AFRICAN JOURNAL OF MEDICINE and medical sciences

VOLUME 41 NUMBER 1 MARCH 2012

ISSN 1116–4077

Afr. J. Med. med. Sci. (2012) 41, 35-42

Outcome of nontraumatic coma in a Nigerian tertiary hospital

OR Obiako[1] and A Ogunniyi[2]

Neurology Unit, Department of Medicine[1], Ahmadu Bello University Teaching Hospital Zaria, and Department of Medicine[2], University College Hospital, Ibadan.

Abstract

Background: Coma occurring in the course of an illness traditionally implies a poor prognosis, but few data define the factors that affect its outcome. Although prognostication of coma is difficult because of the heterogeneity of the contributing diseases, ability to accurately predict the outcome of coma of any etiology will help families and health providers make appropriate decisions about continued medical care, especially for patients on life support.

Objective: To determine the outcome of nontraumatic coma in adult patients admitted at the University College Hospital (UCH), Ibadan, including the prognostic factors.

Method: Two hundred consecutive unconscious patients admitted at the medical emergency unit of UCH, from August 2004 to March 2005, were studied for a maximum of 28 days for functional outcome, using a structured protocol comprising clinical history, physical examination and results of relevant diagnostic investigations, although a study was terminated if death occurred before the 28th day.

Results: Sixty-six percent of the patients were males, 50% were aged 40-59 years, 26.5% (≥ 60 years), 23% (20-39 years) and 0.5% (< 20 years) respectively. General outcome were: mortality rate (76%), vegetative state (2%), recovery with severe disability (6%), recovery with some disability (5%), and recovery with no disability (11%). Case fatality rates ranged from 100% (hepatic coma, HIV associated meningoencephalitis) to zero % (alcohol intoxication). Poor prognostic factors were presentations after 6 hours and inability to have relevant investigations performed.

Conclusion: Nontraumatic coma was associated with poor prognosis and outcome.

Keywords: *Case fatality rate, Glasgow coma scale, mortality rate, outcome of non-traumatic coma.*

Résumé

Le coma au cours d'une maladie implique traditionnellement un pauvre pronostic, mais quelques données définissent les facteurs qui affectent les résultats. Bien que la pronostication du coma soit difficile a cause de l'hétérogénéité des maladies contribuant, l'habilité de prédire justement le résultat du coma d'une étiologie aidera les familles et les professionnels de santé à prendre des décisions appropriées à propos des soins médicaux continus, Spécialement aux patients en soins intensif. Le but de cette étude était de déterminer le résultat du coma non traumatique chez les patients adultes admis au Centre Universitaire hospitalier (UCH), Ibadan, incluant les facteurs pronostiques. Deux cent patients consécutifs et inconscient admis dans l'unité du service d'urgence au CHU, d'Aout 2004 à Mars 2005, étaient étudiés Durant 28 jours pour un résultat fonctionnel en utilisant un protocole structurel incluant l'histoire clinique, l'examen physique et les résultats des examens d'investigations bien que l'étude était fini si le décès était enregistre avant 28 jours. Soixante six pourcent des patients de males, 50% étaient âgés entre 40-59 ans, 26.5% (e" 60 ans), 23% (20-39 ans) et 0.5% (< 20 ans) respectivement. Les taux de motilité totale étaient de (76%), état végétatif (2%), convalescent avec un handicap sévère (6%), convalescent avec quelques handicaps (5%), et convalescent sans handicap (11%). Les taux de fatalité variaient de 100% (coma hépatique, VIH associé a la méningo-encéphalite) à zéro % (intoxication alcoolique). Les faibles facteurs pronostiques étaient observés 6.heures après mais un manque des équipements d'investigations. En conclusion, le coma non traumatique était associé avec une faible pronostic et résultat.

