SUMMARY

A STUDY OF
ATTENTION DEFICIT HYPERACTIVITY DISORDER
AMONG ADOLESCENT STUDENTS IN RELATION TO GENDER
AND INTELLIGENCE

INTRODUCTION

Attention Deficit Hyperactivity Disorder (ADHD) is a neuro-behavioural disorder characterized by “inattention, and/or hyperactivity-impulsivity that is more frequent and severe than is typically observed in individuals at a comparable level of development” (American Psychiatric Association [APA], 1994). It is one of the most commonly diagnosed psychiatric disorders of childhood, with an estimated prevalence rate of 3-7% among school-age children (APA, 2000). Of those, up to 70% will continue to have symptoms in adolescence (Weiss & Hechtman, 1993). Adolescents with ADHD have a greater risk of impaired school performance, less participation in extra-curricular activities, increased potential for the incidence of juvenile delinquency and difficulty in social relationships (Barkley, Fisher, Edelbrock, & Smallish, 1993; Klein & Manuzza, 1991). The prevalence of ADHD and its effects on adolescents presents a challenge for health care professionals, educators, counselors and parents (Wiggins, 2001).

RATIONALE OF THE STUDY

The need for research can be gauged from the consequences of ADHD in absence of its early identification and appropriate treatment; these include school failure and drop out, depression, conduct disorder, failed relationships, underachievement in the workplace and substance abuse
The enormous impact of ADHD on society in terms of financial cost, stress to families, interference with academic and vocational activities, negative effects on self-esteem, motor vehicle accidents, drug and alcohol abuse, anti-social and destructive behaviours etc., has been well documented in studies in the US. However, a review of various studies from around the world suggests that ADHD is at least as high in many non-U.S. children; hence similar burden of illness would be expected elsewhere also including India (Climb Up).

ADHD is now being increasingly found to be afflicting young children and school students in India. Research about ADHD in the context of education is sparse in India and is mainly confined to pre-adolescents. The area of comparative study of prevalence of different sub-types of ADHD among adolescent boys and girls and also among adolescents with high and low intelligence has not been explored much. There is an acute need for research and awareness about the disorder in India so as to make information available not only to the parents of those afflicted with ADHD, but also to mainstream school teachers and educational planners.

The present study aimed at gaining greater understanding of ADHD which can be used to advantage in designing of appropriate educational strategies and creating effective teaching - learning environment for the adolescents belonging to different genders and intelligence level that are diagnosed with different sub-types of ADHD.
STATEMENT OF THE PROBLEM

“A STUDY OF ATTENTION DEFICIT HYPERACTIVITY DISORDER AMONG ADOLESCENT STUDENTS IN RELATION TO GENDER AND INTELLIGENCE.”

OPERATIONAL DEFINITIONS OF THE KEY TERMS USED

Attention Deficit Hyperactivity Disorder (ADHD): Attention Deficit Hyperactivity Disorder (ADHD) is a developmental and neurological disorder, present from childhood, which is characterized by developmentally inappropriate levels of inattention and/ or hyperactive – impulsive behaviour (Coleman & Levine, 1988; Murphy & Hagerman, 1992). In the proposed study, ADHD was operationally defined as the disorder diagnosed by the ADHD Rating Scale – IV developed by DuPaul, Power, Anastopoulos and Reid in 1998 based on the globally accepted symptoms listed in the criteria for ADHD in the fourth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) published by American Psychiatric Association. The rating scale was adapted to Indian conditions by the researcher by making it bilingual with the inclusion of Hindi translation of the English items.

Adolescent Students: In the present study, the term adolescent students referred to the school students reaching at the threshold of puberty, identified to be in the age group of 13 to 16 years studying in IX and X standards.

Intelligence: Intelligence here meant cognitive or mental ability of the individual as assessed in terms of I.Q. scores obtained in the Group Test of General Mental Ability developed and revised by Dr. S. Jalota in Hindi.
OBJECTIVES OF THE STUDY

1. To diagnose adolescent students for various sub-types of Attention Deficit Hyperactivity Disorder (ADHD), viz. ADHD predominantly inattentive type (ADHD-IT), ADHD predominantly hyperactive/impulsive type (ADHD-HI) and ADHD combined type (ADHD-CT).

2. To compare the prevalence of various sub-types of ADHD among adolescent girls and boys.

3. To assess whether the adolescent students with high and low intelligence differ in terms of prevalence of various sub-types of ADHD.

4. To study the interactional effect of gender and intelligence on prevalence of various sub-types of ADHD among adolescent students.

