Prevalence of Attention-Deficit/Hyperactivity Disorder Among
A Sample of Primary School Children in Al-Qalyubia Governorate

Thesis
For partial fulfillment of Master Degree in Public Health, preventive & social medicine

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<table>
<thead>
<tr>
<th>Table of Content</th>
<th>Page No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>List of content</td>
<td>1</td>
</tr>
<tr>
<td>List of tables</td>
<td>4</td>
</tr>
<tr>
<td>List of Figures</td>
<td>7</td>
</tr>
<tr>
<td>List of Abbreviations</td>
<td>9</td>
</tr>
<tr>
<td>Abstract</td>
<td>10</td>
</tr>
<tr>
<td>1. Introduction</td>
<td>12</td>
</tr>
<tr>
<td>2. Aim of the Work</td>
<td>15</td>
</tr>
<tr>
<td>3. Review of Literature</td>
<td>16</td>
</tr>
<tr>
<td>3.1. History and Definition</td>
<td>16</td>
</tr>
<tr>
<td>3.1.1. History of ADHD</td>
<td>16</td>
</tr>
<tr>
<td>3.1.2. Definition of ADHD</td>
<td>18</td>
</tr>
<tr>
<td>3.1.3. Types of ADHD</td>
<td>18</td>
</tr>
<tr>
<td>3.2. Burden of ADHD</td>
<td>20</td>
</tr>
<tr>
<td>3.2.1. Prevalence of ADHD</td>
<td>20</td>
</tr>
<tr>
<td>3.2.2. Age and ADHD</td>
<td>21</td>
</tr>
<tr>
<td>3.2.3. Gender differences</td>
<td>21</td>
</tr>
<tr>
<td>3.2.4. Prevalence of ADHD in different countries</td>
<td>22</td>
</tr>
<tr>
<td>3.2.5. Prevalence of ADHD in Egypt</td>
<td>23</td>
</tr>
<tr>
<td>3.2.6. Social and economic impact of ADHD through the</td>
<td>27</td>
</tr>
<tr>
<td>Lifespan</td>
<td></td>
</tr>
<tr>
<td>3.2.7. Social impact of ADHD</td>
<td>27</td>
</tr>
<tr>
<td>3.2.8. Economic impact of ADHD</td>
<td>28</td>
</tr>
<tr>
<td>3.3. The Etiology of ADHD</td>
<td>30</td>
</tr>
<tr>
<td>3.3.1. Genetics</td>
<td>31</td>
</tr>
<tr>
<td>3.3.1.1. Family studies</td>
<td>31</td>
</tr>
<tr>
<td>3.3.1.2. Twin studies</td>
<td>32</td>
</tr>
<tr>
<td>3.3.1.3. Adoption studies</td>
<td>32</td>
</tr>
<tr>
<td>3.3.1.4. Candidate Gene Searches</td>
<td>34</td>
</tr>
<tr>
<td>3.3.1.5. Molecular Genetic Studies of ADHD</td>
<td>35</td>
</tr>
<tr>
<td>3.3.1.6. Genetic syndromes</td>
<td>36</td>
</tr>
<tr>
<td>3.3.2. Environmental factor</td>
<td>37</td>
</tr>
<tr>
<td>3.3.2.1. Biological Factors</td>
<td>37</td>
</tr>
<tr>
<td>3.3.2.2. Psychosocial Factors</td>
<td>41</td>
</tr>
<tr>
<td>3.3.3. Neurological factors in ADHD</td>
<td>44</td>
</tr>
<tr>
<td>3.4. Clinical picture and Diagnosis of ADHD</td>
<td>47</td>
</tr>
<tr>
<td>3.4.1. Clinical picture</td>
<td>47</td>
</tr>
<tr>
<td>3.4.1.1. Attention Deficit Disorder (ADD)</td>
<td>47</td>
</tr>
<tr>
<td>3.4.1.2. Hyperactivity impulsivity Disorder</td>
<td>48</td>
</tr>
<tr>
<td>3.4.1.3. Diagnostic and assessment tools for ADHD</td>
<td>48</td>
</tr>
<tr>
<td>3.4.2. The main diagnostic tools</td>
<td>48</td>
</tr>
<tr>
<td>3.4.3. Direct and indirect assessment techniques</td>
<td>50</td>
</tr>
<tr>
<td>3.4.4. Comorbidities</td>
<td>52</td>
</tr>
<tr>
<td>Section</td>
<td>Subsection</td>
</tr>
<tr>
<td>---------</td>
<td>------------</td>
</tr>
<tr>
<td><strong>3.5. Prevention of ADHD</strong></td>
<td>Measures during pregnancy and labour</td>
</tr>
<tr>
<td></td>
<td>Postnatal preventive measures</td>
</tr>
<tr>
<td></td>
<td>Physical Exercise</td>
</tr>
<tr>
<td></td>
<td>Improving nutrition</td>
</tr>
<tr>
<td></td>
<td>Home-based interventions</td>
</tr>
<tr>
<td></td>
<td>Foster a positive parent-child relationship</td>
</tr>
<tr>
<td><strong>3.6. Treatment of ADHD</strong></td>
<td>Pharmacologic treatment of ADHD</td>
</tr>
<tr>
<td></td>
<td>Stimulant medications</td>
</tr>
<tr>
<td></td>
<td>Non Stimulant medications</td>
</tr>
<tr>
<td></td>
<td>Psychosocial treatments and parental education</td>
</tr>
<tr>
<td></td>
<td>Behaviour Therapy</td>
</tr>
<tr>
<td></td>
<td>Parent training</td>
</tr>
<tr>
<td></td>
<td>Adjusting the classroom environment</td>
</tr>
<tr>
<td></td>
<td>Dietary Management</td>
</tr>
<tr>
<td></td>
<td>Elimination Diets</td>
</tr>
<tr>
<td></td>
<td>Sugar, Aspartame, and ADHD</td>
</tr>
<tr>
<td></td>
<td>Supplementation Diets</td>
</tr>
<tr>
<td><strong>4. Subjects and Methods</strong></td>
<td>Results</td>
</tr>
<tr>
<td></td>
<td>Assessment of the prevalence of ADHD among the studied Group</td>
</tr>
<tr>
<td></td>
<td>Association between ADHD and potential risk factors</td>
</tr>
<tr>
<td></td>
<td>Relationship between ADHD diagnosis based on the parent's rating scale and risk factors</td>
</tr>
<tr>
<td></td>
<td>Relationship between hyperactive, inattention and combined subtypes of ADHD based on the parent's rating scale and risk factors</td>
</tr>
<tr>
<td></td>
<td>Relationship between ADHD diagnosis based on the teacher's rating scale and risk factors</td>
</tr>
<tr>
<td></td>
<td>Relationship between hyperactivity, inattention and combined subtypes of ADHD based on the teacher's rating scale and risk factors</td>
</tr>
<tr>
<td><strong>5. Discussion</strong></td>
<td>Prevalence of ADHD</td>
</tr>
<tr>
<td></td>
<td>Association between ADHD and risk factors</td>
</tr>
<tr>
<td></td>
<td>Study limitations</td>
</tr>
<tr>
<td><strong>6. Conclusion</strong></td>
<td>Recommendation</td>
</tr>
<tr>
<td></td>
<td>Health education program for ADHD prevention</td>
</tr>
<tr>
<td></td>
<td>Integration of mental health within primary health care (family medicine) services and within school health service</td>
</tr>
<tr>
<td></td>
<td>Evaluation and maintenance of the program</td>
</tr>
<tr>
<td>Appendix</td>
<td>Page</td>
</tr>
<tr>
<td>------------</td>
<td>------</td>
</tr>
<tr>
<td>I: Protocol</td>
<td>178</td>
</tr>
<tr>
<td>II: Teacher questionnaire</td>
<td>190</td>
</tr>
<tr>
<td>III: Parent questionnaire</td>
<td>195</td>
</tr>
<tr>
<td>IV: Risk factor questionnaire</td>
<td>201</td>
</tr>
<tr>
<td>V: DSM-IV</td>
<td>204</td>
</tr>
<tr>
<td>VI: ICD 10</td>
<td>206</td>
</tr>
</tbody>
</table>

Arabic summary | 1
<table>
<thead>
<tr>
<th>No.</th>
<th>Title</th>
<th>Page No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Table I</td>
<td>Prevalence of ADHD in different countries</td>
<td>34</td>
</tr>
<tr>
<td>Table II</td>
<td>Prevalence of ADHD in Egypt</td>
<td>36</td>
</tr>
<tr>
<td>Table III</td>
<td>Potential risk factors linked to ADHD</td>
<td>31</td>
</tr>
<tr>
<td>Table IV</td>
<td>Studies used to investigate the role genetics in ADHD</td>
<td>33</td>
</tr>
<tr>
<td>Table V</td>
<td>Candidate gene searches</td>
<td>30</td>
</tr>
<tr>
<td>Table VI</td>
<td>Socio-demographic characteristics of the studied group</td>
<td>33</td>
</tr>
<tr>
<td>Table VII</td>
<td>Classification of the studied group according to probable presence of ADHD and its subtypes based on the teacher's rating scale</td>
<td>34</td>
</tr>
<tr>
<td>Table VIII</td>
<td>Distribution of the studied group according to probable presence of ADHD regarding sociodemographic factors based on teacher’s rating scale</td>
<td>37</td>
</tr>
<tr>
<td>Table IX</td>
<td>Classification of the studied subgroup according to probable presence of ADHD and its subtypes based on the parent's rating scale</td>
<td>38</td>
</tr>
<tr>
<td>Table X</td>
<td>Comparison between parent’s and teacher’s rating scales regarding probable presence of ADHD and ADHD scores</td>
<td>31</td>
</tr>
<tr>
<td>Table XI</td>
<td>Distribution of the studied subgroup according to ADHD diagnosis and sociodemographic characteristics based on parent's rating scale</td>
<td>33</td>
</tr>
<tr>
<td>Table XII</td>
<td>Distribution of the studied subgroup according to ADHD diagnosis and psychosocial factors based on parent's rating scale</td>
<td>35</td>
</tr>
<tr>
<td>Table</td>
<td>Description</td>
<td></td>
</tr>
<tr>
<td>-------</td>
<td>-------------</td>
<td></td>
</tr>
<tr>
<td>Table 8</td>
<td>Distribution of the studied subgroup regarding ADHD diagnosis and prenatal risk factors based on parent’s rating scale</td>
<td></td>
</tr>
<tr>
<td>Table 9</td>
<td>Distribution of the studied subgroup according to ADHD diagnosis and perinatal risk factors based on parent's rating scale</td>
<td></td>
</tr>
<tr>
<td>Table 10</td>
<td>Distribution of the studied subgroup according to ADHD diagnosis and postnatal risk factors based on parent's rating scale</td>
<td></td>
</tr>
<tr>
<td>Table 11</td>
<td>Distribution of the studied subgroup according to ADHD subtypes and sociodemographic characteristics based on parent’s rating scale</td>
<td></td>
</tr>
<tr>
<td>Table 12</td>
<td>Distribution of the studied subgroup according to ADHD subtypes and psychosocial factors based on parent's rating scale</td>
<td></td>
</tr>
<tr>
<td>Table 13</td>
<td>Distribution of the studied subgroup according to ADHD subtypes and prenatal risk factors based on parent's rating scale</td>
<td></td>
</tr>
<tr>
<td>Table 14</td>
<td>Distribution of the studied subgroup according to ADHD subtypes and perinatal risk factors based on parent's rating scale</td>
<td></td>
</tr>
<tr>
<td>Table 15</td>
<td>Distribution of the studied subgroup according to ADHD subtypes and postnatal risk factors based on parent's rating scale</td>
<td></td>
</tr>
<tr>
<td>Table 16</td>
<td>Distribution of the studied subgroup according to ADHD diagnosis and sociodemographic characteristics based on teacher's rating scale</td>
<td></td>
</tr>
<tr>
<td>Table 17</td>
<td>Distribution of the studied subgroup according to ADHD diagnosis and psychosocial factors based on teacher's rating scale</td>
<td></td>
</tr>
<tr>
<td>Table</td>
<td>Distribution of the studied subgroup according to ADHD diagnosis and prenatal risk factors based on teacher's rating scale</td>
<td>102</td>
</tr>
<tr>
<td>---------</td>
<td>------------------------------------------------------------------------------------------------------------------</td>
<td>-----</td>
</tr>
<tr>
<td>Table 19</td>
<td>Distribution of the studied subgroup according to ADHD diagnosis and perinatal risk factors based on teacher's rating scale</td>
<td>103</td>
</tr>
<tr>
<td>Table 20</td>
<td>Distribution of the studied subgroup according to ADHD diagnosis and postnatal risk factors based on teacher's rating scale</td>
<td>106</td>
</tr>
<tr>
<td>Table 21</td>
<td>Distribution of the studied subgroup according to ADHD subtypes and sociodemographic characteristics based on teacher's rating scale</td>
<td>108</td>
</tr>
<tr>
<td>Table 22</td>
<td>Distribution of the studied subgroup according to ADHD subtypes and psychosocial factors based on teacher's rating scale</td>
<td>110</td>
</tr>
<tr>
<td>Table 23</td>
<td>Distribution of the studied subgroup according to ADHD subtypes and prenatal risk factors based on teacher's rating scale</td>
<td>111</td>
</tr>
<tr>
<td>Table 24</td>
<td>Distribution of the studied subgroup according to ADHD subtypes and perinatal risk factors based on teacher's rating scale</td>
<td>112</td>
</tr>
<tr>
<td>Table 25</td>
<td>Distribution of the studied subgroup according to ADHD subtypes and postnatal risk factors based on teacher's rating scale</td>
<td>113</td>
</tr>
</tbody>
</table>
# List of Figures