Introduction

Coma is one of the most common problems in general medicine and perhaps the most common neurological emergency [1-3]. On the scale of intensity of ill health proposed by New York economists, it is as legendary as death and for family members, it may be worse than death because of the continuing distress it causes. In economic terms, it is certainly "more costly than death" because resources might be expended to maintain the patient on life support for many months and sometimes years [4]. Coma occurring in the course of an illness, irrespective of cause, has an independent poor prognostic value [5]. The outcome

Correspondence: Dr. O R Obiako, Neurology Unit, Department of Medicine, Ahmadu Bello University Teaching Hospital, Zaria. E-mail: reginaldobiako@yahoo.com.

of coma is highly variable [6,7], but not totally unpredictable, if the results of studies by previous workers can be relied upon [8-14]. According to these workers, when coma persists more than 48 hours despite intensive care, the mortality rate was, about 77%. If the coma was due to shock or subarachnoid hemorrhage, the mortality rate rose to 95% at 36 hours; and to 84% if due to intracerebral hemorrhage (ICH); 73% if due to hepatic encephalopathy; 65% and 60% if due to thrombotic and thrombo-embolic cerebral infarctions (CIs) respectively. Coma due to drug overdose had the least case fatality of 1% with adequate therapeutic interventions.

The outcome of medical coma has been described in many ways, but the 6 scales described by Jennet and Bond in 1975 [7] and Levy *et al*, 1985 [8] were the most comprehensive. These were : death; minimal conscious state (in which the patient may regain a degree of awareness after coma); vegetative state (in which there is loss of cognitive function, but retention of brainstem function [9]); full recovery with no deficit ; recovery with moderate disability (in which patient remain physically disabled, but is independent of others in so far as daily life activities are concerned); and recovery with severe mental and physical disability (in which patient is totally dependent on others for activities of daily living).

Uncertainty about the outcome of coma and implicit estimates of prognosis in the absence of well established facts have hampered approach to patient management, and added to the difficulty which doctors' experience in making decisions [10].

Prognostication of medical coma is difficult because, in addition to the heterogeneity of the causative or contributing diseases, no collection of clinical signs or prognostic factors can assuredly predict the outcome. However, certain constellations such as severity and extent of brain damage, depth of coma, and presence of co-morbidities may have prognostic values, although all schemes of factors should be taken as approximate indicators, and medical judgments must be gauged by such factors as age and general medical condition of patient, as well as the socioeconomic status [11, 15]. Therefore the identification and possible stratification of prognostic factors in non-traumatic coma will facilitate the ability to predict its final outcome. This may offer physicians, patient's families and health planners' information that may prove useful in making decisions about patient care and resource allocation [11].This study was therefore undertaken to provide data on the outcome of coma in a tertiary health care centre in Nigeria.

Materials and methods

This was a prospective study of 200 adults (≥18 years) who presented to UCH Ibadan with strictly defined coma (Glasgow coma scale score of ≤8), excluding patients with head injury or other causes of surgical coma. Approval of the Institutional Research Committee of UCH and the consent of the patients' relations were obtained. Each patient was first evaluated in the medical emergency unit before transfer to the intensive care unit (ICU) or medical wards as dictated by the patient's condition. Clinical history and physical findings were carefully documented. Relevant diagnostic investigations carried out included plasma sugar; blood films for malarial parasites; full blood counts and differential; serum electrolytes, urea, creatinine and uric acid; liver function tests; serum proteins; blood/urine/stool cultures; cerebrospinal fluid analysis, gram staining and culture, India ink stain for Cryptococcus neoformans; HIV and hepatitis B and C viral serology and CD4+ cell count. Electrocardiogram (ECG); echocardiogram; and electroencephalogram (EEG) were performed when clinically indicated. Computed tomogram (CT scan) of the brain was also performed. Patients were re-examined 6 hours later, then daily for 28 days. Death was recorded as an outcome if it occurred within this period, while the neurological state of survivors on the 28th day was taken as their functional outcome. The latter were classified into: recovery with no disability, recovery with some disability, recovery with severe disability and vegetative state. Mandatory post-mortem examination was performed whenever death occurred within 24 hours of presentation and/or whenever deemed necessary to ascertain the possible cause of death. Data was subjected to frequency distribution, Student't' test, Chi-Square and multiple response analysis using the EPI INFO 6 statistical software. Level of significant (p-value) was fixed at less than 0.05. The total number of patients who died in the hospital and medical wards respectively, during the study period was obtained from the Statistics Unit of the Medical Records, and the data were used to derive the percentages of deaths due to nontraumatic coma in the hospital and the medical wards respectively.