5. To suggest various remedial and supporting techniques which can be adopted by the educationists for the educational betterment of the adolescents diagnosed with ADHD.

HYPOTHESES

Following hypotheses were formulated and tested during the course of the study:

1. There is no significant difference between adolescent Boy and Girl Students in terms of occurrence of ADHD predominantly inattentive type (ADHD-IT).
2. There is no significant difference between adolescent Boy and Girl Students in terms of occurrence of ADHD predominantly hyperactive/impulsive type (ADHD-HI).

3. There is no significant difference between adolescent Boy and Girl Students in terms of occurrence of ADHD combined type (ADHD-CT).

4. There is no significant relationship between I.Q. and occurrence of ADHD predominantly inattentive type (ADHD-IT).

5. There is no significant relationship between I.Q. and occurrence of ADHD predominantly hyperactive/impulsive type (ADHD-HI).

6. There is no significant relationship between I.Q. and occurrence of ADHD combined type (ADHD-CT).

7. (a) Controlling for I.Q., Gender has no significant relationship with occurrence of ADHD predominantly inattention type (ADHD-IT).
   (b) Controlling for Gender, I.Q. has no significant relationship with occurrence of ADHD predominantly inattention type (ADHD-IT).

8. (a) Controlling for I.Q., Gender has no significant relationship with occurrence of ADHD predominantly hyperactive/impulsive type (ADHD-HI).
   (b) Controlling for Gender, I.Q. has no significant relationship with occurrence of ADHD predominantly hyperactive/impulsive type (ADHD-HI).

9. (a) Controlling for I.Q., Gender has no significant relationship with occurrence of ADHD combined type (ADHD-CT).
(b) Controlling for Gender, I.Q. has no significant relationship with occurrence of ADHD combined type (ADHD-CT).

10. There is no interactional effect of I.Q. and Gender on the occurrence of ADHD predominantly inattention type (ADHD-IT).

11. There is no interactional effect of I.Q. and Gender on the occurrence of ADHD predominantly hyperactive/impulsive type (ADHD-HI).

12. There is no interactional effect of I.Q. and Gender on the occurrence of ADHD combined type (ADHD-CT).

DELIMITATIONS OF THE STUDY

The present study was delimited in following aspects:

1. The study was confined to the 449 adolescent boys and girls of age group 13 to 16 years studying in IX and X standards in three co-education schools of Pathankot, a northern city of Punjab state of India.

2. ADHD was studied in relation to two variables - gender & intelligence for the above stated subjects.

POPULATION AND SAMPLE

Population of adolescent students in the present study consists of all the students studying in IX and X standards of Pathankot – a northern city of Punjab state of India situated at the tri-section point of Indian states of Punjab, Himachal Pradesh and Jammu & Kashmir. As the study demanded thorough involvement of school authorities and teachers, three co-educational schools of Pathankot which extended considerable
amount of cooperation and enthusiasm, were randomly selected to sample the population.

As the dependent variable in the study was a categorical variable (presence or absence of disorder), logistic regression analysis was required to be used for statistical analysis. Sample size calculation for logistic regression is considered to be a complex problem but based on the work of Peduzzi, Concato, Kemper, Holford, and Feinstein (1996), it was planned to involve 500 adolescent students studying in IX and X standards of the selected schools. But as the study required extended period of time for its conduct (because of lengthy measurement and diagnostic procedures involved), some of the subjects were gradually excluded from the study due to their one or other form of physical or mental ailments conflicting with the study. Finally, a cluster-sample of 449 students comprising of 178 adolescent girls and 271 adolescent boys, who were present throughout the study and about whom suitable data could be collated from their teachers, parents/ guardians and health care providers, was considered for study. The details of the schools and the students sampled are given below:

**School-wise Sample Details**

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Name of the School</th>
<th>No. of adolescent boys</th>
<th>No. of adolescent girls</th>
<th>Total no. of adolescent students</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Vidya Mandir Public School, Pathankot</td>
<td>47</td>
<td>38</td>
<td>85</td>
</tr>
<tr>
<td>2</td>
<td>Mahavir Public School, Pathankot</td>
<td>42</td>
<td>34</td>
<td>76</td>
</tr>
<tr>
<td>3</td>
<td>Army School, Pathankot</td>
<td>182</td>
<td>106</td>
<td>288</td>
</tr>
<tr>
<td></td>
<td><strong>Grand Total</strong></td>
<td><strong>271</strong></td>
<td><strong>178</strong></td>
<td><strong>449</strong></td>
</tr>
</tbody>
</table>
TOOLS USED

