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# Risk factors for ADHD in 6-9 year old children

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***Abstract:*** *ADHD is a common neurobehavioral developmental disorder among children. One child in every classroom requires help for this problem. In the study, purposive sampling was used to identify students of 6-9 years with symptoms of ADHD. The teacher filled the DSM-IV-TR criteria for the children they suspected fitted the criteria. An age and gender matched control group was also selected by the teachers. Parents of these children were interviewed. 68 students participated, 34 belonged to risk group (24 boys, 10 girls). Significant correlations were seen between family history and ADHD symptoms in children ($p < 0.01$). Number of ADHD symptoms significantly decreased with increase in birth weight ($p < 0.05$). Both groups differed in waist circumference ($p < 0.05$); number of ADHD symptoms significantly reduced with increasing waist circumference ($p = 0.05$). Non-significant differences were seen between the groups for breastfeeding, weaning, weight and height. It is concluded that ADHD could be influenced by family history of the disorder and maternal health status during pregnancy which could impact the birth weight of the child. Another determinant for ADHD, as concluded from this study, could be a low waist circumference.*

***Key words:*** *risk factors, environment, nutrition, hyperactivity*

## Introduction:

Attention Deficit Hyperactivity Disorder is a very common neurobehavioral developmental disorder in children characterized by continuous inattention, hyperactivity, and impulsiveness and is especially prevalent in childhood. [1]It is a problem that is assuming a much larger dimension than imaginable and one that parents are desperate to find solutions for. Thus, this study investigates what could be the possible reasons for ADHD to manifest.

## Subjects and Methods:

***Formulation of tool:*** A questionnaire was developed which consisted of the DSM-IV-TR criteria for ADHD, personal details, anthropometry (weight and height; BMI; waist to height ratio); health history which included family history, medication history, health complaints in the past 6 months, stressors in pregnancy, birth weight of the child, breastfeeding and weaning practices, physical activity, screen time and sleep patterns.

**Sample Selection:** Purposive Sampling Technique was used to select the sample for this study.

The four schools that agreed to participate were Infant Jesus School at Chincholi Bandar (Malad suburbs), St.

Xavier's Boys Academy at Churchgate (East), Bai Bhikhaijee Shapurji Bengallee Girls' High School at Churchgate (East) and St. Xavier's Boys' High School at Marine Lines.

St. Xavier's Boys Academy and St. Xavier's Boys' High School were exclusively boy's schools, whereas B.S. Bengallee was a girl's school. Infant Jesus was a co-educational institute.

***Sample Characteristics:***

The class teachers of standards first to fourth (that is, of 6-9 year old children) in each of the schools were instructed on the study. The Diagnostic and Statistical Manual of Mental Disorders, 4th edition, Text Revision (DSM-IV-TR) criteria was explained to the teachers.

The teachers filled the DSM-IV-TR checklist only for the students whom they perceived or suspected as having the symptoms enlisted in the criteria. A minimum of 6 symptoms was necessary to classify the child as having a risk for Attention Deficit Hyperactivity Disorder. The teachers then filled the DSM-IV-TR criteria for age and gender matched controls. Only those with less than 6 symptoms were included in the control group. The parents of these 2 groups were also made to fill the DSM-IV-TR criteria in a personal interview after obtaining consent for the same to confirm behavior patterns away from school.

Criteria for observational group (risk group for ADHD):

- *Inclusion Criteria*: The child should be within the age group of 6 to 9 years, should show 6 or more symptoms of ADHD currently as marked by teacher and parent and should be in the same school for at least for 6 months.
- *Exclusion criteria*: Children not showing symptoms of ADHD or neurological disorders, should not have a history of thyroid problems, glucose-6-phosphate deficiency, phenylketonuria and fragile X syndrome or metabolic disorders of the liver, kidney or heart.

Criteria for control group:

- *Inclusion Criteria for controls*: Should be of the same age and gender as that of the child in the risk group and should have less than 6 symptoms on the DSM-IV-TR criteria marked by teacher and parent.
- *Exclusion Criteria for controls*: Those with 6 or more symptoms and those with metabolic or neurological concerns.

The sample size was 68, of which 34 belonged to the risk group (24 boys and 10 girls).

**Ethics:**

Each of the schools were voluntary participants with permission from the principal or trustees. At no point was any school lured or forced to participate. Consent forms were issued and only parents who agreed to participate on behalf of their children were included.

