The Ripple Effect: Quality of Life and Mental Health of Parents of children with ADHD in Saudi Arabia a Cross-Sectional Study

Shuliweeh Alenezi *, Samah H Alkhawashki *, Muneera AlKhorayef, Sarah Alarifi, Shahad Alsahil, Renad AlHaqbani, Nouf Alhussaini

Posted Date: 26 March 2024

doi: 10.20944/preprints202403.1543.v1

Keywords: ADHD; parents; mental health; parenting challenges

Article

The Ripple Effect: Quality of Life and Mental Health of Parents of Children with ADHD in Saudi Arabia a Cross-Sectional Study

Shluiweeh Alenezi [1,2,=], Samah H. Alkhawashki [1,2,*,=], Muneera AlKhorayef [1], Sarah Alarifi [1], Shahad Alsahil [1], Renad Alhaqbani [1] and Nouf Alhussaini [1]

[1] Department of Psychiatry, College of Medicine, King Saud University, Riyadh, Saudi Arabia.
[2] SABIC Psychological Health Research and Applications Chair (SPHRAC), Department of Psychiatry, College of Medicine, King Saud University, Riyadh, Saudi Arabia.
* Correspondence: Dr. Samah Alkhawashki, salkhawashki@ksu.edu.sa; Department of Psychiatry, King Saud University, Riyadh, Saudi Arabia. +96654279706
= These authors contributed equally to this work

Abstract: This paper introduces a low-tech capacitive micromachined ultrasonic transducer (CMUT) designed with low environmental footprint materials. The fabrication process involves a copper plate as the fixed bottom electrode, a polymer-based adhesive as a dielectric material, and an aluminum foil as the top electrode.Finite element simulations include studies of displacement, mechanical stresses, and eigenfrequency. Experimental measurements validate the device's electromechanical behavior, showing an eigenfrequency of 88.6 kHz and a displacement of 22 pm. The low-tech CMUT demonstrates potential for applications such as ultrasonic actuation and energy harvesting, offering simplicity, biocompatibility, and low environmental impact. While not directly ready for applications, these transducers provide hands-on experience with technology similar to high-performance silicon-based implementations. These low-tech MUTs are perfect practical case studies for teaching purposes, combining simulation and experimental validation.

Keywords: ADHD; parents; mental health; parenting challenges

1. Introduction

The World Health Organization (WHO) identifies Attention Deficit Hyperactivity Disorder (ADHD) as a widely occurring neurodevelopmental condition that affects children's learning and daily activities. ADHD is characterized primarily by three symptoms: inattention, or a persistent difficulty in sustaining focus; hyperactivity, which involves excessive, situationally inappropriate movements like constant fidgeting, tapping, or talking; and impulsivity, which entails hasty actions that can be harmful to oneself or others. Individuals with ADHD may exhibit predominantly inattentive or hyperactive/impulsive symptoms, or a combination of both (Ather and Salmon 2010; Cappe et al. 2017).

In Saudi Arabia, ADHD prevalence varies between 2.7% (using DSM-IV-TR criteria) and 16.4% (based on the Attention Deficit Disorders Evaluation Scale, both school and parent versions), averaging at 9.2%. This rate exceeds the average for Arab countries, which stands at 5.5%, as well as the global prevalence of 6-7%, as reported by the first global review in 2014 that analyzed 135 studies (AlZaben et al. 2018).

ADHD significantly affects both the individuals diagnosed and their families, creating a complex interplay of stress and behavior. Children's ADHD symptoms can elevate parental stress, and a strained home life may exacerbate ADHD outcomes (Durukan et al. 2008). Studies have shown that many parents of children with ADHD report increased stress (Cappe et al. 2017) and deal with heightened familial and marital discord, parental stress, guilt, susceptibility to depression, increased alcohol use, and diminished quality of life (QOL), especially in emotional and family activity domains. They exhibit less warmth, higher rates of depression and anxiety, and lower WHO Quality

 doi:10.20944/preprints202403.1543.v1

of Life (WHOQoL) scores in social relationships and environmental areas, suggesting that ADHD treatment should involve caregivers (Andrade et al. 2016).

Additionally, ADHD is a significant risk factor for poor QOL, with links to non-adaptive coping, emotional, physical, and coordination issues, as well as parental mental health problems. Such parents face more familial issues and are prone to health disorders (Ahmed et al. 2022).

Studies have demonstrated the negative impact of ADHD on parents' QOL, particularly in psychological well-being, personal fulfillment, and daily activities (Cappe et al. 2017; Ahmed et al. 2022). A study done in Hong Kong noted a significant association of some features such as severity of hyperactivity/inattention symptoms, presence of a comorbid pervasive developmental disorder, having major medical conditions, lower household income, and lower educational level with having lower scores in QOL (Xiang et al. 2009).

The growing burden of ADHD increases the psychological strain on parents, with mothers of children with ADHD particularly affected by anxiety, depression, and stress (Ramli et al. 2007). Moreover, parents of ADHD children have a higher likelihood of depression compared to controls (Margari et al. 2013). Research on parent-child dynamics in ADHD has highlighted the influence of demographic factors like the child's age and sex, and the parents' marital and socioeconomic status on parents' psychological distress (Harrison et al. 2002). With the challenges of raising a child with ADHD, factors like more siblings, learning difficulties, and comorbid conditions in children with ADHD may exacerbate parental depression and anxiety. Research combining QOL, depression, and anxiety among these parents is sparse, thus this study aims to investigate the impact of children with ADHD on their parents' QOL, depression, and anxiety levels. Therefore, this study aim to explore how previously reported variables such as the number of siblings, comorbid learning difficulties, and other psychiatric disorders affect parents' QOL, anxiety, and depression.

2. Methodology

2.1. Study Design, Participants, and Setting

This is a cross-sectional study that was conducted between August 2022 and November 2022. Participants were parents of children that have been diagnosed by a psychiatrist with any type of ADHD (inattention, hyperactivity or their combination) based on the diagnostic criteria of DSM-V TR at neurodevelopmental centers in Saudi Arabia. An online survey was created using Google Forms and participating centers were encouraged to send to their beneficiaries based on their database.

