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Correlates of Parenting Stress and Practices Among a Sample of Egyptian Mothers of Children with Attention Deficit Hyperactivity Disorder

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Abstract

Background: Attention Deficit Hyperactivity Disorder (ADHD) is nowadays one of the most prevalent neurodevelopmental disorders in children. High levels of parenting stress and dysfunctional parenting have been frequently reported and implicated in functional outcome of children and adolescents with ADHD.

Objectives: 1) Compare parenting stress levels and different parenting practices between Egyptian mothers of children diagnosed with ADHD and mothers of apparently normal children. 2) Study the correlations of parenting stress and parenting practices on ADHD symptoms severity and externalizing / internalizing behavioural problems in children with ADHD.

Methods: 100 Children diagnosed with ADHD together with 50 apparently healthy control children matched for age, sex and IQ and their mothers were evaluated using Parenting Stress Index scale (PSI), Parenting Attitude questionnaire, Child Behaviour Checklist (CBCL), and Conner's' Parent Rating Scale-Revised (for case group).

Results: Significant differences were found between mothers of ADHD children and mothers of normal children as regards to levels and types of parenting stress and parenting practices. The different domains of parenting stress had an independent effect on using certain parenting practices. Both parenting stress and parenting practices had an independent effect on ADHD symptom severity and on presenting with externalizing or internalizing behavioural problems.

Conclusion: High levels of parenting stress negatively affects parenting practices. This vicious cycle interaction between parenting stress and parenting practices explains the high rates of externalizing/internalizing child's behavioural problems, lower academic performance and increased severity of ADHD symptoms in children with ADHD.

Keywords: ADHD; Behavioural Problems; Egypt; Parenting Practices; Parenting Stress

Abbreviations

ADHD	:	Attention Deficit Hyperactivity Disorder
ANOVA	:	Analysis of Variance
CBCL	:	Child Behaviour Checklist
PP	:	Parenting Practices
PSI	:	Parenting Stress Index

Introduction

Attention Deficit Hyperactivity Disorder (ADHD) is one of the most prevalent neurodevelopmental disorders in children. Raising a child diagnosed with ADHD may require more care and attention from parents until the child becomes independent.

It interferes with parental productivity and health related quality of life [1]. Moreover, children and adolescents with ADHD are more likely to exhibit behavioural problems whether externalizing (oppositional behaviours, conduct problems, substance abuse, risk taking behaviours) or internalizing (depression, anxiety, withdrawal) than other adolescents [2]. These behaviours offer more challenges and are associated with high levels of parenting stress [3].

Although research examining the aetiology of ADHD has recognized that nearly 70 % of its causal factors are related to heritability and clear neurobiological mechanisms [4], yet, environmental influences such as parenting and parent-child relationship and attachment have been determined to have strong influences on ADHD and associated behavioural problems [5].

The relationship between parenting stress and parenting practices is one of the most complex relationships that are even more pronounced in children diagnosed with ADHD. Parents of children and adolescents with ADHD experience considerable challenges in their parenting roles [6]. Literature establishes a link between high levels of parenting stress and dysfunctional parenting [7]. Diverse approaches to understanding parenting stress have shown multiple associations with negative parenting attitudes and parental well-being, as well as negative parenting behaviour [8]. Parents who experience high levels of parenting stress have poorer psychological wellbeing [9], exhibit fewer positive parenting behaviours [10] and are less able to implement parenting interventions than other parents [11].

In a study associating parenting stress and parenting practices with academic achievement, Rogers and colleagues [12] reported that high levels of parenting stress are associated with the use of more controlling strategies regarding children's academic performance, whereas lower stress is associated with a more supportive style of involvement. Acquisition of positive parenting skills and higher sense of parenting competence improves intervention impact on adolescent internalizing and externalizing behaviours [13].

Several works have been carried out on the bidirectional relationship (parent-to-child and child-to-parent processes) between parenting stress and practices on one hand and child/adolescent's ADHD and associated behavioural problems on the other hand [14]. Most of this work is done in western culture. Although there has been recently an increase in ADHD research in Arab countries, yet, research in this field remains relatively sparse [15]. Only few of them addressed the effect of parenting stress on those children [16-18]. Parenting practices have a major influence on child development. Parenting style or practices differs widely between Western high-income countries and Eastern developing countries due to cultural variations or gaps [19].

