



## Impact of Attention Deficit Hyperactive Disorder Among Hearing Impaired Children

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**Abstract:** Attention Deficit Hyperactive Disorder (ADHD) is a common neuropsychological disorder. Current study focused on identifying ADHD among Hearing Impaired Disorder (HIC) and measuring its impact upon academic achievements of HIC. The study also found out the relationship of ADHD with degree of hearing loss. The target population of the study was all Government institutions of special education for HIC of Southern Punjab. 701 students and 292 parents of HIC participated in the study. Data collection tool was adopted from Diagnostic Statistical Manual (DSM-5) of Mental Disorder (Fifth Edition). One way ANOVA was applied to analyze collected data. ADHD (predominant impulsivity) was found 48% and ADHD (predominant inattention) was recorded 29%. Degree of hearing loss has no relation with ADHD. The ratio of ADHD was found high in males as compared to females HIC. Screening services, skilled staff and proper guidance to parents was recommended to deal students with ADHD.

**Key Words:** ADHD, Hearing Impaired Children, Impulsivity, Hyperactivity, Inattention

### Introduction

Attention Deficit Hyperactivity Disorder (ADHD) is grouped in disruptive behavior problem. It is a neuropsychiatric condition ([Barkley, 2006](#); [Conners, 2000](#); [Palmer & Finger, 2001](#); [Rafalovich, 2001](#); [Rothenberger & Neumärker, 2005](#)). It is a combination of inattention and hyperactive behavior, inattention characterizing difficulties in gaining attention, following directions, and being seemingly careless in direct conversation while in hyperactivity over activity, over efficiency, and impulsivity is dominant. The American Psychiatric Association has identified three types e.g. ADHD (predominant Inattention), ADHD (predominant impulsivity) and combination of both where each has different symptoms. However, current study followed only two categories.

Gratification delay is identified as a major symptom of ADHD ([Barkley, 2006](#)). Parents of HIC usually complaint about the behavior of their children because they are unaware about that

particular behavior disorder by name. They often criticized child's unrest behavior but they never considered it as a disorder.

[Still \(1902\)](#) described ADHD as a defect of moral control but without an impairment of intellect. Teaching is not only concerned with delivering contents to the children. Objectives of the curriculum cannot be fulfilled without effective teaching. Therefore, it is necessary for students to pay attention towards the lesson as well as for teachers to grasp students' concentration before starting the lesson and during the lesson. To achieve the goals of curriculum or objectives of the particular lesson, involvement of learner and teacher is an integral part.

Several studies reported ADHD as a most common disorder, affecting about 6-9% youth and 3-5 % adults ([Dopheide & Pliszka, 2009](#) & [Froehlich et al., 2007](#)). Similarly, [Scahill & Schwab-Stone \(2000\)](#) discovered ADHD as the most

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common behavioral disorder in children, affecting about 5% to 10% of school-age children. In addition, previous studies also declared that ADHD more frequent in males as compared to females the ratio recorded as 1:3 (Biederman & Faraone, 2004; Lindemann et.al, 2012).

Kaplan, Gheen and Midgley (2002) noted male students more disruptive in nature as compare to female students. Stephenson, Martin and Linfoot (2000) also agreed with the fact that male students exhibited more behavior problems as compared to female students. Kovacs & Devlin (1998) declared ADHD among HIC become more problematic and complex. Similarly, Mitchell & Quittner (1996) recorded poor auditory system, attention problems and only visual clue works here. Ruff & Rothbart (1996) listed memory problems in HIC whereas Leigh, Robbins, Welkowitz, and Bond (1989) identified social adjustment problems among HIC.

Frank-Briggs (2011) pointed common symptoms present in a child with ADHD include constantly motion, playing with whatever is in sight, or talk incessantly, blur answer before completion of question at school, squirm and fidget in their seats, roam around the room, wiggle their feet, touch everything, noisily tap their pencil, restless.