To realise the objectives of the present study, the following tools were used for data collection:

1. Group Test of General Mental Ability in Hindi by Dr. S. Jalota (A Standardised Test with good Reliability and Validity)

2. ADHD Rating Scale - IV by DuPaul, Power, Anastopoulos, and Reid with bilingual (English - Hindi) adaptation by Researcher (Adapted version standardised by the researcher)

3. Confirmatory diagnostic interviews with teachers, parents/guardians and health care providers of the ADHD susceptible students

DATA COLLECTION AND SCORING

It was a multi-stage study. In the first stage, the researcher visited various randomly selected schools of Pathankot to explore the feasibility of conducting the study. The heads of the schools were approached and the need and importance of the present study was explained to them. Three schools, which expressed the willingness for conducting the study on their students with active involvement of their teachers and other staff, were finally selected for the study purpose.

First of all, the Group Test of General Mental Ability in Hindi by Dr. S. Jalota was administered to the IX and X standard students of the selected schools as per the method described in the test manual. The scoring of the answer sheets was done with the help of the scoring stencil key by the researcher and the total score for each student was calculated. These point scores were converted into estimated Mental Age (MA) scores with the help of norms mentioned in the manual developed by Jalota (1984).
After knowing the Chronological Age (CA) of each student, the I.Q. score was calculated using the formula \( \text{MA/CA} \times 100 \).

In the second stage, for ADHD diagnosis, the researcher met the class teachers of the students and explained them the purpose of the study along with orienting them about their required contribution in the study. The teachers were then asked to rate the various behaviour parameters of their students using ADHD Rating Scale – IV. While selecting the teachers, it was ensured that they knew the students at least for last six months. The scale required the teacher to circle the number on a scale of 0 - 3 that best described the school behaviour of his/ her student over the past 6 months where 0 = Never or rarely; 1 = Sometimes; 2 = Often; and 3 = Very often. The raw scores of a student for ‘Inattention’ and ‘Hyperactivity-Impulsivity’ sub-scales were obtained by adding the circled numbers corresponding to all odd and even numbered items respectively. The total raw score was obtained by combining both the sub-scale scores. The raw scores were converted into percentile scores by using the appropriate scoring sheets provided along with the scale. Based on the prescribed cut off scores, the potentially susceptible students for various sub-types of ADHD were identified. In the last stage, the parents/ guardians of the students, thus identified, were approached through the school authorities. The researcher then took these parents/ guardians into confidence about the study and provided them the home version of ADHD RS – IV to rate the behaviour of their ward. The raw as well as percentile scores for each student were calculated as done for school version of ADHD RS – IV. The students who met the positive criteria for various sub-types of ADHD through both school as well as home versions of ADHD RS – IV were then selected for the confirmatory diagnosis.
Confirmatory diagnostic interviews were then conducted by the researcher with teachers, parents/guardians and health care providers of the above identified students to confirm whether their ADHD diagnosis conform to all the DSM-IV criteria. Based on these confirmatory diagnostic interviews, the final list of the adolescent students diagnosed with various sub-types of ADHD was prepared.

**STATISTICAL TECHNIQUES USED**

In order to analyse and understand the data better, the mean I.Q. scores were calculated for boys, girls and total students. Then, the prevalence percentages of all ADHD sub-types were calculated for different groups. The I.Q. versus ADHD prevalence data for boys as well as girl students was tabulated and graphically plotted using frequency intervals and frequency bar statistics.

As the various hypotheses to be tested involved dichotomous outcome (presence or absence of disorder) predicted by one or more variables, logistic regression analysis was used for statistical analysis.

Ordinary regression deals with finding a function that relates a continuous outcome variable (dependent variable $y$) to one or more predictors (independent variables $x_1$, $x_2$, etc.). Simple linear regression assumes a function of the form:

$$y = c_0 + c_1 * x_1 + c_2 * x_2 + \ldots$$

and finds the values of $c_0$, $c_1$, $c_2$, etc. ($c_0$ is the intercept or constant term).