Results

The study population comprised 132 (66%) males and 68 (34%) females, with a male: female ratio of 2:1. The mean age of the patients was 50±18years. The mean age for males (49.5±16.1 years) was slightly lower than that for the females (50.9±20.9 years) (t=-0.514, p>0.05), and the 40-59 years age group accounted for 50.0% of the study group. One

hundred and fifty two patients died (with an overall mortality rate of 76%), thus constituting 16.8% (152/906) of total hospital and 61.0% (152/249) of medical inpatient deaths respectively during the study period. Twenty two (11%) recovered fully, 10 (5%) recovered with some disability, 12 (6%) recovered with severe disability and the remaining 4 (2%) patients went into the vegetative state as shown in fig 1 below.

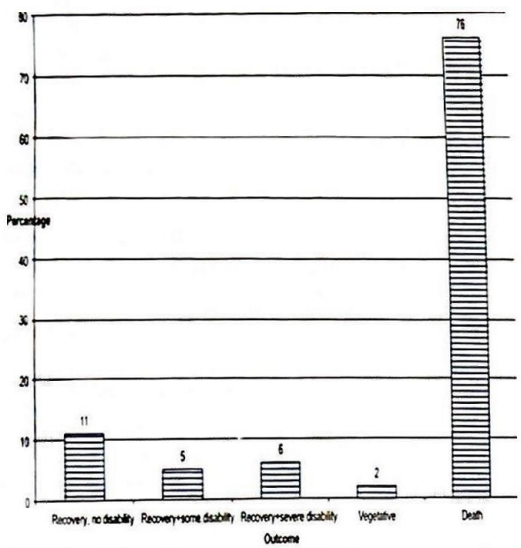

Fig 1: General Outcome of nontraumatic coma

The respective case fatality rates for the various causes of coma in Table 1 showed that all the patients with hepatic coma, tuberculous meningitis, cryptococcal meningitis, acute lymphoblastic meningitis and HIV-associated meningoencephalitis; more than two-third of patients with acute ICH, cardiac arrest, uremic coma, sepsis syndrome and hyperosmolar nonketotic coma; 60% of those with acute pyogenic meningitis; 50% of cerebral malaria and one-third of patients with insulin-induced hypoglycemic coma died. However, all the patients with coma due to oral hypoglycemic agents (OHA), diabetic ketoacidosis (DKA), hypertensive encephalopathy, gamalline poisoning and alcohol intoxication survived.

The functional status of survivors of coma in Table 2 showed that, although all the patients with coma due to OHA survived, 14% went into a vegetative state, 29% and 14%, suffered severe and some disability respectively, while only 43% recovered fully. This outcome was better than insulin-induced hypoglycemic coma, with 33.3% case fatality, 50% each of vegetative state and 50% recovery with severe disability, and no full recovery. All the survivors of acute ICH and 60% of acute cerebral infarctive (CI) stroke recovered with severe disability, while all the cardiac arrest patients and 20% of acute CI went into vegetative state respectively. None of the acute CI patients recovered fully, as remaining 20% recovered with some disability. Survivors of uremic coma, sepsis syndrome, HONK, CNS

