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Behavioral therapy for Combined Attention deficit hyperactivity disorder associated with childhood lead poisoning

Prince Jebadass Isaac[1*], A. Sivakumar[1], Tiki curz[2]

[1] Environmental and analytical chemistry division, School of advanced Sciences, VIT University, Vellore 632 014 Tamilnadu, INDIA.

[2]Department of ENT (AV Unit), Christian Medical College and Hospital, Vellore – 632002, Tamilnadu, INDIA.

ABSTRACT

Attention deficit hyperactivity disorder (ADHD) is one of the most commonly diagnosed mental disorders in children and adolescents, affecting up to 3 to 5% of school-age children. Inattention, hyperactivity, and impulsivity problems fall along a continuum. For some children and adolescents, symptoms do not impair functioning enough to warrant a diagnosis of ADHD, but the symptoms nevertheless cause frustration in the child or adolescent or those who are near and impede their learning to some degree. Although symptoms develop without clear etiological cause, some cases are associated with disorders that negatively impact brain development. This study particularly aimed in discussing about positives of behavioural therapy for children who had high blood lead levels & were diagnosed with combined attention deficit hyperactivity disorder.

INTRODUCTION

Lead is a neurotoxin to which the developing brain is particularly vulnerable. Moreover, lead poisoning in children is known to negatively affect brain systems implicated in cognitive, communication, behavioral and social functioning. The present paper describes two case histories of children who, during periods of lead poisoning, developed ADHD. These cases underscore that there are multiple causes of ADHD and the importance of environmental influences in some cases. ADHD can continue through adolescence and adulthood. Symptoms include difficulty staying focused and paying attention, difficulty controlling behavior, and hyperactivity (over-activity). Inattention, hyperactivity, and impulsivity are the key behaviors of ADHD. It is normal for all children to be inattentive, hyperactive, or impulsive sometimes, but for children with ADHD, these behaviors are more severe and occur more often to be diagnosed with the disorder, a child must have symptoms for 6 or more months and to a degree that is greater than other children of the same age.

***Corresponding author**

Prince Isaac.C

Email id: prince.j.isaac@gmail.com

Although the causes of ADHD remain unclear, both genetic and environmental factors are thought to influence the etiology of ADHD. Lead is one of the well-established environmental poisons, and its general toxic effects, particularly in children, continue to be a major public health issue worldwide (Shannon M *et al.*, 1996).

One of the most common causes of neuro-developmental impairment is childhood lead poisoning. In several cases, a temporal association was noted between elevated blood lead levels and the emergence of ADHD symptoms. In spite of these known deleterious effects, there is no universal screening program, and public health regulations to prevent its exposure in children.

Case 1

Patient 1 is a south Indian child from Tamilnadu. The patient was born full term via normal spontaneous vaginal delivery without complications (Perry R *et al.*, 1995) and was discharged to his home. Subsequent medical records show that early developmental milestones in all areas were attained in an age appropriate fashion. For example, he sat unassisted at 7 months, stood at 9 months, walked at 10 months, and spoke single words at 12 months. He was noted to show

normal interactive behavior at 9 months and to indicate his wants at 15 months.
The child was found to have an elevated blood-lead level at about 48 months of age; elevated levels continued to be reported. The available records concerning his blood lead levels are summarized in fig.1.

