

ORIGINAL ARTICLE**Succimer versus Penicillamine in acute lead poisoning**¹Kamal Kumar, ²Vijay Shriram Chamle^{1,2}Assistant Professor, Department of Pharmacology, Gold Field Institute of Medical Sciences & Research, Faridabad, Haryana, India**ABSTRACT:**

Background: Lead poisoning occurs when lead, a toxic metal, accumulates in the body, often over months or years. The present study was conducted to assess effects of Succimer and Penicillamine on acute lead poisoning patients. **Materials & Methods:** 56 patients of acute lead poisoning of both genders were divided into 2 groups. Group I received D-Penicillamine (250 mg every 6 hours orally for two weeks), and group II received succimer (10 mg/kg for the first 5 days every 8 hours, then every 12 hours up to 14 days). Parameters such as symptoms, length of hospitalization (day), blood pressure, heart rate and outcome of the treatment was recorded. **Results:** Group I had 14 males and 14 females, and group II had 12 males and 16 females. The mean length of hospitalization was 2.4 days in group I, and 3.5 days in group II. Heart rate was 91.2 beats/minute in group I and 89.4 beats/minute in group II. Systolic blood pressure was 130.2 mm Hg in group I, and 126.8 mm Hg in group II. Diastolic blood pressure was 86.4 mm Hg in group I, and 82.4 mm Hg in group II. The difference was non-significant ($P > 0.05$). Symptoms were constipation in 16, and 11, fever in 10 and 5, nausea & vomiting in 11, and 12, abdominal pain in 19, and 12, skin rash in 13, and 8 and weak plantar reflex in 13 and 11. Outcome was recovery in 27 in group I, and 28 in group II and death in 1 in group I. The difference was significant ($P < 0.05$). **Conclusion:** Succimer and Penicillamine found to be equally effective in acute lead poisoning patients.

Key words: Lead, Penicillamine, Succimer

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INTRODUCTION

Lead poisoning occurs when lead, a toxic metal, accumulates in the body, often over months or years. Even small amounts of lead can cause serious health problems, particularly in children under the age of six, who are more vulnerable to its effects. Lead poisoning can affect nearly every system in the body and is particularly harmful to the nervous systems of developing children and fetuses.¹

Lead exposure can occur through several pathways. Lead from paint or gasoline can contaminate household dust and soil. Lead pipes, faucets, and fixtures can leach lead into drinking water. Jobs involving battery manufacturing, home renovation, and auto repair can expose workers to lead. Some toys, jewellery, cosmetics, and traditional medicines from other countries may contain lead.²

The symptoms of lead poisoning vary depending on the level and duration of exposure. In Children, developmental delay, learning difficulties, irritability, loss of appetite, weight loss, sluggishness and fatigue, abdominal pain, vomiting, constipation, hearing loss and seizures.³

Many research have looked into the possible link between blood lead levels and a number of disorders in both adults and children⁴. The amount of lead

present in blood and tissues, along with the length of exposure, may determine how harmful the metal is. Succimer recommended medications for lead poisoning are low-complication medications.⁵ Well-known lead chelator D-penicillamine was once the first-choice treatment for mild to moderate lead poisoning; but, due to the availability of other medications, it is now limited to treating arsenic, copper, and mercury poisoning.⁶ The present study was conducted to assess effects of Succimer and Penicillamine on acute lead poisoning patients.

MATERIALS & METHODS

The present study comprised of 56 patients of acute lead poisoning of both genders. All gave their written consent for the participation in the study.

Data such as name, age, gender etc. was recorded. Patients were divided into 2 groups of 28 each. Group I received D-Penicillamine (250 mg every 6 hours orally for two weeks), and group II succimer (10 mg/kg for the first 5 days every 8 hours, then every 12 hours up to 14 days). Parameters such as patient's symptoms, hospital stay duration, blood pressure, and heart rate was recorded. Data thus obtained were subjected to statistical analysis. P value < 0.05 was considered significant.

