Role of Serum CPK and Serum Magnesium Level as a Predictor of Impending Intermediate Syndrome in Patients of OP Poisoning.

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Abstract

Introduction: Organophosphorus poisoning is one of the most common and deadliest poisoning especially in country like India. The intermediate syndrome occurred after the acute cholinergic syndrome but before organophosphate-induced delayed Polyneuropathy is characterised by the weakness of the muscles of respiration and of proximal limb muscles. Early identification can reduce morbidity and mortality.

Aim: To assess importance of serum CPK and serum Magnesium level in patients of OP poisoning as marker OP intermediate syndrome.

Material method: This was cross sectional study in PBM hospital over 93 patients over a period of 1 year. Serum CPK and magnesium level were assessed on admission and day 5 and were compared in patients who developed and didn't intermediate syndrome.

Result: Thus, CPK level on day 1 as well as day 5 but not magnesium can be used as a predictor for the intermediate syndrome.

Key words: CPK (creatinine Pospho-kinase), Intermediate syndrome, Magnesium, Organophosphorus poisoning.

Introduction

Globally, Organophosphorus pesticide (op) poisoning is a serious occupational hazard accounting for more than 80% of pesticide-related hospitalisation[1]. India being an agriculture-based country, OP pesticide remains the main agent for crop protection and pest control and thus increased risk of OP poisoning both intentional and inhalational is prevalent among Indian farmers.

After an exposure to an Organophosphorus agent, the clinical syndrome progresses through following phases: Initial cholinergic phase, intermediate syndrome and delayed Polyneuropathy phase. Incidence of intermediate syndrome in OP poisoning as reported by various studies lies between 5 to 47 % [2,3,4,5] .The syndrome described comprised characteristic symptoms and signs occurring after apparent recovery from the acute cholinergic syndrome. The characteristic features of the IMS are the weakness of the muscles of respiration (diaphragm, intercostal muscles and accessory muscles including neck muscles) and of proximal limb muscles. Accompanying features often include weakness of muscles innervated by some cranial nerves [6]. Thus by early identification and management of respiratory paralysis in intermediate syndrome morbidity and mortality can be significantly reduced. Present study was undertaken to evaluate the role of serum CPK and serum Magnesium level in patients of OP Poisoning as the particular marker of intermediate syndrome.

Aim: To assess importance of serum CPK and serum Magnesium level in patients of OP poisoning as marker OP intermediate syndrome.
Study design: Cross sectional study

Material Method

A total of 93 patients of OP poisoning who were admitted to PBM Hospital, Bikaner after taking written informed consent were included in the study. Patients with chronic liver disease, myopathy, coronary artery disease, receiving intramuscular injection, cardiopulmonary resuscitation, and trauma were not included in the study.

Confirmation of OP poisoning was done by seeing the packet/container. All the patients were categorized according to Peradeniya Organophosphorus poisoning (POP) scale to predict clinical severity[8].

All the patients were managed as per standard protocol of our hospital, i.e. with initial atropine bolus 2 mg followed by double doses of bolus every 5 minutes till the signs of atropinization appeared which was followed by infusion of atropine plus PAM (adult dose is 1–2 g intravenously followed by 0.5 g/hour infusion). The entire patients were evaluated for the intermediate syndrome and other complications like delayed op induced neuropathy. The characteristic features of the IMS are the weakness of the muscles of respiration (diaphragm, intercostal muscles and accessory muscles including neck muscles) and of proximal limb muscles after the acute phase of cholinergic crises was over. Blood samples were collected by a single prick aseptic method for serum CPK and Magnesium on day 1 and day 5 using spectroscopic methods and other routine. The data thus obtained was analysed using Chi-square and Unpaired Student t-test and SPSS software.

Observation

The Present study was conducted on total 93 patients. Out of total 93 patients 41 patients were in mild POP scale group, 41 patients were in moderate POP scale while 11 patients were in Severe POP scale. Intermediate syndrome developed in 7 patients out of total 93 patients. 3 out of 11 patients developed intermediate syndrome in severe POP scale group of patients (i.e 27.2 % of patients in severe group). 4 out of 41 patients, i.e.9.7 % in the moderate group of POP score developed the intermediate syndrome and none of the patient in mild POP scale group developed intermediate syndrome[8].