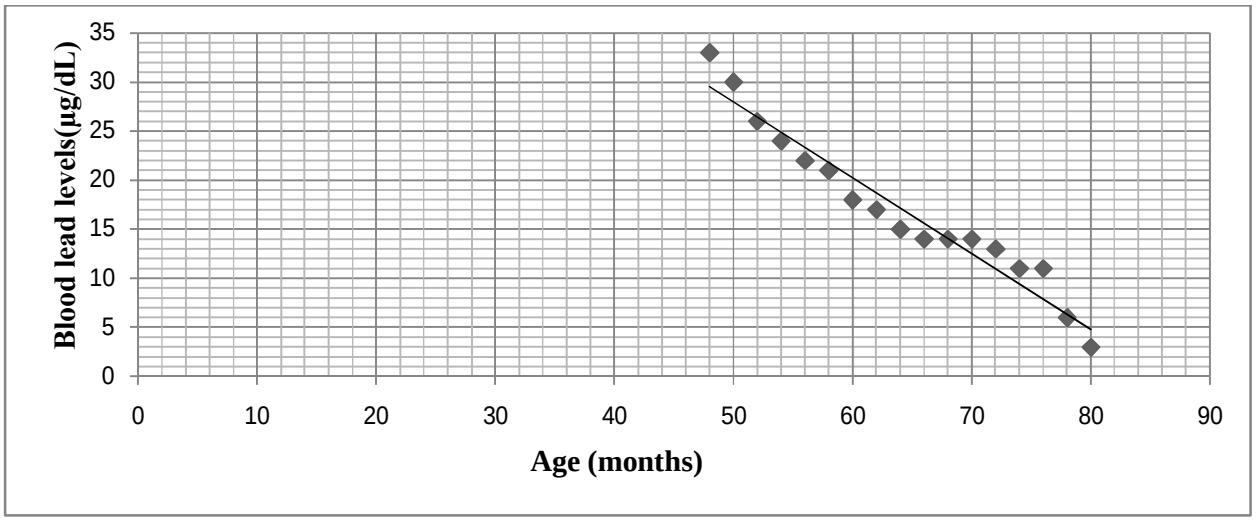

Fig.1 Blood lead levels of patient 1 as a function of age

His parents were worried that the child was undergoing few symptoms like often having a brief gaze, difficulty finishing tasks (e.g., crawling to an object), marked distractibility while eating, and/or early motor development with increased squirming and climbing.

The child was found to have mood symptoms associated with anxiety disorder. The child also had symptoms like irritability, frequent tantrums, poor self-esteem (wheeler J *et al*., 1994) social withdrawal and anxiety problems or disorders. "Deficits are found in both English and Tamil, which are not attributable to bilingualism." Educational evaluations at 50 months were noted to show delays in all areas except gross motor functioning.

For example, he was described as "a notorious child with a very less attention, he can be easily distracted and can be hyperactive at times. He gives very less eye contact and he is affectionate only to his mother and does not respond to anyone else". [The preceding is a quote from his father.]

The patient was first evaluated by the authors of this paper, physicians, audiologists, in Tamil which is the mother tongue of the child, when he was about 3years 2 months of age and, at that time, met *DSM-IV* criteria and was diagnosed as ADHD, Combined Type – where he displays both inattentive and hyperactive/impulsive symptoms.

The boy was neat and appeared quite at ease with his surroundings. Although he was alert, it was not followed by an obvious and prolonged visual concentration on the eliciting stimulus. Throughout the clear if he was oriented to time and place since (Dodge k, 1983) for the duration of the evaluation (2 hours), the patient did not engage in comprehensible speech with either examiner or the physician, he had difficulty paying attention to details and tendency to make careless mistakes; he was very careless easily distracted by irrelevant stimuli and frequently interrupting ongoing tasks to attend to trivial noises or events that are usually ignored by others inability to sustain attention on tasks or activities and he had difficulty finishing any paperwork or performing tasks that require concentration frequent shifts from one uncompleted activity to another, only occasionally made eye contact with either the physician or audiologist and it was not clear, based on his unchanging facial expression, whether he understood what was being said to him. He never engaged in conversation with the author or the physician.

He was showing symptoms of Hyperactivity which includes fidgeting, squirming when seated getting up frequently to walk or to run around, climbing excessively when it's inappropriate, he was having difficulty playing quietly or engaging in quiet leisure activities being always on the go often talking excessively.

He was overly reactive to visual stimulation. While he never turned his head toward the person who was addressing him, he quickly turned to face and focus upon any movement in the testing room. For example, a slight movement of the window blinds due to air currents or a pencil that rolled when placed on the table instantly evoked an orienting response from the patient evaluation, the patient was unable or unwilling to remain seated for more than a few minutes.

