

The Impact of Attention-Deficit/Hyperactivity Disorder Treatment on Caregiver's Burden, Anxiety, and Depression Symptoms

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ABSTRACT

Background: Attention deficit/Hyperactivity disorder (ADHD) affects the quality of life not only of children but also of their caregivers, particularly parents. This study investigates the effects of ADHD treatment on the burden, anxiety, and depression experienced by the parents of children with ADHD.

Methods: This study involved 92 children diagnosed with ADHD, aged 6-17 years and their primary caregivers. Both children and caregivers participated in a structured psychiatric interview based on the DSM-V criteria. At the start of treatment and again 3 months later, the children's behavioral problems were assessed using the Conners' Parent Rating Scale-Revised: Short Form (CPRS-R:S). Caregiver outcomes were evaluated using the Burden Assessment Scale (BAS), the Hamilton Anxiety Rating Scale (HARS), and the Hamilton Depression Rating Scale (HDRS).

Results: A statistically significant reduction in caregiver burden was observed in the BAS scores from the time of ADHD treatment initiation to 3 months later ($P < .001$, $r^2=0.56$). The highest BAS scores were consistently associated with hyperactivity, while the lowest scores were noted in caregivers of children with attention-deficit-dominant ADHD, both before and 3 months after treatment ($P < .001$, $\eta^2=0.312$; $P < .001$, $\eta^2=0.314$, respectively). The caregivers' HARS and HDRS scores decreased after 3 months of treatment, although this change was not statistically significant ($P=.47$ and $P=.36$, respectively).

Conclusion: Attention deficit/hyperactivity disorder treatment significantly reduced the caregiver burden within 3 months, highlighting the importance of timely diagnosis and treatment of ADHD for improving children's symptoms and relieving the caregiver burden of their parents.

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INTRODUCTION

Attention deficit/hyperactivity disorder (ADHD) is one of the most common neurodevelopmental disorders in children and adolescents. It is frequently diagnosed during childhood and can persist into adulthood.^{1,2,3} Systematic reviews estimate its global prevalence in the community to be approximately 5% (ranging from 2% to 7%).² Attention deficit/hyperactivity disorder in children may cause issues concerning focus, self-control, impulsive behavior, and/or excessive activity.^{1,3} Although both medication and non-medication treatments have been shown to alleviate ADHD symptoms, some individuals continue to experience symptoms or functional impairments that adversely affect their lives and the lives of their families.^{4,5} Attention deficit/hyperactivity disorder also impacts family dynamics, complicating parents' lives and diminishing the overall quality of life for both children and their families.^{6,7} Studies report that parents of children with ADHD are

more likely to experience depression and poorer mental health.^{8,9}

Children with ADHD face not only behavioral challenges but also emotional instability. They may become overly sensitive and easily upset, leading to frequent conflicts within families as children compete for attention. The disorder affects each child individually as well as the family system as a whole.¹⁰ Parents often lack time to care for themselves, which can result in fewer intimate moments in their marriage and more frequent family arguments. Additionally, reduced social engagement with neighbors can leave parents feeling isolated and unsupported, increasing their stress levels and putting them at a greater risk of developing mental health issues.^{11,12} Current studies also indicate that mental health issues¹³ and substance use¹⁴ during the peripartum period can increase the likelihood

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of children having ADHD in the future. In summary, a clear interaction exists between ADHD and the mental health of caregiving parents.

The majority of research on caregivers of children with ADHD is typically correlational and cross-sectional.^{12,15} Numerous studies have demonstrated that ADHD significantly affects the daily lives of parents and caregivers, creating difficulties at home and straining family dynamics.^{5,7,9} However, caregiver burden and depression remain underexplored despite their importance.

Stimulant medications, such as methylphenidate and amphetamines, as well as non-stimulant medications like atomoxetine, clonidine, and guanfacine, play a crucial role in treating ADHD and alleviating its symptoms.¹⁶ Although studies highlight the positive effects of these medications on children's academic performance and family dynamics,^{1,16} limited research exists on how these treatments affect the mental health of parents.