2.2. Measures

I. The quality-of-life scale (World Health Organization Quality of Life-Brief (WHOQOL-BREF): is a 26-item instrument consisting of four domains: physical health (7 items), psychological health (6 items), social relationships (3 items), and environmental health (8 items); it also contains QOL and general health items. Each individual item of the WHOQOL-BREF is scored from 1 to 5 on a response scale, which is stipulated as a five-point ordinal scale. The physical health domain includes items on mobility, daily activities, functional capacity, energy, pain, and sleep. The psychological domain measures include self-image, negative thoughts, positive attitudes, self-esteem, mentality, learning ability, memory concentration, religion, and mental status. The social relationships domain contains questions on personal relationships, social support, and sex life. The environmental health domain covers issues related to financial resources, safety, health and social services, living physical environment, opportunities to acquire new skills and knowledge, recreation, general environment (noise, air pollution, etc.), and transportation. The Arabic version from the WHO website was used, and it has been demonstrated in different studies to have good reliability and validity (HF Dalky, et al. 2017, JU Ohaeri, et al. 2009, and JU Ohaeri, et al. 2007).

II. The generalized anxiety disorder scale (GAD7): include seven items calculated by assigning scores of 0, 1, 2, and 3 to the response categories, respectively, of "not at all," "several days,"

 doi:10.20944/preprints202403.1543.v1

"more than half the days," and "nearly every day.". GAD-7 total score ranges from 0 to 21, in which "0–4: minimal anxiety" "5–9: mild anxiety" "10–14: moderate anxiety" "15–21: severe anxiety".

III. The depression scale (PHQ9): is a nine-item self-administered version of the PRIME-MD diagnostic instrument for common mental disorders. The PHQ-9 is the depression module, which scores each of the 9 DSM-IV criteria as "0" (not at all) to "3" (nearly every day). Both GAD7 and PHQ9 where translated and validated on Saudi population and showed great validity and reliability (AN AlHadi, et al. 2017).

IV. The Brief-COPE scale: is a 28 item self-report questionnaire designed to measure effective and ineffective ways to cope with a stressful life event. The scale consists of three subscales: Problem-Focused Coping, Emotion-Focused Coping, and Avoidant Coping. Scores are presented for three overarching coping styles as average scores (sum of item scores divided by number of items), indicating the degree to which the respondent has been engaging in that coping style: (1= I haven't been doing this at all, 2= A little bit, 3= A medium amount, 4= I've been doing this a lot). This tool showed to be valid and reliable instrument among the Saudi population (Alghamdi 2020).

2.3. Procedure

Following approval from the International Review Board (IRB) at King Saud University—College of Medicine, the research team contacted all neurodevelopmental disorders clinics across Saudi Arabia, utilizing publicly available information from the Ministry of Health Website. Subsequently, an electronic survey was meticulously designed, incorporating socioeconomic variables identified through a comprehensive literature review alongside other instruments: WHOQOL-BREF for assessing life quality, the brief-COPE for analyzing coping strategies, and the Patient Health Questionnaire (PHQ) modules for depression (PHQ9-9 items) and generalized anxiety (GAD7-7 items). The survey was disseminated to gather responses from parents of confirmed ADHD cases. Members of the research team oversaw the review and collection of pertinent data from medical charts. Stringent measures were implemented to ensure the security and confidentiality of collected data, with its utilization strictly confined to research objectives.

2.4. Internal Consistency and Reliability of the Measured Questionnaire

The questionnaires were assessed for internal consistency using Cronbach's alpha test. The analysis revealed that the COPE-Brief questionnaire demonstrated good internal consistency, with a Cronbach's alpha coefficient of 0.89. Similarly, the PHQ-9 questionnaire showed sufficient internal consistency, with a Cronbach's alpha coefficient of 0.88. The Generalized Anxiety GAD7 questionnaire also exhibited high internal consistency, with a Cronbach's alpha coefficient of 0.92. Furthermore, the WHOQoL-Bref, which consists of twenty-six indicators assessing parents' perceived quality of life, demonstrated excellent internal consistency, with a Cronbach's alpha coefficient of 0.940 (refer to Table A in the appendix). These findings suggest that all four questionnaire measures were reliably understood and completed by parents, indicating uniformity in their measurement reliability.

2.5. Statistical Analysis

Continuous variables were described using mean and standard deviation, while variables violating the normality assumption were described using median and interquartile range. Categorical variables were summarized using frequencies and percentages. The internal consistency of measured questionnaires was assessed using Cronbach's alpha. Bivariate correlations between metric-measured perceptions were evaluated using Spearman's (Rho) test of correlation.

To assess the statistical significance of predictors for each measured parental perception/concept (Anxiety, Depression, Adaptive & Maladaptive coping), Generalized Linear Multivariable Modeling was employed. Due to skewness in error modeling, Gamma Regression was used. The association

 doi:10.20944/preprints202403.1543.v1

between predictor variables and dependent outcome variables was expressed as multivariate-adjusted Risk Rates (RR) with a 95% confidence interval.

Parental Quality of Life (QoL) was regressed using standard multivariable Linear Regression Analysis against parental and child characteristics and ADHD-related factors. The association between predictor-independent variables and the parental perceived QoL score was expressed as an Unstandardized Beta coefficient with its associated 95% confidence interval.

Statistical data analysis was conducted using IBM SPSS software version 21, while figures and depictions were generated using Excel spreadsheets. A significance level of 0.050 was considered for all tests.

Table-A : The internal consistency analysis of the measured questionnaires .

	Number of items	Cronbach's alpha
Brief COPE questionnaire	28	0.89
Patient health questionnaire (PHQ9)	9	0.880
Generalized Anxiety Disorder (GAD7) scale	7	0.923
World Health Organization Qol (WHOQOL-bref) questionnaire	26	0.940

3. Results

Parental Characteristics and Characteristics of ADHD Children

The yielded analysis findings for the sociodemographic characteristics of the measured sample of ADHD-diagnosed children and their parents are displayed in Table 1.

Table 1. Descriptive analysis of the parent and child sociodemographic characteristics and child ADHD disease related factors.

	Frequency	**Percentage**
Relation to the child		
Mother	93	59.6
Father	63	40.4
Age (years), mean (SD)		40.90 (7.32)
Age group		
25-35 years	38	24.4
36-45 years	80	51.3
>=46 years	38	24.4
Educational Level		
High school or less education	27	17.3
Diploma degree	15	9.6
University degree	82	52.6
Higher studies	32	20.5
Employment status		
Not employed	58	37.2
Employed	98	62.8