Hearing Impaired children are already suffering from many psychological and attention problems, so the probability of prevalence of ADHD increased. Feldman, Heidi and Irene (2007) described ADHD in terms of body functioning and performing various activities. With respect to body functioning although everything looks normal but children with ADHD usually show low IQ score. Alderson, Kasper, Patros, Hudec and Lea (2015) stated poor usage of working memory especially auditory memory and McBurnett, Pffifner and Frick (2001) detected low cognitive skills in ADHD children. Ross & Ross (1976) observed a brain dysfunction in hyperactive

children. Barkley, Fischer, Edelbrock and Smallish (1990) indicated children suffering from ADHD showed poor grades and low academic achievement level.

Ross and Ross (1976) supported the idea of link between brain dysfunction and deviant behavior with respect to performing activities, Child with ADHD has limited social participation, low social adjustment level, low school performance, repeated grades, and required additional academic services and sometimes needed to be a part of special education classes. So they show a high prevalence of tutoring, extra time services in school, after school programs to address deficit body functioning and require special efforts to cope with poor activity performance. These special efforts may become fruitful in decreasing dropout rate and failure rate among ADHD children.

Alderson, Kesper et al., (2013) found deficits in working memory especially auditory memory among inattentive children whereas McBurnett et al., (2001) added slow cognitive approach. Faraone et al. (1993) stated ADHD also has so many secondary effects the most visible and observable one is low academic achievements level. Barkley et al., (2006) connected ADHD with sub average school performance and Serra-Pinheiro et al., (2008) linked ADHD with very slow progress in studies. Feldman, Heidi and Irene (2007) reported a high ratio of dropout, expelled from school, suspended or repeating various courses among ADHD children. Previous studies also added the presence of learning disabilities in children with ADHD (Douglas & Peters, 1979; Richards, Samuels, Turnure, & Ysseldyke, 1990; Rosenthal & Allen, 1978; Taranowski, Prinz, & Nay, 1986).

Different HIC have different hearing level depending upon the degree of hearing loss. Unit for hearing assessment is decibel. Clark (1981) classified hearing impairment into following categories.

**Table 1.** Classification of Hearing Levels

S. No	Hearing Level	Hearing Assessment in Decibels
1	Normal Hearing	-10db to 15db
2	Slight Hearing Loss	16db – 25db
3	Mild Hearing Impairment	26db – 40db
4	Moderate Hearing Impairment	41db – 55db
5	Moderate to Severe Hearing Impairment	56db – 70db
6	Severe Hearing Loss	71db – 90db
7	Profound Hearing Impairment	more than 90db

Current Study was very helpful for special educators, educational administrators, policy makers, psychologists, parents and general public. Moral and behavior training is an integral part of the education. The current study was an attempt to aware people to identify ADHD child. The study was important to control secondary effects of ADHD

## **Theoretical Framework**

Yeschin (2000) considered the psychoanalytical theory of object relations helpful in understanding the psychological and social problems connected with a child having ADHD, it linked the responses of child with ADHD via dynamic intera and interpersonal processes. Evans and Foster (2001) recommended interactional model of synchrony to explain ADHD. Various psychological models consider impulsiveness as poor behavioural inhibition but [Kuntsi & Stevenson \(2000\)](#) suggested hyperactivity in ADHD as a diminished activity in the brain's behavioural inhibition system. [Kuntsi and Stevenson \(2000\)](#) also stated energetic state of person with ADHD depends upon different aspects of inhibition system. [Schachar, Mota, Logan, Tannock and Klim \(2000\)](#), pointed out that stimuli in the environment act as an indicator for activation and inhibition of responding.

[Bailey \(2000\)](#); Berlin et al., (2004) considered Barkley's theory of ADHD as most prominent theory of ADHD. It proved to be helpful in understanding ADHD in all dimensions. Barkley's theory focused the learner with ADHD, which highlighted the neurocognitive functioning of the learner with ADHD. Barkley, Edwards, Laneri and Fletcher, (2001) stated involvement Bronowski's theory of language that revolved around the behavioural inhibition, executive functions and self-regulation regulation. ([Quay & Hogan, 1999](#); Berlin et al., 2004) pointed four major executive functions adversely affected in a child with ADHD in Barkley's theory. These four executive functions included working memory, speech, self-regulation and reconstitution. The target population of the study consisted of HIC, not having developed speech, so only three executive functions working memory, self-regulation and reconstitution was not included for the study.