He was in tears when he was not allowed to do things which he wished to do and screamed and reacted in a very hyperactive way and once he was let to do what he wished like running around making noises and so on he was back to his original good mood within seconds.

The child was treated with an important non-medical approach used in children with ADHD known as behavior therapy or behavior management. Behavior therapy was practiced on the child, which was based on several simple and sensible notions about what leads the child to behave in socially appropriate ways. One reason is that the child generally wants to please his parents and feel good, when his parent is proud of them. When the relationship between parent and child is basically positive, it is a very important source of motivation. A second reason that the child behaves appropriately is to obtain positive consequences for doing so (i.e. privileges or rewards). Finally children will behave appropriately to avoid the negative consequences that follow inappropriate behavior.

The goal of behavior therapy is to increase the frequency of desirable behavior by increasing the child's interest in pleasing parents and by providing positive consequences when the child behaves hyperactively. Inappropriate behavior is reduced by consistently providing negative consequences when such behavior occurs. This is a simplified, but not unreasonable view, of what behavior therapy is all about?

The second focus of behavioral treatment involves providing the child with positive consequences for behaving in appropriate ways. The simple logic is that you can increase the frequency of desired behavior (e.g. putting away toys) by providing rewards when such behavior occurs. At the simplest level, this requires nothing more than noticing when the child is doing something you want to encourage (e.g. playing quietly) and making sure to comment on it ("Your doing such a nice job of playing quietly. I really appreciate that."). It was made sure the child understands what we want him to do, and then be sure to praise him whenever we happen to observe it occurring. This simple technique of noticing good behavior is easy to overlook and can be quite helpful. A conscious effort to catch the child doing something good at least 5 times a day and to point it out was very much necessary.

When the child was convinced that his parents notice and appreciate their efforts at behaving well, it frequently increases their desire to do so. In addition it also involves providing the child with concrete rewards and/or privileges for appropriate behavior. As an example, the child has developed the problematic habit of talking back, you tell him to put away his toys and he tells you "not now, later" and the way to increase the child's compliance was to make a tangible reward or privilege contingent for his following the request without any rejections, for example, he was explained that each time he does what he was told he will earn a point. These points can then be used to "purchase" a privilege such as access to TV, computer time and thus he can show a vast improvement in his behavior.

The audiologist/speech pathologist reviewed this child when he was 6 years old and he was found to show a good improvement in his behavior and was giving a better eye contact. He was accompanied with his parents and he was seen to show more love towards his parents. The child was showing an overall improvement and was considerably having low levels blood lead simultaneously unlike the previous levels, the child's overall behavioral change was incompatible with a diagnosis of ADHD.

Case 2

Patient 2 was a south Indian child born by a caesarean operation, which took sixty minutes, with the administration of anaesthesia by use of intravenous and inhaled anaesthetic agents (general anaesthesia). The skin of the abdomen was cleansed with antiseptic solution and surgical drapes were placed and a sterile operating field during the procedure was maintained.

Prenatal vitamins and iron supplements were taken during the pregnancy, which was monitored with standard prenatal care. Physical growth and development were normal early developmental milestones in all areas were met in an age appropriate fashion (Eppright Td *et al*., 2004). The patient's medical history between the ages of 10-15 months was showing normal blood lead levels.

The patient's history of lead poisoning and blood lead levels are shown in Fig.2. He was showing symptoms like acting quickly without thinking first (Ris MD *et al*., 2004) not able to sit still, running around and climbing around when others are seated, talks when others are talking and keeps daydreaming or seems to be in another world, is sidetracked by what is going on around him.

The patient was first evaluated by the physicians and an audiologist, in Tamil which is the mother tongue of the child, when he was about 48 months of age and, at that time, met *DSM-IV* criteria and was diagnosed as ADHD, Combined Type where he displays both inattentive and hyperactive/impulsive symptoms

The child was very inattentive having difficulty staying focused and attending to mundane tasks. He was easily distracted by irrelevant sights and sounds, shift from one activity to another, and seem to get bored easily. He appeared to forget and even spacey or confused as also often an issue as he was never able to complete a task given in précised time. He even appeared to be sluggish, lethargic and slow to respond and process information.

