COMORBIDITIES ASSOCIATED WITH ATTENTION DEFICIT HYPERACTIVITY DISORDER IN PRESCHOOLERS

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ABSTRACT

Attention deficit hyperactivity disorder (ADHD) is frequently associated with oppositional defiant disorder (ODD), conduct disorder (CD), anxiety disorders, depression and coordination problems. Data were collected from 96 children aged between 1.5 and 5 years of age within the Pediatric Psychiatry Clinic in Cluj Napoca, diagnosed with ADHD according to DSM IV TR and ICD-10 criteria. The control group was recruited from Cluj-Napoca kindergartens. Children older than 6 years, adopted or in foster care, or with a known major somatic disease were excluded. The CBCL 1.5-5 years scale was used and data were analysed using SPSS 17. There was a significant difference in the affective problems reported by the parents between the two groups t(32.26)=2.18, p=.037. On the anxiety scale, the t test for independent sample revealed a value t(33.15)=3.56, p=.001, significant at a threshold p<0.05, and indicates a lower level of disturbance for the control group (M=3.57, SD=2.49) than for the ADHD group (M=6.46, SD=3.84). For the ADHD subscale, the t test registered a value t(94) = 6.22, p=.001, significant at a threshold p<0.01. We expect children from the first group (M=9.31; SD=2.72) to have more ADHD problems than those from the control group (M=4.80; SD=3.3), the difference indicating a lower level of disorders for the latter. The same situation was identified for oppositional problems (ODD scale), with a value t(34.16) = 6.48, p=.001, significant at p<0.05. The main finding of this study is that children within the ADHD group suffer from considerably more evident behavioral and emotional problems compared to their non ADHD peers, noted as the control group.

Keywords: ADHD, comorbidities, preschoolers.

INTRODUCTION

Attention deficit hyperactivity disorder (ADHD) is a neurobiological disorder characterized by inattention, hyperactivity and impulsivity, affecting 3-7% of school-aged children [1]. ADHD is associated with a significant impairment in the patients’ overall functioning, emotional and social wellbeing and quality of life [2]. The most common comorbidities associated with ADHD are oppositional defiant disorder (ODD), conduct disorder (CD), anxiety disorders, depression and coordination problems [3, 4]. In the predominantly inattentive subtype of ADHD, the most frequently associated comorbidities are MDDD (Minor Depression/ Dystimia), ODD (Oppositional defiant disorder) and GAD (Generalised Anxiety Disorder). In the predominantly hyperactive ADHD subtype the most frequent comorbidities are ODD, GAD and MDDD.

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No particular measuring tool destined for ADHD children that could orientate and support differential diagnosis or comorbidities diagnosis at a very young age has been developed yet. However, CBCL 1.5-5 years is an instrument which assesses a wide range of emotional and behavioural symptoms and is valid for ADHD children population.

The aim of our study is to assess and compare the level of emotional and behavioural problems between children with ADHD and healthy children groups, at preschool age, using CBCL 1.5-5 years. We underline the necessity of screening for associated emotional and behavioural problems, even in preschool children, because of the increased incidence of comorbid mental disorders, particularly in ADHD.

MATERIAL AND METHOD

This is an observational, prospective, analytical clinical study. Data were collected from 96 children aged 1.5-5 (inclusive). For the clinical group (ADHD) the main data source was represented by the consultations within the Cluj Napoca Child and Adolescent Psychiatry Clinic which also serves neighboring counties. The control group included clinically healthy children that were recruited from kindergartens in Cluj Napoca.

The ADHD group included 26 children (9 girls and 17 boys) and the group of healthy control subjects 70 children (35 girls and 35 boys). The children with ADHD were diagnosed according to DSM IV TR and ICD 10 criteria. None of the children in the control group met the DSM IV TR criteria for ADHD. For all children enrolled in the study we required and obtained the caregivers' consent to use medical data while ensuring privacy and the subject’s identity protection.

Children over 6 year of age, adopted children or in foster care and children with a known major somatic disease were excluded. As instruments we used the CBCL 1.5-5 years scale. The scale was designed on 5 DSM categories: affective problems, anxiety disorder, ADHD, opposition/defiant disorder and pervasive developmental disorders. Scores on the internalizing, externalizing scales and total score can be determined. The children’s parents or caregivers were asked to fill in the questionnaire. One of the caregivers was asked to answer as accurately as possible the 100 items of the scale regarding their child. Each item is quoted with 0 „false”, 1 „sometimes true”, 2 „very true frequently”. Most of the caregivers were represented by mothers. The questionnaire was analysed according to the instructions specified by the authors in the guide book. Medical data were completed with data from the patients' observation charts and from their medical documents.