Table 1: Case fatality rates of nontraumatic coma

S/No	Cause of coma	Total number of patients	Total number of deaths	Case fatality rate(%)
1	Hepatic coma	12	12	100.0
2	HIV –associated meningoencephalitis	2	2	100.0
3	Tuberculous meningitis	7	7	100.0
4	Cryptococcal meningitis	5	5	100.0
5	Acute lymphoblastic meningitis	5	5	100.0
6	Acute intracerebral hemorrhagic stroke (ICH)	52	46	88.5
7	Cardiac arrest	8	7	87.5
8	Uremic coma	24	20	83.3
9	Sepsis syndrome	21	16	76.2
10	Hyperosmolar nonketotic coma (HONK)	21	15	71.4
11	Acute infarctive stroke	14	9	64.3
12	Streptococcal pneumoniae meningitis	5	3	60.0
13	HIV-associated CNS lymphoma	5	3	60.0
14	Plasmodium falciparum cerebral malaria	2	1	50.0
15	Insulin-induced hypoglycemia	3	1	33.3
16	Oral hypoglycemic agent(OHA)-induced hypoglycemia	7	0	0.0
17	Diabetic ketoacidotic coma (DKA)	4	0	0.0
18	Hypertensive encephalopathy	1	0	0.0
19	Alcohol intoxication	1	0	0.0
20	Gamalline (pesticide) poisoning	1	0	0.0
	MORTALITY RATE (%)	200	152	76.0

Table 2: Case survival rates and Functional status of survivors

S.No	Cause of coma	Number of patients	Number of survivors	Case survival rate(%)	Functional status of survivors(%)			
					Vegetative state(%)	Recovery with severe disability (%)	Recovery with some disability (%)	Recovery with no disability (%)
1	Oral hypoglycemic agent (OHA)-induced hypoglycemia	7	7	100.0	1(14.3)	2(28.5)	1(14.3)	3(42.9)
2	Diabetic ketoacidotic coma (DKA)	4	4	100.0	0 (0.00)	0 (0.00)	0 (0.00)	4(100.0)
3	Hypertensive encephalopathy	1	1	100.0	0 (0.00)	0 (0.00)	0 (0.00)	1(100.0)
4	Alcohol intoxication	1	1	100.0	0 (0.00)	0 (0.00)	0 (0.00)	1(100.0)
5	Gamalline poisoning	1	1	100.0	0 (0.00)	0 (0.00)	0 (0.00)	1(100.0)
6	Insulin-induced hypoglycemia	3	2	66.7	1(50.0)	1(50.0)	0 (0.00)	0 (0.00)
7	Plasmodium falciparum cerebral malaria	2	1	50.0	0 (0.00)	0 (0.00)	0 (0.00)	1(100.0)
8	Streptococcal pneumoniae meningitis	5	2	40.0	0 (0.00)	0 (0.00)	0 (0.00)	2(100.0)
9	HIV-associated CNS lymphoma	5	2	40.0	0 (0.00)	0 (0.00)	0 (0.00)	2(100.0)
10	Acute infarctive stroke	14	5	35.7	1 (20.0)	3 (60.0)	1(20.0)	0(0.0)
11	Hyperosmolar nonketotic coma (HONK)	21	6	28.6	0 (0.00)	0 (0.00)	0 (0.00)	6(100.0)
12	Sepsis syndrome	21	5	23.8	0 (0.00)	0 (0.00)	4 (80.0)	1(20.0)
13	Uremia	24	4	16.7	0 (0.00)	0 (0.00)	4 (100.0)	0(0.00)
14	Cardiac arrest	8	1	12.5	1 (100.0)	0 (0.0)	0 (0.0)	0(0.0)
15	Acute intracerebral hemorrhagic stroke (ICH)	52	6	11.5	0 (0.0)	6(100.0)	0 (0.0)	0(0.0)
	Survival Rate (%)	200	48	24.0	4 (2.0)	12 (6.0)	10 (5.0)	22 (11.0)

Table 3: Multiple response analysis of the contribution of predisposing factors to outcome of coma