Logistic regression is a variation of ordinary regression, useful when the observed outcome is restricted to two values, which usually represent the occurrence or non-occurrence of some outcome event i.e. the outcome is measured with a dichotomous or binary variable usually coded as 1 (presence of disorder, true, success, etc.) or 0 (absence of disorder, false,
failure, etc.). It produces a formula that predicts the probability of the occurrence as a function of the independent variables. Logistic regression fits a special s-shaped curve by taking the linear regression (above), which could produce any y-value between minus infinity and plus infinity, and transforming it with the function \( p = \frac{e^y}{1 + e^y} \) producing p-values between 0 (as y approaches minus infinity) and 1 (as y approaches plus infinity). This now becomes a special kind of non-linear regression called logistic regression. (Pezzullo & Sullivan)

Logistic regression generates the coefficients (and its standard errors and significance levels) of a formula to predict a logit transformation of the probability of presence of the characteristic of interest:

\[
\text{logit}(p) = b_0 + b_1X_1 + b_2X_2 + b_3X_3 + \ldots + b_kX_k
\]

where \( p \) is the probability of presence of the characteristic of interest. \( b_0, b_1, b_2, \ldots b_k \) are the regression coefficients of the regression equation. An independent variable with a regression coefficient not significantly different from 0 (P>0.05) can be removed from the regression model. If P<0.05 then the variable contributes significantly to the prediction of the outcome variable.

Online programme on Logistic Regression (Version 05.07.20) by John C. Pezzullo available as interactive web page at http://statpages.org/logistic.html (Pezzullo & Sullivan) was used to perform various logistic regression analyses. The programme was chosen for being quite user friendly and easier to use. It supports the import and export of data from and to spreadsheets and word documents. Moreover, it provides the options of feeding the data as records at individual level or as summary information. The programme performs logistic analysis providing immediate and accurate results (verifiable by other statistical
software like SPSS). The programme generates the coefficients of a prediction formula (and standard errors of estimate and significance levels), and odds ratios (with 95% confidence intervals).

**MAIN FINDINGS**

1. Out of total 449 students, a total of 48 students (10.69%) were found to be suffering from ADHD of various sub-types. The study identified 36 students to be suffering from ADHD predominantly inattentive type (ADHD-IT), 5 students with ADHD predominantly hyperactive/impulsive type (ADHD-HI) and 7 with ADHD combined type (ADHD-CT). The prevalence rate of ADHD-IT, ADHD-HI and ADHD-CT among adolescent students thus came out to be 8.02%, 1.11% and 1.56% respectively.

2. Out of total 178 adolescent girls involved in the study, 9 were diagnosed with ADHD-IT and 1 each with ADHD-HI and ADHD-CT showing prevalence rate of 5.06%, for ADHD-IT and 0.56% each for ADHD-HI and ADHD-CT.

3. A total of 271 adolescent boys were included in the study. 27 out of them were diagnosed with ADHD-IT, 4 with ADHD-HI and 6 with ADHD-CT giving rise to the prevalence rates of 9.96%, 1.48%, and 2.21% respectively.

4. Prevalence rates for all the three sub-types of ADHD seem to be higher among adolescent boys than adolescent girls but after testing the corresponding hypotheses it is concluded that the adolescent boys and girls do not differ significantly in terms of occurrence of ADHD-IT, ADHD-HI and ADHD-CT.

5. The results of the hypotheses testing the relationship between intelligence and occurrence of various sub-types of ADHD
revealed that the probability of occurrence of ADHD-IT increases with decrease in intelligence in adolescent students while the probability of occurrence of ADHD-HI as well as that of ADHD-CT is not correlated with intelligence in adolescent students.

6. The hypotheses were also tested to know the effects of independent variables on the occurrence of various sub-types of ADHD in controlled conditions. It was found that controlling for gender, the probability of occurrence of ADHD-IT decreases with increase in intelligence while controlling for intelligence, gender has no significant correlation with the occurrence of ADHD-IT. It also followed that controlling for each other, gender and intelligence have no statistically significant relationship with occurrence of ADHD-HI as well as that of ADHD-CT. The results are similar to the previous hypotheses tested in uncontrolled conditions.

7. The hypotheses testing the interactional effects of both the independent variables i.e. Intelligence and Gender proved that these variables do not have any interactional effect on the occurrence of any sub-type of ADHD be it ADHD-IT, ADHD-HI or ADHD-CT.

**Remedial and Supporting Measures for Adolescents with ADHD**

Summary of the various remedial and supporting insights about the disorder, arrived on the basis of personal interactions with parents and teachers of ADHD students along with qualitative analysis of the relevant research studies and guidelines, is given below:

- Stimulants based medications can be tried with caution for their possible abuse and side effects among adolescents with
severe ADHD which may improve the core symptoms of ADHD. However, the medication should be the part of a comprehensive care package including psychological and educational components. In fact the most effective treatment approach for ADHD is multimodal approach consisting of medical, educational, behavioural and psychological interventions involving parental and school supports.

- ADHD students should be encouraged to participate in sports or other recreational activities as a part of psychosocial interventions to promote their social skills and self-esteem and to improve their positive relationships with peers and family members.