Notably, a scarce number of prospective studies have examined the impact of ADHD therapy on the burden, anxiety, and depressive symptoms experienced by parents of children with ADHD. This prospective follow-up study aims to investigate the effects of treatment on recently diagnosed ADHD children aged 6-17 years, focusing on the burden, anxiety, and depression experienced by their caregivers. The study also seeks to monitor these effects during the 3-month treatment period. The primary objectives include assessing the impact of ADHD treatment on caregiver burden, determining whether stimulant and non-stimulant medicines differ in terms of caregiving burden, evaluating the effect of ADHD treatment on caregiver anxiety and depression levels, and examining the potential correlation between caregiver burden and the type of ADHD. The primary hypothesis posits that both caregiver burden and anxiety and depression levels will alleviate with ADHD treatment.

MAIN POINTS

- Treatment of children with ADHD reduces the ADHD-related burden on caregivers.
- Caregivers of children with ADHD who experienced high-burden scores before and after treatment were associated with hyperactivity, while those with attention-deficit-dominant ADHD had the lowest burden scores.
- A 3-month treatment of children with ADHD did not significantly change the anxiety and depression scores of the caregivers.
- Both stimulant and non-stimulant medications resulted in similar reductions in the caregiving burden for parents of children with ADHD after 3 months of treatment.
- Early diagnosis and treatment of ADHD are vital for alleviating children's symptoms and reducing the disease-related burden on parents.

MATERIAL AND METHODS

Study Design and Participants

The Institutional Review Board of the Mugla Sitki Kocman University has approved this project on 25.01.2024 (protocol/decision number: 240024/17). All procedures were conducted in accordance with the 1964 World Medical Association (WMA) Declaration of Helsinki-Ethical Principles for Medical Research Involving Human Participants, its subsequent amendments, and similar ethical standards and guidelines established by the institutional and national research committees. All patients and their caregiver(s) provided written informed consent to participate in the study after receiving a complete explanation of the study protocol. Parents were allowed to participate during their regular visits together with their children.

The study inclusion criteria for children were as follows: age 6-17 years, being treated for ADHD for the first time, not receiving any psychotropic medication apart from stimulant and non-stimulant (atomoxetine) therapy at the start and 3 months later, not suffering from any other comorbid psychiatric or disruptive disorders or a severe physical illness. The inclusion criteria for caregivers were as follows: being the mother or father of a child with ADHD, having only 1 child with ADHD at home, living with a child diagnosed with ADHD for at least 6 months, not receiving psychiatric treatment or diagnosed with a psychiatric disease, not having a debilitating physical disease, speaking Turkish fluently, and being able to provide written informed consent. The exclusion criteria for caregivers were as follows: being the parent of a child who has a severe mental illness not related to ADHD, such as addictions, schizophrenia, autistic spectrum disorders, or depressive disorders.

After explaining the study protocol, the children and Turkish-speaking caregivers (or legally authorized representatives) who agreed to participate voluntarily in the study and met the inclusion and exclusion criteria signed informed consent forms. Participants received no payment for their involvement. The study population consisted of 92 children with newly diagnosed ADHD who did not have any other psychiatric condition(s), and caregiver parents of these 92 children who did not have any chronic physical or psychiatric illnesses. The children were assessed for ADHD using DSM-5 criteria by a child psychiatrist, who determined their specific type of ADHD. Subsequently, they were prescribed appropriate stimulant and non-stimulant medications.

Rating Scales

The children were evaluated at baseline and 3 months later with the 27-item Conners' Parent Rating Scale-Revised: Short Form (CPRS-R:S) to evaluate the change in symptoms of ADHD. Upon admission, at the onset of treatment for

ADHD, a psychiatrist assessed the mental condition of parents (caregivers) using the Burden Assessment Scale (BAS), Hamilton Anxiety Rating Scale (HARS), and Hamilton Depression Rating Scale (HDRS). Three months later, another psychiatrist readministered these scales to the parents.

The CPRS-R:S is commonly used to diagnose ADHD, determine its prevalence, and evaluate the effects of treatment and training on symptomatic improvement in ADHD. It assesses 3 sub-dimensions: defiance, hyperactivity, and cognitive problems, including attention, with 27 items with a total score ranging between 27 and 81 points. A higher score indicates a greater and more significant impact on the issues outlined in the scale. Conners et al¹⁷ developed and revised this scale, while Kaner et al¹⁷ conducted a standardization study for the authors' country.