The statistical software used for data analysis was the SPSS 17 program. To describe the studied population and CBCL 1.5-5 year data, we used univariate statistical analysis (mean, median, frequency tables). Bivariate statistical analysis (correlation, t test) was used to identify significant associations between the groups.

RESULTS

96 patients were enrolled in the study, from which 26 had a diagnosis of ADHD and 70 were without a psychiatric diagnosis. In the group of children with ADHD, the gender ratio (male: female) was 1.88:1 and in that of children without a psychiatric diagnosis 1:1. Mean age of patients in the ADHD group was 51.81 months and 39.67 months for those in the control group. There were no statistically significant age differences between the
groups (the average age being of 42.96 months with a standard deviation of 12.07 months) or in gender repartition.

Means and standard deviations were calculated for each CBCL 1.5-5 years subscale (Affective problems, Anxiety problems, Pervasive problems, ADHD problems and Oppositional problems) for ADHD and control groups.

Table I. Means and standard deviations for each of the five CBCL 1.5-5 years subscales in the studied groups.

<table>
<thead>
<tr>
<th>Subscale</th>
<th>LOT</th>
<th>N</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Std. Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Affective problems</td>
<td>ADHD</td>
<td>26</td>
<td>3.73</td>
<td>3.38</td>
<td>66</td>
</tr>
<tr>
<td>Affective problems</td>
<td>Normal</td>
<td>70</td>
<td>2.18</td>
<td>2.08</td>
<td>24</td>
</tr>
<tr>
<td>Anxiety problems</td>
<td>ADHD</td>
<td>26</td>
<td>6.64</td>
<td>3.81</td>
<td>75</td>
</tr>
<tr>
<td>Anxiety problems</td>
<td>Normal</td>
<td>70</td>
<td>3.57</td>
<td>2.09</td>
<td>29</td>
</tr>
<tr>
<td>Pervasive problems</td>
<td>ADHD</td>
<td>26</td>
<td>4.78</td>
<td>4.17</td>
<td>33</td>
</tr>
<tr>
<td>Pervasive problems</td>
<td>Normal</td>
<td>70</td>
<td>3.52</td>
<td>2.78</td>
<td>33</td>
</tr>
<tr>
<td>ADHD problems</td>
<td>ADHD</td>
<td>26</td>
<td>9.30</td>
<td>2.72</td>
<td>33</td>
</tr>
<tr>
<td>ADHD problems</td>
<td>Normal</td>
<td>70</td>
<td>4.80</td>
<td>3.59</td>
<td>39</td>
</tr>
<tr>
<td>Oppositional problems</td>
<td>ADHD</td>
<td>26</td>
<td>6.30</td>
<td>3.12</td>
<td>33</td>
</tr>
<tr>
<td>Oppositional problems</td>
<td>Normal</td>
<td>70</td>
<td>2.67</td>
<td>2.14</td>
<td>25</td>
</tr>
</tbody>
</table>

In order to examine the differences in reported affective problems between the control and ADHD group, a t-test for independent samples was conducted. Given the violation of Levene’s test for homogeneity of variances, F(94)=10.86, p=.001, a t-test not assuming homogeneous variances was calculated. The results of this test indicated that there was a significant difference in the affective problems reported by the parents between the two groups, t(32.26)=2.18, p=.037, suggesting that individuals in the ADHD group (M=3.73; SD=3.38) have more affective problems than individuals in the control group (M=2.18; SD=2.08).

Table II. T test for independent samples results for affective problems subscale in the studied groups.

<table>
<thead>
<tr>
<th>Subscale</th>
<th>ADHD group</th>
<th>M</th>
<th>SD</th>
<th>N</th>
<th>Control group</th>
<th>M</th>
<th>SD</th>
<th>N</th>
<th>95% CI for Mean Difference</th>
<th>t</th>
<th>DF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Affective problems</td>
<td>3.73</td>
<td>3.38</td>
<td>26</td>
<td>2.18</td>
<td>2.08</td>
<td>70</td>
<td>6.46</td>
<td>2.49</td>
<td>0.1, 1.299</td>
<td>2.18</td>
<td>32.26</td>
</tr>
</tbody>
</table>

Figure 1. Affective problems repartition between the studied groups.

With regard to the anxiety scale, the t test for independent samples revealed a t value (33.15)=3.56, p=.001, significant at a threshold p<0.05, which suggests that for this scale there are significant differences between the control group (M=3.57, SD=2.49) and ADHD group (M=6.46, SD=3.84), the difference is significant at a threshold p<0.05, and indicates a lower level of disturbance for the control group.

Table III. t test for independent samples results for anxiety problems subscale in the studied groups.