Predisposing factor	Number of patients (%)	Number of Survivors (%)	Number of deaths (%)	Survival Rate (%)	Mortality Rate (%)
Substance/herbal medication abuse	8 (4.0)	0 (0.0)	8 (4.0)	0 (0.0)	100
HIV	23 (11.5)	2 (1.0)	21 (10.5)	4.8	95.2
Hepatitis B surface antigenemia	13 (6.5)	1 (0.5)	12 (6.0)	7.7	92.3
Diabetes mellitus	28 (14.0)	4 (2.0)	24 (12.0)	14.0	86.0
Systemic hypertension	77 (38.5)	13 (6.5)	64 (32.0)	16.9	83.1
Alcohol abuse	17 (8.5)	3 (1.5)	14 (7.0)	17.6	82.4
Old age	20 (10.0)	4 (2.0)	16 (8.0)	21.4	78.6
Obesity	14 (7.0)	5 (2.5)	9 (4.5)	35.7	64.3

**Consumption of 2 or more alcohol units per ay for women and 4 or more unit per day for men for most days of the week in the preceeing month*

**Persons of age group ≥ 65 years*

**Boy mass index (BMI) of ≥ 30 kg/^{2}*

Table 4: Multiple responses analysis of contribution of co-morbid illnesses to outcome of coma

S.no	Co-morbidity/ Complication	Number of patients affected (%)	Number of Survivors (%)	Number of deaths (%)	Survival Rate (%)	Mortality Rate (%)
1	Liver cirrhosis	12 (6.0)	0 (0.0)	12 (6.0)	0	100.0
2	Aspiration pneumonia	53 (26.5)	8 (4.0)	45 (22.5)	15.1	84.9
3	Acute pulmonary edema	24 (12.0)	4 (2.0)	20 (10.0)	16.7	83.3
4	Anemia	20 (10.0)	4 (2.0)	16 (8.0)	20.0	80.0
5	Urinary tract infection	10 (5.0)	2 (1.0)	8 (4.0)	20.0	80.0
6	Hyperglycemia	22 (11.0)	5 (2.5)	17 (8.5)	22.7	77.3
7	Systemic hypertension	31 (15.5)	11 (5.5)	20 (10.0)	35.5	64.5
8	Recurrent seizures	30 (15.0)	11 (5.5)	19 (9.5)	36.7	63.3
9	Acute renal failure	5 (8.5)	2 (1.0)	3 (1.5)	40.0	60.0
10	Recurrent stroke	4 (2.0)	2 (1.0)	2 (1.0)	50.0	50.0

lymphoma, acute pyogenic meningitis, and cerebral malaria recovered either completely or with some disability; while DKA, hypertensive encephalopathy, gamalline poisoning and alcohol intoxication patients recovered with no disability.

Tables 3 and 4 respectively showed that the mortality rates associated with predisposing factors and co-morbidities ranged from 50% to 100%. The mortality rates associated with the identified predisposing factors, arranged in descending order, were: substance/herbal medication abuse (100%); HIV infection (95.2%); hepatitis B surface antigenemia (92.3%); diabetes mellitus (86%); systemic hypertension (83.1%); alcohol abuse; old age (77%) and obesity (64%). Although mortality was higher in the 192 (96%) patients with predisposing factors than the remaining 8 (4%) patients without the factors (76.6%: 62.5%), the difference was statistically insignificant ($p>0.05$).

Multiple response analysis of mortality rates associated with identified co-morbid conditions, when arranged in descending order, were: liver cirrhosis (100%); aspiration pneumonia (84.9%); acute pulmonary edema (83.3%); anemia and urinary tract infections (80% each); hyperglycemia (77.3%); systemic hypertension (64.5%); recurrent seizures (63.3%); acute renal failure (60%) and recurrent stroke (50%).

When the mortality rate (70.7%) of patients with co-morbidities (184, 92%) was compared with that (68.8%) of the patients without co-morbidity (16, 8%), it was not statistically different ($X^2 = 0.501$, $p=0.479$). Analysis of the outcome of coma in relationship to the time to present to UCH (before or after 6 hours), revealed that 77% of 168 (84%) patients who presented after 6 hours of coma onset died compared with 63% mortality for the 32 (16%) others who were brought in within 6 hours of coma ($X^2= 24.5$, $p=0.01$). Also, analysis of relevant investigation and outcome showed that all 35 (17.5%) patients who had no ancillary investigation died, compared to the mortality rate of 71% in the 165 (82.5%) patients who had some or all relevant investigations ($X^2 =14.04$, $p= 0.00$).

