

# The Aetiology of Non-traumatic (Medical) Coma.

K IRFAN M A NADEEM K AHMED I WAHEED T WASEEM A H KHAN

Department of Medicine, K. E. Medical College, Mayo Hospital, Lahore

Correspondence to: Dr. Muhammad Arif Nadeem, Senior Registrar Medicine

Coma of unknown aetiology is a major contributor to emergency room admission figures around the World and accounts for an even larger share of hospital mortality figures. In the interest of an optimal outcome, speed in making a correct diagnosis and instituting emergency measures is required, and a prior familiarity with coma aetiology is of great help. The aetiological audit of coma has been the subject of many studies in Western literature, but no such effort has been made in our country until now. This prospective study was prompted by the lack of indigenous statistics for common causes of non-traumatic coma in a tertiary care setup. One hundred and sixteen (males 67, females 49) patients, falling maximally (72%) in the age range of 21-60 years, with coma due to non-traumatic (medical) causes were included in the study, and their diagnosis was established using clinical, laboratory and radiological techniques. It was found that coma due to metabolic causes was the largest category (57%), followed by structural (28%), diffuse cerebral (12%), and psychogenic (3.4%) causes of coma. Cerebrovascular accidents (24%), poisoning (16%), coma due to hepatic (12%) and renal failure (11%), and diabetic coma (10%) were the leading individual causes in declining order. There is need to establish a Poisoning Information Centre and availability of toxicology analysis for better management of patients with coma due to poisoning. Furthermore, measures should be taken to have a CT Scan of comatose patient promptly and free or on minimal charges.

**Key words:** Coma Non-traumatic Aetiology Structural Metabolic Diffuse cerebral Psychogenic

Coma and related disorders of consciousness are among the most important emergency presentations in tertiary care hospitals. A major problem faced by emergency physicians worldwide is that of coma of unknown aetiology. A grave life threatening emergency, with an extremely wide range of potential causes, coma presents to the emergency physician as a diagnostic challenge, which requires speed, clinical acumen and a sound theoretical background to be countered effectively. In USA, about 3% of all emergency patients present with a disorder of consciousness.<sup>1</sup> Studies based on general intensive care units yield a figure of 12.5% patients with altered consciousness.<sup>2</sup> Published statistics in Pakistan are not available, but a look at crude statistics from Mayo Hospital, Lahore, supports these figures. In a 6 month period immediately preceding this study, more than 3% patients presented with unconsciousness. Among 728 admitted patients in a medical unit over this period, disorders of consciousness accounted for almost 28%. Statistics from a general intensive care unit over the same period revealed 35% admissions with coma having an alarming mortality rate of 72%.

Despite great progress in diagnostic techniques and easy access to advanced treatment modalities in the West the prognosis of coma remains poor, with an adverse outcome of more than 80% in some studies.<sup>3</sup> This apparent failure of the medical science is accounted for by the fact that neuronal death is irreversible. Furthermore, the human brain is the most vulnerable of all tissues to the effect of hypoxia: the neurons of the cerebral cortex and purkinje cells of the cerebellum succumb permanently in less than 5 minutes.<sup>4</sup>

Thus the time available to the emergency resident in which to form a diagnosis and start treatment is very brief. The primary aim should therefore be neuroprotection by instituting basic resuscitative measures and ensuring adequate oxygenation and perfusion. Once the danger of further damage due to hypoxic-ischaemic insult is averted, the doctor must identify the cause of the coma, and try to reverse it as soon as possible. A knowledge of the common conditions likely to cause coma in the patient's setup is crucial to formulate a correct diagnosis and successful patient's management. The prevalence and presentation of most diseases, including coma is influenced by geographical and cultural factors. It is therefore mandatory for doctors dealing with emergencies to be conversant with the native disease pattern. Unfortunately, unlike the West, no attempt has been made to formulate our indigenous database of this very common medical emergency. This study was conceived in view of this deficit, and although small in scope, some basic statistics will be presented for local doctors dealing with coma in emergency room.

## Aims and objectives

This study was undertaken to study the aetiology of coma due to non-traumatic (medical) causes presenting in the emergency room.

## Material and methods

This study was planned as a prospective, observational study in which the participants were followed through their hospital stay but no therapeutic interventions were performed as a part of the study protocol. The study was

conducted in East Medical Ward (Medical Unit-I) of Mayo Hospital, Lahore.

**Inclusion criteria**

- ◆ Sustained impairment of consciousness occurring in patients older than 12 years of age due to causes other than trauma.

**Exclusion criteria**

- ◆ Brief (episodic) impairments of consciousness lasting less than one hour, thereby falling under the definition of syncope.
- ◆ Traumatic coma.
- ◆ Patients succumbing to their illness so rapidly that any diagnostic work up could not be performed.