In particular, parents in the Egyptian culture, from all social, economic and educational backgrounds, generally tend to use harsh discipline with their children [20]. This would possibly be more pronounced in parents of children suffering from ADHD, especially mothers who face more parenting challenges, being the primary and direct caregiver of the child. The interaction between parenting practices and parenting stress in parents of children suffering from ADHD is still a matter of debate. How this interaction affects the severity of ADHD symptoms and the presence of behavioral problems is still poorly understood in the Egyptian children. Thus, this study was carried out aiming at: 1) comparing parenting stress levels and different parenting practices between Egyptian mothers of children diagnosed with ADHD and mothers of apparently normal children. 2) Study the correlations of parenting stress and parenting practices on ADHD symptoms severity and externalizing / internalizing behavioural problems in children with ADHD.

Materials and Methods

Design

This work is a cross-sectional, case-control study conducted in the period from July 2017 to February 2018.

Participants

This study was supposed to be conducted on a sample of parents (both mothers and fathers), depending on whom attended the clinical setting with the child. However, this work was shifted to be conducted on mothers only due to predominance of mothers attending clinic seeking help for their children. Finally, one hundred children diagnosed with ADHD according to DSM-IV criteria were recruited consecutively, after taking parental consents, along with their mothers from Ain Shams University, Child Psychiatry Out-Patient Clinic with the following inclusion criteria**:** age range from 6-16 years, both sexes, fulfilling the criteria of ADHD diagnosis according to the DSM-IV criteria. Exclusion criteria included: IQ below 70, having any medical illness. A control group consisted of 50 apparently healthy children matched for age, sex and IQ, free of any medical or psychiatric illness, were randomly selected from children of employees working at Misr University for Science and Technology.

Procedures and Tools

After taking consent from the ethical committee of the Institute of Psychiatry, Ain Shams University, all participants were subjected to the following: 1. full clinical and psychiatric history was taken from mothers using the semi-structured child psychiatry sheets of Institute of Psychiatry, Ain Shams University hospitals including: personal history, demographics (mothers' and fathers' education and occupation, the number of family members and housing details, family income, crowding index and sanitation), complaint, and history of presenting complaints, past medical and psychiatric history, family history, and diagnosis. 2. MINI-KID

[21] for psychiatric diagnoses to assess current and past episodes of psychopathology in children and adolescents. Arabic Version was used [22]. 3. Wechsler Intelligence Scale for children, Arabic Version [23]: for measuring IQ in children. 4. Parenting Stress Index (PSI): it evaluates the stress significance in parent-child system and includes 120 items which comprises both childhood (47 items) and parenthood (54 items) domains plus an optional scale for life conflicts (19 items). The child domain comprises six subscales: adaptability, acceptability, demandingness, mood, distractibility/ hyperactivity, and reinforces parent. The parent domain consists of seven subscales: competence, isolation, role restriction, attachment, depression, marital relationships, and parent health. 100 items are rated on a 5 points scale (totally agree up to totally disagree) and 20 yes/ no questions regarding life stress. Each item is given a raw score; scores of each subscale items are added to form a total domain (Chil-d- Parent-Life). Scores are converted to percentages interpreted as follows: 16 - 80 Percentile: Normal Range, 81 - 84 Percentile: Borderline, 85 - 99+ Percentile: Clinically Significant. Reliability coefficients for the Child, Parent, Life domains and Total Stress Scale were 0.90 or greater [24]. 5. Parenting Attitude questionnaire: this is an Arabic questionnaire designed by Ismail and Mansour [25] to assess parenting attitudes and practices. It consists of 146 statements measuring parental attitudes on 10 subscales namely "control, overprotection, negligence, spoiling, harshness, induction of psychological pain, inconsistency, discrimination, lying and using positive parental attitudes". Each answer is given a score on a three-point scale (0-2). Each scale is given a total raw score then changed to a percentage by multiplying it to special constant. The Cronbach alpha coefficients revealed good internal consistency for different parenting attitudes (range 0.986 - 0.997). 6. Child behaviour checklist (CBCL) [26]. It is a 113-question checklist designed for children from 4 to 16 years. It assesses problems classified as internalizing behaviour on 3 dimensions (withdrawal, somatic complaints, anxiety/depression) and externalizing behaviour on 2 dimensions (delinquent behaviour/ aggressive behaviour). In addition, there are 3 non-specific dimensions (social problems, thought problems, attention problems). Items are scored as normal, borderline range or abnormal. The Arabic version was used [27]. 7. The Arabic version of Conner's' Parent Rating Scale-Revised [27]: applied to parents of case group only. It was developed by C. Keith Conner [28], translated by El-Sheikh and colleagues [27], and validated through use in many subsequent researches. It assesses the severity of ADHD symptoms (based on DSM-IV) in children and adolescents aged 6 to 18 years old. It has a total of 48 items forming six subscales, including Hyperactivity, Inattention, Impulsivity, Oppositionality, Liability and Cognitive problems. Items are rated on a 4-point scale (0-3 points)**.** Higher scores indicate more severe symptoms.