<table>
<thead>
<tr>
<th>No.</th>
<th>Title</th>
<th>Page No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Figure I</td>
<td>Genes – environmental interaction and ADHD</td>
<td>30</td>
</tr>
<tr>
<td>Figure 1</td>
<td>Classification of the studied group according to probable presence of ADHD based on the teacher's rating scale</td>
<td>35</td>
</tr>
<tr>
<td>Figure 2</td>
<td>Classification of the studied group according subtypes of ADHD based on the teacher's rating scale</td>
<td>36</td>
</tr>
<tr>
<td>Figure 3</td>
<td>Classification of the studied subgroup according to probable presence of ADHD based on the parent's rating scale</td>
<td>39</td>
</tr>
<tr>
<td>Figure 4</td>
<td>Classification of the studied subgroup according to subtypes of ADHD based on the parent's rating scale</td>
<td>40</td>
</tr>
<tr>
<td>Figure 5</td>
<td>Comparison between ADHD scores based on parent's and teacher's rating scales</td>
<td>42</td>
</tr>
<tr>
<td>Figure 6</td>
<td>Distribution of the studied subgroup according to ADHD diagnosis and sociodemographic characteristics based on parent's rating scale</td>
<td>44</td>
</tr>
<tr>
<td>Figure 7</td>
<td>Distribution of the studied subgroup according to ADHD diagnosis and psychosocial factors based on parent's rating scale</td>
<td>46</td>
</tr>
<tr>
<td>Figure 8</td>
<td>Distribution of the studied subgroup regarding ADHD diagnosis and prenatal risk factors based on parent's rating scale</td>
<td>49</td>
</tr>
<tr>
<td>Figure 9</td>
<td>Distribution of the studied subgroup according to ADHD diagnosis and perinatal risk factors based on parent's rating scale</td>
<td>50</td>
</tr>
<tr>
<td>Figure</td>
<td>Description</td>
<td>Page</td>
</tr>
<tr>
<td>--------</td>
<td>-------------</td>
<td>------</td>
</tr>
<tr>
<td>10</td>
<td>Distribution of the studied subgroup according to ADHD diagnosis and postnatal risk factors based on parent's rating scale</td>
<td>92</td>
</tr>
<tr>
<td>11</td>
<td>Distribution of the studied subgroup according to ADHD diagnosis and sociodemographic characteristics based on teacher's rating scale</td>
<td>99</td>
</tr>
<tr>
<td>12</td>
<td>Distribution of the studied subgroup according to ADHD diagnosis and psychosocial factors based on teacher's rating scale</td>
<td>101</td>
</tr>
<tr>
<td>13</td>
<td>Distribution of the studied subgroup according to ADHD diagnosis and prenatal risk factors based on teacher's rating scale</td>
<td>104</td>
</tr>
<tr>
<td>14</td>
<td>Distribution of the studied subgroup according to ADHD diagnosis and perinatal risk factors based on teacher's rating scale</td>
<td>105</td>
</tr>
<tr>
<td>15</td>
<td>Distribution of the studied subgroup according to ADHD diagnosis and postnatal risk factors based on teacher's rating scale</td>
<td>107</td>
</tr>
<tr>
<td>16</td>
<td>Distribution of the studied subgroup according to ADHD subtypes and sex based on teacher's rating scale</td>
<td>109</td>
</tr>
</tbody>
</table>
# List of Abbreviation

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADD</td>
<td>Attention Deficit Disorder</td>
</tr>
<tr>
<td>ADHD</td>
<td>Attention deficit-Hyperactivity Disorder</td>
</tr>
<tr>
<td>ADHD I</td>
<td>Attention Deficit Hyperactivity Disorder Inattentive type</td>
</tr>
<tr>
<td>ADHD RS-IV</td>
<td>ADHD rating scale</td>
</tr>
<tr>
<td>CDC</td>
<td>Centers for Disease Control and Prevention's</td>
</tr>
<tr>
<td>DAT</td>
<td>Dopamine transporter gene</td>
</tr>
<tr>
<td>DRD 4</td>
<td>Dopamine receptor gene</td>
</tr>
<tr>
<td>DSM III</td>
<td>Diagnostic and Statistical Manual of mental health 3rd edition</td>
</tr>
<tr>
<td>DSM-III-TR</td>
<td>DSM-III text revision</td>
</tr>
<tr>
<td>DSM IV</td>
<td>Diagnostic and Statistical Manual of mental illness 4th edition</td>
</tr>
<tr>
<td>EEG</td>
<td>Electro Encephalogram</td>
</tr>
<tr>
<td>IQ</td>
<td>Intelligence Quotient</td>
</tr>
<tr>
<td>MRI</td>
<td>Magnetic Resonance Imaging</td>
</tr>
<tr>
<td>USA</td>
<td>United States of America</td>
</tr>
<tr>
<td>WHO</td>
<td>World Health Organization</td>
</tr>
</tbody>
</table>
Abstract

Background: Attention Deficit Hyperactivity Disorder is among the most common psychiatric disorders of childhood that interferes with social and educational development.

Objectives: This study aimed to determine the prevalence of ADHD in a sample of primary school children in Al Qalyubia Governorate, to investigate the relationship between ADHD and potential risk factors and to recommend a prevention and control program for this disorder.

Methods: A cross sectional comparative study was conducted in four primary schools chosen randomly, in Al Qalyubia Governorate. A total number of 933 students aged 3-33 years were recruited. The presence of ADHD was assessed by using Dr. Mohamed El-Noby questionnaires (teacher copy and parent copy). The children were assessed for potential risk factors by administering a questionnaire to the parents.

Results: The prevalence of ADHD among primary school children was 33.12% based on teacher rating scale and 33.32% based on parent rating scale. The prevalence was found to be higher among children from low socioeconomic level, aged ≥ 9 years, late birth order, exposed to hitting and had consanguious parents (P<0.05). The proportion of children with ADHD was higher in those living with single parent, had irritable parent’s relationship, irritable parent-child relationship, whose mothers had hypertension of pregnancy and exposed to passive smoking during pregnancy, were born by caesarean section and had cyanosis compared to ADHD negative children (P<0.05). In addition, children who were fed artificially, watching too much TV and exposed to head trauma were more likely to be ADHD positive (P<0.05).
Conclusion: ADHD presents a troublesome public health problem among primary school children in Al Qalyubia Governorate. The link between ADHD and a number of risk factors indicate collaborative efforts to control these risk factors and to decrease the prevalence of ADHD.

Key words: ADHD, School children, Prevalence, Risk factors


Introduction

Attention-Deficit/Hyperactivity Disorder (ADHD) is the most common neurobehavioral disorder of childhood which is characterized by persistent hyperactivity, impulsivity and inattention (Cunningham and Jensen, 2011).

ADHD prevalence rates ranging from 2.5% to 3.3% raise concerns about the consistency of estimates and the validity of diagnoses (Wolraich et al., 2011). A meta-analysis of studies published worldwide between 1994 and 2010 revealed that the prevalence of ADHD in children and adolescents was 2.9-3.1% (Willcutt, 2011). In the United States, in 2011, approximately 11% of children aged 3-17 years (3.3 million) were diagnosed with ADHD. (American Psychiatric Association, 2011 and CDC, 2011).

In Egypt, there is no reported overall prevalence rate for ADHD, in spite of the presence of many studies in hospitals and in the community. Al-Haggar et al., (2009), in his hospital based 10 years retrospective epidemiological study of ADHD among children in Delta region, stated that ADHD is not uncommon in our community. Its frequency among cases referred for childhood diagnostic clinics approximates 4.9% and prevalence would be much lower if evaluated among asymptomatic school children. Recently, a community study performed by Farahat et al., (2014), reported a prevalence rate of 5.4% of ADHD among primary school children aged 3-17 years in Menoufia governorate.

ADHD is generally, first noticeable in preschool years and is likely to persist into adolescence and adulthood. Because of its chronic nature, ADHD has a significant impact across many aspects of patient’s lives, including social, academic, occupational functioning and quality of life.
Individuals with ADHD frequently have other types of co-existing mental health problems (such as oppositional defiant disorder, aggression or high levels of anxiety) and/or specific learning disabilities such as reading disability and language impairments. These co-existing problems may increase the risk for poor educational and social outcomes ([Jensen et al., 1111]). Without identification and proper treatment this disorder may have serious consequences, including school failure, depression, problems with relationships, substance abuse, delinquency, risk for accidental injuries, and job failure ([Harpin, 1115]). Moreover, ADHD may affect the lives of parents, carers or other family members by causing difficulties in the home and putting strain on relationships ([Biederman et al., 1111 and Brod et al., 1117]).

To date no single factor has been identified as the cause of ADHD. ADHD is thought to be the result of complex interactions between genetic, environmental and neurobiological factors ([Mick and Faraon, 1111]).

Diagnosis of ADHD requires that the symptoms should be persistent and occurring in at least two settings such as home, school or community ([James and Alcott, 1111]). There are two main diagnostic tools in current use: the International Classification of Mental and Behavioral Disorders 3rd revision (ICD-3) and the Diagnostic and Statistical Manual of Mental Disorders 4th edition (DSM IV) ([National Institute for Health and Clinical Excellence, 1114]).

The teacher is most often the first person to make referral for assessment for ADHD. He can play an important role in screening by providing objective description about the child's strengths and needs, the frequency and severity of the child's behavioural and/or academic difficulties, performance, social relations and general everyday
functioning. This information can in turn form the basis of discussion and collaborative problem-solving with the child's parents (Zentall, 2016).

A multimodal treatment concept is recommended for ADHD in which the administration of psychostimulants is combined with educational and behavioral therapeutic measures. The choice of treatments is influenced by the nature of the patient’s comorbid disorder(s), level of impairment and family issues or concerns (Brock et al., 2019).

However, individuals with ADHD can do well in school and can succeed in life if they are early identified, diagnosed and properly treated. So, it was aimed at studying the prevalence and risk factors of ADHD in school children in Al Qalyubia governorate in order to recommend a program that might help in prevention and control of this problem.
Aims and Objectives

Goal:

The goal of this study was the prevention of ADHD among primary school children in Al Qalyubia Governorate.

Aim:

This study aimed to assess the size of the problem of ADHD among a sample of primary school children in Al Qalyubia Governorate and to identify the underlying risk factors related to the problem.

Objectives:

The specific objectives of the study were as follows:

1. To assess the prevalence rate of ADHD among a sample of the primary school children in Al Qalyubia Governorate.
2. To investigate the relationship between ADHD and some potential risk factors.
3. To outline a program for the prevention of ADHD amongst the primary school children.
3.1. History and Definition

3.1.1. History of ADHD

The Goulstonian Lectures of Sir George Frederic Still in 1891 are by many authors considered to be the scientific starting point of the history of ADHD. Still described the children as being hyperactive, unable to concentrate and having learning difficulties and conduct problems. He named the children as having "morbid defects of moral control". He noted that boys were more often affected than girls and postulated both organic and environmental etiology (Yamazaki, 1111 and Barkley, 1116).

In 1933 a pandemic of encephalitis lethargica swept across Europe and North America and some of the children, who recovered from the brain inflammation, were reported to have developed cognitive deficits, and tended to be overactive, distractible and prone to impulsive acts (Sharkey and Fitzgerald, 1117).

In 1933, the German physicians Franz Kramer and Hans Pollnow reported on a hyperkinetic disease of infancy that the most characteristic symptom of affected children was a marked motor restlessness. The main symptoms of the hyperkinetic disease as described by Kramer and Pollnow were very similar to the current concept of ADHD (Lange et al., 1111).

In 1937, Charles Bradley reported a positive effect of stimulant medication in children with various behavior disorders. He identified children who were most likely to benefit from benzedrine treatment as characterized by short attention span, dyscalculia, mood liability, hyperactivity, impulsiveness and poor memory. These features are nowadays associated with ADHD (Conners, 1111).
The concept of the three main symptoms of inattention, impulsivity and hyperactivity characterizing ADHD was established with the definition of minimal brain dysfunction (Lange et al., 1111).

In 1968, a definition of the concept of hyperactivity was incorporated the second edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-II). This concept was labeled “Hyperkinetic Reaction of Childhood” (Lange et al., 1111).

In 1978, the American Psychiatric Association renamed the disorder “Attention Deficit Disorder (ADD) (with or without hyperactivity)” (Barkley, 1116).

In 1981, the revision of the third edition DSM removed the concept of two subtypes of ADD with or without hyperactivity and renamed the disorder “Attention deficit-Hyperactivity Disorder (ADHD)”. The symptoms of inattention, impulsivity and hyperactivity were combined into a single list of symptoms with a single cutoff score. The symptoms were empirically derived by rating scales and a field trial (Conners, 1111 and Barkley, 1116).

It was finally recognized in the 1990s that ADHD was not exclusively a childhood disorder, which disappeared with age as was previously thought, but rather a chronic, persistent disorder remaining into adulthood in many cases (Barkley, 1116).