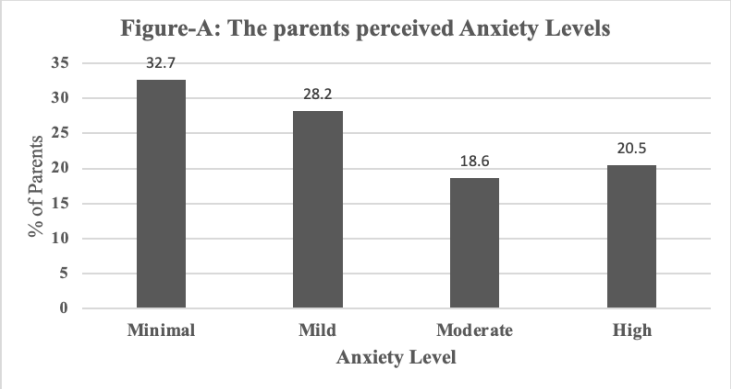
 doi:10.20944/preprints202403.1543.v1

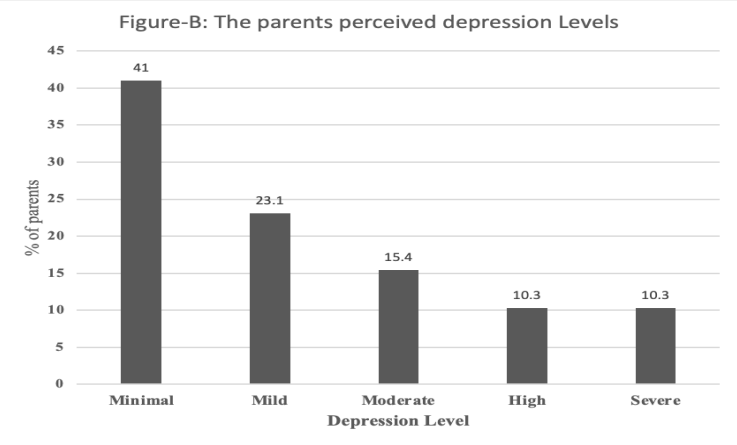
Households Monthly Income (HHI)		
<5000 Riyals/M	35	22.4
5000 - 10,000 Riyals/M	43	27.6
10,000-15,000 Riyals/M	42	26.9
More than 15,000 Riyals/M	36	23.1
Parental separation		
No	138	88.5
Yes	18	11.5
Comorbidity		
No	122	78.2
Yes	34	21.8
What chronic illness		
Diabetes	10	28.6
Hypertension	8	22.9
Thyroid Disease	8	22.6
Skin disease	3	8.6
Other disease	12	34.3
autoimmune disease	7	20
Have you been previously diagnosed with mental illness		
No	140	89.7
Yes	16	10.3
Are still diagnosed with mental illness		
No	138	88.5
Yes	18	11.5
Affected ADHD child sex		
Female	29	18.6
Male	127	81.4
Affected ADHD child age (years), mean (SD)		10.03 (3.63)
Number of live siblings, median (IQR)		2 (2)
Does the child receive ADHD treatments?		
No	68	43.6
Yes	88	56.4
Does the child have from any of these disorders?, n=110		
Separation Anxiety	4	3.6
Learning difficulties	89	80.9
Autism	31	28.2
Asperger's syndrome	4	3.6
Residence		
Riyadh city	123	78.8

 doi:10.20944/preprints202403.1543.v1

Other cities	33	21.2

According to the GAD7 scale 18.6% of parents were considered to have moderate anxiety and 20.5% high anxiety levels (Figure-A). Moreover, the PHQ-9 Scale showed 23.1% of parents were considered to have mild depression and 15.4% moderate depression level, while 10.3% and 10.3 % were found to have high and severe depression levels, respectively (Figure-B).





The study's bivariate correlations unveiled several noteworthy insights concerning parents' perceived quality of life (WHOQol-bref) scores and their relationships with various factors, as illustrated in Table 2.

The findings highlighted that parents' perceived quality of life scores exhibited positive correlations with the subscale scores of physical, psychological, social, and environmental well-being. Additionally, parents' general life and health satisfaction scores demonstrated positive and significant associations with their mean perceived quality of life scores.

Conversely, significant negative correlations were observed between parents' mean perceived quality of life scores and their perceived generalized anxiety and depression scores (rho=-0.541, p<0.010, rho=-0.725, p-value<0.010, respectively). These findings suggest that as anxiety levels and depression increased, perceived quality of life scores tended to decrease.

Furthermore, the study revealed that a higher utilization of maladaptive coping strategies among parents of children with ADHD predicted lower perceived quality of life (rho=-0.426, p-value<0.010). Interestingly, no significant correlation was found between parents' perceived adaptive coping scores and their mean perceived quality of life scores.

Moreover, parents' mean perceived depression scores exhibited positive correlations with their mean perceived maladaptive and adaptive coping scores (p-value<0.010), indicating that as depression levels increased, both maladaptive and adaptive coping strategies tended to increase.

 doi:10.20944/preprints202403.1543.v1

Table 2. : Spearman's (Rho) correlations between the parents measured perceptions.

	WHO Qol-Bref	*Phys*	*Psych*	*SOC*	*ENV*	*GL*	*GH*	*GAD*	*GAD_DIFF*	*PHQ*	*PHQ_DIFF*	*MADAPT*
QOl_bref100 Quality Of Life (0-100%) score	1.000											
Physical_Dom100 Physical Well-Being	.845**											
Psych_Dom100 Psychological Well-Being	.859**	.672**										
Social_Dom100 Social Well-Being	.824**	.590**	.543**									
Environm_Dom100 Environmental satisfaction	.833**	.612**	.713**	.611**								
Qol_1 How would you rate your life	.539**	.456**	.439**	.469**	.454**							
Qol_2 How satisfied are you with your health:	.502**	.496**	.445**	.453**	.270**	.466**						
GAD7_score Generalized Anxiety	-.541**	-.566**	-.501**	-.381**	-.353**	-.490**	-.431**					

 doi:10.20944/preprints202403.1543.v1

Disorder score												
GAD7_DIFF Perceived ADL difficulties associated with anxiety feeling	-.491**	-.568**	-.402**	-.336**	-.356**	-.450**	-.408**	.540**				
PHQ9_score General Health Anxiety PHQ9 scale score	-.725**	-.727**	-.630**	-.575**	-.464**	-.589**	-.617**	.789**	.640**			
PHQ9_DIFF Perceived ADL difficulties associated with depression	-.522**	-.558**	-.498**	-.354**	-.378**	-.476**	-.444**	.574**	.780**	.668**		
Maladaptive (Negative) coping	-.426**	-.445**	-.376**	-.255**	-.304**	-.282**	-.269**	.417**	.336**	.509**	.323**	
Adaptive (Positive) coping	-.019	-.061	.044	-.058	.060	-.126	-.083	.151	.275**	.232**	.222**	.475**

* correlation is significant at 0.050 level, ** correlation is significant at 0.010 level ,.

