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Research Paper

Diet intervention and ADHD symptoms with reference to gender, socio-economic status and area of residence

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■ **ABSTRACT :** This study is intended to provide a comprehensive overview of the role of diet intervention on the behaviour of a random group of male and female School going Children of different socio-economic status and area of residence who meet the DSM IV criteria for ADHD. Though there is a wealth of research studies on the association of diet and supplements with the ADHD symptoms, there has been minimal empirical research in India charecterising dietary intervention with gender, socio-economic status and area of residence. The present study was carried out with a questionnaire consisting of 25 questions in the form of five scale rating which was administered to the subjects in six sessions to determine the prevalence of ADHD symptoms during the diet intervention. School going children of age group of 4-12 years were assessed for ADHD symptoms using DSM IV criteria. Forty one male and nine females with ADHD symptoms were selected for the diet intervention study. This current pre post study establishes that elimination of chocolates, Maida, bakery confectionaries, soft drinks, and junk food in the diet and replacing with highly nutritive value foods as per the RDA can reduce the ADHD symptoms. The study also revealed that gender, socio-economic status or the area of residence doesnt play any role in the diet intervention of ADHD children though the prevalance of ADHD is more seen in the males.

■ **KEY WORDS:** ADHD – Attention deficit hyperactivity disorder, Diet intervention, Food elimination, School going children, DSM IV criteria

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Attention Deficit hyperactivity disorder is characterised by symptoms of in attention, Hyperactivity, distractibility, over activity and impulsivity Arnold *et al*. (2011). Research also shows that the symptoms of ADHD presented in female children and adolescents are different from male. Some studies have indicated that there are lower prevalence rates of ADHD in females (Lesley, 2000). Attention Deficit Hyperactivity Disorder is a disorder most commonly found in the school going children and drawing concern; medication / drugs is the common and most studied treatment to ADHD Cormier and Elder (2007). The concern to treat the ADHD symptoms in children is the need of the hour for the educators and the parents. Research indicates that diet modification in children with ADHD can exhibit substantial changes in

the symptoms of ADHD and behaviour Pelsser *et al.* (2009). Several studies conducted outside India revealed both in support and against the possibility of foods or additives causing behaviour disorders in ADHD children. Duca (2010); Waring and Lapne (2008) and Rucklidge *et al.* (2009). But there are not many studies to show the role of gender, socio-economic status and area of residence with refernce to the ADHD symptoms has been done in India. The present study is to determine the impact of diet interventiion on the behaviour of a heterogeneous random group of DSM 1V diagnosed children with ADHD aged 4-12 years in randomised controlled trial with refernce to the gender, socio economic status and area of residence.

■ RESEARCH METHODS

Hypothesis:

The null hypothesis is that there is no effect of Diet Intervention with ADHD diet on the ADHD scores of the subjects with refernce to the gender, socio-economic status and area of residence.

Definition of terms :

ADHD :

Attention Deficit Hyperactivity Disorder (ADHD) is a neurobehavioral disorder which affects 3 to 5 per cent of all school-going children. The disorder generally manifests itself before the age of 7 and is characterized by symptoms of inattention, impulsive behaviour and hyperactivity.

DSM-IV:

Diagnostic and statistical manual of mental disorders (DSM), published by the American Psychiatric Association (2013), offers a common language and standard criteria for the classification of mental disorders.

ADHD diet:

Hill and Taylor (2001) published a basic algorithm for treatment of ADHD with a protocol derived from standard recommendations and evidence, intended for outpatient medical clinic practice in secondary care. In this protocol the use of a few foods diet is being advised in predetermined cases of children with ADHD. Based on the previous established studies, the ADHD diet in this study refers to a diet which is with elimination of chocolates, confectionaries, maida products, junk foods and soft drinks whereas vegetables, fruits, rice, fish and meat are allowed every day as per the recommended daily allowances stated by the ICMR (2009). Occasionally the diet will be varied to avoid foods for which the child has a particular craving or dislike.

Chocolates:

Chocolate in the current study refers to a typically sweet, usually brown, food preparation of Theorem cacao seeds, roasted and ground, often flavoured, as with vanilla. Cocoa solids are a source of flavonoids and alkaloids, such as therobromine, phenethylamine and caffeine.