Three subtypes of ADHD were identified on the basis of structured diagnostic interviews of multiple informants and of validation diagnoses. Under the DSM-IV, the ADHD syndrome was consequently subdivided into three subtypes i.e. a predominantly inattentive type, a predominantly hyperactive-impulsive type and a combined type with symptoms of both
3.1.1. Definition of ADHD

Attention deficit hyperactivity disorder (ADHD) is a psychiatric disorder characterized by levels of inattention, hyperactivity and impulsivity that are inconsistent with the level of development of the child or adolescent. Inattention, hyperactivity and impulsivity are behavior characteristics present in all young children which gradually decrease as they mature into adulthood. However, children with ADHD are distinguished from their normal peers by increased inattention, hyperactivity and impulsivity relative to that expected for their age and gender and these differences in behavior often continue to adulthood (Lahey et al., 1994).

3.1.3. Types of ADHD

There are three different types of ADHD, depending on which types of symptoms are the strongest in the individual. These are inattention, hyperactivity–impulsivity and combined inattentive/hyperactive impulsive subtype (combined ADHD) (National Institute of Mental Health, 1994).

a. Predominantly Inattentive Presentation: It is characterized by difficulty to organize or finish a task, to pay attention to details, or to follow instructions or conversations. The person is easily distracted or forgets details of daily routines (CDC, 1994).

b. Predominantly Hyperactive-Impulsive Presentation: The person fidgets and talks a lot. It is hard to sit still for long (e.g., for a meal or while doing homework). Smaller children may run, jump or climb constantly. The individual feels restless and has trouble with impulsivity. Someone who is impulsive may interrupt others a lot, grab things from
people, or speak at inappropriate times. It is hard for the person to wait their turn or listen to directions. A person with impulsiveness may have more accidents and injuries than others (CDC, 1114).

c. **Combined Presentation:** Symptoms of the above two types are equally present in the person (CDC, 1114)
3.1. Burden of ADHD

3.1.1. Prevalence of ADHD

Epidemiological research in ADHD has been hampered by difficulties involved in the diagnosis of ADHD due to lack of available biological markers and the numerous definitional changes that have taken place in the past 31 years. Despite these difficulties, rigorous estimates indicate that ADHD has been described almost everywhere around the world. Studies reported highly variable rates for ADHD prevalence worldwide during childhood and adolescence, ranging from 1.92 to 312, raising concerns about the consistency of estimates and the validity of diagnoses (Cornejo et al., 1115; Bener et al., 1116 and Wolraich et al., 1111).

Caution must be used when comparing epidemiological data from different studies, because diverse types of instruments and questionnaires have been used in different epidemiological trials and the DSM-IV definition of impairment is operationally vague. These issues are a source of subjective knowledge to the clinical evaluator when deciding the affection status. Furthermore, random selection of the sample versus “volunteer” participation could introduce a relevant bias in the estimation of epidemiological parameters. For example, stigmatization of ADHD patients and their families may lead to an underestimation of its prevalence. On the other hand, patients already under medication will exhibit less severe symptoms at the time of the screening (Acosta et al., 1114).

Differences in perception between parents and teachers should also be considered in ADHD studies. Teacher reports may be influenced by factors such as class size, teacher training or disciplinary aptitudes and practices. Although the DSM IV age criterion to establish the diagnosis is
∀ years, some studies reported patients with diagnosis done after ∀ years. Associated limitations involve the presence of comorbid and underlying conditions that mimic in part ADHD, especially in studies using rating scales or structured diagnostic interviews, rather than clinician-based semistructured interviews (*Rowland et al.*, ₧ ₧ ₧; *Rowland et al.*, ₧ ₧ ₧ and *Acosta et al.*, ₧ ₧ ₧).

∀.∀.∀.∀ Age and ADHD

ADHD is most frequently identified during elementary school years; however the onset of ADHD frequently occurs earlier, with presentation as young as ∀ years of age (*Greenhill et al.*, ₧ ₧ ₧).

∀.∀.∀.∀ Gender differences

Male-to-female ratio was ∀:∀ in population based studies and between ₧:∀ to ₧:∀ in clinical samples (*Gaub and Carlson*, ₧ ₧ ₧; *American Psychiatric Association*, ₧ ₧ ₧ and *Sandberg*, ₧ ₧ ₧). Research on gender differences suggested that girls might be consistently underidentified and underdiagnosed. This was mostly explained by differences in the expression of the disorder among boys and girls. Females with ADHD were reported to have fewer hyperactive/impulsive symptoms and more inattentive symptoms when compared with males with ADHD. Further, females with ADHD presented more commonly with the inattentive subtype than did boys. Less disruptive behavior in females with ADHD might contribute to referral bias causing underidentification and lack of treatment for females with ADHD (*Gershon*, ₧ ₧ ₧; *Biederman et al.*, ₧ ₧ ₧; *Hinshaw et al.*, ₧ ₧ ₧; *Quinn*, ₧ ₧ ₧ and *Rucklidge*, ₧ ₧ ₧).

For example, Sciutto et al., found that teachers more often referred boys than girls for treatment for ADHD, even when showing equal levels of impairment. Another major contributing factor to late or missed
diagnoses in females appears to be the presence of coexisting symptoms that often cloud the diagnostic picture (Sciutto et al., 2011 and Quinn, 2011).

3.1.1.3 Prevalence of ADHD in different countries

The prevalence of ADHD in a sample of Italian students in a study divided in two phases was 32%. In Phase I, a total of 3133 schoolchildren (3131 males and 3115 females, aged range 5–18 years) were screened using the rating scale for teachers. In Phase II, the parents of children and adolescents who met high screen criteria according to rating scale were invited to complete a specific clinical-diagnostic assessment for ADHD with the help of an experienced clinician. Within the entire sample, 114 children dropped out and 11 had mental retardation, whereas 333 subjects (3131 males and 3115 females, age range 5–18 years) completed the Phase II of the study. One hundred ninety subjects (3131 males and 3115 females, male: female ratio 3:1, mean age 8 years) were diagnosed with ADHD. ADHD subtypes included the following: combined (n = 3131; 53.12%), inattentive (n = 3115; 35.32%) and hyperactive/impulsive (n = 333; 33.32%) (Bianchini et al., 2011).

A meta-analysis examined the prevalence of the DSM-IV ADHD in 3 studies of children and adolescents over the period between 1993 and 2011. The results suggested that when full DSM-IV diagnostic criteria were applied, the overall prevalence of ADHD in children and adolescents defined by parent ratings, teacher ratings, or a best estimate diagnostic procedure was (5.9–3.3%). Furthermore, ADHD-inattention type was the most common subtype in all samples (Willcutt, 2011).

In the United States, The American Psychiatric Association stated that 52% of children had ADHD based on DSM-5. In 2011 approximately 11% of children 4–17 years of age (7.4 million) were diagnosed with
ADHD. The percentage of children with ADHD diagnosis continues to increase, from 3.12% in 2013 to 9.52% in 2013 and to 33.12% in 2013. (American Psychiatric Association, 2013 and CDC, 2013).

The prevalence of ADHD in children of school age (6-11 years) in Island of Mallorca, using ADHD Rating Scales-IV (ADHD RS-IV) for home and school, was 3.32% with 3.32% for the hyperactive subtype, 3.32% for the inattention subtype and 3.32% for the combined subtype (Cardo et al., 2017).

The prevalence of ADHD in Africa based on studies coming from the continent ranges between 5.32% and 1.32% among populations of school children (Meyer et al., 2014; Kashala et al., 2015 and Adewuya and Famuyiwa, 2017).

The prevalence of ADHD among students in public schools in Brazil was 52% (Pereira and Cruz, 2017).

The prevalence of ADHD in Palestinian schoolchildren aged 6–15 years, using the ADHD DSM-IV Checklist filled by parents and teachers, was 3.32% (Thabet et al., 2011).

The prevalence of ADHD among School Children in the United Arab Emirates, using the Conner Parent and Teacher Scale, was 3.32% as per the parent report and 3.32% as per the teacher report (Eapen et al., 2019).

The prevalence of ADHD in different countries are summarized in table I 3.1.1.4

**Prevalence of ADHD in Egypt**

Different studies on ADHD were made in Egypt; the results of these studies are summarized in table II
Table (I): Prevalence of ADHD in different countries.

<table>
<thead>
<tr>
<th>Reference</th>
<th>Site</th>
<th>Tool</th>
<th>Age</th>
<th>Sample size</th>
<th>prevalence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bianchini et al., 2013</td>
<td>Italy</td>
<td>Rating scale and clinical-diagnostic assessment</td>
<td>5-15</td>
<td>6183</td>
<td>3%</td>
</tr>
<tr>
<td>CDC, 2013</td>
<td>USA</td>
<td>Parent reporting scale and health care provider interview</td>
<td>4-17</td>
<td>Survey include USA school aged children</td>
<td>11%</td>
</tr>
<tr>
<td>Willcutt, 2014</td>
<td>Palestine</td>
<td>Meta-analyses of results between 1994 to 2010</td>
<td>Children and adolescents</td>
<td>86 studies</td>
<td>5.9-7.1%</td>
</tr>
<tr>
<td>Thabet et al., 2011</td>
<td>The United Arab Emirates</td>
<td>DSM-IV Checklist</td>
<td>6-15</td>
<td>349</td>
<td>4.3%</td>
</tr>
<tr>
<td>Eapen et al., 2004</td>
<td>Island of Majorca</td>
<td>Rating Scales-IV (ADHD RS-IV)</td>
<td>5-16</td>
<td>1175</td>
<td>4.6%</td>
</tr>
<tr>
<td>Cardo et al., 2007</td>
<td>USA</td>
<td>Systematic review of Prevalence studies and meta-regression analyses of results</td>
<td>Up to 18 years</td>
<td>107 studies</td>
<td>Worldwide pooled prevalence 5.29%</td>
</tr>
<tr>
<td>Adewuya and Famuyiwa, 2007</td>
<td>Africa</td>
<td>Literature search of databases</td>
<td>Children below 18</td>
<td>9 studies</td>
<td>3.4-8.7%</td>
</tr>
<tr>
<td>Bener et al., 2007</td>
<td>Qatar</td>
<td>Arabic version of Conner</td>
<td>6-13</td>
<td>1541 subjects</td>
<td>9.4%</td>
</tr>
</tbody>
</table>

In 2015, the prevalence of ADHD among elementary schools children in Assiut City was 7%, the subtypes were: ADHD-predominant hyperactive-impulsive type 3.7%, ADHD-combined type 7% and ADHD-predominant inattentive type 7%, male to female ratio was 1.5:1. The
Students were subjected to the following tools; Children's Attention and Adjustment Survey (school and house forms), Wechsler Intelligence Scale, Diagnostic criteria of DSM-IV for ADHD, social scale assessment and clinical evaluation (El-Tallawy et al., 2009).

In 2011, a cross sectional study was done in two primary schools in Cairo total number of students was 339. Teachers detected children possibly having ADHD using the DuPaul ADHD rating scale (a teacher questionnaire). Further evaluation using DSM-IV was done to confirm ADHD symptoms. ADHD cases (35) were compared with (31) control matched by age and sex. A total of 301 (9.5%) of schoolchildren had ADHD diagnosis that was 3 times more common in boys than girls (11.7%, 7.6%) respectively. Hyperactivity and combined types of ADHD were significantly higher among boys, while inattention was significantly higher among girls (Farid et al., 2011).

In 2011, the prevalence of ADHD among preschool and school children (ages 4 to 11 years) in Minia city was 7.5% and the prevalence rates of different subtypes in order of frequency are; hyperactive impulsive type (7.4%), then combined type (7.1%) and lastly inattentive type (7.4%). 3000 children were subjected to the following tools; the modified Arabic version of the Connors ADHD Index, diagnostic criteria of DSM-IV for ADHD, A Stanford Binnet test, Arabic version 4th ed. EEG and routine laboratory workup (Soliman et al., 2011).

In 2011, the prevalence of ADHD among primary school children in Menoufia governorate was 7.8%. Using the ADHD Rating Scale items designed from the DSM-IV filled by teachers (Younis, 2011).

In 2013, the prevalence of ADHD among primary school children in kafrShokr city was 8.7% based on parent’s rating scale (Megahed, 2013).
Table (II): Prevalence of ADHD in Egypt

<table>
<thead>
<tr>
<th>Reference</th>
<th>Site</th>
<th>Tool</th>
<th>Age</th>
<th>Sample size</th>
<th>Prevalence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Farahat et al., 2014</td>
<td>Menoufia governorate</td>
<td>History taking, medical and psychological assessment, IQ estimation and Conner’s questionnaire</td>
<td>6-12</td>
<td>1372</td>
<td>6.9%</td>
</tr>
<tr>
<td>Megahed, 2013</td>
<td>KofrShokr city</td>
<td>Rating Scale items designed from the DSM-IV filled by parents</td>
<td>6-12</td>
<td>133</td>
<td>39.7%</td>
</tr>
<tr>
<td>Younis, 2014</td>
<td>Menoufia governorate</td>
<td>Rating Scale items designed from the DSM-IV</td>
<td>6-12</td>
<td>777</td>
<td>19.9%</td>
</tr>
<tr>
<td>Soliman et al., 2011</td>
<td>Minia city</td>
<td>Arabic version of the Connors, A Stanford Binnet test, Arabic version 4th ed. EEG and routine laboratory workup</td>
<td>4-12</td>
<td>423</td>
<td>6.0%</td>
</tr>
<tr>
<td>Farid et al., 2008</td>
<td>Cairo</td>
<td>DuPaul ADHD rating scale Further evaluation using DSM-IV was done to confirm ADHD symptoms.</td>
<td>4-12</td>
<td>3197</td>
<td>7.9%</td>
</tr>
<tr>
<td>El-Tallawy et al., 2006</td>
<td>Assiut City</td>
<td>Children's Attention and Adjustment Survey Diagnostic criteria of DSM-IV for ADHD, social scale assessment and clinical evaluation</td>
<td>8-10.5</td>
<td>1013</td>
<td>6%</td>
</tr>
</tbody>
</table>

In 2014, the prevalence of ADHD among primary school children aged 6-12 years in Menoufia governorate was 6.9%. All children were subjected to complete history taking, medical and psychological...
assessment as well as IQ estimation. Their parents and teachers filled the Arabic forms of Conner’s questionnaire (Farahat et al., 2014).