Multivariate regression analysis revealed that presentation within 6 hours of coma ($r= 0.2$, 95% CI 0.11-0.73, $p =0.02$) and ability to have relevant investigations performed on the patients ($r = 0.43$, 95% CI 0.14-0.61, $P=0.03$) were associated with poor outcome.

Discussion

Medical coma accounted for 16.8% of all UCH patient deaths during the study period. This figure compared well with the annual death rate of between 300- 400 per 4568 cases recorded in the same institution more than 2 decades ago [15]

The 28th day outcome of coma in this study in which 76% of the patients died, 2% went into vegetative state, 6% recovered with severe disability, 5% recovered with mild disability and 11% recovered with no disability compared well with those published by Levy et al, 1981 [4] and 1985 [8] in which they reported 61% deaths, 12% vegetative state, 12% recovery with severe disability and 5% recovery with mild disability and 10% recovery with no disability in 500 patients and, 59% deaths, 12% vegetative state, 13% recovery with severe disability,5% recovery with mild disability and 11% recovery without disability in 310 patients respectively.

The 100% case fatality for hepatic coma, HIV meningo-encephalitis, and the meningitides could be attributed to multifactorial factors, some

of which were distinct to each disease condition. The hepatic coma patients had background liver cirrhosis and hepatitis B surface antigenemia and probably were in the terminal phases of their illness with little or no hepatic reserve. Other factors documented to contribute to mortality in them like fulminant hepatitis (from hepatitis B virus and substance/herbal medicines/alcohol abuse), internal bleeding, dehydration, electrolyte imbalance, infection especially spontaneous bacterial peritonitis, brain edema and intracranial hypertension could also be implicated [16-18]. In the HIV-associated meningo-encephalitis patients, no other aetiological agents other than HIV could be identified by the laboratory means available to us at the time. Tuberculous, cryptococcal and lymphoblastic meningitides, and CNS lymphoma are common opportunistic infections/neoplastic AIDS-defining illnesses in HIV infected individuals with CD4+ counts less than 100 cells/ μL [19-22]. They are uniformly fatal if untreated.

The patients who presented in coma due to acute intracerebral hemorrhage (ICH) had worse outcome than those with acute infarctive (ischemic) stroke. The result in this regard was not different from what is known that ICH is associated with more morbidity and mortality than infarctive stroke [23-26]. The 30- day case fatality rates for acute ICH and infarctive stroke in this study were similar to the 40-84% reported worldwide, although that for acute ICH was higher than 60.4% reported by Ogun in Lagos [26]. Poor prognostic factors in our patients were late presentation, recurrent seizures, aspiration pneumonia, hyperglycemia, systemic hypertension, recurrent stroke, obesity and alcohol abuse.

Although there is paucity of epidemiological data on cardiac arrest outcome in Nigeria, there is the tendency to believe that it may not be different from the 88% case fatality in our study. This assumption is hinged on the lack of a standard cardio-pulmonary resuscitation policy in the country coupled with paucity of standard emergency or intensive care units (ICU) in most of our hospitals [27]. In these patients late presentation, poverty and thus inability to pay for ICU care were factors responsible for poor outcome. Uremic coma and sepsis syndrome also had a high mortality of 83.3% and 76% in this study respectively.

The case fatality rate for hyperosmolar non ketotic coma (HONK) in this study (71.4%) was slightly lower than the 100 % reported in this centre more than three decades ago [28]. In this part of the world mortality from diabetic coma, particularly HONK is still above 50%, inspite of availability of glucometers and human insulin. In our patients, late presentation, severe dehydration and hypovolemic shock, renal failure (acute or chronic), systemic hypertension, sepsis and many other co-morbidities were responsible for poor outcome. Although many of these factors may also have prevailed in diabetic ketoacidotic coma, our experience was that those patients had better outcome with no mortality.