The BAS is a self-rated, 19-item scale that focuses particularly on objective and subjective repercussions for caregivers. Ten items measure the objective burden and refer to the behavioral impacts of caregiving that may be observed, such as money issues, restrictions on one's activities, disturbances at home, and strained social relationships. Nine items evaluate the subjective components of the burden, including the caregiver's emotions, behaviors, and sentiments, using a 4-point Likert scale.¹⁸ Validity and reliability analysis of its Turkish version was completed in 2012.¹⁹

The HDRS, developed by M. Hamilton et al,²⁰ is a popular tool evaluated by clinicians for assessing depression. The corresponding scale scores are interpreted as follows: no depression: 0-7 points; mild depression: 8-15 points; moderate depression: 16-28 points; severe depression: ≥ 29 points. Studies on the validity and inter-rater reliability of this scale in Turkish were published by Akdemir et al in 1996.²¹

Hamilton Anxiety Rating Scale, which is still often employed in clinical studies, is one of the earliest scales created to assess the severity of anxiety symptoms. The 14-item scale measures both somatic (i.e., bodily complaints associated with anxiety) and psychic (i.e., mental agitation and psychological distress) anxiety. A set of symptoms characterizes each item on the scale. Studies on the validity and reliability of its Turkish version were carried out by Yazici et al in 1998.^{22,23}

Statistical Analyses

In this study, statistical analyses were performed using the SPSS v.25.0 (IBM SPSS Corp.; Armonk, NY, USA) statistical package program, and a *P* value of less than .05 was considered statistically significant. The Kolmogorov-Smirnov test was used to analyze the probability of the data. Data that showed a normal distribution were presented with mean and SD values. In contrast, numerical data that did not conform to a normal distribution were expressed with median, minimum, and maximum values.

Non-parametric tests were applied in group comparisons since the numerical data did not fit a normal distribution. The Wilcoxon test was used for pairwise group comparisons with dependent variables, and the Mann-Whitney U-test with independent measurements. The Kruskal-Wallis test was used for comparisons among three or more groups determined based on the type of ADHD. The Mann-Whitney U-test was also performed with Bonferroni correction to test the significance of pairwise differences between groups (with a *P*-value of $<.017$ for statistical significance) to adjust for multiple comparisons.

RESULTS

The study population of 92 participants who completed the study consisted of 58 male and 34 female patients and their caregivers (parents). Fourteen patients were born in rural areas, while 78 were born in the city center. The caregivers had varying levels of education: primary school ($n=74$), secondary school ($n=12$), and high school ($n=6$) graduates. The mean age of the patients was 9.91 ± 2.43 (6-15) years. The number of patients receiving different medications was as follows: short-acting methylphenidate (Ritalin®, Novartis, Swiss) (22 mg/day) ($n=25$), long-acting methylphenidate (Concerta®, Johnson & Johnson, NY, USA) (42 mg/day) ($n=38$) (42 mg/day), atomoxetine (Strattera®, Camber Pharm, NY, USA) (84 mg/day) ($n=13$) (84 mg/day), or extended-release methylphenidate ($n=16$) (Medikinet®, Assos Pharm, Turkey) (30 mg/day) ($n=16$). The children were not taking any medication other than these drugs, as required by the inclusion and exclusion criteria of the study. When categorized by ADHD type, 29 individuals exhibited a predominant attention deficit, 26 showed predominant hyperactivity, and 37 had a combined clinical presentation. The primary caregivers were the mothers of 84 participants and the fathers of 8 patients.

Ninety-two caregivers of children with ADHD were evaluated 3 months later. The mean age of the caregivers was 33.82 ± 4.12 (28-44) years. The median caregiver burden score (BAS) was 43.5 (28-76) before and 42 (27-76) 3 months after the onset of treatment for ADHD, with a statistically significant difference indicating a considerable size effect according to Cohen's *d* statistic ($z=-5.373$, $P < .001$, $r=0.56$). The median (range) HDRS and HARS scores of the caregivers at the start of the treatment and 3 months later did not differ statistically significantly (6 [1-15]) and (6 [1-14] vs. 4 [1-11] and 4 [1-11], respectively) ($P=.471$ and $.364$, respectively) (Table 1).