3.1.1 Social and economic impact of ADHD through the Lifespan

The chronic nature of ADHD means that it has a significant impact across many aspects of patients’ lives, including social, academic and occupational functioning. These impairments can have long-term consequences for an individual’s functioning and quality of life. ADHD can also affect the lives of parents, carers or other family members by causing difficulties in the home and putting strain on relationships (Biederman et al., 2016 and Brod et al., 2011).

3.1.1.1 Social impact of ADHD

ADHD can have a significant social impact on patients’ lives, causing disruption at home, school, work and in relationships (Biederman et al., 2011).

a- At home, ADHD may affect a child’s ability to follow family routines, particular difficulty in the late afternoon/early evening and late evening periods. ADHD may negatively impact on children's relationships with their parents compromising family life. The child with ADHD may also reduce the parents' productive participation in activities outside the family (work and community life) (Coghill et al., 2014 and CDC, 2014). In adults, symptoms of ADHD have been associated with relatively high rates of arrests and imprisonment. Individuals experiencing symptoms of ADHD are also associated with more traffic offences, for example, speeding, vehicular crashes and license suspensions (Barkley et al., 2014 and Biederman et al., 2014).
At school, by the age of 31, children with ADHD were more likely to display difficulties with reading, writing and mathematics. Academic deficits continued into adolescence associated with lower grade and not being qualified for upper secondary school at the age of 33 years (Holmberg, 2011).

c- At work, adults with ADHD may find that the concentration and organization difficulties they had at school are carried over into employment. ADHD may impact on an individual’s productivity in the workplace and their reputation as an employee, with unemployment and a high turnover of jobs (Halmøy et al., 2019 and Gjervan et al., 2011).

d- Relationships, individuals with ADHD often experience social difficulties and are less likely to participate in social activities such as school groups, extracurricular activities or sports. Children with ADHD may also be involved in bullying behavior at school, both as the bully and as the victim. In adulthood, ADHD has also been associated with less stable romantic relationships and high divorce rates (Biederman et al., 2016 and Twyman et al., 2011).

Economic impact of ADHD

The financial burden of ADHD may be associated with costs for individuals, families, society and healthcare services (Biederman et al., 2017). A major contributing factor to the societal burden of ADHD is the increased healthcare resource use observed in patients with ADHD. In the UK, estimated annual healthcare costs associated with the treatment of ADHD in adolescents have been reported as £3.3 million, with education and National Health Service (NHS) resources accounting for approximately 7% and 4% of spending, respectively. This equates to a mean cost per adolescent for NHS, social care and education resources of £5493 in 2011 prices. ADHD has been reported as a significant predictor
of substance abuse disorders, which may contribute to the increased healthcare resource use. ADHD carries a burden to employers in terms of absenteeism from the workplace and reduced efficiency at work. Also the families of patients with ADHD may feel a financial burden from the disorder (Wilens et al., 2011 and Telford et al., 2011).
The Etiology of ADHD

To date no single factor has been identified as the cause of ADHD. Rather, as is the case for other psychopathologies, ADHD is thought to be the result of complex interactions between genetic, environmental and neurobiological factors (table III) (Mick and Faraon, 2014).

Behavioral genetic study have demonstrated conclusively that genetic influences play a role in the etiology of ADHD, as it is true for virtually all psychological traits and disorders (Plomin et al., 2011).

Individuals cannot be randomly assigned to different environmental or genetic backgrounds (figure I). Therefore, family, adoption and twin studies take advantage of naturally occurring events to estimate the relative influence of genetic and environmental factors on a trait or disorder (Plomin et al., 2011 and Pennington, 2011).

Figure I: Genes – environmental interaction and ADHD adopted from Thapar A, Cooper M, Jefferies R and Stergiakouli E. (2011). What causes attention deficit hyperactivity disorder?. Archives of Disease in Childhood. 96(7):260–265.
Table (III): Potential risk factors linked to ADHD

<table>
<thead>
<tr>
<th>Group</th>
<th>Timing</th>
<th>Etiologic factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Genetics</td>
<td></td>
<td>Genetic syndromes, idiopathic</td>
</tr>
<tr>
<td>Environmental factors</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Biological</td>
<td>Prenatal</td>
<td>Developmental cerebral abnormality, chromosome anomaly, viral exanthema, alcohol, nicotine, lead, cocaine, anemia, hypothyroidism, iodine lack</td>
</tr>
<tr>
<td>Perinatal</td>
<td></td>
<td>Prematurity, low birth weight, anoxic-ischemic encephalopathy, meningitis, encephalitis</td>
</tr>
<tr>
<td>Postnatal</td>
<td></td>
<td>Viral meningitis, encephalitis, cerebral trauma, nutritional deficiencies, additives, sensitivities and television viewing, thyroid dysfunction and otitis media</td>
</tr>
<tr>
<td>Psychosocial</td>
<td></td>
<td>Severe marital discord, low social class, large family size, paternal criminality, maternal mental disorder and foster placement.</td>
</tr>
<tr>
<td>Neurobiological factors</td>
<td></td>
<td>Dopamine pathway, noradrenergic system and serotonergic system</td>
</tr>
</tbody>
</table>

(Faraone and Biederman, 2007; Christakis et al., 2004; Wolraich et al., 2007 and Millichap, 2008).

3.3. Genetics

There is strong evidence that genetics play powerful etiological role in ADHD. Evidence in support of this conclusion comes from a variety of sources including family, twin, adoption, genome and candidate gene search studies (Mick and Farone, 2008).

Different studies were used to investigate the role genetics in ADHD. Table (IV) summarizes these studies.
3.3.1.1. **Family studies**

Studies demonstrated clearly that ADHD is familial. In comparison to the families of children without ADHD, the rate of ADHD was significantly higher in the biological relatives of probands with DSM-III ADD, DSM-III-TR ADHD and DSM-IV ADHD (*Faraone et al.,* 1997; and *Willcutt, 1997*).

30-35% of the full siblings of ADHD probands met criteria for ADHD, indicating that the relative risk for ADHD was \( \times 3 \) times higher among first degree relatives of probands with ADHD than the base rate of ADHD in the population. Moreover, the relative risk was similar for relatives of both boys and girls with ADHD (*Faraone et al.,* 1997).

3.3.1.2. **Twin studies**

Analysis of twin data involves a comparison of the rate of concordance for the disorder of interest in pairs of monozygotic vs. dizygotic twins. All twin studies of ADHD that reported concordance rates found that the rate of concordance was significantly higher among monozygotic pairs (30-50%) than same-sex dizygotic pairs (3%-4%), providing further evidence that ADHD is significantly heritable (*Levy et al.,* 1997; *Willcutt et al.,* 1997; and *Levy et al.,* 1997).

3.3.1.3. **Adoption studies**

Because family members share, if not the same, very similar environments it is possible that ADHD is transmitted by the common environment and not by common genes. To test this hypothesis adoption studies have been conducted. If genetics (and not shared environment) is the primary factor in the development of ADHD, then siblings with ADHD reared apart should be more similar than adopted siblings reared in the same family (*Brock et al.,* 1997).
Adoption studies focused on hyperactivity, confirmed that the biological relatives of children who were hyperactive were more likely to have hyperactivity than the adopted relatives of these children (Willcutt, 1111).

Another study employing *DSM III-TR* ADHD diagnostic criteria also found that the biological relatives of children with ADHD are more likely to have ADHD than their adopted relatives (Sprich et al., 1111).

**Table (IV): Studies used to investigate the role genetics in ADHD**

<table>
<thead>
<tr>
<th>Type of study</th>
<th>Reference</th>
<th>Results</th>
<th>Sample size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Family studies</td>
<td><em>Faraone et al., 1111</em></td>
<td>The relative risk for ADHD was $3$-times higher among first degree relatives of probands with ADHD than the base rate of ADHD in the population.</td>
<td>One hundred forty children with ADHD and $33$ normal control children and their biological relatives</td>
</tr>
<tr>
<td>Twin studies</td>
<td><em>Levy et al., 1444</em></td>
<td>The rate of concordance was significantly higher among MZ pairs than same-sex DZ pairs.</td>
<td>$1,443$ families with twins</td>
</tr>
<tr>
<td>Adoptions studies</td>
<td><em>Willcutt, 1111</em></td>
<td>Biological relatives of children who were hyperactive were more likely to have hyperactivity than the adopted relatives of these children</td>
<td>$59$ hyperactive and $41$ control children</td>
</tr>
<tr>
<td></td>
<td><em>Sprich et al., 1111</em></td>
<td>The biological relatives of children with ADHD are more likely to have ADHD than their adopted relatives</td>
<td>$59$ adopted probands with ADHD and compared them with $41$ nonadopted probands with ADHD and $27$ nonadopted, non ADHD control probands</td>
</tr>
</tbody>
</table>
3.3.1.4. Candidate Gene Searches

The candidate gene approach investigates the role of a specific gene identified because it is part of a biological system that is associated with the disorder (Willcutt, 2011).

The most important genes which appeared to be implicated in the etiology of the disorder are Dopamine receptor gene (DRD2), Dopamine receptor gene (DRD5), Dopamine transporter gene (DAT1) and Catechol O methyl transferase (COMT) which are summarized in table V (Thapar et al., 2011).

a. Dopamine receptor gene (DRD2)

This receptor binds both dopamine and nor epinephrine. This gene is associated with personality trait of novelty seeking, which has been compared to the high levels of impulsivity and excitability often seen in ADHD (Faraone et al., 2011; Faraone et al., 2001 and Li et al., 2011).

b. Dopamine receptor gene (DRD5)

A microsatellite genetic marker located close (31.5 kb) but outside the gene region, serves to stimulate adenylcyclase activity and is thought to be involved in the induction of long-term potentiation related to novel events (Li et al., 2011; Gizer et al., 2011).

c. Dopamine transporter gene (DAT1)

It is responsible for the reuptake of dopamine in the pre-synaptic cleft, inhibited by stimulants and the DAT1 knockout mouse exhibits hyperactivity and deficits in inhibitory behavior (DiMaio et al., 2011; Gainetdinov, 2011).
d. Catechol O methyl transferase (COMT)

It catalyses the degradation of dopamine. Functional polymorphism in the gene, affects enzyme activity. The COMT genotype (associated with greater enzyme activity) was found to be associated with antisocial behavior in patients with ADHD (Thapar et al., 1115).

Table (V): Candidate gene searches

<table>
<thead>
<tr>
<th>Gene</th>
<th>Reference</th>
<th>Role</th>
<th>Relation to ADHD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dopamine receptor gene (DRD2)</td>
<td>Ebstein et al., 1111 and Li et al., 1116</td>
<td>It binds both dopamine and nor epinephrine</td>
<td>Associated with the personality trait of novelty seeking</td>
</tr>
<tr>
<td>Dopamine receptor gene (DRD5)</td>
<td>Li et al., 1113 and Gizer et al., 1119</td>
<td>It serves to stimulate adenylcyclase activity</td>
<td>The induction of long-term potentiation related to novel events</td>
</tr>
<tr>
<td>Dopamine transporter gene (DAT1)</td>
<td>DiMaio et al., 1111 and Gainetdinov, 1111</td>
<td>Reuptake of dopamine in the pre-synaptic cleft</td>
<td>Inhibited by stimulants and exhibits hyperactivity and deficits in inhibitory behavior</td>
</tr>
<tr>
<td>Catechol O methyl transferase (COMT)</td>
<td>Thapar et al., 1115</td>
<td>It catalyses the degradation of dopamine</td>
<td>Associated with antisocial behaviour</td>
</tr>
</tbody>
</table>

3.3.1.5. Molecular Genetic Studies of ADHD

Although an estimated 99.92% of the deoxyribonucleic acid (DNA) sequence that comprises the human genetic code is identical among all
people, the genetic sequence varies at tens of thousands of locations across the remaining $1.32\%$ of the human genome. Many of these sequence differences, or polymorphisms cause individual differences in protein production which may then lead to individual differences in neural development or adult brain functioning if the polymorphism is in a gene that is expressed in the central nervous system (Willcutt, r.r.11).

Researchers try to find differences that are consistently found among family members who have ADHD, but not among those without this disorder. By determining how close these polymorphisms unique to the ADHD family members are to a specific gene (done via statistical methods), it can be “linked” to that gene (Brock et al., r.r.7).