Mean CPK levels on day 1in the patients with intermediate syndrome was 970±629.86 as compared to 495±324.44in patient without intermediate syndrome and this was statistically significant. Mean serum magnesium level in patients having intermediate syndrome was 1.81±0.16 as compared to 2.08±0.21 on day 5 but this was statistically insignificant.

Magnesium and CPK as a predictor of impending intermediate syndrome on day 1

On Day 1	Intermediate Syndrome				T	P
	Present		Absent			
	Mean	SD	Mean	SD		
CPK	970.85	629.86	495.15	324.44	3.430	0.001
Magnesium	1.81	0.16	1.98	0.24	1.803	0.075

When we compared CPK on day 5 with intermediate syndrome mean CPK level was 551.00±227.67 in patients with intermediate syndrome as compared to 208.79± 120.46 , the difference was found statistically highly significant ($p<0.001$) but when we compared magnesium on day 5 with intermediate syndrome the difference was found statistically insignificant ($p>0.05$).

Magnesium and CPK as a predictor of impending intermediate syndrome on day 5

On Day 5	Intermediate Syndrome				T	P
	Present		Absent			
	Mean	SD	Mean	SD		
CPK	551.00	227.67	208.79	120.46	6.683	<0.001
Magnesium	2.08	0.21	2.15	0.19	0.828	0.410

