

Attention Deficit Hyper Activity Disorder (ADHD) and Stress: A Mutual Relationship between Children and Mothers

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ABSTRACT

Introduction: Attention Deficit Hyperactivity Disorder (ADHD) is a neurodevelopmental disorder characterized by high levels of inattention, hyperactivity and impulsivity which may result in mothers' stress. The current study aims to compare stress among 45 mothers of ADHD children who had referred to "Rofeydeh psychiatric center" with 45 mothers of normal children.

Methods: Brief demographic researcher-made questionnaire, Child Symptom Inventory-4 (CSI-4), the Child Behavior Checklist (CBCL), and Parental Stress Index-Short Form (PSI/SF) were completed for each mother and child.

Results: The results showed that except the component of acceptance, ADHD children had more problems in the field of attention compared with normal children. Mothers of ADHD children had also more stress compared with mothers of normal children.

Discussion: ADHD can impair mothers' mental health by inducing stress and this issue has important clinical and treatment implications. Specific treatment programs should be designed and implemented in Iran for the mothers of ADHD children to reduce stress among them and therefore, improve their mental health status.

1. Introduction

Attention deficit hyperactivity disorder (ADHD) is one of the most common neuro-psychological disorders in school children and young adults which has neuro-biological and brain origins (Mahone et al., 2011). This disorder is defined as "consistent pattern of attention defect or hyperactive and impulsive behavior" which is more severe in younger children and is similar to developmental levels (Sadock & Sadock, 2000). The early anatomical MRI studies showed anomalies in cortical (frontal) regions among ADHD patients (Durstun et

al., 2004; Mostofsky et al., 2002), and anomalies in basal ganglia (Castellanos et al., 1996), and the sub cortical brain regions as well (Valera et al., 2007).

Notably, the basal ganglia play an important role in the etiology of ADHD (Soliva et al., 2010; Nachev et al., 2008; Akkal et al., 2007). Recent research findings have shown that children with ADHD show reduced short interval cortical inhibition which suggests early abnormalities in dopamine (Gilbert et al., 2011; Castellanos et al., 2002). ADHD impacts motor intentional systems (Durstun et al., 2010), motor coordination and response control (Jacobson et al., 2011). Indeed, school-aged chil-

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dren with ADHD show deficits in controlling behavior including difficulties with inhibition and delay aversion (Sonuga-Barke et al., 2010).

Since the behavioral problems of ADHD children are considerable, their parents especially their mothers have more stress than parents of normal children (Anastopoulos et al., 1992). Stress in the family context, especially when stress is chronic and present early in development, has detrimental impacts on the well being of parents, children and parent-child relationship (Deater Deckard Scarr, 1996). Parenting stress is a set of process that results in aversive psychological and physiological reactions originating from attempts to adapt to the demands of parenthood (Mattow, 2006: 15-16). A study analyzed some reports from mothers whose boys were hyperactive in certain situations and compared them to reports from parents whose boys' behaviors were not hyperactive, it found that the mothers of hyperactive children experienced more stress (Beck et al., 1990).

Parenting stress has been found to be associated with a range of negative outcomes for children including insecure attachment and behavior. In reviewing ADHD children interaction with their mothers, it is observed that in the conditions of conducting assignments, the conflict between parent and child increases and child compliance and mother responsiveness decrease and mothers become more negative and act more in a wrong way (Barkley et al., 1991). Research studies show that elevated levels of parenting stress are associated with disruptions to the parent-child relationship and parenting practices (Abidin, 1992) and disruptions in parent psychological functioning (Pimentel et al., 2011).

Several reports in the literature indicate that mothers of children with ADHD experience increased levels of parenting stress compared with the mothers of nonproblem children (Anastopoulos et al., 1992; Baker, 1994). These elevations in parenting stress begin early (Du Paul et al., 2001) and appear chronic in nature (Baker et al., 1991).

Elevated levels of parenting stress can result in disruptions to the parent-child relationship, parenting practices (Abidin, 1992; Belsky, 1984) and disruptions in parent psychological functioning (Belsky, 1984; Mash & Johnston, 1990). Mothers of ADHD children may face with more parenting challenges than mothers of normal children and parenting stress affects mothers in different ways. In fact, children's problem behavior could significantly result in overall levels of parenting stress (Anastopoulos, 1992; Harrison & Sofronoff, 2002) and parenting stress in the child domain (Baker, 1994). Maternal

psychopathology and health status (Anastopoulos, 1992) and perceived control over child behavior also make a significant contribution to mothers' reported parenting stress (Harrison & Sofronoff, 2002).

