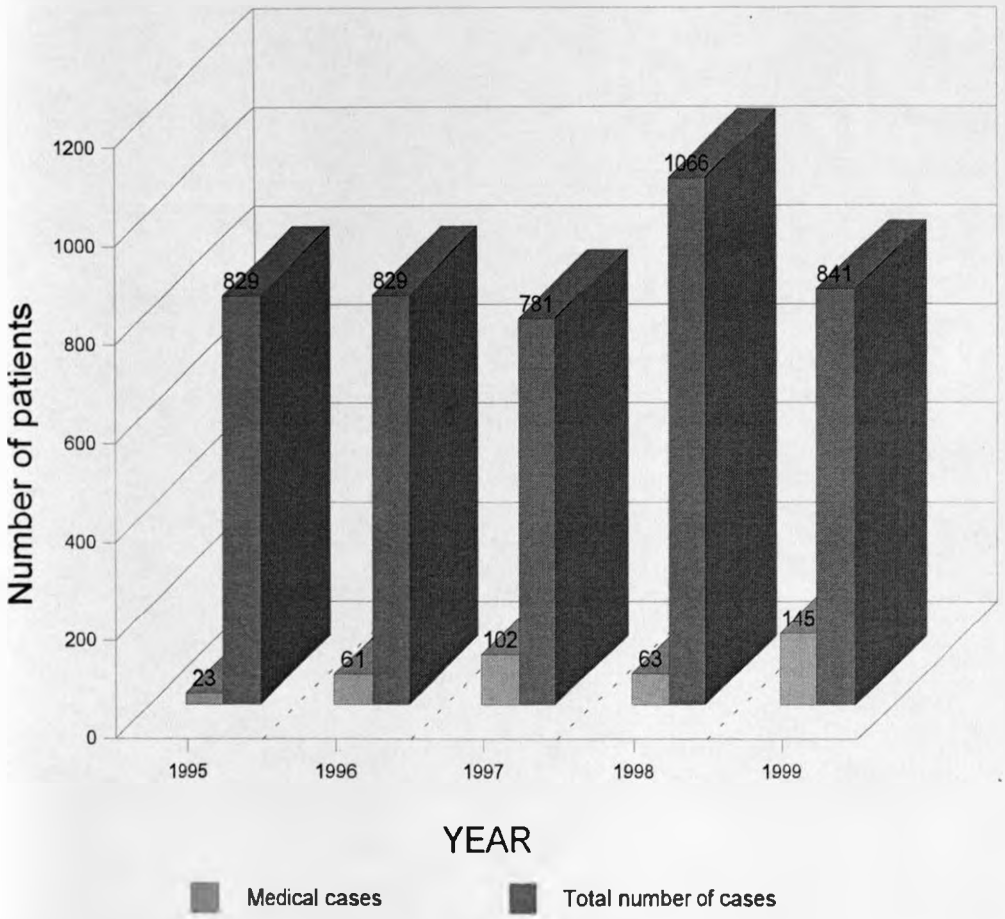
The number of cases varied from 23 to 145 with an average of 78.8 cases per year (table 1).

On the other hand, the distribution of the total number of patients both medical and surgical were distributed during the same period as in table 2.

Table 2: Distribution of the total number of patients January1995-December 1999.

Year	1995	1996	1997	1998	1999
Number of patients	829	829	781	1066	841

Figure 1: Yearly distribution of medical cases admitted to KNH-ICU 1995-1999.



The total number of patients (medical, trauma and surgical) over the five year study period were 4346 with overall mortality of 30.3%. The percentage of medical cases was 9% of the total number of ICU admissions over the five year study period.

Table 3: Sex distribution.

	Frequency	Percent
Male	196	49.7
Female	198	50.3
Total	394	100.0

Table 3 presents the sex distribution of patients admitted to ICU.

The ratio of male to female was approximately 1:1.

Distribution of age.

Ages were found to range between less than 1 year and over 70 years for both sexes. The mean age was 21.5 years with standard deviation of 23.9 . The age distribution is shown in table 4.

Table 4: Age distribution.

Age group (years)	Frequency	Valid percent
< 1	122	31.4
1-5	51	13.1
6-10	7	1.8
11-20	30	7.7
21-30	72	18.5
31-40	33	8.5
41-50	19	4.9
51-60	17	4.4
> 60	38	9.8
Total	389	100

Five patients did not have their ages recorded in their documents at time of admission to the time of discharge. This gives a percentage of 1.3% missing data on age. Children below 10 years accounted for 46.3% with those below 1 year accounting for the most number of patients, 122 (31.4%).

Outcome.

This was assessed by comparing the proportion of the number of patients who died to the total number admitted in a disease category, age group or the number of organ dysfunction the patient had at the time of admission. Grossly, the patients were either classified as survived or died (mortality and survival rates expressed as percentages).

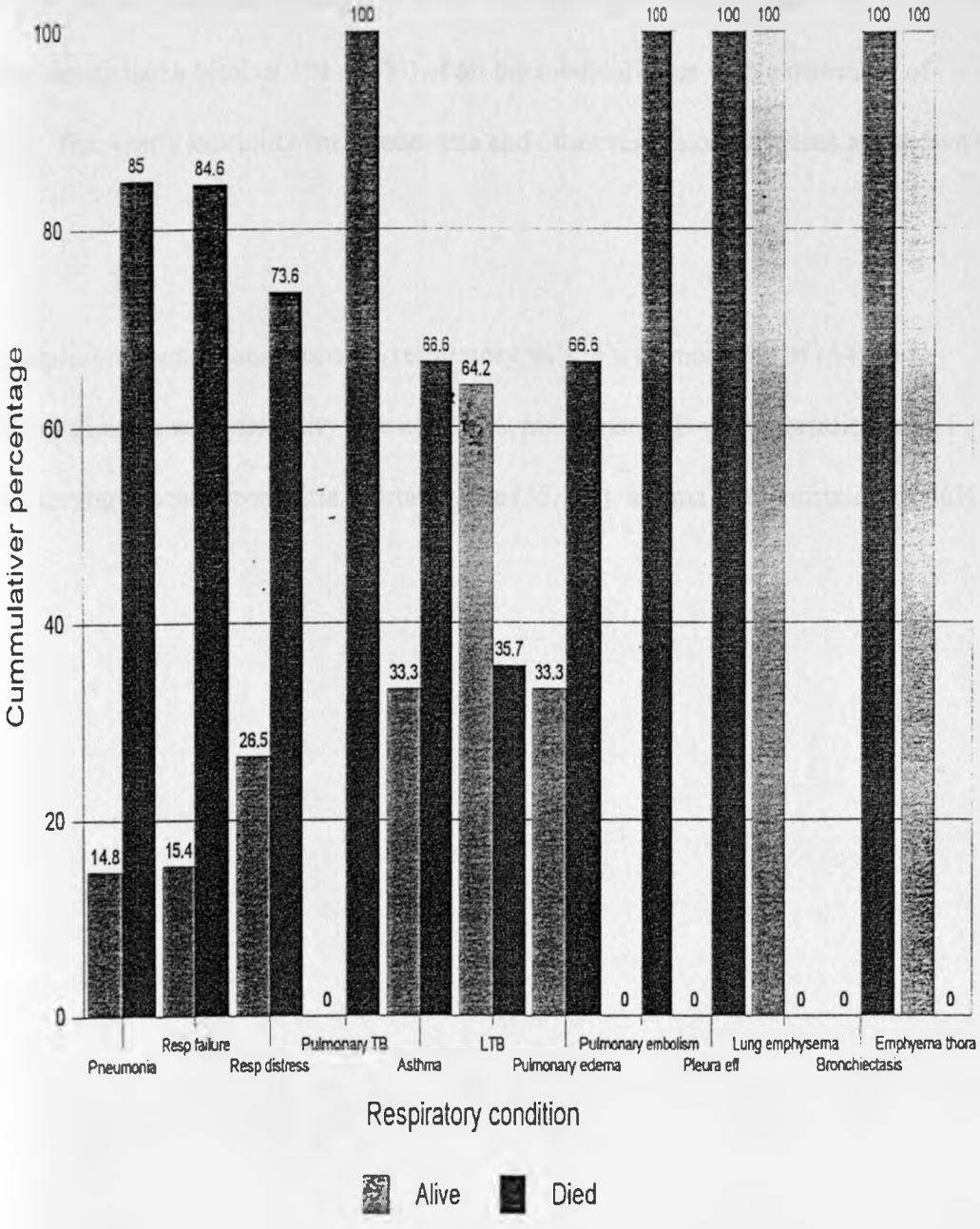
The disease categories were broadly grouped into major systems affected; thus respiratory, cardiovascular, neurological. endocrine and others which did not fall under any of the above and outcome was either survival or mortality at the end of the patients' stay in ICU.