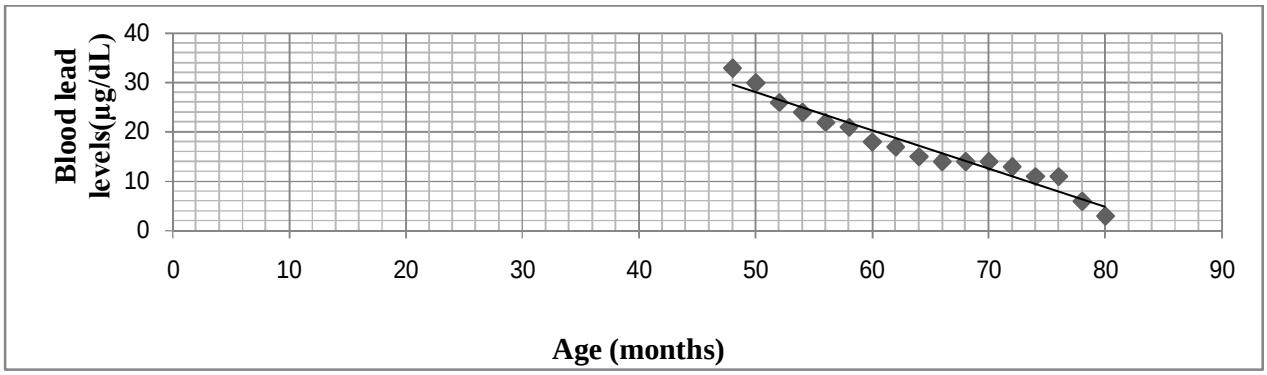

Fig.2 Blood lead levels of patient 2 as a function of age

He suddenly showed high levels of activity, which may present as physical and/or verbal over activity. He was in constant motion, perpetually "on the go' as if driven by a motor. He had difficulty keeping his body still, moving about excessively, spurning or fidgeting. He suddenly feels restless, and talks excessively, (lid sky. T et al., 2003) interrupt others, and monopolize conversations not letting others get in a word. It is not unusual for an individual with hyperactive symptoms to engage in a running commentary on the activities going on around them. His behaviors tend to be loud and disruptive. This difficulty regulating his activity level often creates great problems in social, school and work situations.

He was also treated with the non-medical approach the behavior therapy or behavior management. Behavior therapy was practiced on the child and since, there was lack of cooperation from the child there was not much of improvement. Since the child continued to have problems with core symptoms (Hoza *et al*., 2005) including inattention, hyperactivity and impulsivity, since medication wasn't part of the initial treatment plan, then a stimulant medication was considered and behavior therapy was reinforced (wheeler J *et al*., 1994). Stimulants include different formulations of methylphenidate short acting, such as Ritalin and Focalin, with duration of 3-5 hours intermediate acting, and which can be used just once a day.

When the patient was about 7 years old, the physician evaluated him (Perry R *et al*., 1995). At the time of this assessment he no longer met *DSM-IV* criteria for ADHD disorder. He looked like a well-nourished boy who was quiet but cooperative during the testing session. He sat with his head facing down for most of the time, making eye contact only briefly and (Dodge KA, 1983), when the contact was reciprocated, quickly averted his eyes. He showed no emotion and exhibited few spontaneous movements. No unusual behaviors or abnormal body use were observed (Hoza B *et al*., 2005). He showed an appropriate interest in and use of toys and other objects, such as a pencil. The patient always answered questions when asked, but typically replied with single words or a 2 to 3 word phrase. He was accompanied with his mother and he was seen to show more love towards her. The child was showing an overall improvement and was considerably having low levels blood lead simultaneously unlike the previous levels, the child's overall behavioral change was considerably better.

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