Statistical Analysis

Data entry, processing and statistical analysis were carried out using MedCalc version 15.8. Mean, Standard deviation (± SD) and range were used for descriptive parametric numerical data, while Median and Inter-Quartile Range (IQR) for non-parametric numerical data. Frequency and percentage were used for non-numerical data. Tests of significance (Chi square, Mann-Whitney's test, ANOVA, Spearman's correlation analysis, multiple and logistic regression analysis) were used for analytical study. Data were presented and suitable analysis was done according to the type of data (parametric and non-parametric) obtained for each variable. P-values less than 0.05 (5%) were considered to be statistically significant.

Results

The sample of this study is divided into two groups: Case group which included 100 children diagnosed with ADHD; 61 (61%) males and 39 (39%) females with mean age 9.1 ± SD 2.35. Mean IQ for case group was 96 ± SD 6.6. According to ADHD subtype, 60 cases (60%) were of Combined type, Inattentive 23 (23%) and Hyperactive 17 (17%). The control group consisted of 50 apparently healthy children; 26 males (52%) and 24 females (48%) with mean age 9.6 ± SD 2.8. Mean IQ for control group was 97.6 ± SD 6.7. Sociodemographic data of both groups are represented in table 1.

Variable		Control group (50)	ADHD group (100)	X^2 value	p-value
Gender	Female	24 (48%)	39 (39%)	0.77	0.3803
	Male	26 (52%)	61 (61%)		
Socio-economic status	Low	10 (20%)	59 (59%)	28.176	< 0.0001**
	Middle	28 (56%)	38 (38%)		
	High	12 (24%)	3 (3%)		
Child's educational level	Primary	36 (72%)	86 (86%)	4.303	0.1163
	Preparatory	11 (22%)	11 (11%)		
	Secondary	3 (6%)	3 (3%)		

Child's academic performance	Poor	0 (0%)	9 (9%)	52.263	< 0.0001**
	Barely adequate	2 (4%)	14 (14%)		
	Fair	8 (16%)	44 (44%)		
	Good	22 (44%)	33 (33%)		
*= Significant **= Highly significant					

Table 1: Shows sociodemographic data of ADHD and control groups using Chi square test.

Conner's Parent Rating Scale-Revised

The mean scores for subscales of the Conner's Parent Rating Scale-Revised in the ADHD group were as follows: means ± SD for Hyperactivity was 77.15 ± 13.86, Inattention 76.16 ± 12.01, Impulsivity 76.23 ± 13.36, Cognitive problems 70.64 ± 9.61, Liability 68.2 ± 12.44, Oppositionality 74.04 ± 13.74.

Child Behavior Checklist (CBCL)

When comparing Child Behavior Checklist between both case and control groups using Mann-Whitney's test, there was highly significant statistical difference in increased externalizing problems (delinquent, aggressive and total externalizing score, U= 595.5, 952.5, 700 respectively, $p < 0.0001$ for each respectively) and increased internalizing problems (withdrawn, anxious depressed and total internalizing score, U= 880, 1552.5, 1271.5 respectively, $p < 0.0001$ for each respectively), decreased sex problems and increased social, attention problems and total CBCL scores among ADHD group compared to control group (U=1685, 891, 375, 655 respectively, $p < 0.0001$ for each respectively). While thought problems, somatic complaints did not show any difference between both groups ($p > 0.05$ respectively).

Parenting Stress Index (PSI)

When comparing different domains of Parenting Stress Index (PSI) in both cases and control groups, it was significantly apparent that the child, parent and total PSI domains were significantly higher in the case than in the control group. However, marital relationships and life stress domain failed to show difference between both groups (see table 2).