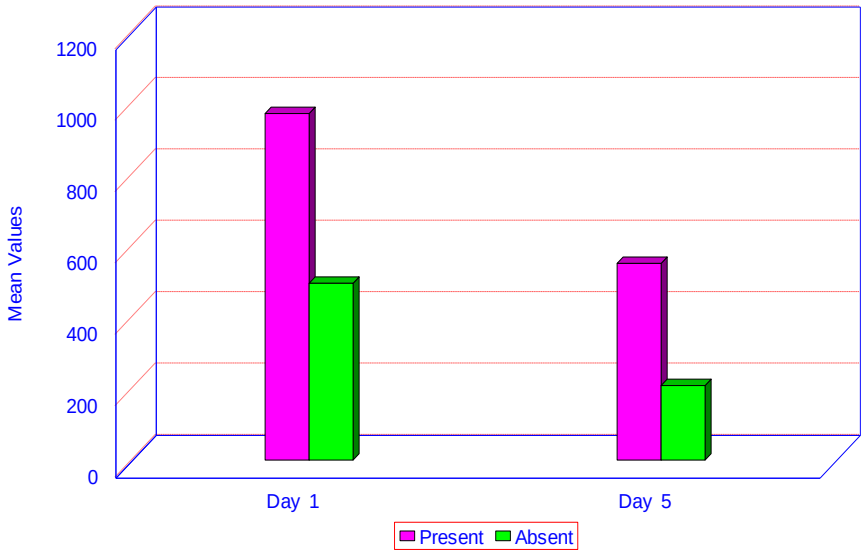

Fig. 1: CPK as a predictor of impending intermediate sundrome on Day 1 and Day 5

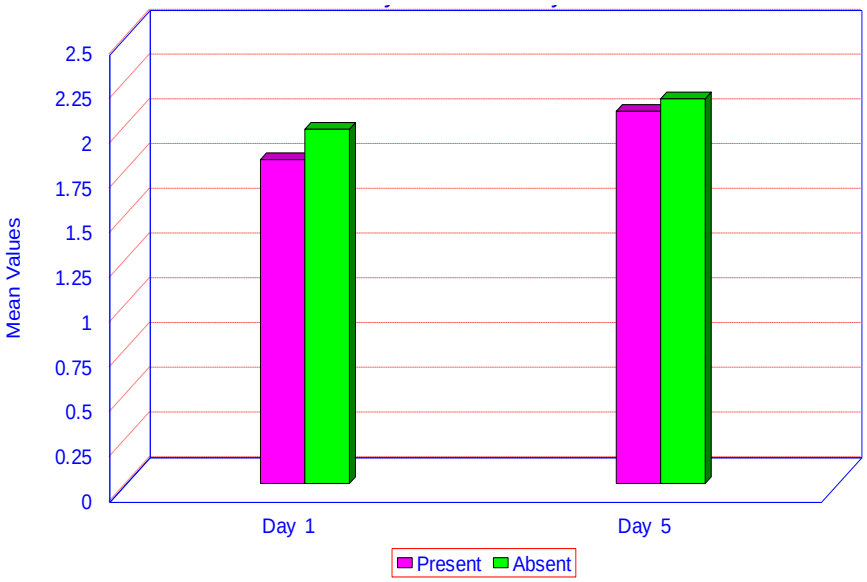

Fig. 2: Magnesium as a predictor of impending intermediate syndrome an Day 1 and Day 5

Discussion

The term 'intermediate syndrome' was first coined by Senanayake from Sri Lanka in 1987 but intermediate syndrome was first described by Wadia as type II paralysis in 1974[2, 3]. Wadia [3] had suggested that persistence of nicotinic effects due to lack of early use of oximes may be responsible for the paralysis. Senanayake[2] felt that the neuromuscular junctional dysfunction is the predominant factor in the pathogenesis of intermediate syndrome. The intermediate syndrome is constellation of symptoms and signs occurring after apparent recovery from the acute cholinergic syndrome. As the syndrome occurred after the acute cholinergic syndrome but before organophosphate induced delayed polyneuropathy, the syndrome was called 'intermediate syndrome'. The characteristic features of the IMS are the weakness of the muscles of respiration (diaphragm, intercostal muscles and accessory muscles including neck muscles) and of proximal limb muscles. Accompanying features often include weakness of muscles innervated by some cranial nerves [6]. Thus by early identification and management of respiratory paralysis in intermediate syndrome morbidity and mortality can be significantly reduced.

In OP poisoning, intermediate syndrome (IMS) manifests between the end of the acute cholinergic crisis and delayed neuropathy.

Intermediate syndrome developed in 7 patients out of total 93 patients. Of these 4 out of 41 patients, i.e.9.7 % in the moderate group of POP score developed intermediate syndrome and 27.2% (3 patients in 11) developed the intermediate syndrome. There was no patient with the intermediate syndrome in the mild group of POP scale in patients with intermediate syndrome was. Mean CPK level in patients with intermediate syndrome was 970±629.86 on day 1 as compared to 495±324.44 in the patient without the intermediate syndrome. This led to the inference that increased level of CPK on day 1 can be used as a marker to identify impending intermediate syndrome on day 1 itself. When CPK were serially monitored on day 5 mean CPK levels were 551±227.67 in the group of patients who developed intermediate syndrome as compared to mean level of 208.79±120.46 in patients not having the intermediate syndrome. Similarly, serum magnesium level in patients having intermediate syndrome was 1.81±0.16 on day 1 and 1.98±0.24 on day 5. On day 5 mean magnesium level was 2.08±0.21 on day 1 as compared to 2.15±0.19 on day 5 in patients having and not having intermediate syndrome respectively, though there was decreased level of Magnesium in patients of intermediate syndrome but the data, when evaluated, was found to be insignificant in both the cases i.e. on day 1 and 5. Thus, CPK level on day 1 as well as day 5 but not magnesium can be used as a predictor for the intermediate syndrome. Respiratory paralysis in IMS, if identified early can reduce the need for ventilator support, morbidity, and mortality. Serum creatine phosphokinase (CPK) is elevated in IMS.

This was in agreement to Kumar et al [8] of kolar who found increased CPK level in the patients of OP poisoning who developed the intermediate syndrome. In their study three patients developed IMS, and their serial CPK levels were 1837.33 ± 243.19 IU/L, 1935 ± 97.41 IU/L, and 714.66 ± 394.82 IU/L. These observations suggest that there is a direct relation between serum CPK levels and IMS. This was also supported by Kale et al [9] who conducted a study on creatine kinase and lactate dehydrogenase as a marker of muscular damage in intermediate syndrome and found a positive correlation between both the factors.

Hence, it is necessary for estimating CPK levels, in moderate to severe poisoning patients, so that IMS can be recognized at the earliest and patients can be referred to higher centres for immediate management of respiratory failure, reducing morbidity and mortality.

Conflict of Interest: None
Source of Support: Nil

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