## **Working Memory**

Working memory kept the events in respective

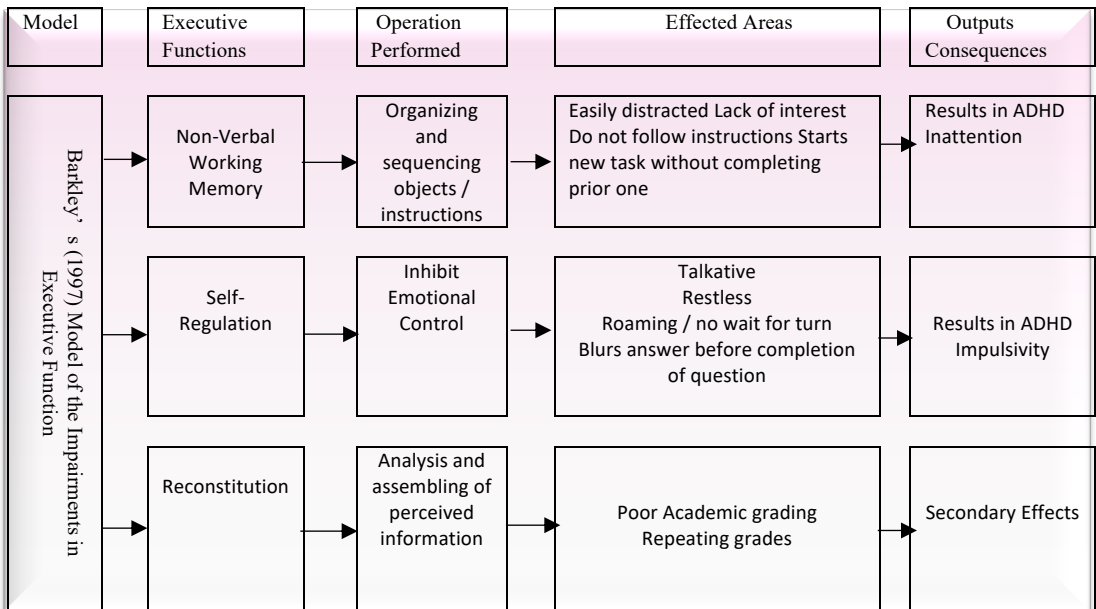
sequence which seemed to be problematic. Consequently, students with ADHD exhibited problems in retaining information, linking it and sequencing new instructions. Such children who have impaired working memory faced difficulties in managing time. Barkley's model recognized non-verbal working memory as a significant feature to be developed (Berlin et al; 2004). The functioning of working memory is linked with concentration and attention paid by a person. Thus, this part of theory supported to identify ADHD predominantly inattention. Children with ADHD /Inattention faced problems in organizing, objects and time management of tasks, consequently failed to follow teacher's instructions. This lack of attention led to lack of interest so they distracted easily, and usually started new task in class without completing prior one. Learners who have deficit working memory, faced difficulties in processing new information, anticipating their own future behaviour and understanding the passing of time.

## **Self-Regulation of Affect, Motivation and Arousal**

Human brain represents information in four forms namely affective, appetitive, motivational and arousal sense. Individual with ADHD usually find hard to handle emotional conditions like anger, sadness, happiness, anxiety, frustration, feeling upset in a positive manner. Which causes impulsiveness in them for a long span of time as compared to normal peers. It also becomes a reason in self-regulating emotions. The researcher used this feature of theory to identify the child with ADHD predominant Impulsivity or hyperactivity. This inhibits emotional control resulted in talkativeness, roaming around the room, running meaninglessly, restlessness, and unnecessary interruption, etc.