- The group training programme based on the principles of social learning theory should be organised for the parents of ADHD children/adolescents. This will not only help them in dealing with their wards effectively but also in transcribing to their wards the important principles of social learning. Group psychological treatment or social skills training programmes should also be organised for young adolescents with ADHD. In fact peer-tutoring or peer-influencing approaches should be used for achieving classroom goals. For older adolescents, individual psychological therapy should be considered.

- One should be consistent in dealing with ADHD adolescents making generous use of positive reinforcement to enhance their work productivity. There should be occasional use of immediate and systematic negative consequences for disruptive or inappropriate behaviour.
- Efforts should be made to inculcate problem-solving, communication and self-advocacy skills among ADHD adolescents. They should also be actively involved in school planning and management teams as student representatives.

- Parents and school officials should work in coordination with each other to ensure the consistent, simultaneous, and quick adoption of behavioural interventions for better results. There should be better and more frequent communication between parents and school authorities.

- There should be trained teachers for providing proper behavioural interventions in the classroom. They may teach ADHD students in the regular classroom with minor adjustments. However, the intensity of the disorder sometimes may require specialized education services which can be explored with the involvement of experts of the relevant fields.

- Some of the core symptoms of ADHD like limited attention, persistence, and disorganization may require changes in the curriculum and student work load.

**EDUCATIONAL IMPLICATIONS**

The educationists should put more efforts in getting better insight about ADHD-IT symptomology and corresponding remedial-cum-supporting techniques for adolescent students as the prevalence rate of ADHD-IT among adolescent students is more than other two sub-types of ADHD (viz. ADHD-HI and ADHD-CT). As adolescent boys and girls do not differ significantly from each other in terms of prevalence of any of the ADHD sub-types, a carefully drafted common educational strategic plan would serve ADHD students of both the genders equally well. The
adolescent students with low intelligence level in general are more prone to ADHD-IT while other two ADHD sub-types are not correlated to intelligence level of the students. This highlights the need to carefully monitor the adolescent students with below average intelligence level for the symptoms of inattention. The teacher should report the susceptible cases to the concerned authorities including health practitioners for proper diagnosis and remediation. Education planners, school authorities and teachers should be aware of the most effective multimodal treatment approach for ADHD comprising of medical, educational, behavioural and psychological interventions requiring their active involvement. Curriculum planners should be considerate towards the special needs of ADHD adolescents while deciding about the curriculum and study work load for them taking into account their limited attention, persistence, and disorganization. School authorities should provide sufficient opportunities to ADHD adolescent students to participate in co-curricular activities like sports and cultural events to develop healthy peer relationships and to improve their social skills and self-esteem. Schools should organise the specifically designed social skills training programmes for the ADHD adolescents as well as for their parents. Along with these group psychological treatment programmes, the individual psychological therapy sessions with experts should be organised for older adolescents requiring more intense treatment. The school authorities should actively involve the ADHD adolescents in school planning and management by nominating them to corresponding teams and committees of students. They should also try to devise a strong communication channel with the parents of the concerned students which could be in the form of a daily journal of student’s general conduct to be shared with the parents on daily basis. Teachers should be properly trained for dealing with ADHD adolescent students. ADHD
students can be taught in the regular classroom with minor adjustments. However, in case of intense form of the disorder, the specialized education services can also be organised with the involvement of experts of the relevant fields. Teachers should be consistent in dealing with ADHD adolescents making generous use of positive reinforcement to enhance their work productivity along with occasional use of immediate and systematic negative consequences for disruptive or inappropriate behaviour. They should adopt peer-tutoring or peer-influencing approaches for achieving classroom goals. Special emphasis should be given to train the students in problem-solving, communication and self-advocacy skills.

**SUGGESTIONS FOR FURTHER RESEARCH**

The present study was a descriptive correlational study meant to get better insight about the ADHD disorder. Future studies involving devising and testing suitable intervention techniques for the educational betterment of adolescent students would prove to be of great significance for these students.

As only two independent variables viz. intelligence and gender were involved in the present study, the future research studies could aim at studying relationship of other variables with ADHD like socio-economic status and family environment of students.

ADHD can be viewed in positive light too as from presidents and inventors to artists and musicians, many famous people with adult ADHD succeeded beyond their wildest dreams (Jacobs & Wendel, 2010). Hence, instead of considering the ADHD behavioural features as deficits, teachers should perceive the same as different learning styles and should try to use the same for pedagogical purposes. This could be a vital focus for further research.