Variables	Control group (50) Median (IQR)	ADHD group (100) Median (IQR)	U value	p value
Child domain				
Adaptability	24 (20-29)	29 (26-31)	1576.5	0.0002**
Acceptability	14 (12-18)	27 (26-29)	185	< 0.0001**
Demandingness	19.5 (18-22)	26 (24-28.5)	867	< 0.0001**
Mood	10 (7-12)	14 (13-16)	751	< 0.0001**
Distractibility/ Hyperactivity	25.5 (13-26)	28 (28-30)	766.5	< 0.0001**
Reinforces parent	12 (10-14)	16 (14-18)	1139.5	< 0.0001**
PSI Child (Total)	**105.5 (85-118)**	**143 (135-148)**	**420.5**	**< 0.0001****
Parent domain				
Competence	23 (20-30)	28 (24.5-30)	1996.5	0.0441*
Isolation	15.5 (13-16)	20 (18-24)	666	< 0.0001**
Role Restriction	20 (18-23)	24 (20-26)	1532.5	0.0001**
Attachment	15 (13-16)	16 (14-20)	1575	0.0002**
Depression	20 (18-23)	28 (26-30)	784	< 0.0001**
Marital Relationships	15 (14-18)	16 (14-18)	2336	0.5089
Health	15 (11-16)	18 (14-20)	1333	< 0.0001**
PSI Parent (Total)	**122 (113-136)**	**152 (140-60)**	**1148**	**< 0.0001****

PSI Life Stress	**10 (0-11)**	**10 (5-20)**	**2227.5**	**0.2625**
PSI (Total)	**230.5 (205-257)**	**294 (276.5-308.5)**	**721**	**< 0.0001****
*= Significant **= Highly significant				

Table 2: Compares PSI between ADHD and control groups using Mann Whitney's test.

Parenting Practices (PP)

As seen from table 3, all types of parenting practices (except Overprotection and Negligence) were significantly different in the ADHD group in comparison to control group.

Variable	Control group (50)	ADHD group (100)	U value	P-value
	Median (IQR)	Median (IQR)		
Control	10 (8-12)	20 (16-23)	491	< 0.0001**
Overprotection	9 (6-10)	8 (6-14)	2217.5	0.2561
Negligence	6 (4-10)	6 (4-8)	2473.5	0.9141
Spoiling	7 (4-8)	6 (4-8)	1789	0.0036**
Harshness	4 (0-6)	12 (8-14)	663.5	< 0.0001**
Induction of psychological pain	10 (8-12)	16 (10-18)	1222	< 0.0001**
Inconsistency	10 (8-14)	15 (14-16)	1143.5	< 0.0001**
Discrimination	6 (4-10)	16 (14-18)	530.5	< 0.0001**
Lying	8 (6-10)	6 (6-8)	1600	0.0002**
Using positive parental attitudes	206 (194-222)	163 (150-176)	550.5	< 0.0001**
*= Significant **= Highly significant				

Table 3: Compares Parenting Practices (PP) data between ADHD and control groups using Mann-Whitney's test.

Relation Between Parenting Stress and Parenting Practices in Mothers of ADHD Children

To find out the correlations of PSI scores in mothers of ADHD children on their parenting practices, multiple regression analysis was conducted. The increase in child PSI domain alone had significant independent effect on increasing practicing of control, induction of psychological pain, lying and discrimination ($p < 0.0001$ respectively), increased negligence and harshness practicing ($p = 0.0102, 0.0212$ respectively).

While increased both child and life stress PSI domains had significant independent effect on increased practicing of overprotection ($p = 0.0255$, $p = 0.0288$ for each domain respectively). Also, increased child and parents PSI domains had significant independent effect on increased practicing of inconsistency ($p < 0.0001$, $p = 0.0011$ for each domain respectively). Whereas decreased child and parent PSI domains had significant independent effect on increased using positive parental attitudes ($p = 0.0164$, $p < 0.0001$ for each domain respectively).

Parenting Stress and Parenting Practices: Correlations with ADHD Subtypes

Comparisons between ADHD subtypes in relation to PSI and parenting practices (PP) scores were conducted using Analysis of Variance (ANOVA) test. Table 4 shows that mothers of hyperactive and inattentive subtypes showed significantly increased negligence and spoiling practices compared to mothers of combined subtype ($p = 0.016$, $p = 0.028$ respectively). At the same time, the hyperactive and combined subtypes were significantly associated with increased child and parent PSI scores in comparison to inattentive subtype ($p = 0.001$, $p < 0.001$ respectively).