**Statistics:**

[2]The height, weight and BMI were compared to the Centre for Disease Control and Prevention (CDC) standards. Data was analyzed using Statistical Package for Social Science (SPSS) software for windows, version 19. Frequency analysis, independent samples test and non-parametric tests were used to identify the distribution and compare means between the two groups. Microsoft Office Excel 2007 was used for creating graphs and observing trends within the

risk group, as also for comparing the two groups.

**Results and Discussions:** 68 students participated, 34 belonged to risk group (24 boys, 10 girls). There is a significant association between family history of ADHD and ADHD symptoms present in children ($X^2$ = 8.838, p = 0.003) by the Fisher's Exact Test.

In this study, there was no significant difference in the stressors that were faced by the mothers of the children in the risk group and the control group during pregnancy as per Fisher's Exact Test ($X^2$ = 2.061, p = 0.246). Only two parent participants of the risk group mentioned of a stressor during pregnancy which were bed bug sprays and passive smoking as a family member was an active smoker.

The average birth weight of the risk group was found to be 2.83 kg (2,800 g) with a minimum of 1.13 kg and a maximum of 4 kg with a standard deviation of ±0.64 and a standard error of 0.11. There was a significant difference in the birth weights of the risk group versus the control group by the Independent Samples z test. (z = 2.207, p= 0.031).

There was no difference between the two groups on the basis of duration of breastfeeding. ($X^2$ = 0.605, p = 0.895). There was a small difference of 8.8% of the mother's in the ADHD group who started weaning before 6 months as compared to the control group. Both the groups had similar kinds of complementary foods ($X^2$ = 4.784, p = 0.091).

76.5% of all the 68 children in the study were not on any kind of medication while 23.5% did consume them. Only one child in the risk group was under stimulant medication for hyperactivity. There was no difference in the kind of medications taken by the two groups ($X^2$ = 1.220, p = 0.875).

38.24% of the children in the control group showed visible signs of ill health as compared to 70.59% of the risk group. The checklist of possible symptoms of nutrient deficiencies was created using information from websites like [4]ProHealth by Blake Graham, 2009; [5]American Academy of Pediatrics, 2000 and [6]Nutrional Healing. None of the parents of the children in the control group, complained about poor memory or lack of concentration or vision issues, as compared to 8.82%, 2.94% and 2.94%, respectively, in the risk group.

There was no difference in the physical activity levels of the two groups in this survey ($X^2$ = 0.066, p = 0.5) by Fisher's exact test. However, there was no child who was involved in sports in either group.

Social media today could have a crucial influence on behavior patterns, especially in children. The time spent in these activities was not significantly different in the two groups in this research ($X^2$ = 2.412, p = 0.491) which could indicate, a rise in in-door leisure activities (lifestyle change) and thus decreased physical activity.

There was a negative relation between the weight of the child and the symptoms of ADHD, however, this result was not significant (r = -0.142, p = 0.125). There was no correlation between the height of the child and the symptoms of ADHD (r = 0.09, p = 0.408).

There was a strong inverse association between the number of symptoms for

ADHD and the waist circumference of the child (r = - 0.201, p = 0.05). Thus, as the number of symptoms of ADHD increased in the children, the waist circumference decreased. However, whether ADHD is a cause for a lower waist circumference or vice versa cannot be commented on.

A waist to height ratio (WHtR) higher than 0.5 has been proposed as a cutoff point for abdominal obesity in both sexes and at all ages. It is an indicator of metabolic risk. [3]The international standard of a cut-off of 0.5 may not hold true for all ethnicities and regions. In this study, 94% of the risk group and 67.6% were below or at the 0.5 cut-off suggested. Of those at risk for ADHD, 5.8% had a waist to height ratio greater than 0.5 as compared to 32.4% of the control group. There is a negative relationship between the number of symptoms of ADHD and waist to height ratio, however, this relationship is not significant (r = - 0.164, p = 0.09).

## Conclusion:

Family history seems to influence ADHD but some children with no issues had parents with signs of ADHD.. A low birth weight (z = 2.207, p < 0.05) may put the child at risk for ADHD. Poor memory, vision, and lack of concentration could be a cause or effect of nutrient deficiencies in those at risk for ADHD. Thus, genetic, environmental and nutritional factors may contribute influence the occurrence of ADHD in children; however, further research in this domain with large population groups is required.

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