There is growing awareness that the negative impact of ADHD and stress extends beyond the affected child to his or her family, place of learning, and the community. As critics have pointed out, however, much of the research in the relation between stress and child behavior problems is based on maternal report in developed countries (Fischer, 1990). There is also a paucity of research on this issue in a developing country like Iran. To partly contribute to this understanding, the present study preliminarily aims to investigate and compare stress among mothers of children with ADHD and mothers with normal children at a psychiatric center with hope to contribute to knowing some aspects of stress and its reduction among these mothers.

2. Methods

2.1. Study site and sample recruitment

The study had a cross-sectional design and was conducted at "Rofeydeh psychiatric center" which belongs to University of Social Welfare and Rehabilitation Sciences in Tehran. 45 mothers of 3-12 aged children with psychiatric diagnosis of ADHD (American Psychiatric Association, 2000), who had referred to "Rofeydeh psychiatric center" were eligible to participate and were randomly recruited in the study. This was done directly with a well-trained psychiatrist. A control group of 44 normal children were also randomly selected. The group of ADHD children was matched with the control group based on socio-economic status of the families (e.g. middle class), family income and mothers' education.

Eligibility criteria included 1) Age range of 3-12 years, 2) Signing consent form by the mothers of the two groups, 3) Having at least primary education among mothers, 4) Having at most 3 children and 5) Parents who are living together. Exclusion criteria included 1) Psychiatric diagnosis of comorbidity with ADHD among children, and 2) Neurological disorders.

The cases would be excluded from the study when the diagnosis of mental retardation, autism and other developmental disorders were made on ADHD children.

Normal children were accepted into the control group if their parents reported that they were not experiencing difficulties in managing their child's behavior, if they

did not meet DSM-IV.TR criteria for ADHD (American Psychiatric Association, 2000) and if they were not receiving medication to manage behavioral difficulties.

2.2. Study instruments

2.2.1. Brief Demographic Researcher-Made Questionnaire

Details of demographics such as age, education and the number of children were collected by a researcher-made questionnaire. The reliability of this questionnaire was (Alpha Cronbach: $r= 98\%$) in a two week pre test-post pilot test assessment on 30 cases were high to meet the study aims.

2.2.2. Child Symptom Inventory-4 (CSI-4)

The Child Symptom Inventory-4 (CSI-4) evaluated attention problems in children. CSI-4 is a behavior rating scale that screens for DSM-IV emotional and behavioral disorders including ADHD in children between 5 and 12 years old. The CSI-4 can be scored to derive Symptom Count Scores (diagnostic model) or Symptom Severity scores (normative data model). Scoring is quick and easy with user-friendly score sheets. CSI-4 scores demonstrate satisfactory test-retest reliability, show a high degree of correspondence with psychiatric diagnosis (predictive validity), and correlate well with other commonly used dimensional scales (concurrent validity). CSI-4 is used to diagnose ADHD and assess its severity (Sprafkin & Gadow, 1987). The reliability of CSI-4 was (Alpha Cronbach: $r= 92\%$) in a two week pre test-post pilot test assessment on 25 children, it indicated high reliability of the questionnaire to meet our study aims.

2.2.3. The Child Behavior Checklist (CBCL)

The Child Behavior Checklist (CBCL) is a parent-report questionnaire on which the child is rated on various behavioral and emotional problems. It was first developed by Thomas M. Achenbach. It assesses internalizing (i.e. anxious, depressive, and over controlled) and externalizing (i.e. aggressive, hyperactive, noncompliant, and under controlled) behaviors. Several sub-areas are measured including social withdrawal, somatic complaints, anxiety and depression, destructive behavior, social problems, thought problems, attention problems, aggressive behavior, and delinquent behaviors. Previous studies showed high validity and reliability to evaluate children's problems in this field (Achenbach, 1992). In the Child Behavior Checklist (CBCL) there are three

main subscales of children's behaviors; internalizing, externalizing and other behaviors. Internalizing behavior is a total score of anxious/depressed subscale, withdrawn/depressed subscale and somatic complaints. Externalizing behavior is a total score of rule-breaking behavior subscale and aggressive behavior subscale. Other Behaviors is a total score of social problems subscale, thought problems subscale, attention problems subscale and other problems subscale. The reliability of CBCL was (Alpha Cronbach: $r= 85\%$) in a two week pre test-post test assessment on 30 children indicated high reliabilities of the two questionnaires to meet the current study aims.