3.3.1.6. Genetic syndromes

Genetic syndromes associated with ADHD include fragile X, Klinefelter, velocardiofacia, Williams, Turner, Prader-Willi and neurofibromatosis type 1, but these disorders are rare among ADHD-clinic patients. The prevalence of cytogenetic abnormalities was assessed in 311 children with combined-type ADHD and normal intelligence. One girl with ADHD had a sex chromosome aneuploidy ($47,XXX$) and 1 boy had a permutation- sized allele for fragile X, but none of the subjects showed the full mutation. In the absence of clinical signs or family history, routine chromosome analysis in children with ADHD is not generally recommended (Bastain, r.r.7).

While family, twin and adoption studies offered persuasive evidence that ADHD is highly heritable, genome and candidate gene searches suggested that the genetics of ADHD is complex. However, it is safe to say that this disorder is likely mediated by many different genes (Faraone et al., r.r.e and Mick and Faraone, r.r.h). Further, a study suggested the possibilities that the genetics of ADHD is a dynamic
process where in different genes are being turned on across development (Kuntsi et al., 2017). Finally, as illustrated in Fig. I, it would appear that ADHD is not entirely heritable and that there may be some role for environmental factors and/or gene by environment interactions as a cause of ADHD (Das Banerjee et al., 2017).

3.3.1. Environmental factor:

Environmental variables thought to be playing a role in ADHD symptom expression include both biological and psychosocial factors (Barkley, 2017 and Das Banerjee et al., 2017).

3.3.1.1. Biological Factors:

A variety of biological factors have been associated with an increased risk for ADHD. These include pre-, peri- and post-natal complications (Banerjee et al., 2017).

Varieties of pregnancy, birth and neonatal complications have been associated with a predisposition to ADHD. These include duration of labor, fetal distress, fetal post-maturity, forceps delivery, toxemia or eclampsia, poor maternal health, younger maternal age and low birth weight (Biederman and Faraone, 2017).

a. Prenatal risk factors:

This include tobacco smoke, alcohol, cocaine abuse, exposure to lead, PCBs and pesticides, lack of iodine and hypothyroidism. Exposure to viral infections, especially influenza and viral exanthema, in the first trimester of pregnancy or at the time of birth has been correlated with the diagnosis of ADHD, maternal anemia and toxemia of pregnancy (Millichap, 2017).

Maternal smoking during pregnancy was one of the most commonly cited prenatal risks associated with increased rates of ADHD. Associations
with both ADHD symptoms and diagnoses were observed using maternal reports of cigarette smoking and objective measures of serum nicotine. In addition a dose–response relationship was been seen the more the mother smokes, the greater the associated risk (Thapar et al., 2011).

Maternal alcohol use during pregnancy and exposure to illicit substances was associated with increased risk of ADHD (Linnet et al., 2013).

Exposure to Lead was linked to ADHD. The National Health and Nutrition Examination Survey from 1999–2013 found higher blood lead concentrations in mothers of children with ADHD, with lead exposure accounting for 9% excess cases of ADHD in US children, equal to the number of cases related to prenatal tobacco exposure (Braun et al., 2016).

Toxic industrial products, Polychlorinated biphenyls (PCBs) are toxic manufactured organochlorine congeners, which were once mass-produced for a variety of industrial and commercial uses and now persist as environmental contaminants. Both human and animal studies found that PCB exposure lead to impairments in working memory, response inhibition and cognitive flexibility – neurobehavioural effects, which were comparable with those seen in ADHD (Eubig et al., 2011). Furthermore, a dose-response relationship, between low level prenatal PCB exposure (as measured by umbilical cord PCB levels) and ADHD-type behaviors in middle childhood was found in a prospective study of a PCB-contaminated area (Sagiv et al., 2011).

Prenatal organophosphate exposure is associated with adverse outcomes related to ADHD symptomatology in an investigation of umbilical cord plasma chlorpyrifos levels on subsequent cognitive and motor development in infancy and early childhood (Rauh et al., 2016).
Exposure to viral infections during winter months in the first trimester of fetal life or at the time of birth might be a predisposing factor in 1/2 of subjects with ADHD with comorbid learning disabilities. In a case-control study in Italy, children born to women who had a viral exanthematous rash during pregnancy had an increased risk of ADHD. Measles, varicella, or rubella was reported by 3 of 33 mothers of children with ADHD and none of the 33 control mothers (Arpino et al., 1115 and Millichap, 1114). HIV Infection, among 3 previously treated HIV-infected children aged 7 to 17 years, the most common behavioral problems, as measured by the Conners’ Parent Rating Scale, were learning (10%), hyperactivity (10%), impulsive hyperactive (5%), conduct (10%) and anxiety (%) problems. Mean Wechsler Intelligence Scale for Children-III scores were less than average norms, and hyperactivity was more frequent in children with a performance IQ of <90 (Nozyce et al., 1116). Borrelia burgdorferi infection causes Lyme disease, was reported to induce numerous psychiatric and neurologic presentations, including ADHD. Influenza viral infection is associated with behavioral disorder, influenza viral infection as a potential cause of ADHD has received little attention (Millichap, 1114).

Maternal stress during pregnancy was noted to be associated with offspring ADHD (Grizenko et al., 1114 and Glover, 1111).

b. Perinatal and early-life risk factors:

Most studies, including meta-analyses of premature and/or low birth weight children find evidence of an association with ADHD (relative risk of 3.33 for ADHD in premature children) and ADHD symptoms/attentional problems. The risk appears to be strongest for extreme prematurity and very low birth weight in relation to inattention symptoms and ADHD inattentive subtype. Some studies also suggest the
likely importance of intrauterine growth restriction (small for gestational age) \cite{Bhatta et al., Hack et al., Lahti et al. and Aarnoudse et al.}.

The striatum and cingulate-cortical loop are vulnerable to the ischemia induced release of glutamate, which results in hyperactive behavior, impulsivity and inattention \cite{Lou}.

c. Postnatal risk factors

Nutritional deficiencies, endocrine disorder, infections, cerebral trauma, television viewing, additives and sensitivities are some of the factors known to be associated with ADHD \cite{Christakis et al. and Millichap}.

Dietary constituents that had been studied in relation to ADHD symptoms include iron, zinc, omega-3 fatty acids, magnesium, sugar and artificial food colorings \cite{Thapar et al.}.

Iron Deficiency has been involved as a risk factor in a number of neurologic disorders including cognitive and learning disorder. Iron deficiency causes abnormal dopaminergic neurotransmission and may contribute to the pathophysiology of ADHD. In a French study, \textsuperscript{132} of the patients with ADHD had serum ferritin levels of \textsuperscript{31} ng/mL \textit{vs.} \textsuperscript{312} of controls and \textsuperscript{332} had levels of \textsuperscript{35} ng/mL compared with \textsuperscript{32} of controls. \cite{Halterman et al., Konofal et al. and Konfal et al.}.

Zinc in ADHD, in a study at Teheran University (Teheran, Iran), zinc sulfate supplements (\textsuperscript{32} mg/day), as adjunctive therapy with methylphenidate (\textsuperscript{1} mg/kg per day) in a double blind, placebo-controlled trial in \textsuperscript{31} children with ADHD, provided significantly greater improvement than methylphenidate/placebo treatment. Several controlled studies demonstrated a deficiency of zinc in patients with ADHD and a
beneficial response to zinc sulfate supplements ((Akhondzadeh et al., 2004 and Arnold and DiSilvestro, 2006).

Omega-3 Fatty Acids and ADHD, the effects of dietary supplementation with fish oil and evening primrose oil were assessed in a randomized controlled trial in 333 children with developmental coordination disorder, 33 of whom also had ADHD. Significant improvements in reading, spelling and behavior occurred over a 3-month treatment period, but motor skills were not benefited. Comparing the Conners’ Teacher Rating Scale-L/ADHD scores, a reduction and improvement were reported for children in the treatment group, whereas no change was seen in those in the placebo group. (Richardson and Montgomery, 2006).

Magnesium Deficiency and ADHD, some children with ADHD have lowered levels of magnesium. ADHD children with low magnesium (as determined by red blood cell, hair and serum levels of magnesium) were given 311 mg of magnesium per day for 3 months. Those given magnesium supplementation had a significant decrease in hyperactive behavior (Wolraich et al., 2006).

Endocrine disorder includes hypothyroxinemia caused by iodine deficiency results in a critical reduction of intracellular triiodothyronine available to the developing fetal brain. Iodine deficiency and hypothyroidism were both prenatal and postnatal risk factors for ADHD in some environments (Vermiglio et al., 2004).

Infections and ADHD include otitis media streptococcal infections and encephalitis meningitis (Millichap, 2004). Otitis media in preschool-aged children was linked to hyperactive behavior and/or inattention, independent of learning disability, in 33 of 331 children evaluated in a child development clinic. Children with ADHD had significantly more
complaints of earaches during the preceding months and year of observation ((Millichap, 1111). Streptococcal infections are associated with pediatric autoimmune neuropsychiatric disorders, hyperactive behavior, cognitive deficits and oppositional behaviors. Symptom onset and exacerbations of ADHD seem to be triggered by streptococcal infection according to some reports (Swedo et al., 1991). Enterovirus infection with central nervous system involvement might be associated with neurologic sequelae, delayed neurodevelopment and reduced cognitive functioning. Of patients who were recovering from enterovirus aseptic meningitis or encephalitis and attending school, had ADHD and required medication and were in special education (Chang et al., 1117). A patient with encephalitis caused by primary varicella zoster infection developed ADHD and a tic disorder. MRI studies localized the encephalitis to the basal ganglia (Dale et al., 1113).

Early theories of the cause of ADHD focused on brain injury. This disorder has been documented to occur secondary to brain injury (e.g., head trauma, stroke) in childhood, with the occurrence of ADHD being positively correlated with increased injury severity (Max et al., 1111).

An association between early television viewing (at ages and years) and later attention problems (at age years) was reported (Christakis et al., 1114).

Psychosocial Factors

The delineation of psychosocial features in the child’s environment associated with adverse outcome in children with ADHD has potentially important clinical, scientific and public health implications. Moreover, finding environmental risk factors for ADHD could help to design improved preventive and therapeutic intervention programs (Faraone and Biederman, 1110).
A study by Rutter et al., demonstrated how psychosocial risk factors influence child psychopathology. A research revealed six risk factors within the family environment that correlated significantly with childhood mental disturbances: (1) severe marital discord, (2) low social class, (3) large family size, (4) paternal criminality, (5) maternal mental disorder, and (6) foster placement. This research found that it was the aggregate of adversity factors, rather than the presence of any single one, that impaired development (Faraone and Biederman, 1994).

Another study also found that as the number of adverse conditions accumulated, the risk of impaired outcome in the child increased proportionally (Blanz et al., 1991 and Faraone and Biederman, 1994).

The Ontario Child Health Study in Canada showed that family dysfunction and low income predicted persistence and onset of one or more psychiatric disorders over a 3-year follow-up period other work implicated low maternal education, low social class and single parenthood as important adversity factors for ADHD (Offord et al., 1994 and Faraone and Biederman, 1994).

Biederman et al., showed that long-term conflict, decreased family cohesion and exposure to parental psychopathology, particularly maternal psychopathology, were more common in ADHD-affected families compared with control families (Biederman et al., 1994).

Marital discord in families has consistently predicted disruptive behaviors in boys. Reid and Crisafulli reported a meta-analysis of the impact of marital discord on the psychological adjustment of children and found that parental conflict significantly predicted a variety of child behavior problems (Faraone and Biederman, 1994).

The Ontario Child Health Study provided a prospective example of the impact of parental conflict on children’s mental health: family
dysfunction (and low income) predicted persistence and onset of one or more psychiatric disorders over a 4-year period. Low maternal warmth and high maternal malaise and criticism were previously associated with ADHD in children (*Barkley et al., 1991* and *Offord et al., 1991*).

An epidemiologic study examining family attributes in children who had undergone stressful experiences found that children’s perceptions of mothers, but not fathers, differentiated stress-resilient and stress-affected children (*Wyman et al., 1991*).

An extensive literature documented maternal depression as a risk factor for psychological maladjustment and psychiatric disorder in children. This is consistent with the known familial link between ADHD and depression (*Faraone and Biederman, 1997*).

Data revealed a link between maternal depression and child functioning that was independent of the mother’s perceptions. These data suggested that depressed mothers accurately perceived symptomatic behavior but reacted to it in a negative manner that worsened the condition of the child (*Faraone and Biederman, 1111*).

Maternal depression exacerbates family conflict and poor parenting, both of which could exacerbate ADHD symptoms (*Faraone and Biederman, 1111*).

**3.3.3 Neurological factors in ADHD**

When comparing ADHD patients with controls in structural imaging studies, the most common findings were 1) small decreases in the size of certain brain areas in ADHD patients, as well as 2) loss of normal brain asymmetry (areas in the right hemisphere are normally slightly larger than in the left hemisphere) (*Allen, 1111 and Castellanos et al., 1111*).
Imaging studies and neuroanatomical work in animals suggested the presence of a circuit in the brain that extends from the prefrontal cortex to the basal ganglia (striatum) to the thalamus and then back around to the prefrontal cortex. This hypothesized neuroanatomical pathway, the cortical-striatal-thalamic-cortical loop, was thought to be the primary circuit involved in the etiology of ADHD, as well as several other psychiatric disorders (*Allen, Ṵ Ṵ Ṵ*).