Maida products:

Maida products in the present study is any food items made from the refined flour that has had the germ and bran removed with a whitening agent added which contains a high proportion of starches, which are a subset of complex carbohydrate also known as polysaccharides. Maida products have lower proteincontent which makes the flour softer.

Bakery confectionery:

Bakery Confectionery is food items that are rich in sugar and carbohydrates. Confectionery is divided into two broad and somewhat overlapping categories, baker's confections and sugar confections. Bakers confectionery includes principally sweet pastries, cakes, and similar baked foods. Sugar confectionery includes sweets, candied nuts, chewinggum, sweetmeats and other confections that are made primarily of sugar.

Soft drink:

Soft drink in the current refers to any drink that typically contains carbonated water, a sweetener, and a natural or artificial flavouring. The sweetener may be sugar, high-fructose corn syrup, fruit juice, sugar substitutes (in the case of diet drinks), or some combination of these. Soft drinks also contain caffeine, colourings preservatives and other ingredients. Fruit juice, tea and other such non - alcoholic beverages are technically soft drinks by this definition but are not considered as soft drink in this research study.

Junk food:

Junk food is the term used in this study for food

containing high levels of calories from sugar or fat with little fibres, protein, vitamins or minerals and has little "nutritional value".

Methodology :

The methodology adopted to attain the objective of the present study is described below under various heads.

Ethics approved:

The study protocol was approved the Kerala state disability commissioner ate approved the study protocol and there by funded the project titled "Impact of Nutrition on Children with ADHD".

Sample:

Sample of current study consists of fifty children from the schools of Thiruvananthapuram district with ADHD.The sample screening was adapted based on DSM 1V diagnostic criteria and interview with parents and teachers.Selection of the sample was based on inclusion and exclusion criteria.

Inclusion criteria:

(a) ADHD diagnosed according to DSM-IV-TR (1); diagnosis based on structured psychiatric interview and standard questionnaires to be completed by teachers/ clinical psychologists, (b) Children aged between 4 and 12, (c) Children not taking medication such as methylphenidate, (d) Sufficient command of the Malayalam or English language

Exclusion criteria :

– Family circumstances hampering completion of the elimination diet,

– Children already on a diet or who has been diet in the past two months

– Children who were receiving behavioural therapy or medication at the time of registration.

Registration :

After the selection the samples were registered for the study. The sample selection and registration was done with the help of clinical psychologist and developmental therapist.

The procedure of the study includes the following steps; 1)Selection of sample on the basics of inclusion / exclusion criteria and psychometric tests 2) Registration, 3) Educating the parents/teachers/students about the need of the study,the procedure and the expected outcome, 4) Getting informed consent from the expected authorities and parents.

Assessment Materials and Methods :

Assessment of ADHD :

Assessment of ADHD was based on structured interview using DSM 1V criteria. The sample were assessed for ADHD by a clinical psychologist and developmental therapist using the structured interview with DSMIV, DSMV (Diagnostic and statistical manual of mental disorders (2013) based ADHD checklist.

Anthropometric measurements:

Height and Weight of children with ADHD were assessed using calibrated stadiometers and electronic scales. The height and weight was then compared with the standard growth chart of ICMR.

Dietary recall /Nutritional assessment procedure:

The 24 hr. diet recall/food recall was administered to the subjects by the dietician of CeDS to determine the nutritional status of the subjects.

Table A : Demographic characteristics of the sample

	Experimental group		Control group	
Based on gender	Male	Female	Male	Female
	25	5	16	4

	Experimental group		Control group	
Based on area	Rural area	Urban area	Rural area	Urban area
	12	8	8	12

Based on socio economic status	Experimental group			Control group		
	Under privelaged	Middle privelaged	Highly privelaged	Under privelaged	Middle privelaged	Highly privelaged
	4	22	4	0	12	8

ADHD behaviour/ symptoms questionnaire:

A questionnaire consisting of 25 questions in the form of five scale rating was administered to the subjects in six sessions to determine the prevalence of ADHD symptoms.

Six sessions were as follows: V_0=Intial score, V_1=Chocolate avoided score,V_2=Maida products avoided score, V_3=Bakery confectionaries avoided score, V_4=Soft drinks avoided score,V_5=Junk food avoided score.