In this study, caregivers' BAS, HDRS, and HARS scores were compared based on their children's ADHD type at the beginning of the research and after 3 months of ADHD treatment. Since caregivers' BAS, HDRS, and HARS scores did not conform to a normal distribution, median and minimum-maximum values were considered, and non-parametric tests were applied in statistical analysis. The

Table 1. Comparison of Caregivers' Burden Assessment Scale, Hamilton Depression Rating Scale, and Hamilton Anxiety Rating Scale Scores Before and 3 Months After the Onset of Attention Deficit/Hyperactivity Disorder Treatment

	At the Start of ADHD Treatment Median (Min-Max)	Three Months after the Onset of ADHD Treatment Median (Min-Max)	<i>P</i>	<i>r</i> ^a
BAS scores of caregivers	43.5 (28-76)	42 (27-76)	<.001	0.56
HDRS scores of caregivers	6 (1-15)	6 (1-14)	.364	0.039
HARS scores of caregivers	4 (1-11)	4 (1-11)	.471	0.032

A non-parametric test (Wilcoxon) was used because the variables did not follow a normal distribution. Additionally, dependency was existed between the variables. *r*^a=effect size ($r=Z/\sqrt{N}$)

ADHD, attention deficit and hyperactivity disorder; BAS, Burden Assessment Scale; HARS, Hamilton Anxiety Rating Scale; HDRS, Hamilton Depression Rating Scale.

findings revealed that caregivers' HARS and HDRS scores did not exhibit any statistically significant difference based on their children's ADHD type at baseline and after 3 months ($P > .05$). However, the BAS scores did show a statistically significant difference at both baseline and after 3 months ($P < .001$) with a medium effect size ($\eta^2=0.312$ and 0.314 , respectively, according to Cohen's *d* statistic (1992)) (Table 2). To investigate specific group differences, post hoc pairwise comparisons were conducted using the Mann-Whitney U-test following a significant main effect in the Kruskal-Wallis test. To control for Type I error due to multiple comparisons, a Bonferroni correction adjusted the significance level to 0.017 (0.05/3 comparisons). Pairwise comparisons of caregivers' BAS scores at baseline revealed significant differences between attention-deficit vs. hyperactivity ($P < 0.001$), attention-deficit vs. combined type ($P=.016$), and hyperactivity vs. combined type groups ($P < 0.001$). Similar significant differences were observed after 3 months for the same group comparisons ($P < .001$, $P=.016$, and $P < .001$, respectively) (Table 2). These findings indicate that caregivers of children with hyperactivity-dominant ADHD experienced significantly higher levels of burden compared to caregivers of children

with combined-type ADHD, who in turn reported higher burden levels than caregivers of children with attention-deficit-dominant ADHD. This pattern was consistent at both baseline and 3 months after treatment.

In this study, the Conners' Parent Rating Scale scores of children with ADHD were compared at baseline and 3 months later to assess changes in symptom severity. The results indicated a significant decrease in symptom severity at 3 months compared to baseline ($P < .001$, $z=-8.347$) (Table 3). The children were then categorized based on the type of medication they were receiving for ADHD. The differences in Conners' Parent Rating Scale scores at the start of treatment and 3 months later were compared across medication groups. The findings revealed no statistically significant difference in symptomatic improvement among children based on the type of medication used ($P=.771$). To differentiate the effects of stimulant treatment from non-stimulant treatment—which might take longer to demonstrate effects—a sensitivity analysis was performed (Table 4). When the difference between pre-and post-CPRS-R:S is categorized according to the median (25.0), short-acting methylphenidate treatment had a sensitivity of 28.6% and a selectivity of 74.4% for detecting a difference

Table 2. Comparison of Burden Assessment Scale, Hamilton Depression Rating Scale, and Hamilton Anxiety Rating Scale Scores of Caregivers Based on the Attention Deficit/Hyperactivity Disorder Type of Their Children