Table 5: Respiratory conditions and outcome.

Disease process	1995		1996		1997		1998		1999		Cummulative totals		
	A	D	A	D	A	D	A	D	A	D	A (%)	D(%)	Total
Pneumonia	1	7	4	12	5	21	2	14	3	32	15(14.8)	86(85)	101
Respiratory failure	0	2	2	5	3	3	1	12	0	8	6(15.4)	33(84.6)	39
Respiratory distress	1	1	1	1	2	9	3	9	2	5	9(26.5)	25(73.6)	34
Pulmonary TB	0	0	0	2	0	3	0	1	0	9	0	15(100)	15
Asthma	0	0	1	0	0	1	0	1	1	2	2(33.3)	4(66.6)	6
LTB	0	0	3	1	4	5	1	0	1	0	9(64.2)	5(35.7)	14
Pulmonary edema	1	0	1	1	1	1	0	1	0	3	3(33.3)	6(66.6)	9
Pulmonary embolism	0	0	0	0	0	0	0	1	0	1	0	2(100)	2
Pleural effusion	0	0	0	0	0	0	0	0	0	2	0	2(100)	2
Lung emphysema	0	0	1	0	0	0	0	0	0	0	1(100)	0	1
Bronchiectasis	0	0	0	0	0	0	0	0	0	1	0	1(100)	1
Emphyema thorasis	0	0	0	0	1	0	0	0	0	0	1(100)	0	1
Total	3	10	13	22	16	43	7	39	7	63	46	177	223

KEY: A=alive
D=Died

Figure 2: **Respiratory conditions and outcome (1995-1999).**



The total number of patients who had respiratory system disease were 223 (56.6%) as out of the 394 medical patients admitted to KNH-ICU during the study period. Pneumonia as a disease entity had a total of 101 (25%) of all the medical cases with a mortality of (85.1%). The yearly mortality for pneumonia and other respiratory diseases are shown in table 5.

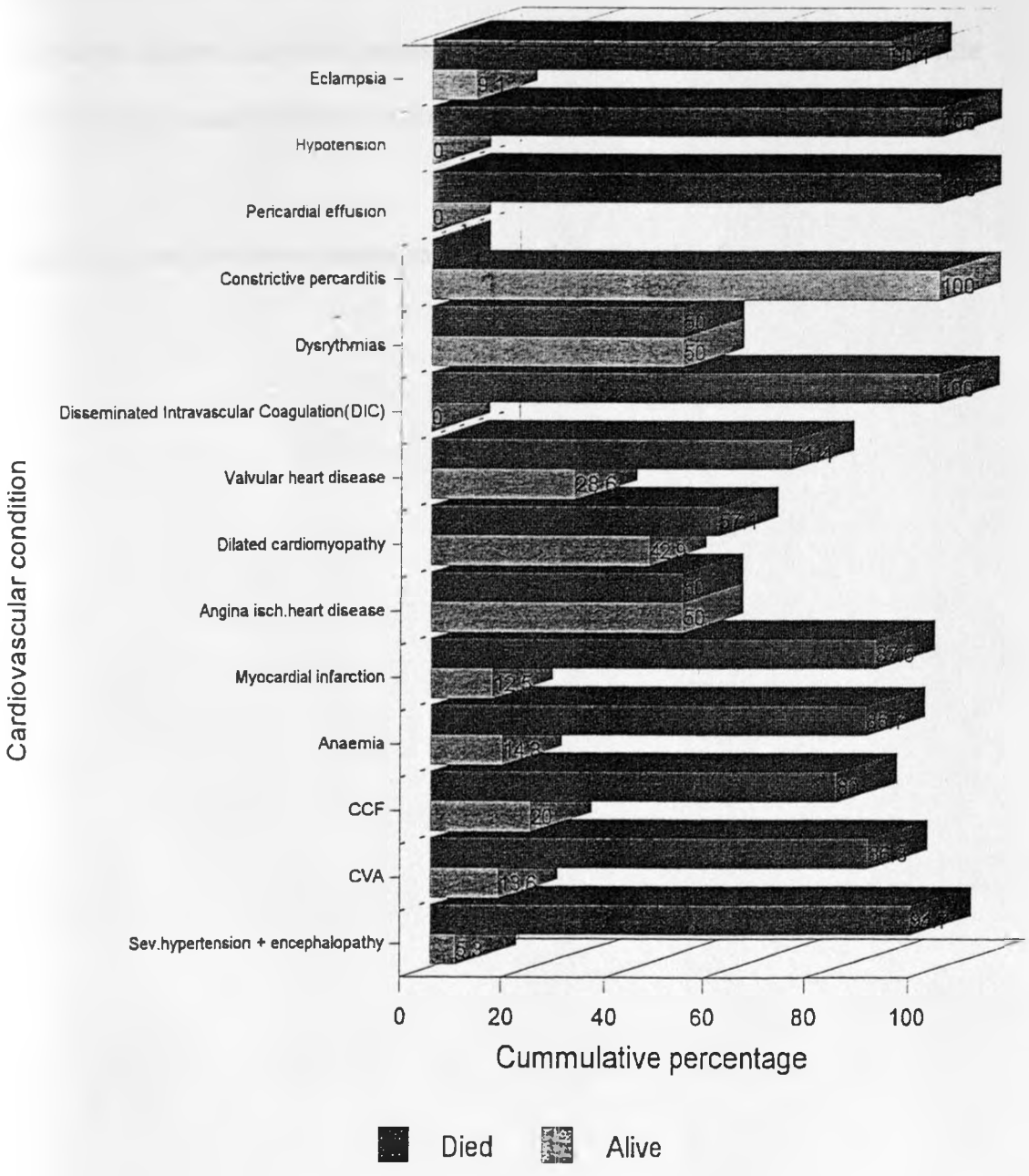
Other respiratory conditions included respiratory failure with mortality of (84.6%). respiratory distress with mortality rate of 73.5%, pulmonary TB with mortality rate of (100%), laryngotracheobronchitis mortality rate (35.7%), asthma with mortality of 66%.

Table 6: Yearly cardiovascular disease occurrence and outcome.

Cardiovascular disease	1995		1996		1997		1998		1999		Cummulative totals		
	A	D	A	D	A	D	A	D	A	D	A (%)	D(%)	
Severe hypertension with encephalopathy	0	4	0	4	1	4	0	1	0	5	1(5.3)	18(94.7)	19
CVA	1	2	0	3	1	4	0	1	1	9	3(13.6)	19(86.3)	22
CCF	0	0	1	3	1	4	1	0	0	5	3(20)	12(80)	15
Anaemia	0	1	0	1	1	0	0	2	1	8	2(14.3)	12(85.7)	14
Myocardial infarction	0	0	0	1	0	1	0	1	1	4	1(12.5)	7(87.5)	8
Angina pain ischaemic heart disease	0	0	0	0	0	1	0	0	1	0	1(50)	1(50)	2
Dilated cardiomyopathy	0	0	1	2	1	0	1	1	0	1	3(42.9)	4(57.1)	7
Valvular heart disease	0	0	0	0	1	1	0	0	1	4	2(28.6)	5(71.4)	7
Disseminated intravascular coagulation(DIC)	0	0	0	0	0	1	0	0	0	1	0	2(100)	2
Dysrrythmias	0	0	0	1	0	0	0	0	1	0	1(50)	1(50)	2
Constrictive pericarditis	0	0	0	0	1	0	0	0	0	0	1(100)	0	1
Pericardial effusion	0	0	0	0	0	0	0	1	0	0	0	1(100)	1
Hypotension (shock)	0	0	0	0	0	1	0	2	0	2	0	7(100)	7
Hypertensive heart disease	0	0	0	0	0	0	0	0	0	1	0	1(100)	1
Eclampsia	0	0	0	3	1	1	0	1	0	5	1(9.1)	10(90.1)	11
Total	1	7	2	18	8	18	2	11	6	45	19	99	

KEY: A= alive, D=Died

Figure 3: Cummulative yearly cardiovascular disease occurrence and outcome (1995-1999).