## **Reconstitutions**

Reconstitution include investigating and assembling internally perceived information and behavioural structures linked with this information. Learner with ADHD usually found it hard with behaviour that is based upon certain rules. The researcher linked poor academic achievement level with low degree of analyzing and assembling information.



**Figure 1:** Barkley's (1997) Model of the Impairments in Executive Function

### Objectives

The current study focused on the following objectives to

1. identify Attention Deficit Hyperactive Disorder among Hearing Impaired Children at elementary level
2. correlate the degree of hearing loss and ADHD
3. find out the impact of ADHD upon academic achievements of the HIC
4. trace out the prevalence of Attention Deficit Hyperactive Disorder gender wise

### Data Collection Tools

Two types of data collection tools were used by the researcher. An observational sheet was used to directly record the behaviour of hearing-impaired children in class by the researcher for a period of six months. A questionnaire was prepared to conduct a survey from parents of hearing-impaired children. This questionnaire was distributed among 300 parents but 292 questionnaires were finally included in the study the return rate was 97%.

Total 18 items were present in the data collection tools (observational sheet and

Questionnaire). These items were adopted from, The Diagnostic and Statistical Manual (DSM V) of Mental Disorders (Fifth Edition). Nine out of the 18 items were used to measure ADHD Inattention and remaining 9 were used to measure ADHD impulsivity among students. If 6 out of these 9 items were consistently exhibited by the child, the prevalence of ADHD is accepted.

Before recording observation of students' researcher collected bio data of the students related to their family and Student's hearing level. For the purpose researcher contacted Audiometerist of school and got the hearing assessment report collected there after pure tone audiometry. Result of students was also recorded to check the achievement level of students. Academic achievement of the students is recorded at average (greater than 45% and less than 70%), below average (less than 45%) and above average (greater than or equal to 70%) levels based on the %age marks secured in last final examination.

The observation of students was recorded in a separate observational sheet. Students were observed for a period of six months. On the basis of recorded data presence of ADHD was identified and recorded in SPSS 17 for further processing.

Observed data is recorded analyzed and then assessment of each participant included in the sample was made. So, total 993 students where 701 students on the basis of direct classroom observation through observational sheet and 292 on the basis of data recorded by the parents of HIC through questionnaire were assessed for ADHD.

All HIC enrolled in government special education institutes of southern Punjab were included in the target population of the study. There are 27 institutions in Bahawalpur division. Total population is 1610 and sample of 701 students and 292 mothers were selected by random sampling methods.

**Table 2.** Distribution of Population and Sample

District	Population		Sample	
	Frequency	% age	Frequency	% age
Bahawalpur district	703	44	330	47%
Rahimyarkhan	486	30	209	30%
Bahawalnagar	421	26	162	23%
Total	1610	100	701	100

### Data Analysis

SPSS 20 was used for the data analysis of collected data. F- Test was applied to find out the impact of

ADHD upon the academic achievements and hearing level of hearing-impaired children.

**Table 3.** Gender Wise Frequency Distribution in Sample

Gender	Students Observation		Parents Observation	
	F	%	f	%
Male	457	65.2	194	66.4
Female	244	34.8	98	33.6
Total	701	100.0	292	100.0

Ratio of male and female hearing-impaired children in parents and student's data was found almost same. Student's data have 65% male and

35% female and parents' data have 66% male and 34% female HIC.

**Table 4.** Frequency Distribution of HIC with respect to Hearing Level

Child Hearing Level	Student Data		Parents Data	
	F	%	f	%
Moderate	10	1.4	6	2.1
Severe	144	20.5	65	22.3
Profound	547	78.0	221	75.7
Total	701	100.0	292	100.0

Hearing impaired children have different hearing level, table 3 shows 21% severe, 1% moderate and 78% profound children were found

in students observed at school and 2% moderate, 22% severe and 76% profound HIC were present in data collected from parents.