Independent variables (ADHD group)	Hyperactive (17)	Inattentive (23)	Combined (60)	ANOVA test	
	Mean ± SD	Mean ± SD	Mean ± SD	F	P value
PP (Control)	19.94 ± 4.74	19.39 ± 5.7	19.73 ± 4.86	0.0635	0.939
PP (Overprotection)	10.94 ± 5.29	10.08 ± 5.09	9.31 ± 6.4	0.535	0.587
PP (Negligence)	8.11 ± 3.56	9.3 ± 6.48	6.23 ± 3.71	4.289	0.016*
PP (Spoiling)	6.35 ± 2.14	6.43 ± 2.82	5.06 ± 2.28	3.719	0.028*
PP (Harshness)	12.35 ± 4.75	9.47 ± 4.23	10.83 ± 4.69	1.917	0.153
PP (Induction of psychological pain)	14.58 ± 3.44	13.82 ± 7.38	15.3 ± 4.53	0.697	0.501
PP (Inconsistency)	15.17 ± 1.74	13.47 ± 4.64	14.73 ± 3.01	1.605	0.206
PP (Discrimination)	16.35 ± 2.37	16.65 ± 6.47	15.2 ± 5.28	0.783	0.460
PP (Lying)	7.41 ± 3.06	6.43 ± 1.47	6.46 ± 1.78	1.621	0.203
PP (Using positive parental attitudes)	162.47 ± 13.61	173 ± 25.3	165.5 ± 20.88	1.478	0.233
PSI Child (Total)	141.94 ± 12.24	131.9 ± 16.5	143.38 ± 10.5	7.224	0.001**
PSI Parent (Total)	153.76 ± 9.82	127.4 ± 25.8	155 ± 15	21.652	< 0.001**
PSI Life Stress	9.7 ± 7.59	11.08 ± 6.9	11.05 ± 7.87	0.223	0.801
*=Significant **=Highly Significant					

Table 4: Shows comparisons between ADHD subtypes and scores of PSI and PP in ADHD group using ANOVA test.

Relation Between Parenting Practices and ADHD Symptom Severity (Measured by Conner's Scale)

The effects of different parenting practices on ADHD symptom severity (measured by Conner's scale) was conducted in ADHD group using multiple regression analysis (table 5). The increased parenting practicing of harshness, inconsistency and lying had a significant statistical independent effect on increasing Conner's Hyperactivity and Oppositionality domains ($p < 0.05$ respectively for each domain). Increased parenting practicing of harshness and inconsistency had a significant statistical independent effect on increasing Conner's Impulsivity domain ($p < 0.05$). While increased practicing of induction of psychological pain had a significant statistical independent effect on increasing Conner's Inattention, Cognitive and Liability domains ($p < 0.001$ respectively for each domain). Whereas, increased practicing of control had a significant statistical independent effect on increasing Conner's Cognitive domain ($p < 0.005$).

Conner's domain	Factor	β	SE	R^2	t	P
Conner's Hyperactivity	Harshness	0.9812	0.3211	0.3193	3.056	0.0029**
	Inconsistency	1.8122	0.4903		3.696	0.0004**
	Lying	2.0607	0.7148		2.883	0.0049**
Conner's Inattention	Induction of psychological pain	1.2294	0.3367	0.1576	3.651	0.0004**
Conner's Impulsivity	Harshness	0.7086	0.3213	0.2571	2.205	0.0299*
	Inconsistency	2.0215	0.4871		4.150	0.0001**
Conner's Cognitive	Control	0.5977	0.1989	0.2837	3.005	0.0034**
	Induction of psychological pain	1.1231	0.2336		4.809	< 0.0001**
Conner's Liability	Induction of psychological pain	1.2854	0.2688	0.2383	4.782	< 0.0001**

Conner's Oppositionality	Harshness	0.8159	0.3159	0.3299	2.583	0.0114*
	Inconsistency	1.9083	0.4824		3.956	0.0001**
	Lying	1.9671	0.7032		2.797	0.0063**
β: Regression coefficient, SE: Standard error, *= Significant **= Highly significant Independent effect: independently affecting outcome without effect of other factors.						

Table 5: Shows the correlations between Conner's severity scores and different parenting practices in the ADHD group using multiple regression analysis.