2.2.4. Parental Stress Index-Short Form (PSI/SF)

The level of mothers' stress was evaluated by Parental Stress Index (PSI/SF). Parenting Stress-Short Form (PSI/SF) has a total of 36 items. This questionnaire has been devised by Abidin and Brunners (Abidin & Brunner, 1995). One simple form contains all the examiner's needs for administering the measure, scoring and profiling results. The Parental Stress Index's brevity allows primary health care providers to identify and target those families most in need of follow-up services for stress. It is also ideal for use in schools, mental health clinics, and research. This questionnaire quickly identifies parent-child problems areas in the age range of 1 month -12 years. It needs 10 minutes, plus 2 minutes for scoring (Abidin & Brunner, 1995).

This measure provides Child Domain (stress perceived to result from child characteristics), Parent Domain (stress perceived to result from parent characteristics), and Total Stress Score. The psychometric properties of the Parenting Stress Index-Short Form (PSI-SF) were examined in a sample of 185 mothers and fathers. Factor analysis revealed high reliability and validity (Haskett et al., 2006). The reliability of Parental Stress Index-Short Form was (Alpha Cronbach: $r= 91\%$) in a two week pre test-post test assessment on 30 mothers indicated high reliabilities of the two questionnaires to meet the current study aims.

2.3. Study procedure

First, the psychiatric diagnosis of ADHD was confirmed by the psychiatrist of Rofeydeh center based on DSM-IV.TR criteria for ADHD among children. After meeting all inclusion criteria, consent form was obtained from each participant and mothers and their children in the two groups were evaluated by Demographic Researcher-Made Questionnaire for children and their

mothers. Then, the Child Symptom Inventory-4 (CSI-4), and the Child Behavior Checklist (CBCL) were completed for each child in each group. Then, Parental Stress Index-Short Form (PSI/SF) was completed for each mother in each group.

2.4. Ethical considerations

Participation was voluntary and confidential. Each participant was individually evaluated. Consent form was obtained from each participant. Participants were informed that non-participation in the study would not harm their psychiatric service utilization. The protocol of the study was approved by the Ethical Committee of University of Social Welfare and Rehabilitation Sciences.

2.5. Data analysis

Demographic data was analyzed by performing descriptive methods of statistics and the results of the two groups were compared and analyzed by performing independent t-test and Levene test in SPSS (version 13.0).

3. Results

50.6% (n=45) were diagnosed as ADHD cases and 49.4% (n=44) were normal. 46 boy and 43 girl samples were recruited. The mean age of the children in ADHD group was 6.87 (SD= 5.3) years old while the mean age of the normal children was 7.02 (SD=5.9) years old. The children ranged in age 2-12 years. The mean age of mothers in the ADHD group was 25.88 years and 26.11 years in the normal group. No significant (P-value) dif-

ference was found between the two groups indicating that they were properly matched (See details in Table 1).

The mean score of subscale of inattention/hyperactivity was higher in the ADHD group [35.07 (SD=4.13)] in comparison with the normal group [21.11 (SD=4.43)]. The score of the subscale of reinforcement was also higher in ADHD group [17.84 (SD=3.31)] in comparison with the normal group [13 (SD=3.12)]. Moreover, mood status was higher e.g. 15.31 (SD=3.41) in the ADHD group compared with normal children [10.09 (SD=3.07)]. In other subscales including acceptance, adaptability, and hyperactivity, ADHD children also received more scores compared with normal children indicating the higher levels and severity of ADHD symptoms among the ADHD group compared with the normal group (See details in Table 2).