<table>
<thead>
<tr>
<th>Subscale</th>
<th>ADHD group</th>
<th>M</th>
<th>SD</th>
<th>N</th>
<th>Control group</th>
<th>M</th>
<th>SD</th>
<th>N</th>
<th>95% CI for Mean Difference</th>
<th>t</th>
<th>DF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anxiety problems</td>
<td>6.46</td>
<td>3.84</td>
<td>26</td>
<td>3.57</td>
<td>2.49</td>
<td>70</td>
<td>1.24</td>
<td>4.54</td>
<td>0.1, 1.299</td>
<td>3.56</td>
<td>33.15</td>
</tr>
</tbody>
</table>

Figure 2. Anxiety problems repartition between the studied groups.

The same procedure was used for the Pervasive subscale. The t test for independent...
samples showed in this case a t value (33.57)=3.66, p=.001, significant at a threshold p<0.05, which suggests there are significant differences between the groups included in the research at a threshold p<0.05. These results suggest that individuals in the ADHD group (M=6.76; SD=4.18) have more pervasive problems than individuals in the control group (M=3.53; SD=2.78).

**Table IV.** *T* test for independent samples results for pervasive problems subscale in the studied groups.

<table>
<thead>
<tr>
<th>Subscale</th>
<th>ADHD group</th>
<th>Control group</th>
<th>95% CI for Mean Difference</th>
<th>t</th>
<th>df</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pervasive problems</td>
<td>M=6.76</td>
<td>M=3.53</td>
<td>1.44, 5.03</td>
<td>3.66*</td>
<td>33.56</td>
</tr>
</tbody>
</table>

For the ADHD subscale, the *t* test for independent samples registered a t value (94)=6.22, p=.001, significant at a threshold p<0.01. In this case, children in the ADHD group (M=9.31; SD=2.72) are expected to have more ADHD problems than children without a psychiatric diagnosis (M=4.80; SD=3.3), at a threshold of significance p<0.01, the difference indicating a lower level of the disorder for the control group.

**Table V.** *T* test for independent samples results for ADHD problems subscale in the studied groups.

<table>
<thead>
<tr>
<th>Subscale</th>
<th>ADHD group</th>
<th>Control group</th>
<th>95% CI for Mean Difference</th>
<th>t</th>
<th>df</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADHD problems</td>
<td>M=9.31</td>
<td>M=4.80</td>
<td>5.07, 3.95</td>
<td>6.22*</td>
<td>94</td>
</tr>
</tbody>
</table>

The same situation was identified for Oppositional problems (ODD scale), where the t value (34.16) = 6.48, p=.001, is significant at p<0.05, and the differences are also obvious between the control group (M=2.67; SD=2.14) and the ADHD group (M=6.31; SD=3.12).

**Table VI.** *T* test for independent samples results for Oppositional problems subscale in the studied groups.

DISCUSSIONS

The main finding of this observational study is that children with ADHD have considerably more behavioral and emotional problems compared to their non ADHD peers. Children in the ADHD group were found to have significantly more affective, anxiety, pervasive, and oppositional problems in contrast to the individuals in the control group. These findings support previous studies results, highlighting the fact that in the field of child psychiatric disorders, comorbidity is the rule rather than the exception.

We found that pervasive, oppositional and anxiety problems were exhibited in relatively similar frequency in children within our ADHD group; on average, 6 patients (approximately 23%) exhibited such problems. This finding greatly corresponds with reports regarding ADHD and its comorbidities. Notably, the large European ADORE study found that the most common comorbidities associated with ADHD were oppositional defiant disorder (ODD), conduct disorder (CD), anxiety disorders, depression and coordination problems [3, 4]. The study found that approximately 67% of the studied
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Volume 3, Issues 3-4, July-December, 2015

cases had ODD; approximately 43% suffered from anxiety; approximately 35% had coordination problems and approximately 33% suffered from depression [5, 6].

The recognition and understanding of ADHD’s frequent comorbid behaviors allows for early screening methods to be used to identify and analyze children of preschool ages presenting with these internalizing and externalizing symptoms; such as emotional reactivity, withdrawal, anxiety, depression, attention problems and aggressive behavior, thought to be the precursors of severe clinical subtypes of ADHD, which in turn determines the disorders persistence into adolescents and adulthood. This method acts somewhat as a prevention measure, as recent research has highlighted that early risk identification and employment of interventions that target the underlying pathogenic process in ADHD can reduce the likelihood of the disorder emerging, limit its course and persistence, as well as reduce the associated long term burden on society and healthcare services believed to accompany the disorder.