RESULTS

Table I Distribution of patients

Groups	Group I	Group II
Drug	D-Penicillamine	Succimer
M:F	14:14	12:16

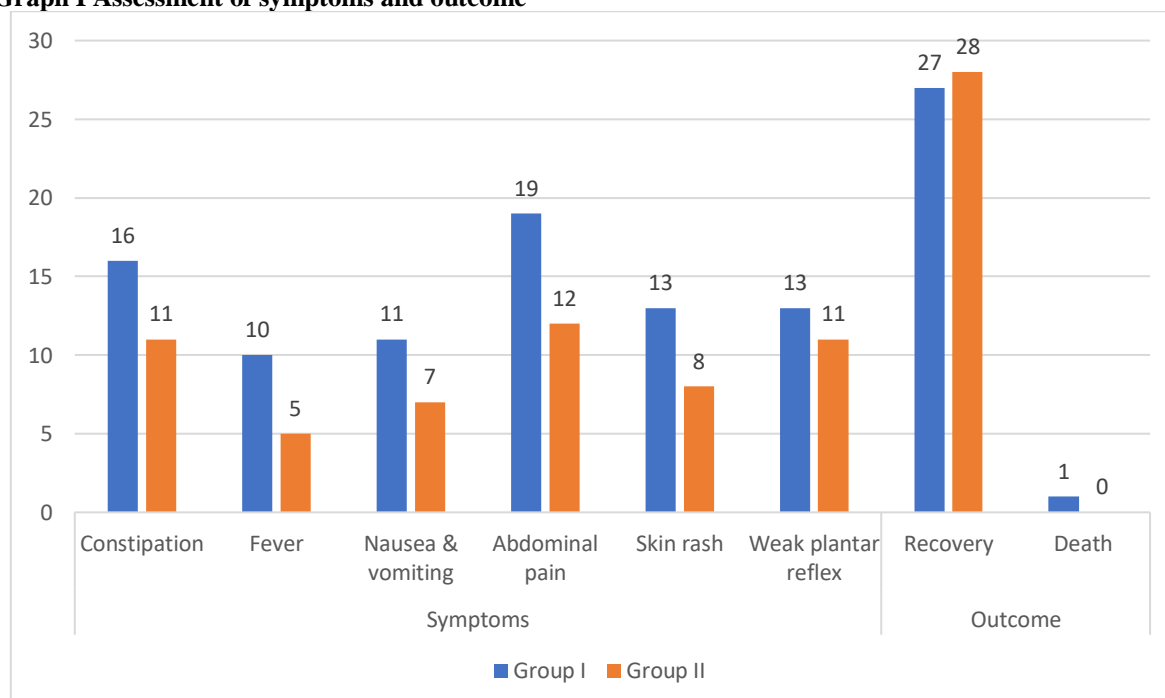
Table I shows that group I had 14 males and 14 females, and group II had 12 males and 16 females.

Table II Comparison of parameters

Variables	Group I	Group II	P value
Length of hospitalization (day)	2.4	3.5	0.96
Heart rate (beats/minute)	91.2	89.4	0.78
Systolic blood pressure (mm Hg)	130.2	126.8	0.81
Diastolic blood pressure (mm Hg)	86.4	82.4	0.94

Table II shows that mean length of hospitalization was 2.4 days in group I, and 3.5 days in group II. Heart rate was 91.2beats/minute in group I and 89.4beats/minute in group II. Systolic blood pressure was 130.2 mm Hg in group I, and 126.8 mm Hg in group II. Diastolic blood pressure was 86.4 mm Hg in group I, and 82.4 mm Hg in group II. The difference was non- significant ($P > 0.05$).

Graph I Assessment of symptoms and outcome



Graph I shows that symptoms were constipation in 16, and 11, fever in 10 and 5, nausea & vomiting in 11, and 12, abdominal pain in 19, and 12, skin rash in 13, and 8 and weak plantar reflex in 13 and 11. Outcome was recovery in 27 in group I, and 28 in group II and death in 1 in group I. The difference was significant ($P < 0.05$).

DISCUSSION

One of the oldest known poisons is lead, and lead poisoning can occur in the workplace or in the environment and is quite deadly.⁷In underdeveloped nations, it is more prevalent and severe. Over the last six years, we have seen a significant increase in the prevalence of lead poisoning among opium users, particularly those who use it orally.^{8,9,10} Work in industries related to lead, such as leaded gasoline, lead smelting and combustion, pottery, boat building, lead-based painting, lead-containing pipes, battery recycling, grids, arm industry, pigments, book printing, etc., are the main sources of human exposure to lead and its compounds.¹¹In adults, major

symptoms include headache, stomach ache, memory loss, renal failure, sexual dysfunction, and reduced sensation in the limbs, and in the early period, non-specific symptoms may manifest such as depression, reduced appetite, intermittent stomach ache, nausea, diarrhea, and constipation.¹²The present study was conducted to assess effects of Succimer and Penicillamine on acute lead poisoning patients.