The observed differences among subscales of attention in Table 2 were evaluated by Levene test and independent t-test ($P < 0.01$). The differences among subscales in Table 3 were statistically significant showing the differences between the two groups of ADHD and normal children except for the subscale of acceptance. The results showed that ADHD children had less attention and more hyperactivity ($t=15.3$, $df=87$, $P=0.000$), worse reinforcement ($t=7.1$, $df=86.8$, $P=0.000$), worse mood ($t=7.5$, $df=87$, $P=0.000$), lower adaptability ($t=9.5$, $df=87$, $P=0.000$), and more hyperactivity ($t=10.6$, $df=87$, $P=0.000$) compared with normal children in the study (See details in Table 3).

The scores received in Parental Stress Index-Short Form (PSI/SF) by mothers were statistically analyzed. The results showed that the mothers in the ADHD group

Table 1. Demographics of mothers and children in the two groups (n=89).

Variable	ADHD group	Normal group	P-value
	n=45	n=44	
Number of children	45 (50.6%)	44 (49.4%)	0.091
Gender			
Boy	23 (51.1%)	22 (50%)	0.013
Girl	22 (48.9%)	22 (50%)	0.016
Mean age of children	6.87 (SD=5.3)	7.02 (SD=5.9)	0.023
Years of education among mothers			
12 years>	13 (28.8%)	32 (72.7%)	0.012
12 years<	23 (51.1%)	21 (47.7%)	0.034
Mean age of mothers	25.88 (SD=10.8)	26.11 (SD=11.1)	0.031

Table 2. Scores of children in different aspects of attention in the two groups (n=89).

Variable	ADHD group	Mean (SD)	Normal group	Mean (SD)
Inattention/hyperactivity	45	35.07 (SD=4.13)	44	21.11 (SD=4.43)
Reinforcement	45	17.84 (SD=3.31)	44	13 (SD=3.12)
Mood	45	15.31 (SD=3.41)	44	10.09 (SD=3.07)
Acceptance	45	19.53 (SD=4.80)	44	16.93 (SD=5.13)
Adaptability	45	37.60 (SD=5.26)	44	26.41 (SD=5.78)
Hyperactivity	45	31.56 (SD=5.96)	44	19.09 (SD=5.02)

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received higher scores in the subscale of qualification [39.58 (SD=6.34)] compared with mothers of normal children [29.84 (SD=5.51)] indicating lower qualification compared with mothers of normal children. Mothers in the ADHD group also received more scores in attachment [18.22 (SD=3.34)], role limitation [22.98 (SD=7.02)] and depression subscales [26.56 (SD=5.67)]. More scores were also received by the mothers in ADHD group in the subscales of spouse relationship, social isolation and parental health indicating lower mental health status and more stress among mothers of ADHD children compared with mothers of normal children (See details in Table 4).

The observed differences among subscales of stress in Table 4 were evaluated by Levene test and independent t-test ($P < 0.01$). The differences among all subscales in Table 4 were statistically significant between the two groups of mothers of ADHD and normal children. The results showed that mothers of ADHD children had less qualification ($t=7.7$, $df=87$, $P=0.000$), less attachment

($t=6.09$, $df=87$, $P=0.000$), limited roles ($t=4.56$, $df=87$, $P=0.000$), more depression ($t=4.13$, $df=87$, $P=0.000$), more social isolation ($t=6.24$, $df=87$, $P=0.000$) and less health ($t=3.30$, $df=87$, $P=0.001$) compared with mothers of normal children (See details in Table 5).

As Table 6 shows mothers of the two groups had significant differences in experiencing stress. Mothers of the ADHD group had more stress (9.42 vs. 7.02) compared with mothers of normal children (See details in Table 6).

The observed difference between the scores of stress of mothers in ADHD group was compared with scores of mothers in normal group with Levene test and independent t-test and the observed difference was significant between stress in mothers of ADHD children and the mothers of normal children ($t=4.13$, $df=87$, $P=0.000$) (See details in Table 7).

Table 3. Variance differences of scores of children in attention in the two groups (n=89).

Variable		Levene test for variance equity		Independent t-test		
		F	Sig.	t	df	Sig.
Inattention/hyperactivity	Variance equity	0.13	0.71	15.3	87	0.000
	Variance inequity	-	-			
Reinforcement	Variance equity	1.0	0.29	7.1	86.8	0.000
	Variance inequity	-	-			
Mood	Variance equity	0.58	0.44	7.5	87	0.000
	Variance inequity	-	-			
Acceptance	Variance equity	0.84	0.36	1.0	87	0.275
	Variance inequity	-	-			
Adaptability	Variance equity	0.11	0.73	9.5	87	0.000
	Variance inequity	-	-			
Hyperactivity	Variance equity	2.7	0.09	10.6	87	0.000
	Variance inequity	-	-			

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Table 4. Scores of parents of the two groups in stress (n=89).

