ORIGINAL RESEARCH PAPER

Volume-8 | Issue-5 | May-2019 | PRINT ISSN No 2277 - 8179

INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

EVIDENCE-BASED STRUCTURED REHABILITATION IN A CASE OF LEAD (PB)-INDUCED QUADRIPARESIS: A CASE REPORT

Medical Science

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ABSTRACT

Lead-induced quadriparesis is very rare. Lead (Pb) exposure can majorly occur through drinking water, smoking, smelting, through battery recycling, and paints. There is a paucity of literature on rehabilitation interventions in lead-induced quadriparesis. A 26-years-old housewife with quadriparesis presented to rehabilitation setting. History suggested that drinking water from hand pump was the possible culprit for lead toxicity. Evidence based structured rehabilitation interventions were followed. Preventive interventions, pharmacological and non-pharmacological interventions were given. Exercises, activities of daily living (ADL) and transfer training along with preventive measures to avoid possible sources of further Lead exposure were advised. Psychological rehabilitation was also followed. Post-intervention there was an improvement in muscle power, transfers, and ADL. There was a better home-environment post intervention specially after psychological rehabilitation. Structured rehabilitation is helpful in improving lead-induced quadriparesis. Further studies on rehabilitation in Lead-induced quadriperesis are essential.

KEYWORDS

Lead (Pb), Quadriparesis, Rehabilitation

INTRODUCTION

Lead (Pb) is the oldest known toxic metal and exposure can majorly occur through drinking water, smoking, smelting, through battery recycling, and paints. According to the Centers for Disease Control and Prevention (CDC) guidelines, blood Pb levels of above 10 µg/dL is to be considered a cause for concern and treated.[1] There is a paucity of literature on rehabilitation interventions in lead-induced quadriplegia. Indian study showed the prevalence of lead toxicity is more in males. According to literature quadriparesis due to Lead toxicity is very rare.[2] The objectives of this case report were mainly (1) to recognize and treat lead toxicity promptly to avoid irreversible neuronal damage. (2) awareness, surveillance and rehabilitation implication in endemic areas. (3) effects of Rehabilitation interventions and its importance.

We are reporting this case after obtaining proper written informed consent.

CASE STUDY

Setting: Rehabilitation setting in an urban tertiary care center.

Case: A 26 years old housewife from Bihar, India presented with weakness of both lower and upper limbs for 8 years. She had difficulty in walking and to get up from sitting posture. History suggested that drinking water from hand pump was the possible culprit for lead toxicity. There was low Haemoglobin, but no basophilic stippling. Even after dropping of blood Pb levels from 51 µg/dL to 18 µg/dL then to normal after chelation therapy, she continued to have the weakness.

Intervention: Evidence based structured rehabilitation interventions were followed.

(a) Preventive interventions: Avoiding hand pump water and using refined packaged water were advised along with other advice.[3] As the patient had one child, our preventive advice was also directed to her child.

(b) Pharmacological[4,5]: Penicillamine (500 mg OD orally X 2 week), Vitamin C (250 mg BD X 1 month), Vitamin E (400 mg), Calcium (500 mg), Vitamin D3 weekly (60000 IU) for 4 week, Iron+folic acid were prescribed.

(c) Non-pharmacological[4]: Diet containing calcium, flavonoids, quercetin (fruits, vegetables) were advised and curcumin, garlic intake were also encouraged as routinely used in Indian cooking. physical therapy & occupational therapy like exercises, activities of daily living (ADL) and transfer training, counseling & psychological Rehabilitation were also followed.

Results:

Electrodiagnostic studies revealed motor axonal polyneuropathy in all four limbs. 3 month post-intervention there was an improvement in muscle power, transfers, gait and ADL (Figure 1 and Figure 2). After intervention blood Lead (Pb) level also came down to 'undetectable level' that is normal level. There was a better home-environment post intervention especially after psychological rehabilitation (Table-1).

TABLE – 1
BEFORE AND AFTER EVIDENCE-BASED STRUCTURED REHABILITATION INTERVENTION

Topic	Before intervention	After intervention
Both sides Muscle power (Manual muscle testing)	Shoulder (all group muscles): 2/5 Hip abductors: (Right:3/5 Left: 2/5). Spinal extensor: 3/5	Shoulder (all group muscles): 4/5 Hip abductors: (Right:4/5 Left: 3/5) Spinal extensor: 4/5
Home & family	Previously separated	Now living with husband in a joint family and recently became pregnant.
Investigations Lead (Pb): Haemoglobin % 25 OH D3 Vitamin	18.9mcg/dl. 10.9 gm%. 7.8 ng/ml	Not detectable (normal) 12.5 gm% 24 ng/ml

Figure 1: Patient's transfer and ambulation status before and after rehabilitation intervention

Figure 2: Post-rehabilitation intervention improved ambulation and gait

DISCUSSIONS:

To the best of our knowledge, this is the first case report where an evidence based structured rehabilitation attempt has been made to manage a Lead induced quadriparesis case. Evidences specific to exercises for quadriparesis due to lead toxicity are extremely less in literature. Though there are literature on lead neuropathy but quadriparesis due to Lead toxicity again are very less. In India, Bihar is second most common state being affected by Lead (Pb) toxicity.[6] This is one of the few case reports from Asia as well. Lead is ubiquitous in nature among all heavy metals, due increased status pollution, toxic exposure is also common but due to improved public health interventions in India, Lead toxicity is relatively rare. Furthermore, prevention, prompt detection and treatment are essential part. According to guidelines[5] if blood Lead level >5µg/dL, preventive steps must be taken, if > 10µg/dL, special attention is to be given in woman those who want pregnancy or pregnant because even at >5µg/dL levels there are increased risk of 'possible spontaneous abortion' and 'possible postnatal developmental delay'. In our case, rehabilitation played an important role as Lead caused here some residual motor weakness which was improved after intervention. Specially for woman in reproductive age group Lead toxicity has adverse effects on reproduction and in child also, hence complete comprehensive rehabilitation is always essential.

Furthermore, nervous system is the most susceptible to Pb toxicity.[7] Studies have shown that Vitamin C, E, and flavonoids have antioxidant effects in Lead toxicity. As vitamin E improves lead-induced memory impairment, it has been recommended as good for preventing lead-induced health problems with appropriate dosing.[8] Quercetin is effective in reducing Pb-induced liver, kidney, and brain damage.[9, 10] Sukla et al.[11] found in animal studies that curcumin is effective in preventing lead-induced neurotoxicity. Garlic is effective in preventing lead-induced impairment of the liver or reproductive organs.[12] Vitamin C was found to improve the Pb-induced impairments in synaptic plasticity. Among physical therapies, exercises has been found to have beneficial effects in animal study.[13]

In our case such evidences were been gathered to structure the rehabilitation program.

CONCLUSIONS

Structured rehabilitation is helpful in improving symptoms of lead-induced quadriparesis. Furthermore, it can be improved by multi-directional structured rehabilitation. Furthermore, keeping it as differentials in quadriparesis is very important in Indian scenario.

Further research on incidence & prevalence of Lead-induced sensory impairment or motor weakness, determination of pattern of weakness and recovery in Lead neuropathy, and efficacy of dietary factors, development of screening method are necessary.

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