A total of 116 patients presenting in emergency ward with sustained impairment of consciousness were studied. A thorough history and examination was obtained for each patients. The relevant investigations determined by clinical presentation and availability were carried out to establish a diagnosis. The findings were then subjected to statistical analysis. All the patients were managed intensively, and as far as possible using available resources, optimally, during their hospital stay. However, these interventions were not done according to a pre-designed study protocol and, therefore, not included in the results.

**Results**

In our study of 116 (males 67, females 49) patients of coma due to non-traumatic (medical) causes, the diagnosis of 114 could be established, while two cases remained undiagnosed despite the maximum diagnostic work up possible using available resources. Poisoning was the most frequently encountered individual cause (18 patients) comprising 16% of all cases of non-traumatic coma, followed by haemorrhagic cerebrovascular accidents (15%), hepatic coma (14%), uraemic coma (13%) and diabetic coma (12%), (table 1).

Statistical analysis of the aetiology of non-traumatic (medical) coma in this study revealed that cerebrovascular events as a group contributed the maximum percentage of our patients (28 cases, 24%). Of these, haemorrhagic lesions were more frequently associated with coma than ischaemic cerebrovascular events (17 patients, 14.6% Vs 11 patients, 9.5%). Poisoning constituted the second largest group (18 patients, 15.5%), of causes leading to coma. The common individual causes of poisoning encountered in our study were benzodiazepines and aluminium phosphide, used as a grain fumigant (tables 1,2).

Table 1. Aetiology of non-traumatic coma.

Aetiology	No. of cases	%age
Poisoning	18	15.51
CVA (H)	17	14.65
CVA (I)	11	9.48
Hepatic encephalopathy	10	8.62
CRF	9	7.75
Diabetic coma (Hypoglycemic)	6	5.17
Sepsis	5	4.31
ARF	4	3.44
Diabetic coma (Ketoacidotic)	4	3.44
Fulminant hepatic failure	4	3.44
Pyogenic meningitis	4	3.44
Psychogenic	4	3.44
Respiratory failure	4	3.44
Heat stroke	3	2.58
Diabetic coma (Hyperglycemic)	2	1.72
Cardiogenic shock	2	1.72
Unknown	2	1.72
Tuberculous meningitis	2	1.72
Cerebral malaria	1	0.86
Tuberculoma	1	0.86
Brain tumor	1	0.86
Hypertensive encephalopathy	1	0.86
Status epilepticus	1	0.86
Total	116	99.89

Table 2 Types of non traumatic coma

Types	No. of Pts.	%age
Cerebrovascular Events	28	24.1
Haemorrhagic	17	14.6
Ischaemic	11	09.5
Hepatic Coma	14	12.0
Hepatic Encephalopathy	10	08.6
Fulminant Hepatitis	04	03.4
Uraemic Coma	13	11.2
CRF	09	07.7
ARF	04	03.4
Diabetic Coma	12	10.3
Hypoglycaemia	06	05.2
Diabetic Ketoacidosis	04	03.4
Hyperosmolar non-Ketotic coma	02	01.7
Cns Infections	08	07.0
Pyogenic meningitis	04	03.4
Tuberculous meningitis	02	01.7
Cerebral malaria	01	00.8
Tuberculoma	01	00.8

Hepatic coma, including both hepatic encephalopathy and fulminant hepatic failure, followed in third place (14

patients, 12%). Out of hepatic comas, most (10 patients, 8.6%) cases were of hepatic encephalopathy due to cirrhosis of liver (tables 1,2).

Next cause of non-traumatic coma in our series was due to renal insufficiency. There were 13 patients (11.5%) with renal failure in our study. Again, chronic renal failure leading to uraemic encephalopathy was more commonly encountered than acute form (9 patients, 7.7% Vs 4 patients, 3.4%), (tables 1,2).

Endocrine failure causing non-traumatic coma was only represented in our study by diabetic coma, reflecting the overwhelming preponderance of diabetes mellitus amongst endocrine pathologies. Coma due to diabetic complications accounted for 10% of cases (12 patients). Hypoglycaemia was the commonest form of diabetic coma (6 patients, 5%), followed by diabetic keto-acidosis (4 patients, 3.4%) and hyperosmolar non-ketotic diabetic coma (2 patients, 1.7%), (tables 1,2).

Various CNS infections resulting in obtundation of conscious level represented 7% of our patients (8 cases). Meningoencephalitis was the leading cause (6 patients, 5.17%), with pyogenic meningitis predominating (4 patients, 3.4%), followed by tuberculous meningitis (2 patients, 1.7%). Rarer infectious causes included one patient (<1%) each of cerebral malaria and tuberculoma (tables 1,2).

