



Neuro-cognitive profile on exposure to Aluminium at work place – A Case report

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ABSTRACT

Introduction: The aluminum exposure predisposes the individual to health problems as well as psychological problems. It may be a cause for neuropsychological dysfunctions such as forgetfulness, confusion, memory loss, convulsions and inability to concentrate.

Case Report: A single case study aimed to assess the neuro-cognitive profile of exposure to aluminum at work place. The complaints included excess sensitivity to voice, numbness and tiredness in left upper limb and right lower limb and excess tactile sensation for past 3 years. The present complaints have been experienced subsequent to working in a unit which involves exposure to AIO2 hydrocarbons for the last 3 years. Assessments were used in such as Cognitive-Somatic Anxiety Questionnaire (CSAQ) and NIMHANS Neuropsychological Battery-2004 Reassessment was done after 5 months. **Discussion:** On NIMHANS Neuropsychological battery, the case has got low score in the area of motor speed, mental speed, sustained attention, verbal and category fluency and verbal learning and memory. A single case presents the exploratory of evidence about neuropsychological problems associated with exposure to aluminum at workplace. There is a need to develop evidence for the presence of neuropsychological functions and prevention strategies to reduce the harmful effect of exposure to aluminum.

KEYWORDS : Aluminum, Neuro cognitive and Psychological problems

INTRODUCTION

Aluminum exposure predispose individual to health problems as well as psychological problems. Aluminum is commonly found in aluminum cans (the phosphoric acid in soft drinks leaches aluminum from the walls of the can), added as an anti agent (caking agent to salt and sugar), baking powder, antiperspirants, bleaching agent in white flour, used as an emulsifier in some processed cheeses, self-rising flour and frozen dough, commercial teas, toothpaste, sunscreen, lotions, powders / talcs and cosmetics, infant formulas (soy formulas contain 10 times more aluminum than milk based formulas), cigarette filters, anti-acids, buffered aspirin, occupational (welding and smelting) and vaccines^[1]. People experience lung problems while working in places where aluminum was applied during production processes. Aluminum poisoning manifest in the form of loss of intellectual function, forgetfulness, confusion, memory loss, convulsions, inability to concentrate and in extreme cases, full blown dementia^[2] as well as hypersensitivity (emotional instability, nervousness, heightened sensitivity to light or darkness, abnormal sensitivity to hot and cold temperatures, an aversion to noise, touch, movement and odors, unexplained feelings of apprehension or uneasiness, feelings of inferiority, embarrassment or shame and feelings of irritability, agitation or annoyance) which is progressive and if left untreated can escalate into irrational anger and displays of violence as well as affective symptoms and schizophrenia^[3]. Contrary reports exist for its association with disturbance in cognitive functioning^[4]. The present report is going to highlight neuropsychological functions of exposure to aluminum.

CASE REPORT

A 43-years-old married man was presented with the chief complaints of excess sensitivity to voice, numbness and tiredness in his left upper limb and right lower limb and excess tactile sensation for the past 3 years. These complaints have been experienced subsequent in the working unit of which involved exposure to AIO2

hydrocarbons in the last 3 years. It was manifested that he gets irritation whenever he hear sounds (couldn't even bear the sound of rainfall so closes ear with pieces of cotton); also reported presence of dyspnea after walking for 500meters; pain in ear while listening to any sounds, dizziness while visualizing moving objects, especially while driving bike were major complaints associated with not being able to concentrate in riding bike and blurring of vision (mild) and unable to recognize the minor aspect of any object/person while in motion. Burning sensation all over the body whenever he touches food, clothes or other things, dryness of skin and experienced rashes after bath were also seen. For the last 3 years he has been using citefil lotion instead of bathing on physician's advice. He also complained of forgetfulness, less orientation as well as subjective weakness and occasional dizziness. He has had significant absenteeism for work due to above mentioned problem in the last 3 years (<50% work days). He didn't go to work for the last 2 months and had lost 5 kg within 6 months.