The cardiovascular group of diseases is shown in table 6. figure3. A total of 118 cardiovascular related cases were admitted during the 5 year period out of which 99 died, giving rise to a mortality rate of 83.9%. Hypertension and cerebrovascular accidents (CVA) had the highest number of admissions with CVA accounting for 22 (18%) while severe hypertension accounted for 19 (16.1%) of all the CVS related diseases.

The mortality rates for disease related to CVS are shown in table 6.

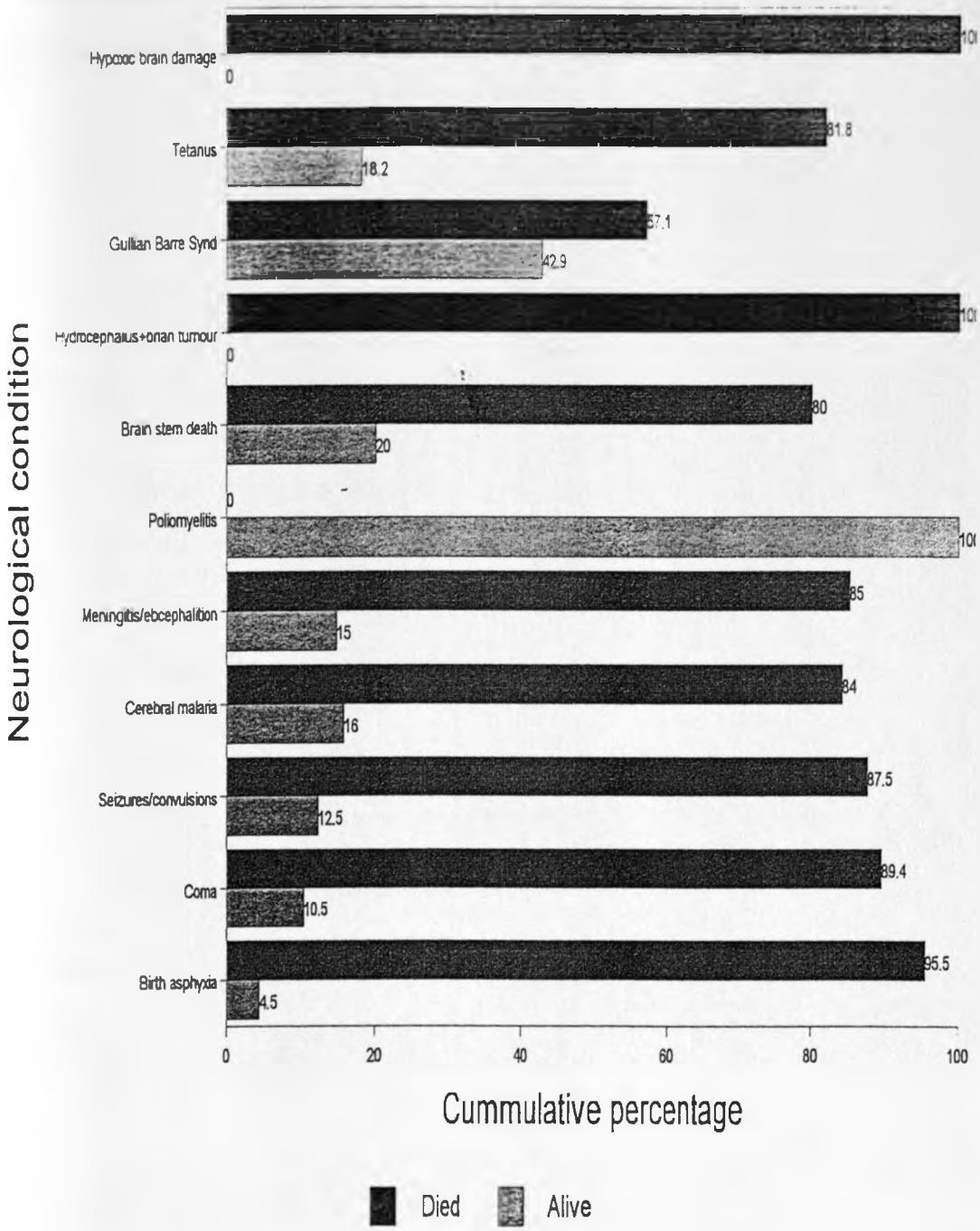
Table 7: Cummulative totals of yearly neurological conditions and outcome

Disease process	1995		1996		1997		1998		1999		Cummulative totals		
	A	D	A	D	A	D	A	D	A	D	A	D	Total
Birth asphyxia	0	0	0	1	1	5	0	5	0	10	1(4.5)	21(95.5)	22
Coma ? Cause	0	2	0	2	1	5	1	3	0	5	2(10.5)	17(89.4)	19
Seizures/convulsions	0	0	0	0	1	3	0	2	1	2	1(12.5)	7(87.5)	8
Cerebral malaria	0	1	2	4	2	4	0	5	0	7	4(16)	21(84)	25
Meningitis/encephalition	0	3	2	8	3	4	1	4	0	15	6(15)	34(85)	40
Poliomyelitis	-	-	-	-	-	-	1	0	-	-	1(100)	0	1
Brain stem death	-	-	1	0	0	2	0	1	0	1	1(20)	4(80)	5
Hydrocephalus + brain tumour	0	1	0	0	0	3	0	0	0	1	0	4(100)	4
Gullina Barre Syndrome (GBS)	0	1	0	0	1	0	0	1	2	3	3(42.9)	457.1)	7
Tetanus	0	1	1	1	1	2	0	2	0	3	2(18.2)	9(81.8)	11
Hypoxic brain damage	0	1	0	0	0	1	0	0	0	0	0	2(100)	2
Total	0	10	6	16	10	29	3	23	3	37	22	115	137

KEY: A=alive

D=Died

Figure 4: Cummulative yearly neurological conditions and outcome



A total of 137 (34.8%) patients had neurological related diseases admitted to ICU of all the medical cases. The overall mortality rate was 83.9% with meningitis/encephalitis admission leading in numbers. The mortality rates ranged from 0-100% (table 7).

Table 8: Endocrine system

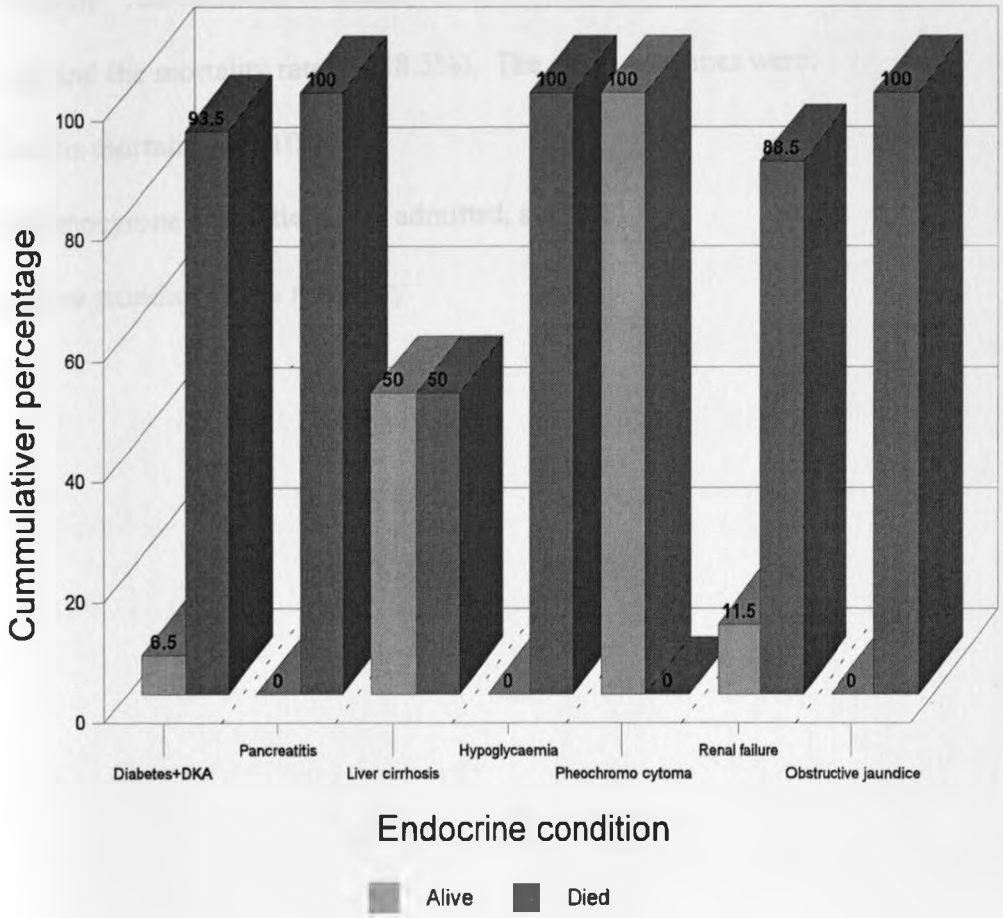
Disease	1995		1996		1997		1998		1999		Cummulative totals		
	A	D	A	D	A	D	A	D	A	D	A (%)	D(%)	Total
Diabetes + DKA	1	6	0	5	0	5	0	4	1	9	2(6.5)	29(93.5)	31
Pancreatitis	0	0	0	0	0	0	0	0	0	2	0	2(100)	2
Liver cirrhosis	0	0	0	1	1	0	0	0	0	0	1(50)	1(50)	2
Hypoglycaemia	0	0	0	0	0	0	0	0	0	2		2(100)	2
Pheochromo cytoma	0	0	0	0	0	0	0	0	1	0	1(100)	0	1
Renal failure	0	3	1	5	1	4	1	7	0	4	3(11.5)	23(88.5)	26
Obstructive jaundice	0	0	0	0	0	0	0	0	0	1	0	1(100)	1
Total	1	9	1	11	2	9	1	11	2	18	7	56	