To gain a deeper understanding of the factors influencing parents' perceived quality of life, standard multivariable linear regression analysis was employed to regress the parents' mean perceived overall WHO-QoL BREF score against various sociodemographic characteristics, ADHD child outcomes and other relevant factors. The resulting findings, presented in Table 3, unveiled several significant correlations.

Firstly, parents' household monthly income level exhibited a significant and positive correlation with their mean perceived quality of life score. Specifically, parents with a household monthly income of >=5000 SAR/Month reported significantly higher mean perceived quality of life scores compared to those with a household income of <5000 SAR/Month, with a beta coefficient of 2.482 and a p-value<0.001.

Additionally, parents' employment status emerged as a significant factor correlated with their mean perceived quality of life score. Employed individuals reported significantly higher mean

 doi:10.20944/preprints202403.1543.v1

perceived quality of life scores compared to unemployed individuals, with a beta coefficient of 3.748 and a p-value of 0.030.

Unsurprisingly, parents' mean perceived depression scores (PHQ9) demonstrated a significant negative correlation with their mean perceived quality of life score. Higher levels of depression among parents of ADHD-diagnosed children predicted significantly lower mean perceived quality of life scores, with a beta coefficient of -1.091 and a p-value<0.001.

Furthermore, the parental mean perceived adaptive coping score exhibited a significant and positive correlation with their mean perceived quality of life score. Greater utilization of adaptive coping strategies among parents of ADHD-diagnosed children predicted significantly higher mean perceived quality of life scores, with a beta coefficient of 4.982 and a p-value<=0.001.

The number of siblings in the household also demonstrated a significant positive correlation with parents' mean perceived quality of life score, with a beta coefficient of 0.874 and a p-value of 0.035.

Table 3. Multivariate Linear Regression Analysis of the ADHD Children parental perceived Quality Of Life (Qol). (N=155).

		95.0% CI for Beta coefficient		
	Unstandardized Beta Coefficients	Lower Bound	Upper Bound	p-value
(Constant)	66،567	53،262	79،871	<0.001
Age of the parent	،144-	،384-	،097	،239
Relationship to the child= Father	،485	3،117-	4،086	،791
Educational Level	1،080-	2،842-	،681	،227
Households Monthly Income level =>5000 SAR/M	2،482	،889	4،075	،002
Employment state= employed	3،748	،375	7،122	،030
General Health Anxiety PHQ9 scale score	1،091-	1،353-	،829-	<0.001
Maladaptive coping	4،369-	7،885-	،853-	،015
Adaptive coping	4،982	2،468	7،497	<0.001
Number of siblings	،876	،064	1،688	،035
Parents history of psychological illness	3،574-	8،359-	1،210	،142
Childs ADHD severity Level	،840	1،667-	3،347	،509

DV= Parental mean perceived Overall Qol score . Model overall statistical significance : f(11,144)=18.41, p-value<0.001Model R=0.764, model adjusted R-squared=0.553.

In a Multivariable Generalized Linear Gamma Regression analysis examining parental perceived Anxiety scores (GAD7), several significant correlations emerged, as detailed in Table 4. Parents' age and educational attainment displayed significant negative correlations with their mean perceived Anxiety (GAD7) scores. With each additional year of parental age, anxiety tended to decrease by a factor of 2.68% on average (p-value<0.001). Moreover, parents holding a diploma degree or higher education reported significantly lower mean perceived Anxiety (GAD7) scores—36.4% times less compared to those with a high school or lower education level (p-value<0.001). A noteworthy correlation was observed between parents' gender. Fathers, on average, reported 19.8% lower mean perceived Anxiety (GAD7) scores compared to mothers (p-value=0.030). Interestingly, households with a monthly income below 5000 SAR/Month were associated with a 28.5% lower mean

 doi:10.20944/preprints202403.1543.v1

perceived Anxiety (GAD7) score compared to those earning >=5000 SAR/Month (p-value=0.003). The severity of ADHD symptoms in children exhibited a significant correlation with parental mean perceived Anxiety (GAD7) scores. Parents of children diagnosed with severe ADHD reported significantly higher mean perceived Anxiety (GAD7) scores—26.5% times higher than those with moderate or less severe ADHD (p-value=0.002). A significant positive correlation was found between parental mean perceived depression scores and their mean perceived Anxiety (GAD7) scores.

Table 4. Multivariable Generalized Linear Gamma Regression analysis for parental perceived Anxiety(GAD7) score (N=156).*.

Parameter	Multivariate adjusted Risk Rate (RR)	95% CI for RR		p-value
		Lower	Upper	
(Intercept)	10،674	4،971	22،917	<0.001
Age of the parent (years)	،973	،961	،986	<0.001
Relation=father	،802	،656	،979	،030
Households Monthly Income <5000	،715	،572	،894	،003
Educational Level = Diploma/University/High studies	،636	،498	،812	<0.001
Employment status= employed	1،139	،935	1،389	،197
Parental current Mental illness= Positive	1،219	،933	1،592	،147
Childs ADHD severity Level = Moderate/ High	1،265	1،090	1،467	،002
Parents mean perceived depression (PHQ9) Score	1،066	1،050	1،083	<0.001
Parents mean perceived (negative) coping score	1،100	،894	1،352	،369
Parents mean perceived (Positive) coping score	1،058	،913	1،226	،454

*Dependent Variable: parents mean perceived anxiety (GAD7) score.

When applying Gamma Analysis to the parents' mean perceived depression score (PHQ9), the results presented in Table 5 revealed several significant findings; There was no significant correlation found between parents' mean perceived maladaptive coping score and their mean perceived depression score (PHQ9). However, a significant positive correlation was observed between parents' mean perceived adaptive coping score and their mean perceived depression score. On average, for every one-point increase in the mean perceived adaptive coping score, the mean predicted depression score increased by 30.9% (p-value<0.001). A significant negative correlation was found between parents' mean perceived quality of life score and their mean perceived depression score (PHQ9). For each additional one-point rise in parents' mean perceived quality of life score, their mean perceived depression score declined by a factor equal to 2.9% on average (p-value<0.001).

These findings highlight the intricate relationship between coping mechanisms, quality of life, and parental depression levels, shedding light on factors influencing parental mental well-being in the context of raising children with ADHD..

Table 5. Multivariable Generalized Linear Gamma Regression analysis for parental perceived depression (PHQ9) score. N=156.