	Hyperactivity Dominant n = 26 Median (Min-Max)	Attention Deficit Dominant n = 29 Median (Min-Max)	Combined Clinical Presentation n = 37 Median (Min-Max)	<i>P</i>	η^2 ^b
HARS (at baseline)	5 (1-11)	4 (2-11)	4 (1-11)	.636	0.150
HARS (3 months after)	5 (2-11)	4 (2-11)	4 (1-10)	.641	0.134
HARS (Last-First)	0 (1-1)	0 (1-2)	0 (2-3)	.712	0.031
HDRS (at baseline)	6 (1-13)	6 (3-10)	7 (1-15)	.653	0.199
HDRS (3 months after)	7 (1-11)	6 (4-9)	6 (2-14)	.194	0.336
HDRS (Last-First)	0 (4-5)	0 (2-4)	1 (3-5)	.776	0.072
BAS (at baseline)	63 (29-75) ^c	41 (28-76) ^d	44 (28-56) ^d	<.001	0.312
BAS (3 months later)	62 (27-75) ^c	40 (28-76) ^d	42 (28-58) ^d	<.001	0.314
BAS (Last-First)	1 (1-10)	0 (1-10)	1 (3-5)	.568	0.126

A non-parametric test (Kruskal-Wallis) was used because the variables did not follow a normal distribution.

Similar letters in the same row (c or d) indicate similarities between groups, while different letters indicate statistically significant differences between groups. ^b η^2 =effect size, $\eta^2=(H - k + 1)/(n - k)$

ADHD, attention deficit and hyperactivity disorder; BAS, Burden Assessment Scale; HARS, Hamilton Anxiety Rating Scale; HDRS, Hamilton Depression Rating Scale.

Table 3. Comparison of Conners' Parent Rating Scale-Revised: Short Form Score Differences in Children at Baseline and 3 Months Later

later CPRS-R:S (At Baseline) Median (Min-Max)	CPRS-R:S (3 Months Later) Median (Min-Max)	P	r ^a
65 (42-75)	40 (30-55)	<.001	0.870

Non-parametric Wilcoxon test was used because the variables did not follow a normal distribution, and there was dependency between the variables. r^a = effect size ($r = Z / \sqrt{N}$)

CPRS-R:S, Conners' Parent Rating Scale-Revised: Short Form.

greater than 25 points, long-acting methylphenidate treatment had a sensitivity of 36.7% and a selectivity of 53.5%, extended-release methylphenidate treatment had a sensitivity of 22.4% and a selectivity of 88.4%, and non-stimulant treatment had a sensitivity of 12.2% and a selectivity of 83.7%. The highest sensitivity (36.7%) was found with long-acting methylphenidate treatment, and the highest selectivity (88.4%) was found with extended-release methylphenidate treatment.

DISCUSSION

This study explored the impact of ADHD treatment on family burden, anxiety, and depression symptoms among parents of children diagnosed with ADHD, as well as the relationship between these symptoms and ADHD subtypes. Few studies have examined the relationship between ADHD and caregiver burden in comparison to other chronic psychiatric conditions. Existing research indicates that female caregivers of individuals with ADHD often experience moderate-to-severe disease-related burdens.^{12,25} To the best of the knowledge, this is the first prospective study to investigate the effect of ADHD treatment on caregiver burden.

Children with ADHD commonly exhibit inattention, hyperactivity, and impulsivity, resulting in behaviors such as excessive talking, easy distractibility, mood swings,

and uncooperativeness. These behaviors can significantly strain caregivers' parenting abilities, particularly parents. Unsurprisingly, parents of children with ADHD report higher stress levels than parents of typically developing children.²⁶ One study found that caregivers of children and adolescents with ADHD encountered substantial challenges in their professional, social, and family lives, experiencing worry and stress even when their children were receiving ADHD medications.²⁷

Hyperactivity and inattention symptoms contribute significantly to parenting stress.⁴ In this study, it was observed that caregivers of children with hyperactivity-predominant ADHD consistently had the highest BAS scores both before and after treatment. Conversely, caregivers of children with attention deficit-predominant ADHD exhibited the lowest BAS scores. These findings both align with and diverge from previous literature. Most studies suggest that caregivers of children with hyperactive and combined ADHD types experience greater burdens.^{27,28} In line with this, one study found that family burden outcomes were inversely associated with higher scores in the combined and inattention subtypes of ADHD.²⁹ However, a small number of studies have found contrasting results. For example, Calvo et al⁷ found that the inattention subtype had a more significant impact on family burden than anticipated.