Relation Between Parenting Practices and Associated Behavioral Problems (measured by CBCL)

Additionally, multiple regression analysis was done to assess parenting practicing factors affecting behavioral problems (CBCL) in both control and ADHD groups (table 6).

CBCL	Factor	β	SE	R^2	t	P-value
Total CBCL Externalizing $_{\text{control group}}$	PP (Spoiling)	2.8057	0.5712	0.6332	4.912	< 0.0001**
	PP (Inconsistency)	2.2438	0.3198		7.017	< 0.0001**
Total CBCL Externalizing $_{\text{ADHD group}}$	PP (Overprotection)	-0.3588	0.1051	0.8376	-3.415	0.0009**
	PP (Negligence)	-0.8315	0.1457		-5.706	< 0.0001**
	PP (Harshness)	0.7668	0.1514		5.066	< 0.0001**
	PP (Inconsistency)	0.7351	0.3218		2.285	0.0246*
	PP (Using positive parental attitudes)	-0.3679	0.0460		-7.988	< 0.0001**
	Conner's PR (Hyperactivity)	0.3320	0.0473		7.014	< 0.0001**
Total CBCL Internalizing $_{\text{control group}}$	PP (Control)	0.4916	0.1540	0.5829	3.192	0.0026**
	PP (Spoiling)	1.0901	0.4189		2.603	0.0125*
	PP (Harshness)	0.6541	0.2096		3.120	0.0032**
	PP (Inconsistency)	1.0786	0.2114		5.103	< 0.0001**
Total CBCL Internalizing $_{\text{ADHD group}}$	PP (Control)	0.2701	0.1112	0.5910	2.428	0.0171*
	PP (Negligence)	0.4713	0.1143		4.124	0.0001**
	PP (Inconsistency)	0.5420	0.1787		3.033	0.0031**
	Conner's PR (Hyperactivity)	-0.2518	0.0375		-6.699	<0.0001**
β: Regression coefficient, SE: Standard error, *= Significant **= Highly significant Independent effect: independently affecting outcome without effect of other factors.						

Table 6: Shows effects of parenting practicing on CBCL total scores in both control and ADHD groups using multiple regression analysis.

Child's Academic Performance: Relations to Parenting Stress and Practices

When comparing the child's academic performance between ADHD and control groups using Spearman's correlation analysis, it was found that child's academic performance was significantly negatively correlated with total child PSI scores only in the ADHD group (r= -0.206, p =0.03), but not in the control group. In addition, child's academic performance in the ADHD group had a significant negative correlation with practicing induction of psychological pain (r= -0.302, p =0.002) and a significant positive correlation with using positive parenting attitudes (r= 0.27, p =0.006). While in the control group, the child's academic performance had significant negative correlations with practicing induction of psychological pain (r= -0.307, p =0.03) and practicing inconsistency (r= -0.33, p =0.01).

Lastly, logistic regression analysis was applied using Backward method to assess all factors affecting ADHD susceptibility. It showed that increased child, parent, life stress PSI scores; increased negative practicing of (control, overprotection, spoiling, harshness and induction of psychological pain) had an

independent effect on increasing the probability of ADHD susceptibility with significant statistical difference ($P < 0.05$ respectively) (table 7).

Independent variables	β	SE	R^2	Wald	P-value
(Constant)	-44.1238		0.9446		
PSI Child (Total)	0.46745	0.19569		5.7061	0.0169*
PSI Parent (Total)	-0.12683	0.059415		4.5567	0.0328*
PSI Life Stress	0.17135	0.086128		3.9580	0.0466*
PP (Control)	0.81055	0.34998		5.3636	0.0206*
PP (Overprotection)	1.17237	0.53457		4.8097	0.0283*
PP (Spoiling)	2.50281	1.12748		4.9276	0.0264*
PP (Harshness)	2.21240	0.93338		5.6183	0.0178*
PP (Induction of psychological pain)	0.90687	0.41179		4.8500	0.0276*
PP (Inconsistency)	0.65979	0.37490		3.0974	0.0784
β: Regression coefficient, SE: Standard error, *= Significant **= Highly significant Independent effect: independently affecting outcome without effect of other factors.					

Table 7: Shows Logistic Regression analysis for the factors affecting ADHD susceptibility.

Discussion

Children diagnosed with ADHD often present maladaptive behaviors that are inconsistent with their developmental level and may have a disruptive effect on all their environments [29]. These children are more challenging to their parents and tend to be less compliant with parents' requests, more oppositional, negative and typically more demanding of help and attention than children with normative development [30].