Parameter	Multivariate adjusted Risk Rate (RR)	95% CI for RR

 doi:10.20944/preprints202403.1543.v1

				p-value
		Lower	Upper	
(Intercept)	10.885	4.089	28.976	<0.001
Age of the parent (years)	.997	.984	1.010	.606
Relation to the child= Father	.903	.746	1.092	.294
Educational Level	1.127	.892	1.424	.316
Employed parent	1.156	.961	1.392	.124
Childs ADHD severity Level = Moderate/ High	1.091	.953	1.250	.206
Parents mean perceived (maladaptive / Negative) coping score	1.033	.856	1.246	.737
Parents mean perceived (Adaptive / Positive) coping score	1.309	1.140	1.503	<0.001
Parental mean perceived Quality Of Life QoL score	.971	.963	.979	<0.001
Parental perceived Generalized Anxiety GAD7 score	1.075	1.055	1.095	<0.001
Households Monthly income	.960	.883	1.043	.337

Dependent Variable: Patients Health Questionnaire (depression) score.

A Gamma regression employing the Generalized multivariate model was utilized to explore parental coping strategies using their mean maladaptive coping score. The findings derived from the analysis, as presented in Table 6, yielded several significant insights. Fathers of children diagnosed with ADHD reported a significantly higher mean maladaptive coping score compared to mothers, measuring 9.7% higher on average (p-value=0.019) Furthermore, parents diagnosed with a history of mental or psychological illness demonstrated significantly higher mean maladaptive coping scores compared to parents without a known history of mental illness. Specifically, their scores were 14.5% higher on average (p-value=0.024). Interestingly, parental perceived anxiety exhibited a significant and positive correlation with their mean perceived maladaptive coping score (p-value=0.004). Higher levels of parental anxiety predicted significantly higher levels of maladaptive coping in general.

Table 6. Multivariable Generalized Linear Gamma Regression analysis for parental perceived maladaptive coping score. N=156.

	Multivariate adjusted	95% CI for RR		
Parameter	Risk Rate (RR)	Lower	Upper	p-value
(Intercept)	1.565	1.123	2.180	.008
Age of the parent (years)	.996	.991	1.002	.219
Relation to the patient = father	1.097	1.016	1.186	.019
Prior diagnosis with mental Illness	1.145	1.018	1.289	.024
Sex of the ADHD diagnosed child= Male	.946	.883	1.014	.115
Age of the ADHD affected child (years)	1.010	.999	1.020	.083
Parental mean perceived Quality Of Life QoL score	.993	.990	.996	<0.001

 doi:10.20944/preprints202403.1543.v1

Parents mean perceived (Positive) coping score	1.258	1.193	1.326	<0.001
Parental perceived Generalized Anxiety GAD7 score	1.010	1.003	1.017	.004
Having an ADHD child with Learning difficulties	.912	.848	.979	.012
Having An ADHD child with Autistic traits	.891	.813	.976	.013

Dependent Variable: Maladaptive coping score.

The analysis of parents' mean Adaptive coping score (Table 7) revealed several significant findings. The parents' mean perceived quality of life score (Qol) exhibited a positive and significant correlation with their mean Adaptive coping score (p-value<0.001). Higher perceived quality of life among parents predicted significantly higher perceived adaptive coping.

Interestingly, household income did not correlate with parents' mean perceived adaptive coping. However, their educational level showed a positive correlation, with parents holding a diploma or higher educational level reporting significantly higher mean perceived adaptive coping scores (13.2% times higher) compared to those with a high school or lower educational level on average (p-value=0.017).

Furthermore, parents' mean perceived maladaptive coping score positively correlated with their mean perceived adaptive coping score. This suggests that parents may utilize both adaptive and maladaptive coping strategies simultaneously. For each additional one-point increase in parents' maladaptive coping score, their mean predicted adaptive coping score tended to rise by 30.9% on average (p-value<0.001).

Additionally, parents' mean perceived activities of daily living (ADL) difficulties associated with anxiety positively and significantly correlated with their mean perceived adaptive coping score. As parents' mean perceived ADL difficulties due to anxiety increased by one point on average, their mean adaptive coping tended to rise incrementally by a factor equal to 11.4% on average (p-value<0.001).

These findings underscore the complex interplay between various factors, such as parental perceived quality of life, education level, maladaptive coping, and ADL difficulties associated with anxiety, in shaping parents' adaptive coping strategies in the context of raising children with ADHD.

Table 7. Multivariable Generalized Linear Gamma Regression analysis for parental perceived Adaptive coping score. N=156.

	Multivariate adjusted	95% CI for RR		
Parameter	Risk Rate (RR)	Lower	Upper	p-value
(Intercept)	.669	.430	1.040	.074
Age of the parent (years)	.999	.994	1.005	.763
Relation to the patient = father	.976	.898	1.060	.564
Child receives ADHD treatments/therapy	1.030	.959	1.107	.410
Parental mean perceived Quality Of Life QoL score	1.009	1.005	1.012	<0.001
Households Monthly income <5000 SAR/Months	1.075	.978	1.183	.135

 doi:10.20944/preprints202403.1543.v1

Parental educational level = Diploma degree or higher	1.132	1.023	1.254	.017
Parents mean perceived (negative) coping score	1.309	1.216	1.410	<0.001
Parental perceived ADL difficulty associated with anxiety	1.114	1.052	1.180	<0.001

Dependent Variable: parents mean Adaptive coping score.

4. Discussion

Parenting is a continuous, challenging endeavor that places a substantial burden on parents, potentially limiting their ability to maintain the lifestyle they enjoyed before their child's birth. The behavior of a child with ADHD introduces additional challenges to parenting, as highlighted by Harrison and Sofronoff (2002). This discussion aims to examine the relationship between parental anxiety, depression, and quality of life within the context of ADHD, along with the coping mechanisms parents utilize to manage these challenges.

Our study's findings indicate that anxiety is a prevalent issue among parents of children with ADHD, with over 39% reporting medium to high levels of anxiety. This aligns with prior research, consistently demonstrating that parents of children with ADHD often face increased levels of anxiety (Durukan et al., 2008; Ramli et al., 2007; Segenreich et al., 2009). We observed significant negative correlations between parents' age and educational attainment and their mean perceived anxiety scores, suggesting that older and more educated parents tend to experience lower levels of anxiety, corroborated by Oguzoncul and colleagues (AF Oguzoncul et al., 2019). A notable correlation was also found between parents' gender, with fathers reporting lower mean perceived anxiety scores compared to mothers. Given that mothers typically serve as the primary caregivers and spend more time with the children, they encounter greater challenges in managing ADHD (Barkley, 1998). While some studies suggest that mothers of children with disabilities experience higher stress levels than fathers (Uguz et al., 2004), other research indicates that fathers are comparably affected (AF Oguzoncul et al., 2019). The disparity in mental illness prevalence between mothers and fathers and its impact on children's functionality requires further investigation.