**Table 5.** Frequency Distribution of Academic Achievement Level

Academic Achievements	Student's Data		Parent's Data	
	F	%	f	%
Below Average	153	21.8	47	16.1
Average	354	50.2	163	55.8
Above Average	194	27.7	82	28.1
Total	701	100.0	292	100.0

Table 4 represents 50% students with average, 28 % with Above Average and 22% with below average academic achievement level in student Data. Parents' data column indicates that

16% students with below average, 56% with average and 28% show above average academic achievement level.

**Table 6.** Frequency Distribution of Attention Deficit Hyperactive Disorder

ADHD	Student's Data		Parent's Data	
	f	%	f	%
Inattention	209	29.8	65	22.3
Impulsivity	340	48.4	140	47.9

Data present in table 6 shows 22.3% hearing impaired children with ADHD/Inattention and 47.9% HIC with ADHD Impulsivity according to

data recorded from parents while 29.8% with ADHD/Inattention and 48.4% HIC with ADHD impulsivity found in data recorded by students.

**Table 7.** Gender wise Distribution of ADHD

ADHD	%	Student's Data			Parent's Data		
		Count	Male	Female	Total	Male	Female
Inattention	% Within group	68.4	31.6	100	84.6	15.4	100
	% of Total	20.4	9.4	29.8	18.8	3.4	22.3
Impulsivity	% within group	71.7	28.3	100	71.4	28.6	100
	% of Total	34.8	13.7	48.5	34.2	13.7	47.9

Data recorded from parents showed 84.6% male and 15.4 % female with ADHD inattention and 71.4% male, 28.6% female with ADHD impulsivity on the other hand data recorded from

parents showed 68.4% male, 31.6% female hearing impaired children were with ADHD inattention and 71.7% male, 28.3% male with ADHD impulsivity or hyperactivity.

**Table 8.** Frequency Distribution of Academic Achievement Level among ADHD Hearing Impaired Children

ADHD	%age	Below average		above average		Total	ADHD	%age	Below average		average		
		Parent	Student	Parent	Student				Parent	Student			
Inattention	Count	18	65	39	113	Inattention	Count	18	65	Impulsivity	Count	25	89
	% within group	27.7	31.1	60	54.1		% within group	27.7	31.1		% within group	18	25.7

Table 8 presents that from students' data with ADHD Inattention children 31.1% were with below average academic level, 54.1% average and 14.8% at above average academic and students with ADHD Impulsivity 25.7% were at below average, 54.6% at average and 19.8% at above average academic achievement level. Table also denoted that in parents' data prevalence of ADHD Inattention is

22.3% out of which 27.7% students were at above average academic achievement level, 60% at average academic level, and remaining 12.3% with above average academic achievement level while for ADHD Impulsivity out of 47.9% of hyperactive hearing-impaired children 18% showed below average, 60% average and 22% above average academic achievement level.

**Table 9.** Effect of ADHD /Inattention upon Level of Academic Achievement (Students' Data)

	ANOVA	Sum of Squares	DF	Mean Square	F	Sig.
ADHD Inattention	Between Groups	6.326	2	3.163	15.730	.000
	Within Groups	140.361	698	.201		
	Total	146.688	700			

Table 8 shows that effect of ADHD / Inattention is significant upon Academic Achievements. It shows that value of  $F=15.730$  is significant at the level of 0.05. Degree of freedom

for the F is between 2 and 698. It can be inferred from the table that  $F(2,698) = 15.730$  is significant  $< 0.05$ .

**Table 10.** Effect of ADHD/Impulsivity on Academic Achievements Level (Students' Data)

	ANOVA	Sum of Squares	df	Mean Square	F	Sig.
ADHD/Impulsivity	Between Groups	5.538	2	2.769	11.400	.000
	Within Groups	169.054	698	8.243		
	Total	174.592	700			

Table 10 reveals that F value of 11.4 at the significance level of less than 0.05. Degree of freedom for F is between 2 and 698. It can be

stated that  $F(2,698) = 11.400$  is significant ( $< 0.05$ ). This value indicates strong effect between groups and within groups.