We found that group I had 14 males and 14 females, and group II had 12 males and 16 females. The study by Ahamad et al¹³ aimed at determining the proportion of children with >10 mug/dL blood lead levels (BLLs), association between BLLs, and sociodemographic characteristics, if any, and

alterations in biochemical indices in the blood as an underlying mechanism of lead intoxication. A total of 62 children (4–12 y) were recruited to determine BLLs, delta-aminolevulinic acid dehydratase (delta-ALAD) activity, catalase (CAT) activity, and malondialdehyde (MDA) and glutathione (GSH) levels in the blood. Mean level of blood lead was 7.47±3.06 microg/dL (2.78–15.0) and 29% exceeded 10 microg/dL, CDC intervention level. The BLLs were found to be significantly influenced by social status, area of residence, source of water supply, maternal educational status ($p < 0.001$), type of house, and proximity to traffic density ($p < 0.01$). delta-ALAD was significantly lower in the group of children with BLLs 11.39±1.39 microg/dL when compared to children with BLLs 7.11±1.25 microg/dL and 3.93±0.61 microg/dL ($p = 0.0007$, 0.0005, respectively). However, CAT activity was higher in the groups of children with higher blood levels than with lower BLLs ($p = 0.0159$, 0.0001, respectively). There was an increase in MDA level with a concomitant decrease of GSH in children with BLLs 11.39±1.39 microg/dL compared with those of children with BLLs 7.11±1.25 microg/dL and 3.93±0.61 microg/dL ($p = 0.0001$, 0.0002, and $p = 0.0001$, respectively). There was statistically significant correlation of BLLs with delta-ALAD ($r = -0.44$, $p = 0.00035$), MDA ($r = 0.46$, $p = 0.00018$), GSH ($r = -0.62$, $p = 0.00001$), and CAT ($r = 0.44$, $p = 0.00035$). Significantly, CAT activity, MDA, and GSH levels were in turn, found to be correlated with delta-ALAD ($r = -0.45$, $p = 0.00024$; $r = -0.43$, $p = 0.00053$; $r = -0.43$, $p = 0.00053$, respectively). Results of the present study indicate a declining trend of BLLs in children when compared with those reported from metropolitan cities of India when leaded gasoline was in practice and that the BLLs were significantly associated with biochemical indices in the blood which have the potential to be used as biomarkers of lead intoxication.

We found that mean length of hospitalization was 2.4 days in group I, and 3.5 days in group II. Heart rate was 91.2 beats/minute in group I and 89.4 beats/minute in group II. Systolic blood pressure was 130.2 mm Hg in group I, and 126.8 mm Hg in group II. Diastolic blood pressure was 86.4 mm Hg in group I, and 82.4 mm Hg in group II. We observed that symptoms were constipation in 16, and 11, fever in 10 and 5, nausea & vomiting in 11, and 12, abdominal pain in 19, and 12, skin rash in 13, and 8 and weak plantar reflex in 13 and 11. Outcome was recovery in 27 in group I, and 28 in group II and death in 1 in group I. Gurer-Orhan H et al investigated the involvement of oxidative damage in lead-induced toxicity in humans and to enlighten whether oxidative stress indicators are correlated with the known indices of lead toxicity. For these purposes, selected oxidative stress parameters along with some clinical indices of lead poisoning were determined in blood of battery plant workers and control subjects. Workers had

significantly increased erythrocyte malondialdehyde (MDA) levels, catalase and glucose-6-phosphate dehydrogenase (G6PD) activities, and decreased blood glutathione: glutathione disulfide ratio compared to the controls. Increased blood lead concentrations and zinc protoporphyrin (ZPP) levels, and decreased delta-aminolevulinic acid dehydratase (ALAD) activity were used as clinical indices of lead toxicity. Statistically significant correlation between oxidative stress parameters and clinical indices implies that disrupted prooxidant/antioxidant balance might contribute to lead-induced toxicity in erythrocytes. A significant correlation was found between ALAD activity and blood lead levels in human subjects. Similarly significant correlation between ALAD activity and erythrocyte MDA concentrations was shown.

CONCLUSION

Authors found that Patients with acute lead poisoning responded equally well to succinylcholine and penicillamine.

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