Although experiencing some parenting stress is considered normal or even beneficial to help parents develop coping skills needed to adapt and manage threats during life [31], yet, parents of children and adolescents with ADHD experience more parenting stress than parents of control children [32]. This puts more strain on the parent–child relationship and negatively affects parenting practices and child development [33].

In accordance with previous studies, the results of the current study showed a highly significant increase in parenting stress domains; child, parent and total domains among mothers of children with ADHD (except for marital relationship). The increase in child and parent PSI scores was significantly higher in hyperactive and combined subtypes compared to inattentive subtype. These findings are in agreement with several studies done in western cultures [34-38] and in Middle East/Egyptian cultures as well [16,39]. Similarly, Tzang and colleagues, Theule and colleagues [34,36] showed that hyperactive and combined subtypes were predictive of parenting stress. Some studies explained the high levels of parenting stress in parents of ADHD children by various challenges including financial burden of expensive prescribed medications, special schooling required, in addition to stigma related to any form of abnormal behavior and difficulties associated with imposing a daily routine and discipline on the ADHD child [18,40].

Simultaneously, the current results showed a highly significant increase of using negative parenting practices as control, harshness, induction of psychological pain, inconsistency and discrimination and highly significant decrease in using positive parenting practices in ADHD group compared to control group. Some of these negative practices (increased negligence and spoiling) were also significantly higher in hyperactive and inattentive children compared to combined group of children This is in line with other research reporting children with ADHD to be victims of inadequate parenting practices [17,30,36,41]. Commonly, mothers of children with ADHD of the hyperactive type employ physical disciplinary practices more frequently than mothers of children with ADHD of inattentive types or mothers of children without the disorder. Hyperactivity seems to be related to an experience of increased stress by parents due to difficulty in managing this behavior, favoring employment of coercive practices in an attempt to immediately control the child's hyperactive behavior [30].

Moreover, children with ADHD are commonly at greater risk of scholastic underachievement [42] which imposes more burdens on parents especially mothers to improve the academic skills of their children. Likewise, the current results showed that child's academic performance was significantly lower in the ADHD group compared to the control group. It was specifically negatively

correlated with the Child Stress domain and with maternal practicing of induction of psychological pain, but positively correlated with using positive parenting attitudes. In agreement, Rogers and colleagues [12] reported that high levels of parenting stress are associated with the use of more controlling strategies for children's academic performance, whereas lower stress is associated with a more supportive style of involvement. The absence of parental involvement in school activities can contribute to child's poor performance, increased behavioral problems, and worsening of ADHD's typical symptoms [30].

Furthermore, the current results showed that ADHD children significantly displayed increased total externalizing and internalizing problems scores (especially delinquent, aggressive withdrawn, anxious-depressed, social and attention problems scores) compared to control group. Several studies have confirmed these findings among children with ADHD in different cultures [18,43-46]. This high level of behavioral problems either internalizing or externalizing in ADHD children represent a substantial burden on the family as a whole and on parents of ADHD children, in particular, would adversely impact parent's quality of life leading to elevated parenting stress and use of inadequate parenting practices in comparison to parents of control children [18].

Parenting and ADHD: A Bidirectional Relationship

Several researches have been carried out on the bidirectional relationship (parent-to-child and child-to-parent processes) between parenting stress and child/adolescent's ADHD symptoms. Some studies point out that parental stress can increase both the symptoms of ADHD and the psychological maladjustment of children [14]. Conversely, it is well established that the higher ADHD symptom severity, the more parenting stress [36]. Increased parenting stress leads to negative parenting practices (inconsistent discipline, and corporal punishment) which reinforce the unsuitable conducts and oppositional behaviors of children [47]. The current study supports this notion where multiple regression analysis showed that increased child PSI domain alone had significant independent effect on increased negative parenting practicing such as control, negligence, harshness, induction of psychological pain, lying and discrimination. While increased both child and parents PSI domains had significant independent effect on increased practicing of inconsistency. Conversely, decreased child and parent PSI had significant independent effect on increased using positive parental attitudes.