Data analysis:

The pre and post study scores of the samples were subjected to statistical analysis using ANOVA

■ RESEARCH FINDINGS AND DISCUSSION

The results of the current study are illustrated in the tables. The Table 1 depicts that in the comparison using the ANOVA there is a significant difference in the male and female scores of ADHD symptoms after diet intervention ie eliminating chocolates. There is a critical difference of 4.45 in the male and female after eliminating chocolate and there is a significant difference in the score of ADHD after avoiding Maida and chocolate the difference is 9.5269. But there is no significant difference in the scores of ADHD in the male and female after eliminating bakery, soft drinks, and fast foods. Hence the current study reveals that gender plays no role in the ADHD scores and diet intervention

The Table 2 clearly indicates that in the ANOVA results there is no significant difference in ADHD symptom score after diet intervention based on socio-economic status.Socio economic status has no role in the ADHD symptoms especially in the process of elimination of diet.

The Table 3 clearly indicates that the ANOVA comparison there is no significant difference in the ADHD symptom score after diet intervention based on rural and urban residential area. The above ANOVA tables depicts that the ADHD scores reduced after eliminating chocolates, maida, bakery confectionaries, soft drinks and junk food found to be statistically significant. Similar results were reported by Duca in 2010 who explored the efficacy of elimination diet in the symptoms of ADHD in fifty children aged 4-12 years old and the study revealed that there was a significant decrease in symptoms of ADHD in children after elimination of diet. Yet another study of INCA by Pelssar

Table 1 : ADHD symptoms score of females and males after diet intervention

Sessions	Males	Females	Critical difference	F value
V-1(Chocolate avoided diet)	54.488	60.040	4.4532	6.51
V-2(Maida avoided diet)	25.7	13.440	9.5269	6.94
V-3(Bakery avoided diet)	13.316	16.740	11.230	-
V-4(Soft drinks avoided)	9.092	6.880	11.7684	-
V-5(Junk food fvoided)	4.704	3.200	13.1455	-

Table 2 : ADHD symptom score based on socio-economic status after diet intervention

Sessions	Under previlaged	Previlaged	Highly previlaged
V-1 (chocolate avoided diet)	54.050	55.359	57.075
V-2 (Maida avoided diet)	11.7549	15.2918	11.7549
V-3 (Bakery avoided diet)	12.7073	16.5307	12.7073
V-4 (Soft drinks avoided)	13.2893	17.2879	13.2893
V-5 (Junk food avoided)	14.5440	18.9201	14.544

Table 3 : ADHD symptom score after diet intervention based on rural and urban residential area

Sessions	Rural area	Urban area
V-1(Chocolate avoided diet)	57.425	54.072
V-2(Maida avoided diet)	20.700	25.628
V-3(Bakery avoided diet)	16.617	12.067
V-4(Soft drinks avoided)	4.300	11.672
V-5(Junk food avoided)	8.142	1.994

et al. (2009) revealed that the restricted elimination diet had a significant beneficial effect on ADHD symptoms. Several other studies too has shown the association of diet with ADHD symptoms (Goldstein and Ingersll, 2000; Jensen *et al.*, 2007; Molina *et al.*, 2009; Schnoll *et al.*, 2003 and Waring and Lapne, 2008). The current study clearly establishes that chocolate, Maida,bakery confectionaries,soft drinks, and junk food are associated with ADHD symptoms which need to be replaced by healthy/nutritive value rich foods.

Summary and conclusion :

Though several studies (Arnold, 2011; Joseph, 2010 and Lesley, 2000) revealed that ADHD is much more common among males than females. This Study showed that gender, socio-enocnomic status or area of residence doesn't play any role in ADHD symptoms during the diet intervention. This study further establishes that elimination of chocolates,Maida,bakery confectionaries, soft drinks, junk food in the diet can reduce the ADHD symptoms in school going children of age group 4-12.Diets that are associated with ADHD symptoms includes high levels of calories from sugar with little fibre, vitamins and minerals, rich in sugar and carbohydrates, caffeine, colourings, preservatives and other ingredients. Healthy diet which includes high proteins, vitamins, and omega 3 supplements has positive repute of efficiency.Hence it can be recommended that dietary intervention should be considered in children diagnosed with ADHD symptoms. Parent of children with ADHD should have thorough understanding of the role of healthy diet and the elimination of diet. Consultation of dietician should be taken before elimination of diet. If children do not exhibit any change in the ADHD symptoms after subjecting to elimination of diet and consuming healthy foods, only then standard medical treatment and drugs can be considered.

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