In sub-Saharan Africa, treatment of diabetes mellitus is still problematic [29,30]. Ignorance and poverty make many patients to default from hospital treatment, and either engage in self medication or patronise traditional non orthodox medicine dealers with attendant hyperglycemic or hypoglycemic coma [31]. Of the 5 patients with acute bacterial meningitis, 2 recovered fully while the other 3 died from complications of aspiration pneumonia, and recurrent seizures. The patient who died from cerebral malaria had background HIV/AIDS with CD4 count of 90 cells/ μL.

In conclusion, many factors, both intrinsic and extrinsic, contributed to the poor outcome of nontraumatic coma in our study. The most significant factors were late presentation to the hospital and inability to pay for diagnostic investigations. This is borne by the fact that early presentation (in less than 6 hours after coma) and ability to do the necessary investigations were associated with better outcome. The author observed that late presentation of patients to tertiary/specialist health centres in Nigeria was usually due to a combination of ignorance, poverty and poor referral system. Many sick individuals or their relatives would rather buy medicines from the local drug shop for self-medication and when this fails, they engage the services of traditional non orthodox medicine dealers, medical quacks or private health facilities. The specialist/tertiary health facility is usually the final port of call by which time the patient had developed complications from mismanagement. Therefore there is a need for public health education and enlightenment about early presentation in hospital, avoidance of self-medication or visit to alternative practitioners. Over and above all, facilities for comprehensive care of emergency cases should be provided for prompt management of cases presenting in coma.