Much scientific research surrounding ADHD focused on the neurochemical pathways, especially the dopamine pathway. The cell bodies of dopamine-containing neurons are found in the midbrain (*e.g.*, the substantial nigra pars compacta and the ventral tegmental area) and their projections extend throughout the brain, but most notably to the frontal cortex and basal ganglia. Genetic variants of the dopamine transporter (DAT), the D₃ receptor (DRD₃) and the D⁴ receptor (DRD⁴) have all been implicated in ADHD (*Hudziak, Ṵ Ṵ Ṵ and Barr, Ṵ Ṵ Ṵ*).

Scientific inquiry surrounding ADHD also focused on the noradrenergic system because norepinephrine helps to regulate dopamine release and because norepinephrine affects attention, alertness and other ADHD related processes. Like the dopaminergic system, noradrenergic neurons are located in the midbrain and project throughout the brain, especially to the frontal cortex (*Arnsten, Ṵ Ṵ Ṵ and Biederman and Spencer, Ṵ Ṵ Ṵ a*).

Measurements of urinary catecholamines and their metabolites over short periods of time in response to specific tasks suggested that children with ADHD had higher levels of norepinephrine activity and lower levels of epinephrine activity than controls. Moreover, children with ADHD had lower plasma levels of Ṵ-methoxy-⁴- hydroxyphenylglycol, a metabolite of norepinephrine, than those with ADHD and reading disability.
Additional evidence suggesting a possible role for norepinephrine in the etiology of ADHD came from studies of atomoxetine, an investigational drug that is a highly selective norepinephrine reuptake inhibitor and was reported to reduce ADHD symptoms (Mercugliano, 1999 and Michelson et al., ···).

Another neurochemical system implicated in ADHD is the serotonergic system, which also has projections to the frontal cortex. Serotonin is believed to regulate the release of dopamine. Much of the data came from studies of mice in which the genes for the DAT or serotonin 1B receptor were “knocked out” (Quist and Kennedy, ··· and Gainetdinov and Caron, ···).
3.4. Clinical picture and Diagnosis of ADHD

3.4.1 Clinical picture:

The definitions of ADHD and hyperkinetic disorder are based on maladaptive high levels of impulsivity, hyperactivity and inattention. They are all based on observations about how children behave: ‘impulsivity’ signifies premature and thoughtless actions; ‘hyperactivity’ a restless and shifting excess of movement; and ‘inattention’ is a disorganized style preventing sustained effort. All are shown by individual children to different extents and are influenced by context as well as by the constitution of the person (Faraone, r·r·f).

There are three different types of ADHD. These are inattention (ADD), hyperactivity–impulsivity and combined inattentive/hyperactive impulsive subtype (combined ADHD) (National Institute of Mental Health, r·r·f).

3.4.1.1 Attention Deficit Disorder (ADD):

Most children have periods of “day dreaming” in school when attention wanders transiently, but not sufficiently to impair learning. Inattentiveness becomes an attention deficit disorder (ADD) when the child is unable to sustain attention and is frequently distracted by outside stimuli. In order to attend, the child must ignore or tune out irrelevant distracting stimuli. The child with ADD fails to inhibit the background “noise” in the classroom environment. Symptoms of ADD also include a listening problem, forgetfulness, weakness in organization and inability to complete a task (Millichap, r·f·f).
3.4.1.1. Hyperactivity impulsivity Disorder:

Children normally have an excessive degree of motor restlessness at times, particularly in emotionally charged environments. Hyperactive behavior is abnormal when accompanied by short attention span and distractibility and when it is purposeless, inappropriate and undirected toward a specific meaningful goal. The inability to focus and perform structured tasks is the hallmark of the hyperactive school-age child. The quality and direction of the hyperactivity are abnormal, not necessarily the total daily activity. Hyperactivity is frequently accompanied by impulsivity, a tendency to interrupt others and inability to wait in line (Millichap, 2011).

3.4.1. Diagnostic and assessment tools for ADHD

3.4.1.1. The main diagnostic tools

Two main diagnostic criteria are in current use: the International Classification of Mental and Behavioral Disorders 3rd revision (ICD-31) and the Diagnostic and Statistical Manual of Mental Disorders 4th edition (DSM IV). ICD-31 uses a narrower diagnostic category, which includes people with more severe symptoms and impairment. DSM-IV has a broader, more inclusive definition, which includes a number of different ADHD subtypes. Although ICD-31 excludes any comorbidity, for the purposes of this guideline coexisting conditions are accepted as a common aspect of the diagnosis and treatment of ADHD. Severe ADHD corresponds approximately to the ICD-31 diagnosis of hyperkinetic disorder. This is defined as when hyperactivity, impulsivity and inattention are all present in multiple settings and when impairment is severe. Determining severity is a matter of clinical judgment (National Institute for Health and Clinical Excellence, 2011).
ADHD behaviors must have persisted for at least 3 months. Symptoms must be displayed in two or more settings including home, school, work and social situations. Consequently, when making the ADHD diagnosis it is critical that data be obtained from two or more different sources and/or settings (e.g., parents and teachers and/or home and school) If symptoms are present in only one setting then alternative explanations for the ADHD-like behaviors must be considered. For example, the presence of a reading disability may result in ADHD-like behaviors at school, but not in home or community settings (American Psychiatric Association, and Brock et al., ).

a. DSM IV

DSM IV specifies that for the diagnosis of ADHD to be made, “There must be clear evidence of clinically significant impairment in social, academic, or occupational functioning”. Thus, the diagnostic assessment must include data indicating that ADHD symptoms have an adverse effect. This means, for example, that if an inattentive and hyperactive student is obtaining passing grades, following school rules, and has adequate peer relationships, there would be reason to question if an ADHD diagnosis is appropriate (American Psychiatric Association, ).

DSM-IV Diagnostic Criteria for Attention-Deficit Hyperactivity Disorder table (see appendix) consist of symptoms of inattention and or hyperactivity- impulsivity have persisted for at least 3 months to a degree that is maladaptive and inconsistent with developmental level (American Psychiatric Association, ).

b. ICD-

The diagnosis of hyperkinetic disorder requires the definite presence of abnormal levels of inattention, hyperactivity and restlessness
that are pervasive across situations and persistent over time and that are not caused by other disorders such as autism or affective disorders. Onset of the disorder is no later than the age of 3 years. The criteria of inattention and hyperactivity-impulsivity should be met for more than a single situation (World Health Organization, 1991).

ICD-3 Diagnostic Criteria for Hyperkinetic Disorders table (see appendix)

3.4.1.1 Direct and indirect assessment techniques:

The diagnosis of ADHD requires use of both indirect and direct assessment techniques.

3.4.1.1.1 Indirect assessment techniques:

Indirect assessment techniques involve obtaining data from caregivers about the student being assessed (e.g., by asking parents and teachers to complete behavior rating scales and conducting interviews). They have the advantage of tapping into the significant amount of experiences working with and observing, the student typically possessed by these caregivers. However, it is important to acknowledge the subjective nature of indirect assessment. On some occasions parents and teachers have biased and/or inaccurate views of a student’s behavior (Brock et al., 1996).

When assessing ADHD, rating scales should include both broad and narrow band measures. The broad-band measures have the advantage of helping to document not only the presence of ADHD behaviors, but also other behavioral and emotional disorders (Gordon et al., 1997).

a. Broad-band scales:

Broad-band scales evaluate general behavioral and psychosocial functioning. The Strengths and Difficulties Questionnaire (Goodman,
A widely available and used example is the Achenbach scales (Achenbach and Rescorla, 1991 and Achenbach et al., 1991), which cover the age range 18 months to 59 years with adult, parent, teacher and adolescent self-report versions. Another example is the long version of the Conners’ Rating Scales (CRS) (Conners, 1997) for young people, which have versions for parents and teachers.

b. Narrow-band scales:

Narrow-band scales are specific to ADHD symptomatology. These include the Brown Attention Deficit Disorder Scale (Brown, 1996 and Brown, 1991) with versions for adults and young people; ADHD Rating Scale (ADHD-RS) IV (DuPaul et al., 1991); the Child Attention Profile; and the Home Situations Questionnaire (Barkley and Murphy, 1991 and Brock et al., 1999).

3.4.1.1.1 Direct assessment techniques:

Direct assessment involves obtaining data by directly observing the student suspected to have ADHD (e.g., via psychological testing and behavioral observation). It has the advantage of being relatively objective and is less influenced by biased and/or inaccurate caregiver perceptions of the child’s behavior. However, it is important to acknowledge that the behavior of children with ADHD can be quite variable (from one situation to the next), thus the generalizability of this type of assessment data must always be questioned. Consequently, indirect assessments are important elements of any diagnostic assessment. By questioning parents and teachers about the behaviors observed during a direct assessment, individuals making an ADHD diagnosis will be able to determine if the obtained observational data are typical (Brock et al., 1999).

In a review of the literature published within the last 35 years and making use of the PsycINFO database, it was concluded that the four most
frequently recommended diagnostic procedures include the indirect assessment techniques of behavior rating scales and interview and the direct assessment techniques of laboratory/psychological testing and behavioral observations (*Brock and Clinton,* 2017).

### 3.4.3. Comorbidities

Comorbid disorders are psychiatric disorders sometimes associated with ADHD include oppositional defiant disorder, conduct disorder and anxiety disorders (*Millichap,* 2011).

**a. ADHD and Oppositional-Defiant Disorder (ODD)**

The presence of comorbid ODD with ADHD is likely to generate substantial impairment and would be expected to result in increased referrals for treatment (*Busch et al.*, 2011).

**b. ADHD and Conduct Disorder (CD)**

Co-occurrence of ADHD and CD in adolescents is often a precursor of antisocial behaviors; nicotine use; substance use or abuse; anxiety or depression; and development of antisocial personality disorder as adults (*Barkley et al.*, 2014).

**c. ADHD and Anxiety**

ADHD and anxiety contribute to social, behavioral and academic dysfunction. Thus, having both ADHD and anxiety disorders may substantially worsen the outcome of children with both disorders (*Spencer et al.*, 2017).
3.5. Prevention of ADHD

The practitioner in primary care as well as the mental health provider who deals with children, parents and women of childbearing age has the opportunity and obligation to inform about prevention, early intervention and steps that can be taken to modify known genetic and environmental risk factors, as well as to treat manifest developmental and mental disorders. Prevention should address pre-pregnancy and pregnancy physical health, optimize chronic illness management and stress avoidance (Baumgaertel et al., 2011).

Primary preventions impede the emergence of a disorder or injury, and typically take the form of public health initiatives, such as the use of seatbelts in cars, inoculations for viral diseases, promoting exercise and healthy diets for preventing obesity and cardiovascular disease (Halperin et al., 2011).

3.5.1 Measures during pregnancy and labour

Primary prevention initiatives include programs that promote maternal health such as warnings against alcohol, cigarette use and drug use, especially cocaine during pregnancy, birth and breast feeding as well as initiatives to reduce environmental toxins, such as lead and mercury, optimal medical attention and nutrition during pregnancy, optimal obstetric care and avoidance of brain damage from anoxia and premature birth (Millichap, and Halperin et al., 2011).

3.5.2 Postnatal preventive measures

These include optimal nutrition for the infant, child and lactating mother, early recognition and treatment of postpartum depression. Prompt pediatric attention to neonatal jaundice, hypoglycemia, febrile illness, convulsions and thyroid dysfunction. Testing and treatment for lead
exposure and poisoning in early childhood. Educational programs for the prevention of head injuries, accidental drug ingestion and other poisonings. Early interventions for developmental and behavioral problems should be encouraged, rather than adopting a “wait and see” attitude. Anticipatory guidance includes supporting the parent’s understanding of the infant’s and child’s developmental needs and capabilities. Avoiding active and passive TV and video exposure during the first 3 years and limiting it afterward. If you have a preschooler, play games, build with blocks and do puzzles together. It's good practice for building attention skills. Reading to your child is another good way to teach them how to pay attention (Baumgaertel et al., 2011 and Millichap, 2011).

Well-structured and healthy emotional home environment should be provided to prevent the negative impact of bad home environment on child development. Optimal teacher-pupil ratio in small classrooms that lessens distractibility and facilitates learning (Millichap, 2011).

In the child who is at high risk for or who has manifested ADHD, supportive interventions are important for improving self-esteem and peer and family relationships, which can buffer the negative effects of ADHD on psychosocial functioning. Peer friendships, extracurricular activities (sports, arts, scouting, etc.), social–altruistic engagement and parent involvement in school activities improve self-esteem and self concept. Family activities and rituals, as well as stable daily routines, help to provide the external emotional and temporal stability that is often very fragile in children with ADHD (Baumgaertel et al., 2011).

3.5.3 Physical Exercise

Physical exercise has been shown to increase levels of brain-derived neurotrophic factor, levels of synaptic proteins, glutamate receptors and
the availability of insulin-like growth factor, all of which contribute to cell proliferation and neural plasticity. Exercise-induced behavioral changes, such as enhanced spatial learning and memory. Importantly, the greatest cell proliferation in response to exercise occurs early in development, suggesting that exercise interventions may be particularly effective during early childhood. Nevertheless, the beneficial effects of exercise are not limited to early childhood. Physical exercise has been reported to increase brain-derived neurotrophic factor levels, enhance cognitive performance, and promote brain health in human adults \((\text{Kim et al.,} \, \cdot \cdot \cdot \text{and Halperin et al.,} \, \cdot \cdot \cdot \text{)}\).