On evaluation, he was noted to have anxiety and memory problem. In view of this he was evaluated for abnormal illness behavior and Neuropsychological functions. Assessments using the Cognitive-Somatic Anxiety Questionnaire (CSAQ), revealed predominantly high score in somatic anxiety which indicates high scores on rapid heartbeats, nervously pace, perspire, feel tense in his stomach, get diarrhea, become immobilized and feel jittery in his body. NIMHANS Neuropsychological Battery-2004 yields low percentile score in the area of Motor speed and Verbal Learning and memory which indicates premotor area and left temporal involvement. Reassessment was done after 5 months which revealed that he has got low score in the area of motor speed, mental speed, sustained attention, verbal and category fluency and verbal learning and memory. He was prescribed Amitriptyline-10 mg and Clonazepam-0.5mg daily. Cognitive Behavior therapy included psychoeducation, explanation of the interrelationship between thinking processes, mood changes and the effect on cognition. He was also taught

graded exposure through mindfulness, deep breathing exercises, "let's go attitude" cognitive restructuring, checking the distance of closing with cotton and temporal encoding by repeating the words.

DISCUSSION

This case documents the presence of neuropsychological dysfunction in the premotor area and left temporal lobe area as well as presence of affective disturbance. It is corroborated by the finding from others studies. Welder (n=38) exposed to aluminium experienced decreased motor function. The median exposure of aluminum welder was 7065 hours and had seven times higher concentration of aluminum in urine in comparison^[6]. 98 Aluminum welder's mean age of 37 years are compared to matched control of 50 on neurobehavioral tasks. There is no difference in psychomotor performance and neuro behavioral tasks. Beside reaction time which is higher in the welder group [6]. Welder group did not do well on time limited synonym task, embedded figures, digit symbol speed and the backward counting components of the divided attention task^[7]. The total MMSE score of the 66 aluminum exposure group (26.13 ± 2.57) is significantly lower than that of the 77 control group (27.89 ± 1.91) (P < 0.05), particularly the scores on time and place orientation, short-term memory, calculation ability, and language skill (P < 0.05). The detection rate of MCI was significantly higher in the aluminum exposure group (18.2%) than in the control group (5.7%) (P < 0.01)^[8]. A present case study presented the exploratory of evidence of neuropsychological problems associated with exposure to aluminum at workplace. There is a need to develop evidence for the presence of neuropsychological functions and prevention strategies to minimize the harmful effect of exposure to aluminum.

CONCLUSION

The presented case has difficulty in Motor speed and Verbal Learning and memory which indicates premotor area and left temporal involvement. Reassessment results shows difficulty in motor speed, mental speed, sustained attention, verbal and category fluency and verbal learning and memory and this may due to exposure to aluminum. So there is a need to work on individuals working in factories especially chemical related factories as well as other factories. There is also a need to develop evidence for the presence of neuropsychological functions and prevention strategies to reduce the harmful effect of exposure to aluminum. So that it could be prevented and further research has to be done on this area to improve their occupational functioning as well as quality of life.

CONFLICT OF INTEREST

There is no conflict of interest

AUTHOR'S CONTRIBUTIONS

Thamilselvan Palanichamy

Group 1 substantial contributions to conception and design and assessment and reassessment was done (Data collection)

Group 2 drafting the article, revising it critically for important intellectual content

Group 3 final approval of the version to be published

Manoj Kumar Sharma

Group 1 substantial contributions to conception and design, analysis and interpretation of data

Group 2 drafting the article

Group 3 final approval of the version to be published

Santhosh K.Chaturvedi

Group 1 substantial contributions to conception and design

Group 2 drafting the article, revising it critically for important intellectual content

Group 3 final approval of the version to be published

Jamuna Rajeshwaran

Group 1 substantial contributions to conception and design,

analysis and interpretation of data

Group 2 drafting the article

Group 3 final approval of the version to be published

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