Variable	ADHD group	Mean (SD)	Normal group	Mean (SD)
Qualification	45	39.58 (SD=6.34)	44	29.84 (SD=5.51)
Attachment	45	18.22 (SD=3.34)	44	13.75 (SD=3.58)
Role limitations	45	22.98 (SD=7.02)	44	16.93 (SD=5.33)
Depression	45	26.56 (SD=5.67)	44	21.66 (SD=5.49)
Spouse relationship	45	21.56 (SD=5.37)	44	16.34 (SD=4.92)
Social isolation	45	18.20 (SD=4.12)	44	12.98 (SD=3.76)
Parental health	45	14.53 (SD=3.53)	44	12.41 (SD=2.41)

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4. Discussion

Attention problems especially among ADHD children are of those neuro-developmental and cognitive problems that could result in crucial health problems such as stress in mothers of ADHD children. The current study is one of the few studies that have been conducted on the stress that mothers with ADHD children experience in Iran. In this study, differences in behavioral problems between children diagnosed with ADHD and normally developing children were identified. Further, relationships between mothers' stress, according to ADHD symptoms were also explored. The study results showed that children with ADHD had more problems in attention compared with normal children. With the exceptions of the component of acceptance, the two groups showed significant differences in attention and its components.

In a study in Iran, 50 parents with ADHD children and 80 mothers with normal children were selected. There was a significant difference between parenting stress in mothers with ADHD children and mothers with normal children. There was a significant difference between parenting styles among mothers with ADHD children and mothers with normal children, parenting stress level and parenting styles in mothers with ADHD children and mothers with normal children. Parenting stress level had a significant effect on selecting parenting styles with ADHD children (Yousefia et al., 2011).

Impaired attention among ADHD children have important clinical and treatment implications and could contribute to lowering their efficacy in managing everyday life, play and/or schooling. Therefore, ADHD in the children should be treated and managed by implementing ap-

Table 5. Variance differences of scores of mothers in attention in the two groups (n=89).

Variable		Levene test for variance equity		Independent t-test		
		F	Sig.	t	df	Sig.
Qualification	Variance equity	0.323	0.571	7.7	87	0.000
	Variance inequity	-	-			
Attachment	Variance equity	0.704	0.404	6.09	87	0.000
	Variance inequity	-	-			
Role limitations	Variance equity	5.24	0.24	4.56	87	0.000
	Variance inequity	-	-			
Depression	Variance equity	0.000	0.986	4.13	87	0.000
	Variance inequity	-	-			
Social isolation	Variance equity	0.29	0.865	6.24	87	0.000
	Variance inequity	-	-			
Health	Variance equity	4.13	0.45	3.30	87	0.001
	Variance inequity	-	-			

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Table 6. Scores of stress in the two groups of parents (n=89).

Variable	N	Mean score of stress	(SD)
Mothers of ADHD group	45	9.42	8.7
Mothers of normal children	44	7.02	5.7

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appropriate treatment programs such as pharmacotherapy and behavioral interventions.

Moreover, the study results indicated that mothers in ADHD group had more stress compared with mothers in normal group. As a neuro-developmental disorder, ADHD in children could have important health and clinical implications especially for the mothers who spend the most number of hours with such children.

A study of the relationship between family functioning and ADHD symptoms in an Australian community-based sample (n=202) in their second year of formal schooling showed that compared with controls, parents of children screening positive for ADHD reported more emotional impact, impaired family activities, less parental warmth, higher parental depression and anxiety. Parents of children screening positive for ADHD also reported higher stress (Cussen et al., 2012).

A study of 222 elementary school children and their parents showed that the ADHD group showed higher levels of behavioral problems, parenting stress, and maternal depression than the normal group. Moreover, there were significant relationships between ADHD scores and parenting stress, maternal depression, internal behavioral problems, and external problems, but, ADHD risk scores were negatively correlated with social competence. ADHD levels affected the child's internal behavioral problems, mediated by maternal depression. The study results showed that higher risk scores for ADHD indicated a significant effect for behavioral problems. Also, parenting stress and depression influenced child's behavioral problems. These study results suggested that identification of children at risk for ADHD and development of parental education programs could contribute to

the prevention of behavioral problems and aggravation of the ADHD symptoms (Shin & Kim, 2010).