References

1. Adams R.D and Victor M (Eds): Coma and related disorders of consciousness. In: Principles of

Neurology 3rd edition, International ed, McGraw-Hill Book. Co.1985, pg 255-62,

2. Roper A.H: Acute confusional states and coma. In: Harrison's Principles of Internal Medicine, 15th ed. Braunwald E; Fauci, A.S; Isselbacher KJ; Wilson JD *et al,* (Eds) Volume I, Chp24, 2001; pg 132-140.
3. Burst J.C.M. Coma. In: Merritt's Neurology, 10th edition by Lewis PR, 2000, pg 17-23. Lippincott Williams and Wilkins.
4. Levy D.E; Bates D; Caronna J.J; Cartilage N.E.F *et al.* Prognosis in nontraumatic coma. Ann. Intern Med; 1981:94:293-301.
5. Lynn J and Harrell F Jr: Prognoses of seriously ill hospitalized patients on the days before death: Implications for patient care public policy. New Horizons 1997; 5(1): 56-61, Feb.
6. Teasdale G and Jennet B: Assessment of impaired consciousness and coma: a practical scale. Lancet. 1974: 2: 81-84.
7. Jennet B and Bond M: Assessment of outcome after severe brain damage: A practical scale. Lancet 1975:1:480-4.
8. Levy D.E, Caronna J.J, Singer B.H, *et al.* Predicting outcome from ischemic coma. JAMA,1985:253(10):1420-1426
9. The Multi Society Task Force on Persistent Vegetative State (PVS): Medical aspects of the PVS – first of two parts. IV. Engl J. Med 1994; 330: 1499 – 1508.
10. Hammed M.B, Goldman L, Tenor J, Lynn J, Davis R.B, Harrell F.E, Connors A.F. *et al.* Identifications of comatose patients at high risk for death or severe disability. JAMA. June 21 1995; volume 273, No 23, 1842-1848.
11. Cullen D.J; Ferrara L.C; Briggs B.A; Walker P.F and Gilbert J: Survival, hospital charges and follow-up results in critically ill patients. N. Engl J Med. 1976, 294:982-987.
12. Snyder J.V and Colantonio A: Outcome from central nervous system injury. Crit Care Clin. 1994; 10: 217.
13. Hung T.P and Chen S.T: Prognosis of deeply comatose patients on ventilators. J Neurol Neurosurg Psychiatry. 1995; 58:75.
14. Plum F and Posner J: The diagnosis of stupor and coma. 3rd ed. Philadelphia, Davis, 1980.
15. Adetuyibi A; Akisanya JB and Onadeko BO: Analysis of the causes of death on the medical wards of the UCH, Ibadan over a 14-year period (1960-1973).
    Trans, Roy Soc. Trop. Med and Hygiene,70:5/6 1976, 466-473.
16. Otegbayo J.A: Complications contributing to mortality in acute hepatitis at the University College Hospital, Ibadan, Nigeria. Niger. J. Med, 2001 Jul – Sept; 10 (3): 127-129.
17. Olubuyide I.O, Atoba MA and Ayoola EA: Factors in the aetiology of hepatic encephalopathy in the tropics. West Africa Med. J 1990:9(1):50-53.
18. Blei AT and Cyrdoba J. Hepatic encephalopathy. American J. Gastroenterology. 96(7): 1968-1976, 2001.
19. Jain SK, Paul-Satyaseela M and Lamichhane G, "Mycobacterium tuberculosis invasion and traversal across an invitro human blood-brain barrier as a pathogenic mechanism for central nervous system tuberculosis". J. Infect. Dis. 2006 May, 193 (9): 1287–1295
20. Bergemann A and Karstaedt A S: The spectrum of meningitis in a population with high prevalence of HIV disease. Quart .J Med. 1996, 89:499-504.
21. Kumar S, Wanchu A, Chakrabarti A, Sharma A, Bambery P and Singh S. Cryptococcaz meningitis in HIV-infected: Experience from a North Indian Tertiary centre. Neurol India 2008; 56: 444-449.
22. Crowe SM, Cartin JB, Stewart KI, Lucas CR, Hoy JF. Predictive value of CD4 lymphocyte numbers for the development of opportunistic infections and malignancies in HIV-infected persons. J.Acquired Immune Deficiency Syndr 1991; 4: 770-776
23. Brian R. Chambers, John W. Norris, Bette L. Shurvell, Vladimir C. Hachinski: Prognosis of acute stroke. Neurology 1987; 37:221
24. Tejada J and Garc ia M. Early neurologic deterioration in intracerebral hemorrhage: predictors and associated factors. Neurology Aug 10, 2004, 63(3):461-467
25. Davis SM, Broderick J, Hennerici M, Brun NC, Diringer Mn and Mayer SA. Hematoma growth is a determinant of mortality and poor outcome after intracerebral hemorrhage. Neurology. April 25, 2006; 66 (8); 1175-1181.
26. Ogun SA. Acute stroke mortality at Lagos University Teaching Hospital- A five year review (Jan 1987-Dec 1991). Nig. Qt .J. Hosp. Med. Vol 10(1), Jan- Mar, 2000.10 (1) 8-10.
27. Sotunmbi PT. A review of Cardiopulmonary Rsuscitation in Nigeria. Annals of Ibadan Postgraduate Medicine. Vol.4 No2 Dec, 2006; 4 (2) 9-14.
28. Osuntokun BO, Akinkugbe FM, Francis T.I; Reddy S; Osuntokun O and Taylor G.O.L: Diabetesmellitus

in Nigerians: A study of 832 patients. The West Afr. Med J. 1971, 295 – 311.
29. Kolawole B.A, Ajayi A.A: Prognostic indices for intra-hospital mortality in Nigerian diabetic NIDDM Patients: Role of hypertension. J Diabetes Complications. 2000, Mar-April; 14(2):84-89.
30. Sinclair GR, Watter DA, Bagshaw A: Non-tramatic coma in Zambia.Trop. 1985, pg 255-62, Doctor.1989:19(1):6-10.
31. Lester PT: Severe hypoglycemic reactions in Ethiopian diabetics. Ethiopian Med J. 1982; 20:33.

Received: 30/10/09
Accepted: 16/09/11