Aerobic fitness in typically-developing children predicts differences in brain function, as detected with functional magnetic resonance imaging, as well as improved cognitive abilities. The areas of cognition that were found to be improved mainly included those related to executive functioning and the activation of prefrontal cortex and thus are highly relevant to ADHD. While some attention has been paid to the impact of acute physical activity on ADHD symptoms and investigators have pointed out the theoretical potential of chronic physical exercise in ADHD \((\text{Chaddock et al.,} \, \cdot \cdot \cdot ; \text{Gapin and Etnier,} \, \cdot \cdot \cdot ; \text{Medina et al.,} \, \cdot \cdot \cdot \text{and Archer and Kostrzewa,} \, \cdot \cdot \cdot \text{)}\).

**3.5.4 Improving nutrition**

There is strong evidence that improving nutrition in children can lead to healthy cognitive development, improved educational outcomes and reduced risk for mental ill-health. The most effective intervention models are those that include complementary feeding, growth monitoring and promotion. These models combine nutritional interventions (such as food supplementation) with counseling and psychosocial care (e.g. warmth, attentive listening). Iodine plays a key role in preventing mental
and physical retardation and impairment in learning ability. Iodine supplementation programs with iodize salt or water ensure that children obtain adequate levels of iodine. Global efforts such as those supported by UNICEF have led to $\approx 70\%$ of the world’s households using iodized salt. This protects $\approx 1$ million newborns from iodine deficiency and indirectly prevents related mental and physical health problems. Essential fatty acids occupy a special role because they are essential for fetal neurodevelopment, may be protective for mood disorders (WHO, $\ldots$ and Baumgaertel et al., $\ldots$).

### 3.5.5 Home-based interventions

Evidence from home visiting interventions during pregnancy and early infancy, addressing factors such as maternal smoking, poor social support, parental skills and early child–parent interactions, has shown health, social and economic outcomes of great public health significance. These include improvement of mental health both in the mothers and the newborns, less use of health services and long-term reductions in problem behaviors after $\approx 35$ years (Brown & Sturgeon, $\ldots$).

### 3.5.6 Foster a positive parent-child relationship

This can be done by spending quality time with your child each day, your child's "special time." During this time, let them pick an activity, then simply focus on enjoying your child and their interests. Use positive reinforcement when your child behaves well. Praise and reward them for it. Keep your expectations reasonable. Base them on what's appropriate for your child's age and focus on only a few tasks at a time. Clearly explain what type of behavior you expect from your child in order to be rewarded. Provide negative consequences for bad behavior, it is important to explain bad behavior to your child clearly. Start by explaining what's acceptable and what the reward is for that behavior and then explain the negative consequences for bad behavior (Rabiner, $\ldots$)
3.6. Treatment of ADHD

The most important aspect of successful treatment for children with ADHD is comprehensive evaluation and accurate diagnosis for ADHD as well as other comorbidities that frequently occur in children with ADHD. This evaluation needs to include education of the child with ADHD and his or her family about the diagnosis itself, its neurobiological basis and chronicity, as well as the development of a collaborative team approach for ongoing treatment (Brock et al., 1119).

3.6.1. Pharmacologic treatment of ADHD

3.6.1.1. Stimulant medications

Stimulant medication is the first-line treatment and has been repeatedly found to be effective in up to 152% of children with ADHD. The types of stimulants which have been shown to be equally efficacious in treating ADHD include methylphenidate and amphetamine (American Academy of Child and Adolescent Psychiatry Practice Parameter, 1117).

Medication does not cure ADHD; when effective, it alleviates ADHD symptoms during the time it is active. Medication alone generally provides significant short-term symptomatic and academic improvement and the risk-benefit ratio of stimulant treatment in ADHD must be evaluated and monitored on an ongoing basis in each case, but in general is highly favorable (Goldman et al., 1119).

About 312% of children and adolescents with this disorder may not respond to stimulants or may be unable to tolerate potential adverse events, so alternative medications are needed (Noorbala and Akhondzadeh, 1117).
3.6.1.1. Non stimulant medications

a. Atomoxetine

Atomoxetine is another medication which has been approved for ADHD treatment. It works by selectively inhibiting the pre-synaptic noradrenaline transporter thus inhibiting noradrenaline reuptake (Faraone, 2019).

A recent study found that atomoxetine was successful in treating both the ADHD and anxiety symptoms in children with comorbid ADHD and anxiety disorder (Geller et al., 2016).

b. Clonidine and Guanfacine

These are alpha two noradrenergic agonist, which have been thought to work in ADHD by affecting noradrenaline transmission in the frontal cortex. Clonidine has been used in combination with stimulants for the treatment of sleep disturbances and aggression associated with ADHD (Connor et al., 2011 and Faraone, 2019).

c. Tricyclic Antidepressants (TCAs)

It is assumed that the activity of TCAs in ADHD arises from their actions on catecholamines (noradrenaline and dopamine) reuptake (Banaschewski et al., 2014).

Advantages of the TCAs include their relative long half-life (approximately 33 hours) eliminating the need to administer medication during school hours, absence of abuse potential and putative positive effects on mood, anxiety and sleep (Biederman and Spencer, 2011b).

d. Bupropion

Bupropion can be used as a second-line agent in the treatment of ADHD. Bupropion has noradrenergic, anticholinergic and indirect
dopaminergic effects. In general, Bupropion appears to be less effective than stimulants (Banaschewski et al., 1114).

e.Venlafaxine

Venlafaxine is an antidepressant with both serotonergic and noradrenergic properties. It has been investigated as a possible alternative treatment in ADHD (Hornig-Rohan and Amsterdam, 1111 and Motavalli Mukaddes and Abali, 1114).

4. Psychosocial treatments and parental education

Despite the predominance of pharmacological management of ADHD symptoms, psychological interventions for ADHD have attracted the interests of clinicians and researchers for a number of reasons as set out below (Faraone, 1119).

Despite the effectiveness of stimulants in achieving a reduction in core symptoms, there have been questions over their long-term effectiveness, with a number of studies indicating that improvements may not be maintained over the longer term and into adolescence. Similarly, some studies have indicated that many of the benefits of stimulant medication may be state-dependent – effects may only last for as long as the person is receiving the medication (Swanson et al., 1993).

Children with ADHD typically have secondary problems, which are not resolved with medication. That is, although stimulants may improve parent-child interactions in analogue settings, (settings where measures may be taken, such as a clinic), families of children with ADHD are dysfunctional in multiple domains such as maternal stress and depression, paternal alcohol misuse and inappropriate parenting skills (Pelham and Gnagy, 1999).
A significant number of children and adults with ADHD fail to respond to stimulant medication (Safren et al., 1995). A significant number of children with ADHD may be intolerant to stimulant medication due to the side effects of stimulants that can be significant and interfere with treatment adherence or cause treatment discontinuation (Faraone, 1999).

It was suggested that lower doses of medication were effective in achieving the same outcomes when combined with behavior modification as a higher dosage of medication alone (Fabiano et al., 1997).

The main aim of all psychological interventions for ADHD is to improve the daily functioning of the child or young person by improving their behavior and family and peer relationships. Interventions for parents are designed to help parents develop optimum strategies to cope with the difficult behavior secondary to, or coexisting with, ADHD rather than addressing the core symptoms of inattention, hyperactivity and impulsivity (Faraone, 1999).

3.6.1.1 Behaviour Therapy:

The chief technique involves the use of rewards or reinforces that are judged likely to encourage the young person to implement targeted changes in motor, impulse or attentional control. This may involve tangible rewards such as extra time for recreational and leisure activities or the means to obtain items that the young person values (Faraone, 1999).

It is important to give much encouragement, praise and affection as students with ADHD are easily discouraged. When negative consequences are administered, they should be delivered in a fashion that does not embarrass the student. In addition, it is important to acknowledge that the
rewards used with these students may lose their reinforcing power quickly and thus should be frequently changed or rotated (Pfiffner and Barkley, and Zentall, ).

a. Token economy systems

These systems represent an example of a behavioral strategy which was proven to be helpful in improving both the academic and behavioral functioning of students with ADHD. These typically involved giving students tokens (e.g., poker chips) when they display appropriate behavior (McGoey and DuPaul, and DuPaul and Weyandt, ).

b. Response-cost programs

The use of a response-cost system has been demonstrated to increase the levels of on-task behavior, seatwork productivity and academic accuracy of students with ADHD. A specific response-cost program, which was found to be effective with ADHD students, involved giving a specific number of points at the start of each day. When a rule was broken (i.e., a problem behavior is displayed) points were taken away. Thus, to maintain their points and receive reinforcement, students had to avoid displaying inappropriate behaviors. At the end of the period or day students are allowed to exchange the points they have earned for a tangible reward or privilege (McGoey and DuPaul, and DuPaul and Weyandt, ).

c. Time-out

This typically involves removing the student from classroom activities. Before time-out is implemented, it should be clear that it is not reinforcing for the child (i.e., giving the student what he or she wants). For example, if a student is displaying aggressive or disruptive behaviors to
receive attention from peers, removing the student from his or her peers (i.e., time-out) would be effective.

However, if a student is trying to avoid schoolwork, time-out can be reinforcing if it allows the student to avoid his or her schoolwork. The time-out area should be a pleasant environment and the student should be placed in it for only a short time. While this procedure is effective with ADHD students, it is recommended to be used only with the most disruptive classroom behaviors and only when there is a highly trained staff member available (Brock et al., 2019).

3.6.1.1 Parent training

Parent training is a behavior therapy intervention, in that it teaches the parents to use behavior therapy techniques with their child. The main goals of parent-training programs are to teach the principles of child behavior management, increase parental competence and confidence in raising children and to improve the parent/carer-child relationship by using good communication and positive attention to aid the child’s development. These programs are structured and follow a set curriculum over several weeks (Faraone, 2019).

3.6.3 Adjusting the classroom environment

Utilizing instructional strategies within the classroom that promote success for the student with ADHD is an important aspect of treatment. These strategies also support learning for all students in the general education classroom (Brock et al., 2019).

a. Task duration

To accommodate to a student’s short attention span, academic assignments should be brief and immediate feedback regarding accuracy provided. For example, long projects can be broken up into smaller parts.
In addition, allowing students to take breaks during long periods of class work is another possible accommodation (Zentall, r · · o).

b. Scheduling

Given that the on-task behavior of students with ADHD typically worsens as the academic day progresses, it is recommended that instruction be provided in the morning. During the afternoon, when problem-solving skills tend to be especially poor, more active, non-academic activities can be scheduled. Further, preferred activities can be scheduled after non-preferred activities to provide an incentive to complete challenging tasks (Brock et al., r · · t).

c. Novelty

Increasing the novelty and interest level of tasks through enhanced stimulation (e.g., color, shape and texture) reduces activity level, increases attention and improves the overall performance of students with attention problems. Teachers can use novelty in the classroom by bolding important elements of written directions, using brightly colored paper, animation, or even different intonations when giving instructions or teaching a lesson. Students with ADHD respond positively to the novelty provided by films, models and skits (Zentall, r · · o).

d. Provide structure and organization

Students with ADHD respond positively to structure and predictability. These students can benefit from the use of a daily schedule and maintaining a consistent day-to-day routine. It may also be helpful to give students with ADHD advanced notice of changes in the class routine. Lessons themselves can be carefully structured and important points clearly identified. For example, providing a lecture outline is a helpful aid that increases memory of main ideas. Students with ADHD perform better
on memory tasks when material is meaningfully structured for them (*Raggi and Chronis, 1916*).

e. Instructions

Students with ADHD often have difficulty following multi-step directions. Thus, it is important for directions to be short, specific and direct. By using fewer direct words to explain assignments, teachers can increase the understanding and engagement of students with ADHD. To ensure understanding, it is helpful if students with ADHD are asked to rephrase directions in their own words (*Zentall, 1915*).

f. Choice

Allowing students a choice of activities can help to reduce disruptive behaviors and increase on-task behavior and task completion (*Raggi and Chronis, 1916*).

g. Distractions

Placing the student in close proximity to the teacher and away from high traffic areas can reduce distractions and increase attention (*e.g.*, seating the student away from activity centers, mobiles, doorways and windows). Eliminating irrelevant and highly desirable distractions such as toys or cartoons from the work area is also an effective modification. Auditory distractions (*e.g.*, side conversations) during complex and cognitively effortful tasks tend to be the most problematic for students with ADHD and thus are especially important to minimize or eliminate (*Zentall, 1915*).
3.6.4. Dietary Management:

Dietary interventions in the treatment of ADHD have been widely used. These include supplementation with substances thought to be deficient or exclusion of substances thought to be harmful (Faraone, 1119).

3.6.4.1. Elimination Diets

Children with inhaled and food allergies, family history food reactivity are more likely to respond to elimination diets, particularly younger children (Brock et al., 1119).

Elimination diets include removal of artificial colorings, preservatives and cross-reacting natural salicylates. Multiple idiosyncratic reactions to food and drink have been alleged to lead to hyperactive behavior. The notion is that one or more substances triggering adverse reactions can affect susceptible children. Therefore, the intervention aims to discover and eliminate from the diet the substances individually implicated for each child (McCann et al., 1117 and Faraone, 1119).

3.6.4.2. Sugar, Aspartame and ADHD

Parents of children with ADHD frequently report worsening of hyperactivity after an excessive ingestion of candy or diet soda. It was found that, the daily sucrose intake and total sugar consumption correlated with duration of aggression. Inattention was increased after sugar intake, but not aspartame or saccharine (Millichap, 1111).