KEY

A=Alive

D=Died

Figure 5: Endocrine system cummulative yearly distribution



Diabetes mellitus accounted for 31 (8.4%) of all the medical cases in the unit (table 8). Most of these patients had co-morbidity especially accompanied by renal failure and hypertension. The mortality in these patients was (93.5)%. Renal failure had 26 patients admitted and the mortality rate of (88.5%). The other outcomes were;

Pancreatitis mortality rate 100%

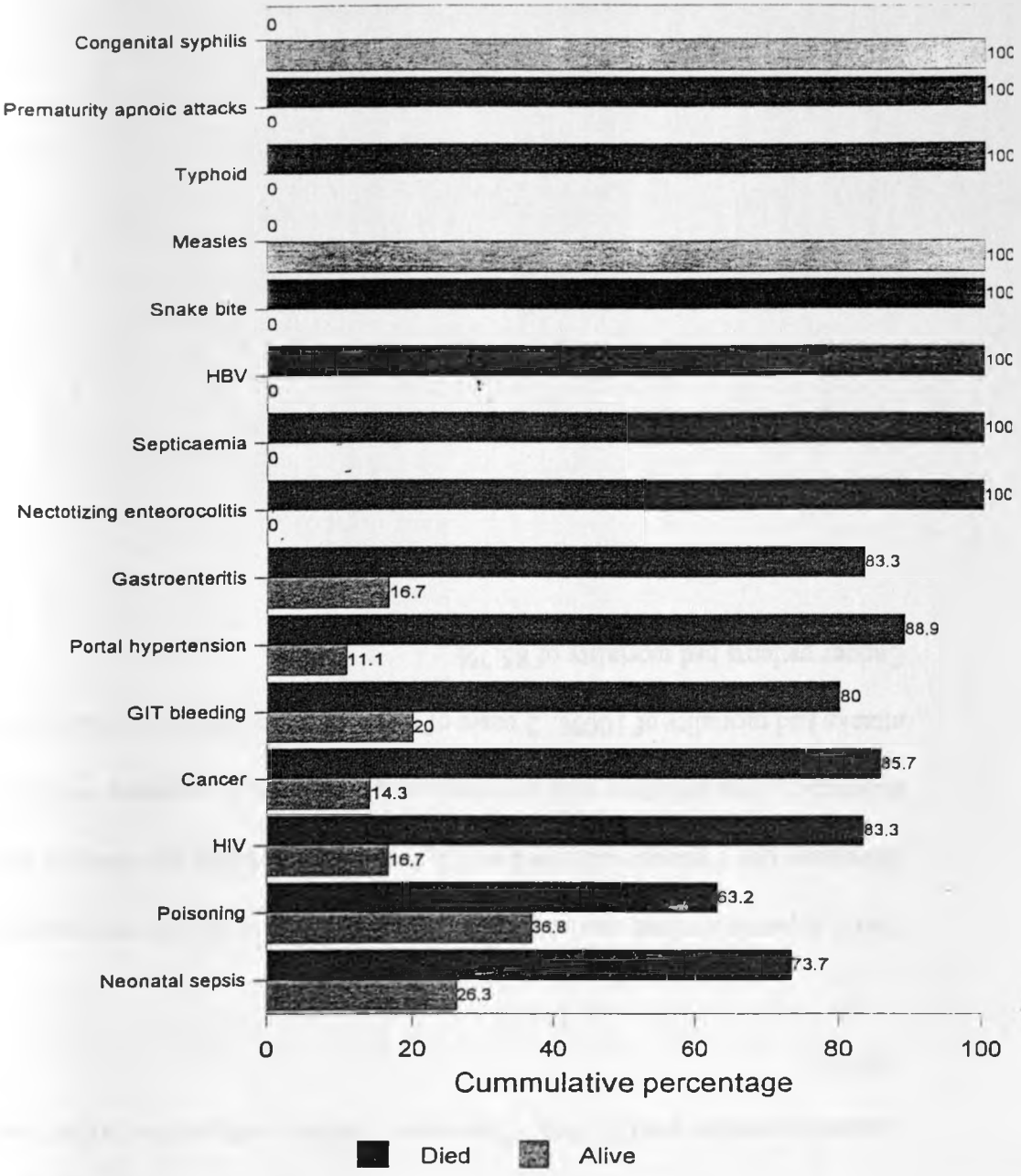
Pheochromocytone one patient was admitted, survived.

Obstructive jaundice 100% mortality.

Table 9: Cummulative totals for yearly outcome of other diseases

Disease process	1995		1996		1997		1998		1999		Cummulative totals		
	A	D	A	D	A	D	A	D	A	D	A (%)	D(%)	Total
Neonatal sepsis	0	1	0	1	3	6	0	3	2	3	5(26.3)	14(73.7)	19
Poisoning (phenobarbitone) Cholorquine,organophsophate, kerosine	-	-	0	1	-	-	5	4	2	7	7(36.8)	12(63.2)	19
Human Immune Deficiency Virus(HIV)	-	1	1	2	2	4	0	2	0	6	3(16.7)	15(83.3)	18
Cancer (stomach thyroid brain)	0	0	1	2	0	3	0	0	0	1	1(14.3)	6(85.7)	7
GIT bleeding	0	0	0	1	1	0	0	0	0	3	1(20)	4(80)	5
Portal hypertension	0	0	0	0	1	8	0	0	0	0	1(11.1)	8(88.9)	9
Gastroenteritis	0	0	0	0	1	2	0	0	0	3	1(16.7)	5(83.3)	6
Nectotizing enterocolitis	0	0	0	0	0	0	0	0	0	1	0	1(100)	1
Septicaemia	0	2	0	0	0	0	0	1	0	1	0	4(100)	4
Hepatitis B-virus (HBV)	0	0	0	0	0	0	0	0	0	1	0	1(100)	1
Snake bite	0	0	0	0	0	0	0	1	0	1	0	2(100)	2
Measles	0	0	1	0	0	0	0	0	1	0	2(100)	0	2
Typhoid	0	0	0	0	0	0	0	1	0	0	0	1(100)	1
Preamturity Apnoic attacks	0	0	0	0	0	0	0	0	0	1	0	1(100)	1
Congenital syphilis	0	0	0	0	0	0	1	0	0	0	1(100)	0	1
Totals	0	4	3	7	8	23	6	12	5	28	22	74	

Figure 6: **Other diseases cummulative yearly distribution (1995-1999).**



The other medical conditions admitted during the 5 year period are presented

Neonatal sepsis, poisoning (with organophosphate, kerosine and dettol), HIV

had the highest number in this group of patients. Neonatal sepsis had mortali

(73.7%); while poisoning had mortality of (63.2%); HIV infection was diagn

patients, mortality was (83.3%). There were 7 patients with cancer, 6 died (m

(85.7%).