Notably, the severity of ADHD symptoms in children was significantly correlated with parental mean perceived anxiety scores. The combined subtype of ADHD was strongly associated with increased parenting stress, life stress, marital discord, and parenting anxiety compared to inattentive presentation (Tzang et al., 2009). These findings echo qualitative studies highlighting the daily caregiving burdens parents of children with ADHD endure due to their children's behaviors (Mofokeng & van der Wath, 2017).

Depression is common among caregivers of children with ADHD (Al-Balushi et al., 2017). Mood disorders were the most prevalent psychiatric disorders among these parents, with major depression rates at 48.1% for mothers and 43.0% for fathers (Ghanizadeh et al., 2008). Our result of 35% of parents reporting moderate to severe depression. Previous studies have identified several risk factors for caregivers' depression, including gender, income level, being the sole caregiver, and the absence of a living spouse (Al-Balushi et al., 2017; Durukan et al., 2018; Wesseldijk et al., 2018). Child-related factors such as hyperactivity, impulsivity, and the combined type of ADHD also emerged as significant depression markers (Al-Balushi et al., 2017). It is crucial for clinical practice to focus on treating depression in caregivers of children with ADHD and to screen for depressive symptoms (Durukan et al., 2018). The significant impact of depression on parents' daily functioning and overall well-being underscores the need for targeted interventions and support services.

Quality of life among parents of children with ADHD was a significant focus of our study. Previous research indicates that these parents experience a lower quality of life compared to parents of healthy children (Xiang et al., 2009). Our use of the WHOQOL-BREF questionnaire to assess parental satisfaction across various life aspects provided valuable insights. Despite reports of

 doi:10.20944/preprints202403.1543.v1

moderate overall life satisfaction, parents exhibited high satisfaction with their work capacity, daily activity performance, personal relationships, and support from friends. The strong link between family support and improved outcomes for parents of chronically ill patients is well-documented (Finzi-Dottan et al., 2011), and our findings reinforce the importance of family support in maintaining the mental health of caregivers of children with ADHD. This contrasts with studies reporting parents' feelings of isolation and intolerance from others towards their children's behavior (Leitch et al., 2019; Moen et al., 2011). Furthermore, a study revealed that two-thirds of ADHD caregivers experienced a low quality of life, with all quality-of-life variables significantly worse than those of non-ADHD children's parents. Caregivers of ADHD children who had never worked or had a history of medical conditions reported an excellent degree of self-liking but only a fair level of quality of life and self-competence (Ahmed et al., 2022).

Several studies have highlighted that parents of children with ADHD often face more marital conflicts and report lower marital satisfaction than parents of children without ADHD (Johnston & Mash, 2001). Interestingly, our study found that parents of ADHD children reported higher levels of marital satisfaction, underscoring the beneficial impact of social support on their well-being. Yet, it's important to note that these parents expressed lower satisfaction regarding their need for medical treatment to function effectively, pointing to potential physical health challenges stemming from their caregiving roles, which could affect their overall well-being (Schulz & Sherwood, 2008).

Our analysis also indicated that household income and employment status significantly influenced the perceived quality of life. Parents with higher incomes and those who were employed reported a better quality of life. Furthermore, higher levels of depression and maladaptive coping were associated with a poorer quality of life, whereas adaptive coping correlated with a better quality of life, aligning with previous findings that non-working parents are more adversely affected than their working counterparts (Alwhaibi et al., 2018).

Research on the coping processes among parents of children with ADHD has been limited. This study reveals that fathers of ADHD-diagnosed children scored significantly higher on maladaptive coping strategies (9.7% higher) than mothers. A systematic review by Craig et al. (2020) found only two studies addressing the coping strategies of both parents, with one study by Podolski and Nigg (2001) reporting no significant differences between mothers and fathers in coping strategies. However, the scant representation of fathers in these studies limits our understanding of gender-based differences in coping strategies, highlighting the need for further research with a larger sample of fathers.

Additionally, our findings showed that parents with a prior mental illness diagnosis exhibited significantly higher maladaptive coping scores (14.5% higher) than those without a mental health history. These parents may face unique challenges in managing stress related to their parenting role, underscoring the importance of considering parental mental health in coping strategy assessments and support provisions. Stress management for parents of ADHD children is critical, as stress significantly affects family functioning and, consequently, children's socioemotional development (Fernandes et al., 2015).

Parents engaging in maladaptive coping reported a lower quality of life, whereas those employing adaptive coping mechanisms experienced a higher quality of life. Adopting problem-focused coping strategies, such as seeking information about ADHD, attending workshops or therapy, and establishing structured routines, can empower parents to manage their children's symptoms more effectively, thus reducing anxiety (Berenguer et al., 2021).

Furthermore, the study unveiled intriguing correlations among parental coping, quality of life, anxiety, and depression scores. Parents employing positive coping strategies reported higher depression levels, suggesting that those with adaptive coping strategies might be more conscious of their depressive symptoms. A significant negative correlation was observed between parents' quality of life scores and their depression scores, indicating that higher quality of life is associated with lower depression levels. Additionally, a positive correlation between parents' anxiety and depression scores was found, reinforcing the notion that these conditions often coexist and are closely related (Kalin,

 doi:10.20944/preprints202403.1543.v1

2020). This underscores the complex interplay between parental coping mechanisms, mental health, and quality of life in the context of parenting a child with ADHD.

5. Conclusion

Living with a child with ADHD presents significant challenges, particularly for parents who must develop specialized coping skills. Our study revealed high levels of anxiety and depression among these parents. Notably, ADHD in children adversely affects their parents' quality of life, with notable detriments to social well-being and environmental interactions. Our findings indicate that higher levels of depression and anxiety correlate with a lower perceived quality of life among parents. The quality of life scores was inversely related to the parents' maladaptive coping scores; the most frequently reported maladaptive strategies involved self-criticism, self-blame for past events, and verbalizing negative feelings as a release. Furthermore, a greater reliance on maladaptive coping strategies was linked to a diminished quality of life.

In summary, the study underscores the profound effects of depression, anxiety, and coping strategies on the quality of life for parents of children with ADHD. It accentuates the critical need for targeted support and interventions to enhance mental well-being and coping mechanisms within this demographic.

6. Limitations

The study delineates specific limitations that could affect the interpretation and generalizability of its findings. Firstly, the small sample size poses a significant constraint, making it difficult to extend the results to a broader population. Secondly, the lack of a control group is a notable limitation. Including parents of children without ADHD could provide a comparative baseline to discern if the observed variables are uniquely prevalent or intensified in the ADHD context.