Over recent years, there has been an increased tendency for ADHD to be identified and diagnosed during pre-school years [7] making the implementation of such a screening instrument advantageous and ideal. Several studies conducted over the past decade have concurred that although persistence of ADHD is common, as it is a life-long disorder, approximately 50% of individuals diagnosed with the disorder during childhood continue to have impairing features of ADHD in adult life, and the majority of these individuals possess some remnant problems, albeit they do not meet the full criteria for clinical ADHD diagnosis as outlined by the DSM-V. Nevertheless, most of the children that were identified as having the disorder in preschool years were found to have considerably improved symptoms upon school entry. This finding solidifies the benefits of such a screening method during these vital years.

Studies have suggested that early indicators of ADHD can be found entrenched in infant behaviours and characteristics, making the preschool age ideal for screening and implementation of interventions with the purpose of preventing any negative evolutions. Examples of such characteristics are: neurodevelopmental immaturity, increased activity level, emotional dysregulation, a heightened response to environmental stimulation and lower cognitive functioning. During the preschool period, ADHD severity was noted to be a significant indicator of the early emergence and persistence of ADHD into adolescent and adult life. Additionally, the presence of ODD was found to be a predictor of early emergence of impairment. Behaviors such as developmental delay, low pre-academic skills, poor social skills, problems maintaining relationships and tantrums led to referral of early emerging ADHD assessment.

Sonuga-Barke et al, hypothesized four phenotypes regarding ADHDs emergence, developmental heterogeneity and its clinical significance. All 4 types were found during the preschool years but their chronicity, persistence and severity were determined by multiple intertwining factors [7].

Several authors have highlighted the ever-growing need to introduce a method to screen, follow and monitor individuals with subclinical presentations of neurodevelopmental psychiatric disorders during pre-school ages. Christopher Gillberg coined the term ESSENCE referring to “Early Symptomatic Syndromes Eliciting Neurodevelopmental Clinical Examinations” [8]. This
label constitutes a collection of symptoms that are not explicitly listed within the diagnostic criteria of childhood disorders, but have been proven to delineate clinically significant syndromes that continue to affect children’s development after the preschool period. Examples of such symptoms are within the field of: general development, communication and language, social interrelatedness, motor coordination, attention, activity, behaviour, mood and sleep. He noted that ADHD was prevalent in 5% of syndromes associated with this acronym. He went on to suggest that children with major difficulties in any one or several of these aspects should be referred to specialised “child ESSENCE centres”, rather than community paediatrics, GP’s, special education units or affective disorder centres, due to the interlinking symptoms and interplay of behaviours found in these disorders. His suggestions were augmented by the abundant evidence that a major problem in just one of the ESSENCE domains before the age of 5 indicates impending major problems in that diagnostic field or similar overlapping disorders a few years later [8]. This study supports our primary objective to highlight the need of ADHD screening during pre school years due to the high association of comorbid mental disorders that presents later in life.

Even though the findings of this study positively reflect and support notions highlighted within the literature, it is important to note some limitations of the study, notably ones which may have incurred during the data collection process, as sample size and preconceived information bias. A sample size of 96 may have been too small to reproduce results of a high stature as seen in other studies, also, the fact that the ADHD group was not equal in number to the control group may have belittled the results. In addition, we selected a sample gender ratio of almost 2:1 which reflects somehow the gender inequality. A larger sample group may produce higher figures, closer to those found in other studies. Regarding potential bias, the fact that the screening test CBCL 1.5-5 years, was filled in by the children’s caregivers, may have led to concealing certain information, in order to deter a diagnosis due to the social stigma associated with neurodevelopmental disorders, or on the other hand, the information provided may have been exaggerated. Information from other legitimate sources such as teachers, older siblings, older family members and both parents in different settings may yield more reliable results.

**CONCLUSIONS**

Children with ADHD do, in fact, possess more emotional and behavioural problems than those from the control group. CBCL 1.5-5 years affective disorders subscale reported an increased level of these problems in the ADHD group compared with the control group. Children with such a diagnosis frequently associate emotional problems in the process which, if not properly identified and treated, significantly worsen the core clinical features and lower the child’s and family’s quality of life. The CBCL 1.5-5 years anxiety disorders subscale has identified the presence of more such symptoms in the ADHD group compared with the control group. Those are targets for the symptomatic intervention because their reduction facilitates compliance with intervention techniques. Results for the pervasive developmental disorder subscale indicate that children with ADHD have more pervasive symptoms. ADHD and opposition-defiant disorder subscales differentiate significantly the ADHD group from the control group.

The results obtained at the five DSM-oriented subscales of the CBCL 1.5-5 years for the two study groups confirm the scale’s utility as a screening tool.
Comorbidities associated with Attention Deficit Hyperactivity Disorder in preschoolers for the various emotional and behavioural problems associated with ADHD, in clinical studies and also in the primary health level.

Although the screening tests are not sufficient for a diagnosis, they may indicate a possible diagnosis and help guide the children with symptoms at risk towards a specialized service.

REFERENCES