**Table 11.** Effect of ADHD/Inattention on Academic Achievements Level (Parents' Data)

	ANOVA	Sum of Squares	df	Mean Square	F	Sig.
Between Groups		2.536	2	1.268	7.636	.001
Within Groups		47.995	289	.166		
Total		50.531	291			

Table 11 represents that effect of ADHD / Inattention is also significant upon Academic Achievements according to the data collected from parents. It shows that value of  $F=7.636$ , is

significant at the level of 0.05. Degree of freedom for the F is between 2 and 289. It can be concluded from the table that  $F(2,289) = 7.636$  is significant  $< 0.05$ .

**Table 12.** Effect of Academic Achievement Level upon ADHD/ Impulsivity (Parents Data)

	ANOVA	Sum of Squares	Df	Mean Square	F	p
Between Groups		1.182	2	.591	12.383	.014
Within Groups		71.694	289	.248		
Total		72.877	291			

Table 12 represents that effect of ADHD / Impulsivity is also significant upon Academic Achievements according to the data collected from parents, it is found that value of  $F=12.383$ , and

$p=0.014$  is significant at the level of 0.05. Degree of freedom for the F is between 2 and 289. It can be concluded from the table that  $F(2,289) = 12.383$  is significant  $< 0.05$ .

**Table 13.** ADHD/ Inattention and Child’s Hearing Level

ADHD	%age	Student’s data				Parent’s Data			
		Moderate	Severe	Profound	Total	Moderate	Severe	Profound	Total
Inattention	Count	5	41	163	209	1	14	50	65
	% within group	2.4	19.6	78.0	100	1.5	21.5	76.9	100
Hyperactive	Count	6	68	266	340	3	27	110	140
	%within group	1.8	19.8	78.5	100	2.1	19.3	78.6	100

Table 13 presents that 29.8% children with ADHD predominant Inattention and 2.4% have moderate hearing level, 19.6% have severe hearing loss and 78% profound level of hearing loss in student’s data while in parents’ data from 22.3% children with ADHD/Inattention 1.5% have moderate hearing loss, 21.5% have severe hearing loss and remaining 76.9% have profound level of hearing loss. According to the table 11 out of 48.5% children who show ADHD/impulsivity 1.8% have moderate level of hearing loss, 19.8% have severe hearing loss and 78.5% have profound level of hearing loss in student’s data. While in parent’s data out of 47.9% children who show ADHD/impulsivity 2.1% have moderate level of hearing loss, 19.3% have severe hearing loss and 78.6% have profound level of hearing loss.

language access early in childhood. Therefore, hearing loss may be considered the reason for high rate of ADHD among HIC.

The current study identified almost equal ratio of ADHD impulsivity among HIC from both sources i.e., parents of HIC and Students’ direct observation in classrooms. However, results for ADHD inattention were not found relatively similar. It was high from students’ perspectives as compared to parents’ perspectives. It clearly shows that child’s hyperactive behavior is equally noticed both at school and at home too whereas parents ignore inattention behaviour present in their hearing-impaired child. One of the reasons is that parents consider hearing problem as a possible reason of inattention and they usually ignore their child’s inattention.

### Conclusion and Discussion

Current study was an attempt to identify co-occurrence of hearing loss and ADHD and its impact upon academic achievements of students. The study revealed the presence of ADHD among hearing impaired children is fivefold high as compared to normal hearing children. Dopheide and Pliszka (2009) and [Froehlich et al., \(2007\)](#) reported 3-5 % normally hearing school going children with ADHD while previous studies, Parasnis et al. (2003) and Sibley (2015) also reported a higher rate (up to 38.7%) of ADHD among HIC. Hearing loss might be one of the reasons of higher rate of ADHD occurrences among HIC as (Miller, (1980); Morgan and Vernon, (1994) concluded hearing impairment with similar symptoms to ADHD inattention including looking around the room and seeking visual cues and (Marschark, 1993) found hyperactivity among HIC due to the lack of

The results of the study are consistent with the findings of previous studies ([Biederman & Faraone, 2004](#); Lindemann et al. 2012; Parasnis, 2003; Sibley, 2015) that found ADHD more frequent in males as compared to females. ADHD inattention and ADHD impulsivity both represented almost same ratio 71% for males and 29% for females.