Additionally, the methodological design restricts the breadth of possible interpretations due to its inability to assess causality. Without the ability to ascertain the directionality of the effects, it remains unclear whether variables such as depression and anxiety are outcomes of coping with a child's ADHD or if they precede and potentially contribute to the perceived challenges of parenting.

Lastly, the cross-sectional nature of the research does not account for the longitudinal impact of environmental factors on the variables studied. This restricts the study's capacity to understand the evolving nature of parental experiences and the potential for changes in mental well-being, coping strategies, and quality of life over time. Future research could address these limitations by incorporating larger, more diverse samples, control groups, methodological designs capable of assessing causality, and longitudinal approaches to explore the enduring effects of environmental influences.

7. Recommendation

In Saudi Arabia, limited studies have addressed the importance of early intervention for psychological distress in parents of ADHD children. Conducting more studies on prevention methods and psychological screening for parents of ADHD children is recommended.

Author Contributions: Each author contributed significantly to the conception and design of the study, acquisition of data, and analysis and interpretation of the findings. Furthermore, all authors actively participated in drafting the manuscript and revising it critically for important intellectual content. Finally, each author provided final approval for the version of the article to be published and committed to being accountable for all aspects of the work.

Funding: The authors are grateful to the Deanship of Scientific Research, King Saud University, for funding through the Vice Deanship of Scientific Research Chairs.

Ethical Considerations: This study was approved by the International Review Board at King Saud University—College of Medicine on June 13th, 2022 (Ref. No. 22/0483/IRB). The data was encrypted and analyzed to maintain participants' confidentiality.

 doi:10.20944/preprints202403.1543.v1

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study. The consent to participate was obtained by including a page before starting the survey, where we informed the participants about the aim of the study at the start of the survey and then asked them to click on "yes" if they agreed to participate.

Data Availability Statement: The data presented in this study are available upon reasonable request from the corresponding author.

Acknowledgments: The authors extend their gratitude to all parents of ADHD children who participated in the survey. They also express appreciation to the Saudi ADHD Society for their continuous support of scholarly endeavors. Additionally, the authors acknowledge the SABIC Psychological Health Research and Applications Chair (SPHRAC), Department of Psychiatry, College of Medicine, King Saud University, for their ongoing support of mental health research. Funding for this study was provided by the Deanship of Scientific Research, King Saud University, through the Vice Deanship of Scientific Research Chairs.

Conflict of Interest: The authors declare that the research was conducted without any commercial or financial relationships that could be construed as a potential conflict of interest.

Abbreviations:

ADHD Attention Deficit Hyperactivity Disorder

QOL Quality of Life

ADL Activities of Daily Living

KSUMC King Saud University Medical City

WHO World Health Organization

HHI Household monthly income

References

1. Ahmed, Mona Gamal Abd, Ebaa Marwan Felemban, and Marwa Abd El-Fatah El-slamoni. 2022. "A Comparative Study: Quality of Life, Self-Competence, and Self-Liking among the Caregivers of Children with Attention Deficit Hyperactivity Disorder and Other Non-ADHD Children." *Middle East Current Psychiatry* 29 (1). https://doi.org/10.1186/s43045-022-00189-x.
2. AlHadi, A. N., AlAteeq, D. A., Al-Sharif, E., Bawazeer, H. M., Alanazi, H., AlShomrani, A. T., ... & AlOwaybil, R. (2017). An arabic translation, reliability, and validation of Patient Health Questionnaire in a Saudi sample. Annals of general psychiatry, 16, 1-9.
3. Al-Balushi, Naser, Muna Al Shekaili, Mohammed Al-Alawi, Manal Al-Balushi, and Samir Al-Adawi. 2017. "Prevalence and Predictors of Depressive Symptoms among Caregivers of Children with Attention-Deficit/hyperactivity Disorder Attending a Tertiary Care Facility: A Cross-Sectional Analytical Study from Muscat, Oman." *Early Child Development and Care* 189 (1): 1–10.
4. Al-Dubai, Sami Abdo Radman, Zainab Jameel Alnakhli, and Sarah Almutari. 2020. "Assessment of Burden on Caregivers of Children with Attention DeficitHyperactivity Disorder in Al-Madinah Saudi Arabia." *International Journal of Medical Research & Health Sciences* 9 (11): 10–17.
5. Alwhaibi, Reem Mohammed, Uzma Zaidi, Ibtisam Alzeiby, and Adel Alhusaini. 2018. "Quality of Life and Socioeconomic Status: A Comparative Study among Mothers of Children with and without Disabilities in Saudi Arabia." *Child Care in Practice* 26 (10): 1–19.
6. AlZaben, Faten N., Mohammad G. Sehlo, Waleed A. Alghamdi, Haythum O. Tayeb, Doaa A. Khalifa, Abdulrahman T. Mira, Abdulaziz M. Alshuaibi, Mosab A. Alguthmi, Ahmad A. Derham, and Harold G. Koenig. 2018. "Prevalence of Attention Deficit Hyperactivity Disorder and Comorbid Psychiatric and Behavioral Problems among Primary School Students in Western Saudi Arabia." *Saudi Medical Journal* 39 (1): 52–58.
7. Andrade, Elisa Meirelles, Laysa Minella Geha, Paula Duran, Raphael Suwwan, Felipe Machado, and Maria Conceição do Rosário. 2016. "Quality of Life in Caregivers of ADHD Children and Diabetes Patients." *Frontiers in Psychiatry / Frontiers Research Foundation* 7 (July): 127.
8. Ather, Muhammed, and Gill Salmon. 2010. "Attention Deficit Hyperactivity Disorder." *British Journal of Hospital Medicine* 71 (11): 641–44.