Caregiver depression, often linked to caregiver burden, is a prevalent issue among those caring for individuals with ADHD.⁴ This can further complicate parenting and child-rearing responsibilities.³⁰ Some research suggests that treating ADHD in children may alleviate depressive symptoms in caregivers.^{31,32} For instance, a follow-up study involving 40 caregivers by Gökçen et al³⁰ concluded that ADHD treatment in pediatric patients reduced mothers' depressive symptoms and burnout levels. Similarly, a 1-year follow-up study found a decrease in depressive symptoms among caregivers.³³ However, any statistically significant difference in caregivers' scores for depression

Table 4. Comparison of Differences in Conners' Parent Rating Scale-Revised: Short Form Scores Estimated at Baseline, and 3 Months Later According to Drug Groups

	Short-acting Methylphenidate n = 25 CPRS-R:S (Last-First) Median (Min-Max)	Long-acting Methylphenidate n = 38 CPRS-R:S (Last-First) Median (Min-Max)	Extended-release Methylphenidate n = 16 CPRS-R:S (Last-First) Median (Min-Max)	Non-stimulant drug n = 13 CPRS-R:S (Last-First) Median (Min-Max)	P	η^2 ^b
	25 (10-33)	24 (8-33)	25 (13-27)	24 (21-32)	.771	0.736
Sensitivity	28.6	36.7	22.4	12.2		
Specificity	74.4	53.5	88.4	83.7		
PPV	56.0	47.4	68.8	46.2		
NPV	47.8	42.6	50.0	45.6		

Non-parametric Kruskal-Wallis test was used because the variables did not follow a normal distribution.

^b η^2 = effect size, $\eta^2 = (H-k+1)/(n-k)$

CPRS-R:S, Conners' Parent Rating Scale-Revised: Short Form; NPV, negative predictive value; PPV, positive predictive value.

and anxiety over 3 months was not observed. However, in this study, no statistically significant differences were observed in caregivers' depression and anxiety scores over 3 months. This lack of significant change may be due to the relatively short follow-up period. Based on studies linking caregivers' anxiety and depression symptoms to caregiver burden,³⁴ the lack of change in caregivers' anxiety and depression scores over 3 months in this study allows us to confidently attribute the decrease in caregiver burden to the treatment of ADHD.

Anxiety and depression scores of parents were also compared based on their children's ADHD subtypes at the start of treatment and 3 months later. The authors found no difference in the anxiety and depression scores based on ADHD type, both at the beginning of treatment and 3 months later. Contrary to the findings, a study found that hyperactive/impulsive and combined clinical presentation of ADHD were significant predictors of caregiver depression.⁸ Most studies exploring the relationship between ADHD subtypes and caregiver depression and anxiety are cross-sectional.^{8,10} Research suggests that ADHD, irrespective of subtype, can result in long-term financial and social repercussions for families, disrupting family dynamics and affecting parents' mental health.^{36,37} Although this study did not consider the long-term effects of ADHD on caregivers, these factors may explain the lack of significant differences in depression and anxiety scores by ADHD subtype. It is essential to emphasize that the inability to find a statistically significant difference in the depression and anxiety scores of caregivers regarding children's ADHD subtypes during the three-month treatment period does not reduce the importance of psychological evaluations for parents in this context.