Portal hypertension had mortality of (88.9%). Gastroenteritis with severe ele

imbalance had 6 patients admitted with 5 deaths. Necrotizing enterocolitis, s

hepatitis B virus infection with liver cirrhosis, typhoid and premature with ap

attacks had mortality of 100%. 2 cases of measles and congenital syphilis all

Cancer patients had mortality of 85.7%

Table 10: Yearly outcome as per age groups (mortality, survival).

Age groups (years)	1995		1996		1997		1998		1999		Cummulative totals		
	A	D	A	D	A	D	A	D	A	D	A (%)	D(%)	Total
< 1	1	6	3	10	11	29	2	17	3	40	20(16.4)	102(83.6)	122
1-5	-	-	4	7	5	15	3	7	1	9	13(25.5)	38(74.5)	51
6-10	0	3	0	0	0	1	0	0	1	2	1(14.3)	6(85.7)	7
11-20	0	2	3	2	1	3	3	4	3	9	10(33.3)	20(66.6)	30
21-30	0	2	3	7	4	14	3	11	5	23	15(20.8)	57(79.2)	72
31-40	0	0	4	6	0	2	0	5	0	16	4(12.1)	29(87.9)	33
41-50	0	2	0	1	1	2	0	2	2	9	3(15.8)	16(84.2)	19
51-60	0	0	0	4	1	2	0	1	2	7	3(17.6)	14(82.4)	17
≥ 61	2	5	1	6	0	8	2	2	0	12	5(17.9)	23(82.1)	28
Total	3	20	18	43	23	76	13	49	17	127	74	305	

KEY:

A=Alive

D=Died

Figure 7: Outcome of ICU in relation to age.

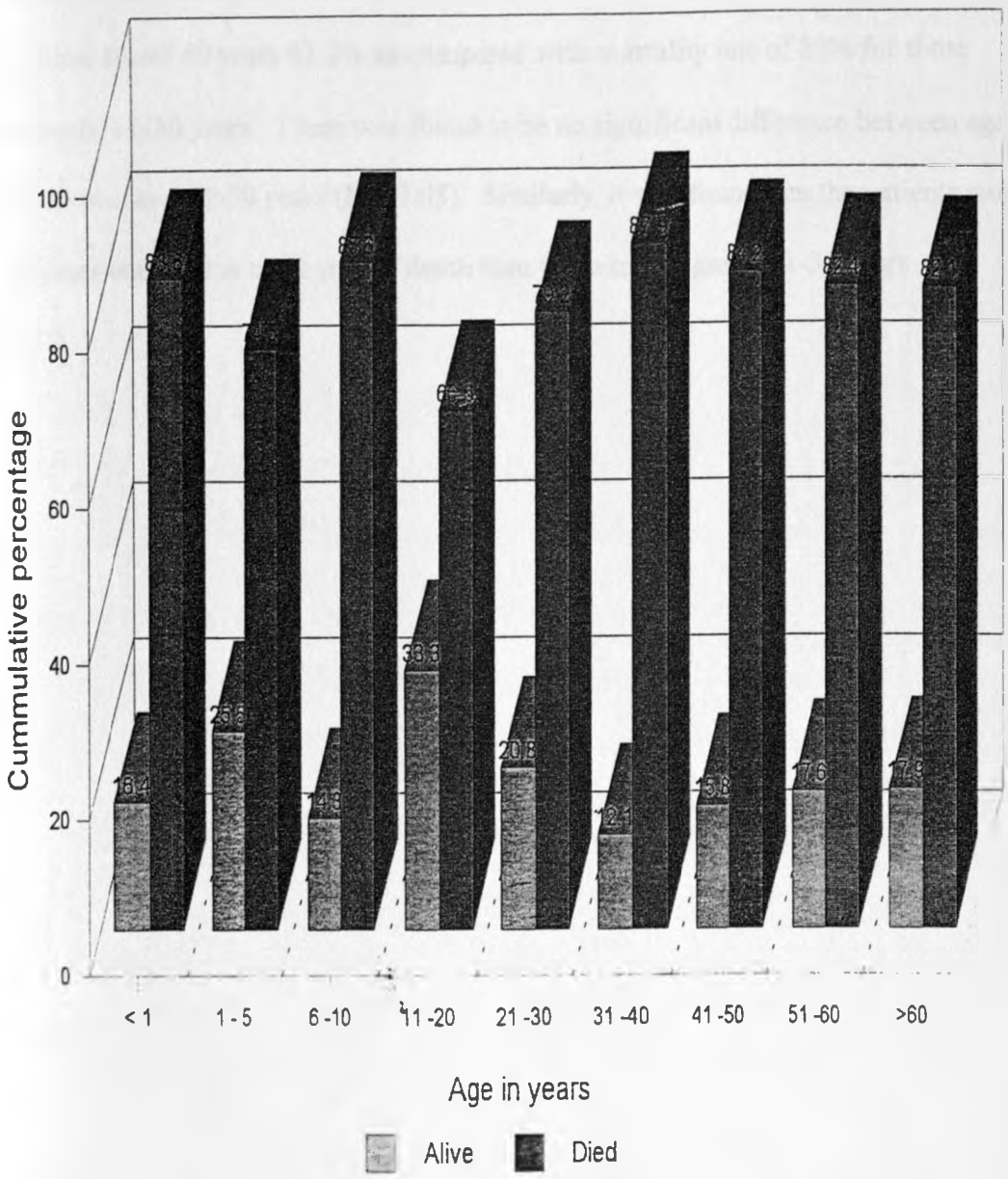


Table 10 shows the yearly outcome by age group. The mortality rate was higher in age groups at the extremes. The mortality rate for those less than 1 year was 83.6% while among those above 60 years 82.2% as compared with mortality rate of 80% for those aged between 11-30 years. There was found to be no significant difference between age group 1-5 years and 11-30 years ($P > 0.05$). Similarly, it was found that the patients more than 50 years were not at more risk of death than those in age group 11-30 years ($P=0.567$).

Table 11: Length of hospital stay in days versus outcome.

Outcome	1-5 days	6-30 days	> 30 days	Total
Dead %	227(57.6)	84(21.3)	9(2.3)	320(81.2)
Alive %	21 (5.3)	42(10.7)	11(2.8)	74(18.8)
Total count % of total	248(62.91)	126(32)	20(5.1)	394(100)

In parenthesis are percentages

Over the 5 year period it was observed that more patients were staying for shorter periods with subsequent years since 1995. There was a statistically significant difference between cases of deaths for 1999 and 1997 (P value < 0.05). More deaths occurred for people who stayed shorter (1-5 days) than those who stayed longer than 30 days. Distribution of patients according to length of hospital stay by outcome is presented in table 12.