 doi:10.20944/preprints202403.1543.v1

9. Berenguer, C., Rosello, B., & Miranda, A. (2021). Mothers' stress and behavioral and emotional problems in children with ADHD. Mediation of coping strategies. *Scandinavian journal of psychology*, *62*(2), 141-149.
10. Cappe, Emilie, Mélanie Bolduc, Marie-Caroline Rougé, Marie-Claude Saiag, and Richard Delorme. 2017. "Quality of Life, Psychological Characteristics, and Adjustment in Parents of Children with Attention-Deficit/Hyperactivity Disorder." *Quality of Life Research: An International Journal of Quality of Life Aspects of Treatment, Care and Rehabilitation* 26 (5): 1283–94.
11. Craig, Francesco, Rosa Savino, Isabella Fanizza, Elisabetta Lucarelli, Luigi Russo, and Antonio Trabacca. 2020. "A Systematic Review of Coping Strategies in Parents of Children with Attention Deficit Hyperactivity Disorder (ADHD)." *Research in Developmental Disabilities* 98 (March): 103571.
12. Dalky, H. F., Meininger, J. C., & Al-Ali, N. M. (2017). The reliability and validity of the Arabic World Health Organization quality of life-BREF instrument among family caregivers of relatives with psychiatric illnesses in Jordan. Journal of Nursing Research, 25(3), 224-230.
13. Durukan, İbrahim, Murat Erdem, A. Evren TUFAN, Ayhan Cöngöloğlu, and Tümer Türkbay. 2008. "Depression and Anxiety Levels and Coping Strategies Used by Mothers of Children with ADHD: A Preliminary Study." *Anatolian Journal of Psychiatry* 9 (4): 217–23.
14. Durukan, İbrahim, Koray Kara, Mahmoud Almbaideen, Dursun Karaman, and Hesna Gül. 2018. "Alexithymia, Depression and Anxiety in Parents of Children with Neurodevelopmental Disorder: Comparative Study of Autistic Disorder, Pervasive Developmental Disorder Not Otherwise Specified and Attention Deficit-Hyperactivity Disorder." *Pediatrics International: Official Journal of the Japan Pediatric Society* 60 (3): 247–53.
15. Fernandes, S. S., Machado, M., & Machado, F. (2015). Parental acceptance, parental stress, and quality of life: A study with parents of ADHD children. Italian Journal of Special Education for Inclusion, 3(1), 71-84.
16. Finzi-Dottan, Ricky, Yael Segal Triwitz, and Pavel Golubchik. 2011. "Predictors of Stress-Related Growth in Parents of Children with ADHD." *Research in Developmental Disabilities* 32 (2): 510–19.
17. Ghanizadeh, Ahmad, Mohammad Reza Mohammadi, and Rozita Moini. 2008. "Comorbidity of Psychiatric Disorders and Parental Psychiatric Disorders in a Sample of Iranian Children with ADHD." *Journal of Attention Disorders* 12 (2): 149–55.
18. Harrison, Christine, and Kate Sofronoff. 2002. "ADHD and Parental Psychological Distress: Role of Demographics, Child Behavioral Characteristics, and Parental Cognitions." *Journal of the American Academy of Child and Adolescent Psychiatry* 41 (6): 703–11.
19. Johnston, Charlotte, and Eric J. Mash. 2001. "Families of Children With Attention-Deficit/Hyperactivity Disorder: Review and Recommendations for Future Research." *Clinical Child and Family Psychology Review* 4 (3): 183–207.
20. Oguzoncul, A. F., Kurt, O., Devecı, S. E., Pırınccı, E., & Yazıcı, I. P. (2019). Determination of depression and anxiety levels among parents of ADHD children. Annals of Clinical and Analytical Medicine Original Research, 12, 69-73.
21. Ohaeri, J. U., Awadalla, A. W., El-Abassi, A. H. M., & Jacob, A. (2007). Confirmatory factor analytical study of the WHOQOL-Bref: experience with Sudanese general population and psychiatric samples. BMC Medical Research Methodology, 7, 1-9.
22. Ohaeri, J. U., & Awadalla, A. W. (2009). The reliability and validity of the short version of the WHO Quality of Life Instrument in an Arab general population. Annals of Saudi medicine, 29(2), 98-104.
23. Kalin, Ned H. 2020. "The Critical Relationship Between Anxiety and Depression." *The American Journal of Psychiatry* 177 (5): 365–67.
24. Leitch, Sophie, Emma Sciberras, Brittany Post, Bibi Gerner, Nicole Rinehart, Jan M. Nicholson, and Subhadra Evans. 2019. "Experience of Stress in Parents of Children with ADHD: A Qualitative Study." *International Journal of Qualitative Studies on Health and Well-Being* 14 (1): 1690091.
25. Lloyd, Tracey, and Richard P. Hastings. 2009. "Parental Locus of Control and Psychological Well-Being in Mothers of Children with Intellectual Disability." *Journal of Intellectual & Developmental Disability* 34 (2): 104–15.

26. Margari, Francesco, Francesco Craig, Maria Giuseppina Petruzzelli, Annalinda Lamanna, Emilia Matera, and Lucia Margari. 2013. "Parents Psychopathology of Children with Attention Deficit Hyperactivity Disorder." *Research in Developmental Disabilities* 34 (3): 1036–43.
27. Moen, Oyfrid Larsen, Marie Louise Hall-Lord, and Birgitta Hedelin. 2011. "Contending and Adapting Every Day: Norwegian Parents' Lived Experience of Having a Child with ADHD." *Journal of Family Nursing* 17 (4): 441–62.
28. Mofokeng, Meisie, and Anna E. van der Wath. 2017. "Challenges Experienced by Parents Living with a Child with Attention Deficit Hyperactivity Disorder." *Journal of Child and Adolescent Mental Health* 29 (2): 137–45.
29. Ramli, Bin Musa, Ramli Bin Musa, and Zasmani Shafiee. 2007. "Depressive, Anxiety and Stress Levels among Mothers of ADHD Children and Their Relationships to ADHD Symptoms" 8 (1): 20–28.
30. Schulz, Richard, and Paula R. Sherwood. 2008. "Physical and Mental Health Effects of Family Caregiving." *The American Journal of Nursing* 108 (9 Suppl): 23–27; quiz 27.
31. Segenreich, D., D. Fortes, G. Coutinho, G. Pastura, and P. Mattos. 2009. "Anxiety and Depression in Parents of a Brazilian Non-Clinical Sample of Attention-Deficit/ Hyperactivity Disorder (ADHD) Students." *Brazilian Journal of Medical and Biological Research = Revista Brasileira de Pesquisas Medicas E Biologicas / Sociedade Brasileira de Biofisica... [et Al.]* 42 (5): 465–69.
32. Tzang, R. F., Chang, Y. C., & Liu, S. I. (2009). The association between children's ADHD subtype and parenting stress and parental symptoms. International Journal of Psychiatry in Clinical Practice, 13(4), 318-325.
33. Wesseldijk, L. W., G. C. Dieleman, F. J. A. van Steensel, M. Bartels, J. J. Hudziak, R. J. L. Lindauer, S. M. Bögels, and C. M. Middeldorp. 2018. "Risk Factors for Parental Psychopathology: A Study in Families with Children or Adolescents with Psychopathology." *European Child & Adolescent Psychiatry* 27 (12): 1575–84.
34. Xiang, Yu-Tao, Ernest S. L. Luk, and Kelly Y. C. Lai. 2009. "Quality of Life in Parents of Children with Attention-Deficit-Hyperactivity Disorder in Hong Kong." *The Australian and New Zealand Journal of Psychiatry* 43 (8): 731–38.