It is likely that inattention, hyperactivity and impulsivity among mothers of ADHD group in our study acted as a barrier against the mental health of their mothers and resulted in feeling stress among them. Moreover, ADHD is a pervasive developmental disorder that could be worse as time prolongs. Therefore, long days or months spending with ADHD children resulted in stress in their mothers. Stress among the mothers of ADHD group is a crucial health concern that requires special treatment and preventative programs. Mothers of ADHD children should be educated about the nature of ADHD. The mothers of ADHD children had elevated parenting stress. This issue argues strongly for the inclusion of programs such as enhancing parents' coping resources as well as directly targeting the child's symptoms of ADHD and associated difficulties.

A study of the effect of parent training program on children with ADHD showed that mothers of 18 children with ADHD and 6 children with pervasive developmental disorders (PDD) underwent a parent training (PT) program. After the program, parenting stress, significantly decreased from 15 to 8. A total of 22 mothers had increased parenting self-esteem, and better parent-child relationships were noted in these cases. An analysis of children's behavior by using Achenbach's Child Behavior Checklist showed that introversion tendency, physical failure, aggressive behavior, and extroversion score improved significantly after the parent training. After the parent training, out-of-control behaviors improved in 19 children and continued in 5. The parent training for mothers of children with ADHD and/or high-functioning PDD was also significantly effective in improving both

Table 7. Variance differences of scores of mothers in stress in the two groups (n=89).

Variable		Levene test for variance equity		Independent t-test		
		F	Sig.	t	df	Sig.
Stress in mothers of ADHD group	Variance equity	0.53	0.48	4.13	87	0.000
Stress in mothers of normal children	Variance inequity	-	-			

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the parenting skills of mothers and adaptive behaviors of children (Motayama et al., 2012).

A study of the children with ADHD and other comorbid mental and physical health conditions (n=5473) showed that the parental strain, parental health, and community characteristics among children with ADHD was high. Specifically, parental strain was greatest for children with ADHD plus a comorbid conduct disorder but greater access to social support and neighborhood amenities were related to reduced parental strain (Hinojosa et al., 2012).

ADHD has important serious health implication for parents especially mothers. A study showed that the role of psychosocial factors in perpetuating and predisposing towards the development of ADHD symptoms has been neglected within the field of child mental health. Clinicians, when told that a child had ADHD, have been found to underestimate the presence of psychosocial factors, and they are less likely to ask about the effects that this issue could have on parents (Richards, 2012). Recent neurobiological findings showing the impact on brain development of early abuse and attachment concerns are cited. The implications of these findings both for clinicians, and at policy level, are discussed, and the reasons underlying the need for a more integrated bio-psychosocial approach to ADHD are outlined (Richards, 2013) especially for mothers of children with ADHD.

Difficult behaviors exhibited by children with ADHD may be significant family stressors. These stressors are associated with negative outcomes to the children and generally to the family. Therefore giving extra-attention to the psychological well-being of parents would help them to adopt more adaptive parental nurturing. In fact, suggestion has been made to consider assessment of parental psychological aspects together with the assessment of ADHD children in developing a comprehensive treatment program. In the treatment of ADHD children, one must not ignore the possible psychological distress suffered by this group of mothers. Harrison and Sofronoff proposed that interventions for ADHD are not only aimed at children's behavior but also at paying equal attention to their mothers (Harrison & Sofronoff, 2002). This can be done by screening their mothers for any psycho-logical morbidities and delivering the necessary interventions. Healthy nurturing of the children only comes from healthy mothers.

Parent training may have a positive effect on the behavior of children with ADHD. It may also reduce mothers' stress and enhance mothers' confidence. Data concern-

ing ADHD-specific behavior especially neuro-cognitive studies on the neurological basis of ADHD-specific behavior are not well-documented. Future research should ensure better reporting of the outcomes with extensive follow-up stages.

The differences that we observed in the components of attention problem among ADHD children compared with normal children in this study are subjects to further studies and need extensive longitudinal research studies with representative samples.

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