Furthermore, mothers of children with ADHD were found to use more negative and controlling practices [30]. High levels of negative parenting practices were associated with ADHD symptom severity [48], higher rates of inattention, homework, social and home impairment [14]. Consistently, multiple regression analysis in the current study showed that increased parenting practicing of harshness, inconsistency and lying was significantly correlated with increased Conner's Hyperactivity and Oppositionality and increased parenting practicing of harshness and inconsistency was significantly correlated with increased Conner's Impulsivity. While increased practicing of induction of psychological pain was significantly correlated with increased Conner's Inattention, Cognitive and Liability domains. Whereas increased practicing of control was significantly correlated with increased Conner's Cognitive domain.

On the other hand, common comorbid behavioral problems in children and adolescents with ADHD may negatively impact parent–child relationships and result in higher levels of parenting stress [49]. While parenting stress has a direct bearing on the severity of ADHD symptoms and also associated behavioral problems [38]. In agreement, the current results showed that increased total externalizing problems was positively correlated with increased negative practicing (of harshness, inconsistency) and increased Conner's severity for Hyperactivity, but negatively correlated with using positive parental attitudes. Whereas increased total internalizing problems was positively correlated with negative practicing of control, negligence, inconsistency and negatively correlated with Conner's (Hyperactivity). In accordance, several studies reported that maternal negative parenting practices were associated with increased risks for later internalizing behavioral problems in children and adolescents [36,50,51] and also for externalizing behavior problems [32,52].

Another interesting and important finding obtained from the current study was that increased parenting stress (child, parent and life stress) and increased negative parenting practices (of control, overprotection, spoiling, harshness and induction of psychological pain) were predictors for increased probability of ADHD susceptibility (table 7). In a more detailed study, Keown [53] reported that lower levels of paternal sensitivity and maternal positive regard in early childhood are uniquely predictive of higher levels of inattentiveness in middle childhood while intrusive paternal behaviors are predictive of hyperactive- impulsive behaviors at school. Furthermore, recent evidence provides a link between parenting practices and child brain structure and function. Research investigating the neurobiological effects of parenting showed that positive maternal behavior directed to the child is associated with an acceleration of the normal pattern of cortical thinning in the prefrontal cortex (involved in executive functions, attention and response inhibition) during early adolescence which appears to reflect positive development and superior functioning. While negative parenting might indirectly influence poor adolescent outcomes and functioning via immature or delayed brain maturation [54].

Thus, certain parenting practices can have short and long-term negative influence on the child's behavior. Nevertheless, the acquisition of positive parenting skills and higher sense of parenting

competence improves both internalizing and externalizing behavior and lower parenting stress [13]. Therefore, including parents of children and adolescents with ADHD in the clinical assessment of their children and in the intervention, process as well is crucial to minimize the aforementioned vicious cycle. Recent evidence supports the effectiveness of parenting programs in improving the emotional and behavioral adjustment in children with ADHD [55-56]. They emphasize the bidirectional nature of parent–child interactions aim at reducing parental stress, teaching parent's positive child management skills, and helping parents to implement these skills in a naturalistic setting [57].

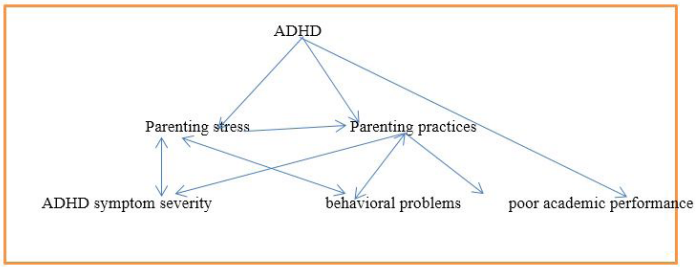

Figure 1: Summary diagram showing the correlational impact of parenting stress and practices on ADHD symptom severity and associated behavioral problems.

Lastly, this work has faced some limitations. One of these is non-inclusion of fathers in this study due to little number of fathers attending clinic with their children. Second, the inability to assess parents for psychopathology, in order to clarify the extent to which parental psychopathology influences the quality of parenting behavior. Also, the small sample size of controls may be a risk for sampling bias.

Conclusion

High levels of parenting stress negatively affects parenting practices. This vicious cycle interaction between parenting stress and parenting practices explains the high rates of externalizing/ internalizing child's behavioral problems, lower academic performance and increased severity of ADHD symptoms in children with ADHD. Thus, different psychotherapeutic interventions should address both parenting stress and parenting practices in order to provide support for mothers of children with ADHD and help them to effectively manage ADHD symptoms and any evolving behavioral problems.

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Competing Interests

The authors declare that they have no conflicts of interest.

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