Table 12: ICU length of stay cross tabulation with outcome

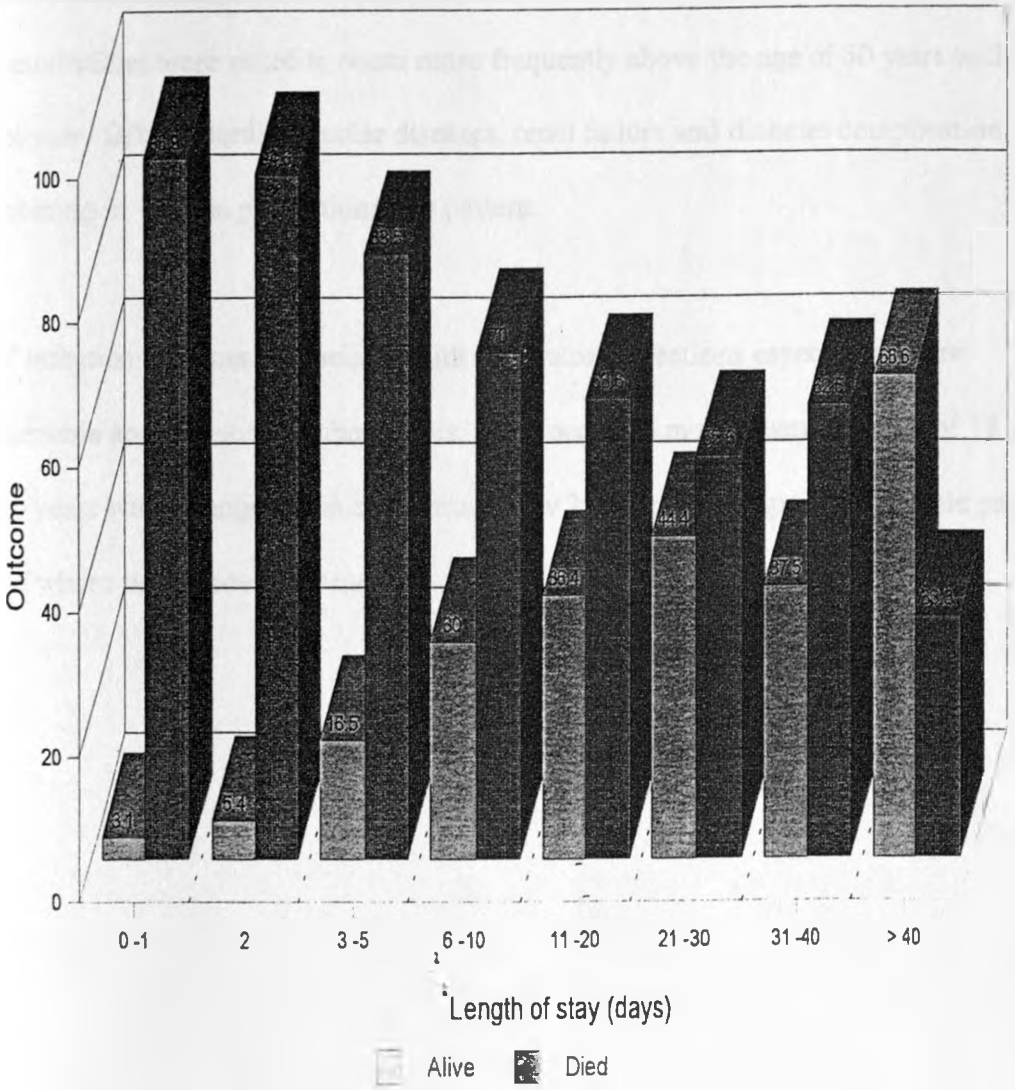
Days(grouped)	1995		1996		1997		199
	A	D	A	D	A	D	A
0-1	0	2	3	13	1	33	0
2	0	2	1	2	0	9	0
3-5	2	7	0	12	4	16	6
6-10	1	4	7	10	6	12	3
11-20	0	2	4	2	4	3	3
21-30	0	2	2	3	2	2	0
31-40	0	1	0	1	2	2	0
> 40	0	0	1	0	4	2	1
Total	3	20	18	43	23	79	13

KEY

A=Alive

D=Died

Figure 8: ICU length of stay and outcome



Multiple organ system outcome with mortality trends is tabulated in table 13.. Patients admitted with one organ system failure had mortality rate of 73.94%; while those with 2 organ systems failing had mortality rate of 94.6%; above 4OSF the mortality was 100%. Co-morbidities were noted to occur more frequently above the age of 50 years with respiratory failure, cardiovascular diseases, renal failure and diabetes complications combining in various proportions in a patient.

HIV infection was more associated with respiratory infections especially severe pneumonia and pulmonary tuberculosis. This occurred mostly between ages of 18 years to 40 years with younger female patients below 25 years as compared with male patients all of whom were above 30 years.

Table 13: ICU multiple disease categories and outcome and cumulative totals (1995-1999).

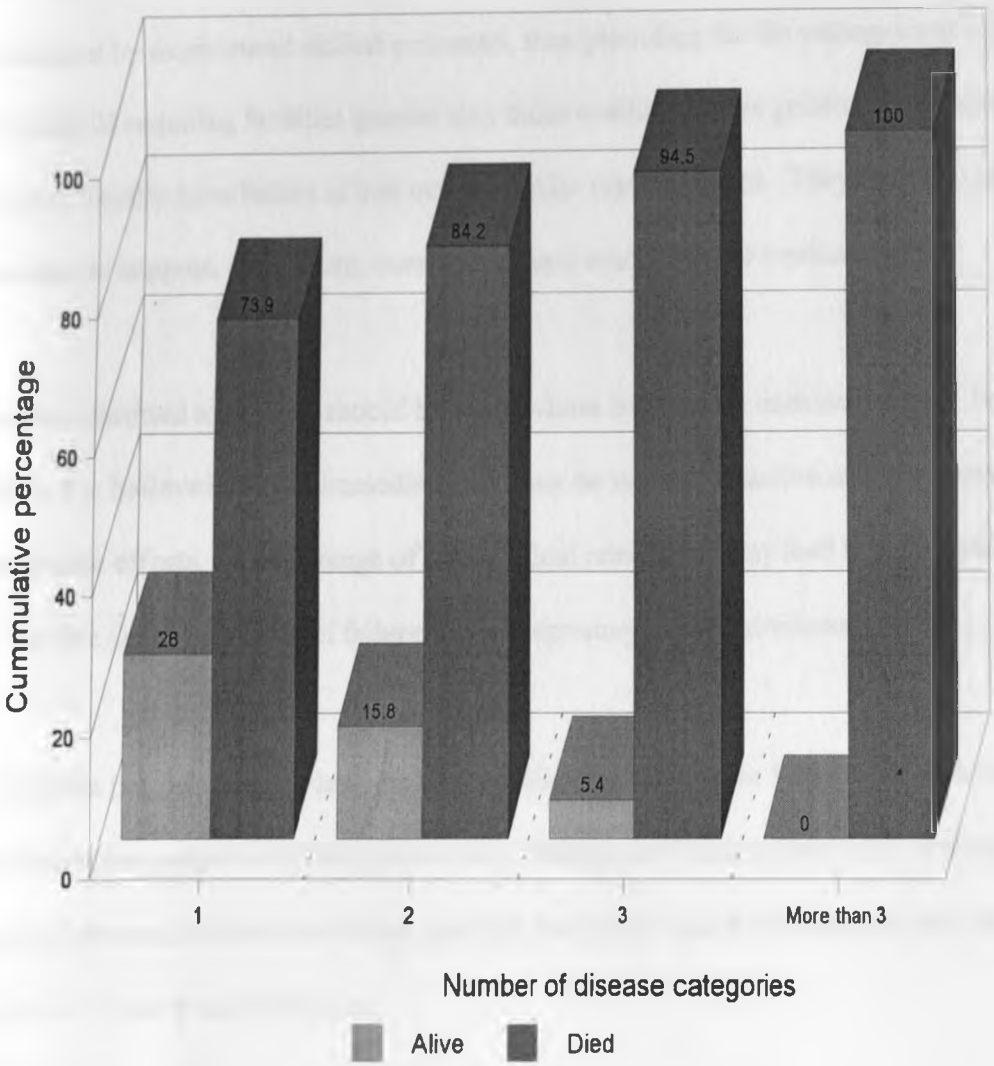
	1995		1996		1997		1998		1999		Cummulative totals		
	A	D	A	D	A	D	A	D	A	D	A (%)	D (%)	Total
1	2	8	11	13	12	29	6	15	12	57	43(26)	122(73.9)	165
2	0	7	7	26	11	35	6	30	5	56	29(15.8)	154(84.2)	183
3	1	4	0	3	0	12	1	4	0	12	2(5.4)	35(94.5)	37
More than 3	0	1	0	1	0	1	0	3	0	3	0(0)	9(100)	9
Total	3	20	18	43	23	77	13	52	17	128	74	320	394

KEY:

A=Alive

D=Died

Figure 9: ICU multiple disease categories and outcome



DISCUSSION.

Intensive therapy consists of the care of patients who are deemed to be recoverable but who need continuous supervision or who need or are likely to need specialized techniques by experienced skilled personnel, thus providing for the management of the critically ill requiring facilities greater than those available in the general ward. Such patients usually have failure of one or more major organ systems. They therefore need continuous support, monitoring, nursing care and availability of medical staff.

Patients admitted to the unit should be those whose lives are in imminent danger but in whom it is believed that the immediate risk may be averted by active and often invasive therapeutic efforts. A wide range of pathological conditions may lead to such a state but all involve failure or threat of failure of the respiratory and/or circulatory systems.

During the period under review, medical admissions catered for 9.1% of the total number of patients managed in the critical care unit. Being a multidisciplinary unit involving surgical, trauma, obstetric and other medical disciplines, the burden on this unit can be noted to be heavy and demanding.