This study found more mothers than fathers acting as caregivers for children with ADHD. This aligns with Turkish sociocultural norms, where women typically assume primary caregiving responsibilities. This gender disparity aligns with findings in previous research.^{3,4} Due to the limited participation of fathers in caregiving roles, it was not possible to statistically compare caregiver burden scores between mothers and fathers. Existing literature suggests that societal and cultural expectations often place greater caregiving responsibilities on women.^{8,35} Stress-coping theories indicate that women may be more vulnerable to caregiving stressors, perceiving, reporting, and managing them differently from men.³⁵ Studies consistently show that mothers of children with ADHD experience greater financial difficulties and utilize healthcare services more frequently than fathers.^{8,10,35}

The findings of this study provide critical insights into the treatment outcomes of children with ADHD, as assessed by the CPRS-R:S. A significant reduction in symptom severity was observed 3 months after initiating treatment, underscoring the overall efficacy of interventions for ADHD ($P < .001$, $z = -8.347$). This aligns with existing literature

highlighting the positive impact of pharmacological treatments on ADHD symptoms over time.³⁸

However, when comparing the magnitude of symptomatic improvement across medication types, no statistically significant differences were identified ($P = .771$). This result suggests that in terms of parent-reported symptom changes within 3 months, the type of medication—whether stimulant or non-stimulant—does not substantially influence short-term outcomes. These findings may be indicative of the broadly effective nature of ADHD medications or the variability in individual responses to different pharmacological agents.

The sensitivity analysis provided a nuanced understanding of the efficacy of specific medication types, particularly when focusing on larger improvements in CPRS-R:S scores (differences > 25 points). Among the stimulant treatments, long-acting methylphenidate demonstrated the highest sensitivity (36.7%), indicating its relative effectiveness in detecting substantial symptomatic improvements. Conversely, extended-release methylphenidate exhibited the highest selectivity (88.4%), suggesting it was most specific in identifying cases with significant improvement while minimizing false positives. Non-stimulant treatments, while beneficial, showed the lowest sensitivity (12.2%), reflecting their slower onset of action or potentially less pronounced short-term effects. These findings have several implications for clinical practice. First, they emphasize the importance of individualizing treatment plans, as the response to medication may vary widely among patients. While stimulant treatments appear more likely to yield rapid and significant improvements, non-stimulant options may be more suitable for certain patients, particularly those who do not tolerate stimulants well. Additionally, the selectivity of extended-release methylphenidate highlights its potential utility in targeting specific patient subgroups where high specificity in symptom improvement is critical.

To the best of the knowledge, this is the first prospective study to investigate the effect of ADHD treatment on caregiver burden. The results demonstrate a significant reduction in caregiver burden after 3 months of ADHD treatment. Contrary to the initial hypothesis, the decrease in caregiver burden was not related to the anxiety and depression symptoms of the caregivers. While treating ADHD has a positive impact on children's quality of life, it also significantly eases the burden of the disease on parents. Therefore, diagnosing ADHD early and starting treatment as soon as possible is essential in terms of reducing children's symptoms as well as alleviating the disease-related burden on parents.

This study had several limitations, including a relatively small sample size and a short follow-up period, which may limit the long-term reliability of the findings. One key limitation of this study is the absence of a control group, which restricts the ability to establish causality between

ADHD treatment and the observed reductions in caregiver burden, anxiety, and depression. The improvements in caregiver outcomes could partially result from external factors such as the natural adaptation process of caregivers or developmental changes in the children over time. Future studies should include a control group to isolate the effects of ADHD treatment and strengthen the validity of these findings.

The inclusion criteria relied on parents' self-reports indicating they had not been diagnosed with any psychiatric disorder or were not undergoing psychiatric treatment. A notable limitation was the lack of structured psychiatric interviews with the parents to assess their lifetime history of psychopathology and substance use. Future studies should incorporate these structured interviews to provide a more comprehensive analysis. Moreover, examining the financial burden of ADHD and its impact on family relationships in future research will further enhance the understanding of these dynamics.

Future research should address these limitations by employing larger sample sizes, longer follow-up periods, and addressing the aforementioned constraints. Since most caregivers in this study were mothers, future research should include a greater number of fathers to explore potential differences in caregiver burden between mothers and fathers.

Data Availability Statement: The data that support the findings of this study are available on request from the corresponding author upon reasonable request.

Ethics Committee Approval: This study was approved by the Ethics Committee of Mugla Sitki Kocman University (Approval No: 240024-17, Date: 25.01.2024).

Informed Consent: Written informed consent was obtained from the patients and their caregiver(s) who agreed to take part in the study.

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