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Short Report

Altered activities of monoamine oxidase A in Omani Autistic Children – A brief report.

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ABSTRACT

Autism spectrum disorder (ASD) is a mysterious neurodevelpomental disorder with onset prior to 3 years of age. Monoamine oxidases (MAO) A and B are the enzymes expressed in brain and able to metabolize dopamine, norepinephrine, epinephrine, and serotonin. Numerous studies reported the serotonin neurotransmission abnormalities and abnormal activities of monoamine oxidases (MAO) have been implicated in the pathophysiology of autism and other neuropsychiatric disorders. No such biochemical data is available for Omani autistic children. So, the present study was conducted to evaluate levels of the plasma monoamine oxidases (MAO) activity in Omani autistic children (n=19) by using Invitrogen MAO kit, USA. Significant reduction in the activities of MAO A and no significant change in the activities of MAO B in plasma were found in Omani autistic children as compared with controls. Our results coincide with the previous reports and suggest that there might be some relationship between MAO A and the pathophysiology of autism.

1. Introduction

Autism spectrum disorder (ASD) is a mysterious neuro-develpomental disorder with onset prior to 3 years of age and several factors have been implicated in the etiology of autism, including genetic, environmental, autoimmune and inflammatory factors. The prevalence of autism is increasing worldwide. Despite numerous reports suggesting a high rate of inheritance, no specific single genes have been identified that are more than risk factors [1-2]. The identification of specific biochemical correlates of autism might increase the reliability of the behavioral diagnosis of this disorder. Monoamine oxidase exists in two isoforms (MAO - A and B). MAO A plays a vital role in the metabolism of neurotransmitters such as dopamine, norepinephrine, epinephrine, and serotonin. Abnormalities of serotonin neurotransmission have long been implicated in the psychopathology of autism [3-4]. Dysfunctions of MAO A have been implicated in a variety of neuropsychiatric disorders, such as depression, social anxiety, autism and attention deficit hyperactivity disorder [5-12].

Sultanate of Oman is a developing Arab country located in the South Eastern of the Arabian Peninsula and the total population is approximately 3.5 million, about half of which is below the age of 15 years [13]. 113 diagnosed cases of ASD were reported nationwide and the prevalence of ASD in Oman was reported low (1.4 cases per 10,000 children aged 0–14 years) compared to international estimates, especially in western countries, which is attributed to under-diagnosis and under-reporting. More prevalent cases were among boys (75%) and among low-income families was also reported [14]. According to literature survey there are no scientific evidences about MAOs in Omani autistic children and the cause of ASD remains elusive. So, there is an urgent need for scientific studies which can explore the cause of autism and helps for early detection of autism in Oman and worldwide. Therefore, the present study was aimed to evaluate the levels of plasma monoamine oxidases (MAO) activity in Omani autistic children.

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2.Materials & Methods

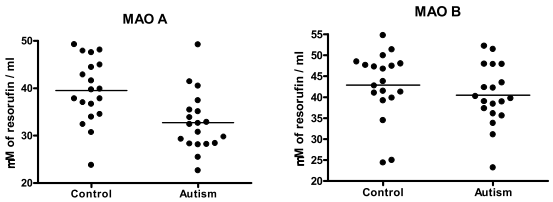
Subjects: A total of thirty eight Omani Children, between the age of 3 to 10 years (19 autistic, 15 males and 4 females and their age matched normal children (19, 10 males and 9 females) from 19 different families were recruited for this study. The autistic children were diagnosed according to the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition, Text Revision (DSM-IV-TR) (15) American Psychiatric Association, 2000). Ascertainment of ASD diagnosis was further supplemented by completing a standardized and validated Arabic version of the Childhood Autism Rating Scale (CARS) questionnaire. A written consent was obtained from the parents in each individual case, according to the guidelines of the Ethical Committee of Sultan Qaboos University, Oman (EC 158/2010).

Biochemical and Data analysis: After an overnight fast, the blood samples from both the autistic and control children were collected at the SQU hospital and used for biochemical analysis. The levels of plasma MAO A and B activities were assessed by using MAO assay kit from Invitrogen, USA. Data analysis was done by using the Graph pad Prism software. All values are Mean ± SD, unpaired student's t test level of significance at $P<0.05$.

3.Results

The levels of plasma MAO A activities were significantly lower in autistic children as compared to their age matched controls (n=19). But there is no significant change in the activities of MAO B in autistic children as compared to their age matched controls (n=19). All values are Mean ± SD, level of significance at $P<0.05$.

Fig 1: Activities of MAO A and B in plasma of Omani autistic children



Parameter	Control	Autism	P value
MAO A (µM of resorufin / ml)	39.51 – 1.553 (N=19)	32.73 – 1.434 (N=19)	0.0028 (**)
MAO B (µM of resorufin / ml)	42.86 – 1.844 (N=19)	40.45 – 1.651 N=19	0.3354 (NS)

4.Discussion

Monoamine oxidases are important enzymes secreted in brain; catalyze the oxidative deamination of a number of biogenic and dietary amines and the degradation of monoamines by MAO produces neurotoxic hydrogen peroxide as a byproduct. In light of the vital role that MAO plays in the metabolism of neurotransmitters, the MAO A dysfunctions have been implicated in most of the neuropsychiatric disorders [5-10]. To find out the involvement of MAOs in Omani autistic children, the present study was conducted.

Studies suggest that there is a gradual decline in platelet MAO activity during childhood and adolescence. Associations were demonstrated between MAO activity and hemoglobin, hematocrit, and platelet count, and should be considered in biological studies of vulnerability to psychiatric illness [16]. Childhood-onset Pervasive Developmental Disorders patients were reported to have lowest levels of platelet MAO activity [17]. The origin of neurotransmitter imbalance in autism appear(s) to be of metabolic origin, i.e., a decreased catabolism and/or an increased biosynthesis of serotonin [18]. A recent study suggests that functional MAOA-uVNTR alleles may act as a genetic modifier of the severity of autism in males [19]. A recent study suggests that the functional MAOA promoter alleles play potential role in the male child, the mother, or both in ASD [20] .

5. Conclusion

The results of this study show that there is a significant reduction in the levels of plasma MAO A activities with non-significant change in the levels of MAO B in Omani autistic children as compared with control subjects. The results of the present study are in agreement with the previously reported data from other countries and confirm the hypothesis that reduction in the levels of MAO A activity might be involved in the pathogenesis and clinical manifestation of autism. Identification of biochemical markers related to autism will be advantageous for an early clinical diagnosis and intervention. But, this study has the limitation in the sample size (n=19). The exact mechanism is still unclear and further extensive research needed.

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Conflict of Interest - None

6. References

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