Respiratory problems accounted for 56.6% of all medical admissions to the ICU. Most of the patients (45.3%) categorized with respiratory conditions had pneumonia as their primary diagnosis (45.29%). Outcome however, associated with respiratory conditions was poor. The high mortality in respiratory conditions was largely due to pneumonia

with 85.5% mortality rate. These patients were admitted to the intensive care with acute respiratory failure. The incidence of acute respiratory distress syndrome could not be established since there was no consistent diagnostic criteria. In many cases, measurement of pulmonary wedge pressure, a major component of earlier definitions of ARDS was not available. A recent report from a tertiary paediatric ICU however, had a mortality of 62% (30) of ARDS. Other studies have shown overall mortality of 52% in neonates (31).

Cardiovascular conditions on the other hand accounted for 29.9% of all medical conditions with an average outcome of 83.9% mortality. Patients are often admitted to the ICU because their cardiovascular status is unpredictable and potentially unstable making continuous availability of information essential. In the KNH, most medical cardiovascular related conditions were hypertensive or hypertensive complications related in nature with minimal occurrence of acute myocardial infarction as the priority cause for admission. They may be related to the population sub type, KNH serves with minimal coronary artery disease profile. Mortality associated was however very high upto (87.5%) of the patients with acute myocardial infarction. This may reflect the poor state of cardiovascular compromise especially when associated respiratory failure with exacerbation of reduced blood oxygenation. Other studies show a better AMI outcome as compared to ours at KNH. After hospital admissions. Martin et al has shown that the risk of death in the first month is 10-15%. with a further risk in the subsequent years of 10% (55).

Neurological related medical conditions accounted for 34.8% of all the medical conditions with average mortality of 83.9%. Meningitis/encephalitis had the most number of patients in the neurological related medical diseases (29%) with a mortality of 85%. Organisms implicated as the causative organism of meningitis was *Neisseria meningitidis*, a gram negative diplococcus which commonly resides in the nasopharynx but migrates into the blood and causes profound response of the complement system. Physiological effects of the released cytokines and other inflammatory mediators, together with activation of complement coagulation and kinin cascade include; disturbed regulation of temperature and vascular tone, myocardial dysfunction, coagulopathy, platelet aggregation and bone marrow suppression. Hypovolaemia occurs as a result of increased permeability and capillary leak. These patients are admitted to ICU with complications associated with severe sepsis which manifest as septic shock with or without multiple organ dysfunction. All organs are virtually affected and they can be single organs or combinations of, adult respiratory syndrome, disseminated intravascular coagulation, acute hepatic failure, acute renal failure and acute central nervous system dysfunction.

Early identification of patients who require more intensive and early management is facilitated by the use of prognostic indicators. None is available in our KNH ICU set up at the moment. The Glasgow meningococcal septicaemia prognostic score is a clinical tool which facilitates rapid assessment of severity (43).

Malaria was diagnosed in 18% of the neurological category of patients with a mortality of 84%. Many of the patients had plasmodium falciparum and presented with either severe hemolysis, renal failure, coma or on admission.

Guillian Barre, tetanus, polio and epileptic seizures are important entities because they rapidly and progressively compromise the respiratory system. Early detection and management in the ICU improves outcome. Guillian Barre had mortality of 57.1% in KNH ICU. In review report by Ravn of 10 series mortality was 22% (44), comparatively lower than what the study showed. Perhaps the concomitant respiratory tract infection associated with prolonged intubation and other co-morbidities are a factor in raising mortality in KNH-ICU. Tetanus had mortality of 81.8%. 19 (13.9%) out of 137 neurological related patients were admitted with coma as presenting sign/symptom. Most of them died before a diagnosis could be established. Mortality in this group was 89.5%.

Diabetic ketoacidosis presenting as coma and shock accounted for 49% of the endocrine related diseases which were 16.0% of all the medical patients. Diabetes as the underlying disease was associated with multiple organ dysfunction when they presented to ICU. These patients presented with combinations of renal failure 26 (36%) patients of the total endocrine related ailments: diabetes ketoacidosis with 31 (49.2%) of endocrine patients. Hypertension: coma and myocardial infarction which have been discussed under the specific organ systems affected. Overall outcome of endocrine related diseases was 86.2% mortality.

The other endocrine organs affected were; pancreatitis with mortality of (100%), pheochromocytoma with one patient who survived; liver cirrhosis with 2 patients over the study period 1 died and 1 survived (50% mortality); obstructive jaundice 1 patient was admitted who died.

The other conditions included those in table 9 all were at risk of multiple organ dysfunction and required specialized care for this. Notably, neonatal sepsis had mortality of 73.7%. Mortality rates elsewhere have been reported to be 10-30% for children with severe sepsis (45), blood lactate concentrations providing an early predictor of outcome. Children at risk include those with myeloproliferative disorder, acquired immunodeficiency; children with congenital cardiac or renal tract abnormalities.

Poisoning with ingestion of organophosphates chloroquine, phenobarbitone, kerosine and 'dettol' had 19 patients (4.8%) of all the medical cases during the study period. Mortality in these patients was (63.2%). The patients presented with complications of ingestion like pulmonary edema, chemical pneumonitis and adult respiratory distress syndrome. Many of the patients with toxic drug ingestion present hours after the ingestion rendering measures of preventing further absorption not beneficial. Supportive therapy of the failing systems though tend to improve outcome in these patients. The prognosis for patients admitted to hospital after drug overdose is excellent unless hypoxic brain damage has occurred before admission or there is a current intercurrent illness/disease. In one series of 1,166 admissions the mortality rate was 0.4% (46). The more severe cases

requiring admission to an ICU have a higher mortality, but prognosis is still good unless the patient has hypoxic brain damage (47).

Acquired Human Immunodeficiency Virus had 18 patients (4.6%) out of the medical cases admitted to ICU during the study period. Mortality was 83.33% among the HIV patients in KNH ICU. A study done by Jeena et al on outcome of human immunodeficiency virus antibody-positive children admitted to an ICU showed a mortality of 100% in patients with AIDS compared with 55% in their controls. The study concluded that outcome in AIDS patients admitted to ICU was significantly worse than the HIV-uninfected patients. However, they also deduced that HIV antibody-positive patients without AIDS do as well as uninfected controls (56).

The remaining disease entities occurred very rarely with varying outcomes. The results showed that the overall mortality rate was 81.2% for all the medical cases admitted to KNH ICU. The outcomes as per univariate predicators in KNH-ICU was determined for age, number of organ systems affected, the diagnosis or underlying disease on top of the acute illness that warranted ICU admission. The mortality rate in KNH ICU is higher than elsewhere in other hospitals. Reported mortality rates for paediatric intensive care vary between 5% and 17% (48). Hospital mortality rates of 26% have been reported for adults undergoing intensive care (49) and 66% for preterm infants with birth weights less than 750g (50). However, comparisons which use crude mortality rates are limited because outcome are affected by factors such as co-morbidity, age and severity of acute

illness. The mortality in KNH-ICU is inevitably higher in view of the pathological process that make it necessary to provide artificial assistance for one or more of the vital systems. It is worth noting that only medical cases were analysed and that some disease entities had very few patients not enough to subject to a statistical analysis.

Age was seen to be a major factor contributing to outcome of ICU admissions during the study period. In terms of numbers, children below 5 years accounted for 43.9% of all the medical related cases. The mortality rate for the children below 5 years was 92.5% while the crude mortality rate of age classes above 50 years was 82.8% (table 10). These findings are not similar to a study in trauma patients of different ages but comparable injuries (13,14). Elderly patients with medical illnesses were not at greater risk of death than those younger than 50 years (15).

Age influences immunity and infectious diseases are more severe at extremes of life. In the very young, immaturity of the immune system leads to poor antigen recognition or antibody recognition. At the extremes of age, a non-specific state of immune deficiency exists either through poor nutrition, hormonal changes, or other mechanisms. In the elderly, there is evidence that hypofunction of the immune system occurs. Outcome from the study for age groups 1-5 years; 11-30 years and more than 50 years compared, showed that there was no significant difference in outcome (mortality) between ages between 1-5 years and 11-30 years ($P > 0.05$); similarly there was no increased risk of death amongst

patients > 50 years as compared with those between 11-30 years (P=0.567). Stay and outcome were not significantly associated but more deaths occurred in 1997 and 1999 within 24 hours of admission. Overall mortality within 24 hours of admission was 96.9%. The mean duration of stay in days was 8.1.