Other common causes of coma were septicemia (5 patients, 4.3%), respiratory failure (4 patients, 3.4%), psychogenic causes of coma (4 patients, 3.4%) and heat stroke (3 patients, 2.6%). Relatively rarer causes were hypoxic-ischaemic coma due to cardiogenic shock (2 patients, 1.7%), brain tumour (2 patients, 1.7%) and status epilepticus (1 patient, <1%), (table 1).

Two patients remained undiagnosed in spite of maximum possible diagnostic work up using available resources and represented as such in our series (table 1).

## Discussion

Coma, a problem of overwhelming importance in any medical setup, has been the subject of many studies from a prognostic point of view,<sup>3,5-6</sup> but there have been relatively few studies in the field of coma aetiology.<sup>2,7</sup> No published work on the aetiology of coma in Pakistan was found in spite of considerable search of recent literature. The significance of studies based on coma aetiology lies in the fact that knowledge of the common causes of coma is a crucial time saving factor in the management. Coma is not a homogenous entity, rather it is a catastrophe, which transcends the boundaries of organ systems. Successful management of a comatose patient critically depends on prompt identification of the causative pathology, and this task is made easier if the emergency physician is familiar with the common causes likely to be encountered in his

setup. It was with this factor in mind that this was conducted as a primarily aetiological study.

The principal objective of this study was the determination of coma aetiology in Pakistan and to detect any differences from the figures reported in Western series. In Plum and Posner's series of 500 patients (1982),<sup>7</sup> coma due to diffuse/metabolic encephalopathies was the leading category, accounting for 65% of all cases, followed by coma due to structural lesions (33%) and psychogenic coma with almost 2% patients. Among metabolic causes, almost 50% were cases of poisoning. There was a predominance of haemorrhagic lesions among structural comas. In Gasporovic et al's series of 665 comatose patients in an ICU over a five year period, metabolic conditions were the most important cause of coma, followed by structural and diffuse cerebral disorders; the foremost among metabolic causes were poisonings and sepsis.<sup>2</sup> Comparable results were obtained in our study: the maximum number of cases were due to metabolic derangements like hepatic, renal and diabetic comas, whereas a smaller proportions was contributed by structural pathologies like cerebrovascular events and space occupying lesions, and even fewer were due to diffuse cerebral abnormalities like CNS infections. A minority of psychogenic causes and 2 undiagnosed cases completed our series. While the categorical distribution of cases reflects similarity between our figures and those quoted in Western literature, a look at the detailed break up of coma aetiology in our study reveals a distinctly indigenous pattern. The commonest individual cause of coma that we encountered was poisoning, like the aforementioned works, but the aetiology of poisoning was dissimilar. In these series as well as others conducted in the West, the principal cause of poisoning was tricyclic antidepressants, and other common drug poisonings included barbiturates, benzodiazepines, paracetamol and anticonvulsants.<sup>8</sup> Suicidal poisonings are by far the most important cause in their series, and homicidal poisonings are rare. In contrast, we encountered a large number of cases in which the patient was the victim of poisoning for the sake of robbery, and in these cases commercially available tablets of benzodiazepines were used in a pulverized form, mixed with some foodstuff that the victim was enticed to try. A major cause of poisoning, and the commonest suicidal agent, was a wheat preservative sold in the form of tablets for the purpose of fumigating grain: the unfortunate aspect of these cases was their young age and very high fatality rate. Coma due to renal failure (11%) and hepatic coma (12%) were important causes in our series, reflecting the high prevalence of end stage renal and hepatic disease in our country, due to highly inadequate primary care facilities. There was a slight preponderance of haemorrhagic lesions among cerebrovascular events leading to coma, a pattern also

seen in Western series:<sup>9</sup> this is at variance with the overall dominance of ischaemic lesions among cerebrovascular accidents, possibly because ischaemic lesions do not cause significant derangement of the arousal mechanisms unless they involve the brainstem directly.<sup>7</sup> An interesting aspect of our results was the relatively high number of patients with psychogenic coma: in our series there were four patients (3.4%) with coma due to this cause compared to 1.6% in Plum and Posner's series.<sup>7</sup> Most of these patients were female and had 'coma' as a conversion reaction; this could be a reflection of the largely unrecognized undercurrent of psychiatric illness in our society.

### Recommendations

The fact that the single largest cause of coma in our study is poisoning emphasizes the need for poison information centres in our country, on the pattern prevalent in the West. It is also recommended that the quality and quantity of primary care is boosted in view of the very large number of patients presenting with end-stage metabolic derangements. The authors encountered great difficulty in establishing the diagnosis of structural coma due to the fact that it is still rather difficult to get CT Scan done timely because of over burden on all CT scanners in the government sector in Lahore and cost factor. This grave situation needs to be remedied. The incidence of psychiatric illness in our society is often under estimated; our figures suggest that this needs to be rethought, and

psychiatric counseling should be accessible at a primary care level.

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