ADHD has significant impact upon academic achievements of the students. The results supported the prior studies that found relationship between poor academic achievement level of children and ADHD (Faraone et al., 1993; Barkley et al., 2006; Serra-Pinheiro et al., 2008; Feldman, Heidi & Irene, 2007). The majority of hearing-impaired children with ADHD showed average level in academic achievements and secured 50 to 60 percent marks. The study revealed that among students with ADHD inattention number of low achievers raised and



number of high achievers fell down as compared to ADHD impulsivity. Almost equal percentage (54-60) of students was recorded at average level of academic achievement. It shows that the lack of concentration of ADHD inattention has adverse effect upon the academic achievement of the hearing-impaired children. ADHD impulsivity and ADHD inattention have no significant effect upon degree of hearing level (moderate, severe, profound) of the students. Therefore, no direct relationship between degree of hearing loss and ADHD exists.

In the present study, the data were collected from parents and recorded by the researchers, both showed a high prevalence of ADHD impulsivity than ADHD Inattention among hearing impaired children. ADHD has no significant relationship with degree of hearing loss. Special care and strategies are required by the teacher to cope with ADHD children.

### **Recommendations**

In view of the results of the study, following recommendations are listed with respect to various stakeholders including special educators, parents and administrators of special institutions.

Special educators are the most important stakeholder who are responsible to implement all

services and are directly linked with students. Special Educators are recommended to identify children with ADHD, evaluate their special needs and strengths, Select appropriate instructional practices according to age and needs of the student then integrate these services with Individualized Educational Plan (IEP). Special Educators are suggested to integrate the three components academic instruction, behavioral interventions, and classroom accommodations. Both special educators and school management should provide counselling and guidance to parents of child with ADHD.

Administrators are recommended to modify programs for students with ADHD and other intellectual and behaviour disorders. As behaviour problems resulted in various secondary issues such as social and emotional disturbance therefore it is suggested to provide screening services to detect early indicators of ADHD and other behavior disorders to address the issues influencing other personality aspects of a student. To minimize secondary effects, arrangement of staff training programs on continuous basis may play a significant role. Government should launch awareness campaign to aware society regarding behavioural disorders including ADHD

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## Appendix A

### Observation Sheet

Name

Gender

Class

S. No	Item	Often	Some times	Never	Very often
<b>ADHD (Predominantly Hyperactivity/ Impulsivity)</b>					
1	often interrupts or intrudes on others (e.g., butts into conversations or games)				
2	often fidgets with hands or feet or squirms in seat				
3	often talks excessively				
4	Often unable to play or engage in leisure activities quietly				
5	often leaves seat in classroom or in other situations in which remaining seated is expected				
6	often has difficulty awaiting turn				
7	is often "on the go" or often acts as if "driven by a motor"				
8	often runs about or climbs excessively in situations in which it is inappropriate (in adolescents or adults, may be limited to subjective feelings of restlessness)				
9	often blurts out answers before questions have been completed				
<b>ADHD (Predominantly Inattention)</b>					
10	often does not follow through on instructions and fails to finish schoolwork, chores, or duties in the workplace (not due to oppositional behavior or failure to understand instructions)				
11	often fails to give close attention to details or makes careless mistakes in schoolwork, work, or other activities				
12	often does not seem to listen when spoken to directly				
13	is often easily distracted by extraneous stimuli				
14	is often forgetful in daily activities				
15	often has difficulty organizing tasks and activities				
16	often avoids, dislikes, or is reluctant to engage in tasks that require sustained mental effort (such as School work or homework)				
17	often has difficulty sustaining attention in tasks or play activities				
18	often loses things necessary for tasks or activities (e.g., toys, school assignments, pencils, books, or tools)				