There was increasing mortality with more than one organ system failing. Mortality of one system failing was 73.9%, 2 organ systems failing 84.2%, while more than 3 organ systems affected at admission had mortality of 100% (table 13, figure 9). The association of multiple organ dysfunction by Wilkison et al revealed that the incidence of multiple organ system failure (MOSF) to paediatric ICU was 27% of the 831 consecutive ICU admissions to paediatric ICU. The mortality for patients with MOSF was 54%. Compared to a mortality of 0.3% in patients without MOSF (23).

The APACHE II score: APACHE II and most recently developed APACHE III were developed by Knaus for use in adults and incooperate data which relate to the degree of acute physiological derangement together with information on chronic heath status (51) with an assigned weight given to each measurement. it is possible to assess pre-admission health status and probability of survival (52). The data from KNH Records Department could not enable computation of APACHE II as intended in the study. Most of the data required was readily available and this included. temperature. blood pressure. heart rate. respiratory rate, partial pressure of arterial oxygen. arterial pH. serum sodium. hematocrit white cell count. Glascow coma scale and serum bicarbonate. The other information

required for APACHE II computation was serum creatinine, arterial oxygen saturation SaO_2, fraction of inspired oxygen $F10_2$ and partial pressure of oxygen in the alveoli PAO_2. The later parameters are not done routinely in ICU on admission unless specifically requested for. Since cost is involved for every investigation undertaken, cautious approach to laboratory investigation is exercised. Tests therefore performed on admission are those which are cost effective and the same time impact on the outcome of the ICU patient. Therefore, missing data in patient's records made it impossible to apply the APACHE II in the study.

In summary, the crude mortality rate for individual diseases indicated a range of outcomes from 0%-100%. Whether or not to continue maximal aggressive intervention, should not be based on crude mortality alone. Other pieces of data with clinical information like rising prothrombin in fulminant hepatic failure and the others listed above needed to be computed to enable the attending physician or a researcher to predict survival rates in an ICU set up.

In order to maintain the morale and sense of purpose of the unit staff, it is essential that the need for therapy rather than the imminence of death is the main criterion for admission to the unit. The appendix (page 58) can be used as the admission sheet whereby APACHE II can be computed, or else KNH researchers should develop a point score system, which should be adhered to when admitting patients, to improve quality care and hence ICU outcome rather than admission reflecting the prejudices of the admitting physician

CONCLUSIONS.

Relatively high percentage (96.9%) of the medical patients admitted to ICU die within 24 hours. (The overall mortality for all the patients medical, surgical and trauma was 43.7% between December 1995 and December 1999). Children below 1 year constituted 31.0% of the medical cases with a mortality rate of 83.6%; may be requiring a paediatric intensive care where there will be economics of scale, with relationship between patient volume and clinical outcome; concentrating the provision of more complex treatments should facilitate provision of experienced staff who are able to maintain their expertise. Nevertheless studies of specialized paediatric services, including oncology and neonatal intensive care, have demonstrated improved outcome when patients are managed in larger more centralized tertiary facilities.

Medical Intensive Care Unit (MICU) triage in KNH-ICU is indeed a very complicated issue. Being a multidisciplinary unit, there is ever increasing pressure on the available facilities which have to cater for a large catchment area. 1-4% of beds in a hospital should be ICU beds. In a hospital like KNH with 2000 beds, the expected number of beds are expected to be 20-80 beds. The beds in KNH ICU are 11 + 7 HDU far less than what is averagely expected. With large numbers admitted in proportion to number of beds and staff. it is justifiable to suggest that for every extra patients. more than 8-12 patients considered the optimum number in a conventional ICU. another medical nursing and auxiliary staff is required for another intensive care.

The admitting physician usually has to choose between a hopeless patient and one with acutely reversible disease. Because of the existence of a specific high risk population cannot be determined on the basis of demographic data, the MICU triage procedure should be based on other factors such as disease processes and or specific organ dysfunction. Wegner et al (29) found that the acute physiological score, age, sex, operation status and particular organ dysfunction could be used to identify low risk monitored admission as candidates for early ICU discharge.

The indications for admission to KNH-ICU were usually based on patient needs, especially the need to resuscitate those who are seriously ill whose condition deteriorates while in hospital; monitor specific therapy like ionotropic support for patients in shock and systems support like in respiratory failure and cardiovascular collapse.

A scoring point system like APACHE II or III is essential even in our set up despite limited resources needed for full and complete data collection for computing the scoring system. This will go a long way in improving the efficiency of ICU admissions and discharges. APACHE score has been used elsewhere to identify ICU admissions who receive only monitoring and floor care services during their stay in ICU, suggesting that routine ICU admissions may not be necessary (16). APACHE can also be used by the physician to decide on admission or discharge by adjusting ICU length of stay for variations in admitting diagnosis, age, sex, severity of illness and other characteristics for example the fastest death occurred within hours of admission while the longest stay was

180 days with Gullian Barre syndrome. The management can also prospectively compare their units case-mix adjusted length of stay to other units or at different seasons same units and modify admission discharge criteria.

Most patients admitted with medical conditions related diseases had more than one organ dysfunction at admission. The main disease processes occuring in various different combination were; cardiovascular; respiratory; neurological; endocrine including diabetes mellitus; renal failure; Human Immune Deficiency Virus Infection; drug poisoning and neonatal sepsis.

The disease processes occurred in different proportions in different patients. All the patients had to be admitted to support their systems especially respiratory system.

RECOMMENDATIONS

The mortality of the medical patients admitted to KNH-ICU is apparently higher than elsewhere. This is perhaps due to overstretched utilization of available facilities because of high patient population pressure beyond what KNH-ICU can accommodate. The number of beds are far less for a 2000 bed capacity hospital like KNH. Hence the need to open up another unit to cater for extra beds needed.

A scoring system applicable to the severely ill patients should be developed for the hospital or apply already researched scoring system like APACHE II to all patients to be admitted to the intensive care. This will enable the admitting clinician to stratify accurately ill patients and evaluate the use of hospital resources and compare efficacy of the unit at different times.

Basic life support should be made available at all levels of health care; from dispensaries to tertiary referral hospitals, with personnel specifically trained for the transfer of the critically ill. Transfer of the critically ill have demonstrated high incidence of adverse effects such as hypotension and hypoxia. Common problems include inadequate circulatory and respiratory support, equipment failures, errors in drug administration and thermal stress.

The answer to this is to train specifically a retrieval team and have the necessary resuscitation done before the team transfers the patient to the intensive care unit.

Intensive care unit staff should be encouraged not only to view the unit in the light of outcome, but to undertake research work towards improving the quality of care and outcome of the patients they look after.

APPENDIX

OUTCOME ICU MEDICAL CASES KNH 1995 - 1999

00. IDENTIFICATION

01. SERIAL NUMBER.....

02. NAME.....

03. IP. NO.....

04. Date of admission.....Date of discharge/death....

1.0 AETIOLOGY

1.1 Diagnosis.....

1.2 Age: [ ][ ] years

1.3 Sex: Male=1, female=2 [ ]

2.0 CLINICAL PRESENTATION
Organ system affected (code no=0, yes=1)

2.1.1 Respiratory [ ]

2.1.2 Cardiovascular [ ]

2.1.3 Multiple trauma [ ]

2.1.4 Endocrine system [ ]

2.1.5 Gastrointestinal [ ]

2.1.6 Neurological [ ]

2.1.7 Renal [ ]

2.1.8 Cancer/immunosuppresion [ ]

2.1.9 Others Specify(.....)

3.0 INVESTIGATIONS AND OBSERVATIONS OF VITAL SIGNS

3.1 Temperature.....

3.2 Blood pressure.....

3.3 Heart rate.....

3.4 Respiratory rate.....

3.5 Oxygeneration $SaO^{2}\%/F1o_2 + (PAO_2 - PaO_2)$.....

3.6 Arterial pH.....

3.7 Serum sodium (Na+).....

3.8 Serum pottasium (K+).....

3.9 Haematocrit (HCT).....

3.9.1 White blood cell count (WBC).....

3.9.2 Glascow coma scale (GCS).....

3.9.3 Serum creatinine (Cr).....

3.9.4 Serum bicarbonate.....

4.0 Duration of stay in ICU..... days.

5.0 Outcome.....

6.0 Impact of age APACHE II and disease group on outcome to be tallied in a table.

7 CHRONIC HEALTH STATUS.

7.1 Chronic liver disease

7.2 Chronic cardiovascular disease

7.3 Chronic respiratory disease

7.4 Chronic renal disease

7.5 Immunosuppression (cancer, HIV infection).

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