3.6.4.3. Supplementation Diets

Supplementation diets include iron, magnesium, zinc and fatty acids (Mousain et al., 1114 and Millichap, 1111).
a. Iron

Low serum ferritin levels were correlated with more severe ADHD symptoms measured. A trial of iron supplementation found improvements in behavior rating scales (Konofal et al., and Millichap,).

b. Magnesium

In children with ADHD and relative magnesium deficiency showed behavioral improvement after \textsuperscript{3}-month supplementation with magnesium vitamin B\textsuperscript{3} (Mousain et al.,).

c. Zinc

Zinc is a cofactor for metabolism of neurotransmitters and fatty acids and regulates dopamine metabolism involved in ADHD. Zinc supplements are of value in treatment children with ADHD (Millichap,).

d. Essential fatty acids

Low levels of long-chain polyunsaturated fatty acids are reported in the plasma and red cells of children with ADHD compared with controls. The Oxford- Durham study compared the effects of dietary supplementation with omega-\textsuperscript{3} and omega-\textsuperscript{3} to placebo in \textsuperscript{333} children, a reduction and improvement occurred during the \textsuperscript{3}-month treatment phase, whereas no change was seen in the placebo group (Colter et al.,).
4. Subjects and Methods

4.1. Technical design:

This is a cross sectional comparative study that was conducted on primary school children in Al Qalyubia Governorate. The field work was carried out during the academic year 2013/2014.

4.1.1. Sampling:

The subjects of the study were recruited using the multi-stage sampling technique which involved dividing Al Qalyubia Governorate into clusters of ten districts (Banha - Khanka - Qaha - Qalyub - Shibin Al-Qanater - Shubra El-Kheima - Tukh - Al Kanater Al Khairia - KafrShukr – Al-Khosoas). Of these, two districts were chosen by simple random sample (Shibin Al-Qanater and Tukh). From each district two primary schools were included in the study; one rural and one urban by simple random sample. Each school was divided into strata reference to different grades then one class from each grade was chosen by simple random sample.

4.1.2. Subjects

All the students in the chosen classes were recruited to be assessed by our tools. Their number was 933 students (339 males and 333 females). For each student, a teacher questionnaire was filled in by the corresponding class teacher and a parent questionnaire was sent in student’s bag to be filled in by parents. All the teacher's questionnaires were completely filled (response rate was 3112), but only 333 of the parent’s questionnaires were completely filled and returned back with a response rate 33.5%.

4.1.3. Inclusion criteria
- Both genders.
- Age between 3-33 yrs.

4.1.4. Exclusion criteria
- Neurological handicapping.

4.1. Operational design:

4.1.1. Ethical consideration:

An approval from the Research Ethics Committee in Benha faculty of medicine was obtained. The teachers and the parents were informed that all data included in the study will be confidential and the information will be only used for the research purpose.

4.1.2. Tools of Data collection:

The questionnaire used was previously prepared by El-Noby, 1115. It is a screening rating scale for ADHD based on DSM-IV. It has two versions, a teacher’s rating scale and a parent’s rating scale. The following tests were used to prove the reliability Cronbach’s Alpha test was .7, Half split test (Spearman brown was .8 and Gutman was .8) and repeating the test was .8 (El-Noby, 1115). This questionnaire was validated before and was used in previous studies in Egypt (Megahed, 1113).

4.1.1.1. Teacher questionnaire

The teacher's questionnaire included personal data of the students (name - gender - educational stage - residence). It also included a rating scale comprising 33 items. Of these, 14 items were for the inattention subtype and 14 items for the hyperactivity/impulsivity subtype. The combined subtype was considered when the child had scores for inattention and hyperactivity/impulsivity. Responses to questions on symptoms were
coded as \(\backslash\), \(\checkmark\) and \(\ast\) corresponding to doing this behavior *seldom*, *occasionally* or *always*. The diagnosis was made when the subject had score \(\geq \frac{\xi}{\lambda}\) of the maximum score which was \(\forall\) (El-Noby, \(\forall\cdots\circ\)).

### 4.1.1.1. Parent questionnaire

The parent's questionnaire comprised personal data of the students (name - gender - educational stage - residence). This scale comprised \(\forall\xi\) items. Of these \(\forall\) items are for the inattention subtype and \(\forall\) items for the hyperactivity/impulsivity subtype. The combined subtype was considered when the child has scores for inattention and hyperactivity/impulsivity. Responses to questions on symptoms were coded as \(\backslash\), \(\checkmark\) and \(\ast\) corresponding to doing this behavior *seldom*, *occasionally* or *always*. The diagnosis is made when the subject had score \(\geq \frac{\xi}{\lambda}\) of the maximum score which is \(\forall\) (El-Noby, \(\forall\cdots\circ\)).

### 4.1.1.3. Risk factors questionnaire

A structured questionnaire containing a number of risk factors that was suggested to be related ADHD was prepared by the investigator. It was attached to parent's rating scale to be filled at home. These risk factors were socioeconomic status, psychosocial factors and biological factors.

### 4.1.1.3.1. Socioeconomic characteristics of the family

These included educational domain for husband and wife, family domain, economic domain, occupation domain for husband & wife, family possessions domain, home sanitation domain and health care domain (Appendix). The total score is \(\lambda\xi\) and according to the score obtained, the socioeconomic level was classified into low, middle and high; (low if score \(\leq 5\cdot\%\), middle if score \(>5\cdot\%\) to \(\leq 20\cdot\%\) and high if score \(>20\cdot\%)\) (El-Gilany et al., \(\forall\cdots\forall\)).
4.1.1.3.1. Psychosocial Factors

These included child living with both parents or a single-parent, birth order, parent’s relationship, parent’s relationship with the child and parent’s consanguinity (Al Hamed et al., *; Bener et al., * and Bishry et al., *).

4.1.1.3.2. Biological Factors:

These included pre-, peri-, and post-natal complications (Banerjee et al., *). Prenatal risk factors comprised toxemia of pregnancy, tobacco smoking, lack of iodine, hypothyroidism, exposure to viral infections and drug intake (Millichap, * and Thompson et al., *).

Perinatal and early-life risk factors were prematurity, low birth weight duration of labor, forceps delivery, cerebral trauma, younger maternal age, Caesarean section and hypoxic-ischemic encephalopathy (Biederman and Faraone, *; Barkley, *; Valdimarsdottir et al., * and Millichap, *).

Postnatal risk factors were artificial feeding, daily time spent on watching television, internet or video games and head trauma (El-Tallawy et al., * and Farid et al., *).

4.1.1. Application of tools

Personal interview was conducted between the research investigator and the teacher of each class to explain the items of the questionnaire. Regarding parents, a letter was sent to them to explain the value of filling the questionnaire and the way of filling it's items.

For each class, we chose the teacher who stay with the students more. Mostly, this was the Arabic teacher as he (she) spends about 3 hours weekly with students. Teachers were asked to fill the teacher questionnaires after explaining the way to answer the questions by the
investigator. A total number of 33 teachers from the included four schools participated in the study.

4.3. Administrative design:

An approval from the Educational Administration of Al Qalyubia Governorate was obtained.

4.4. Data management

The collected data were recorded on a report form. These data were tabulated and analyzed using the computer program SPSS (Statistical package for social science) version 33 to obtain descriptive data and analytical statistics. Data for children having completed both teacher’s and parent’s rating scales were used for analysis of risk factors.

Descriptive statistics were calculated for the data in the form of mean and standard deviation ($\pm SD$) for quantitative data and frequency and distribution for qualitative data.

In the statistical comparison between the different groups, the significance of difference was tested using one of the following tests:-

- Student's $t$-test: - Used to compare mean of two groups of quantitative data.
- Paired t test: - Used to compare mean of two groups of the same sample.
- F test:-Used to compare mean of more than two groups of quantitative data.
- Inter-group comparison of categorical data was performed by using chi square test ($X^2$-value), Mc Nemar test and fisher exact test (FET).
A P-value ≤ 1.15 was considered statistically significant (S) while a P-value > 1.15 was considered statistically insignificant and a P-value < 1.13 was considered highly significant (HS) in all analyses.
5. Results

5.1. Assessment of the prevalence of ADHD among the studied group

Table (1): Some socio-demographic characteristics of the studied group

<table>
<thead>
<tr>
<th>Socio-demographic characteristics</th>
<th>Total no=921</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No</td>
<td>%</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>449</td>
<td>48.8</td>
</tr>
<tr>
<td>Female</td>
<td>472</td>
<td>51.2</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6-9</td>
<td>294</td>
<td>31.9</td>
</tr>
<tr>
<td>9-11</td>
<td>305</td>
<td>33.1</td>
</tr>
<tr>
<td>11-13</td>
<td>322</td>
<td>35.0</td>
</tr>
<tr>
<td>Mean ±SD</td>
<td>11.27±3.57</td>
<td></td>
</tr>
<tr>
<td>Residence</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rural</td>
<td>479</td>
<td>52.0</td>
</tr>
<tr>
<td>Urban</td>
<td>442</td>
<td>48.0</td>
</tr>
</tbody>
</table>

This table describes that 51.2% of the studied sample was females. 35.1% of the studied sample between the age of 11-13 years and 33.1% of the studied sample from rural area.
Table (4): Classification of the studied group according to probable presence of ADHD and its subtypes based on the teacher's rating scale.

<table>
<thead>
<tr>
<th>Probable presence and subtypes of ADHD</th>
<th>Total no=911</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADHD classification</td>
<td>No</td>
</tr>
<tr>
<td>Negative</td>
<td>331</td>
</tr>
<tr>
<td>Positive</td>
<td>313</td>
</tr>
<tr>
<td>Subtypes of ADHD</td>
<td></td>
</tr>
<tr>
<td>Hyperactive</td>
<td>53</td>
</tr>
<tr>
<td>Inattention</td>
<td>33</td>
</tr>
<tr>
<td>Combined</td>
<td>313</td>
</tr>
</tbody>
</table>

This table shows that 33.1% of the studied sample was diagnosed as probably having ADHD based on teacher's rating scale. Regarding subtypes of ADHD, 35.9% had hyperactive subtype, 33.3% had inattention subtype and 53.3% had combined subtype.
Figure (1): Classification of the studied group according to probable presence of ADHD based on the teacher's rating scale

This figure shows that 78% of the studied sample was classified as probably having ADHD based on teacher’s rating scale.
Figure (7): Classification of the studied group according subtypes of ADHD based on the teacher's rating scale

This figure outlines that 53% of positive ADHD students were of combined subtype, 26% were of hyperactive subtype and 21% were of inattention subtype.
Table (1): Distribution of the studied group according to probable presence of ADHD regarding sociodemographic factors based on teacher’s rating scale

<table>
<thead>
<tr>
<th>Sociodemographic variables</th>
<th>ADHD diagnosis</th>
<th>Positive (n=111)</th>
<th>Negative (n=771)</th>
<th>Total (n=882)</th>
<th>Test $X^2$</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
<td>Male</td>
<td>110</td>
<td>54.7</td>
<td>339</td>
<td>47.1</td>
<td>449</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>91</td>
<td>45.3</td>
<td>381</td>
<td>52.9</td>
<td>472</td>
</tr>
<tr>
<td>Age</td>
<td>&lt; 9 years</td>
<td>67</td>
<td>33.7</td>
<td>380</td>
<td>54.9</td>
<td>447</td>
</tr>
<tr>
<td></td>
<td>≥ 9 years</td>
<td>134</td>
<td>66.3</td>
<td>391</td>
<td>45.1</td>
<td>425</td>
</tr>
<tr>
<td>Residence</td>
<td>Rural</td>
<td>88</td>
<td>43.8</td>
<td>391</td>
<td>54.3</td>
<td>479</td>
</tr>
<tr>
<td></td>
<td>Urban</td>
<td>113</td>
<td>56.2</td>
<td>329</td>
<td>45.7</td>
<td>442</td>
</tr>
</tbody>
</table>

This table shows that there were statistically significant differences between ADHD positive and negative students according to age and residence where prevalence of ADHD was higher among those who aged ≥ 9 years and from urban area.
Table (4): Classification of the studied subgroup according to probable presence of ADHD and its subtypes based on the parent's rating scale.

<table>
<thead>
<tr>
<th>Probable presence and subtypes of ADHD</th>
<th>Total no=437</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No</td>
</tr>
<tr>
<td>ADHD classification (333)</td>
<td></td>
</tr>
<tr>
<td>Negative</td>
<td>366</td>
</tr>
<tr>
<td>Positive</td>
<td>71</td>
</tr>
<tr>
<td>Subtypes of ADHD (35)</td>
<td></td>
</tr>
<tr>
<td>Hyperactive</td>
<td>31</td>
</tr>
<tr>
<td>Inattention</td>
<td>35</td>
</tr>
<tr>
<td>Combined</td>
<td>36</td>
</tr>
</tbody>
</table>

This table outlines that 33.3% of the studied sample was diagnosed as probably having ADHD based on parent's rating scale. About half of them were of combined subtype.
Figure (*): Classification of the studied subgroup according to probable presence of ADHD based on the parent's rating scale

This figure demonstrates that 84% of the studied subgroup was classified as probably having ADHD based on parent’s rating scale.
Figure (4): Classification of the studied subgroup according to subtypes of ADHD based on the parent's rating scale

This figure shows that 28% of positive ADHD students were of combined subtype, 21% were of hyperactive subtype and 51% were of inattention subtype.
Table (9): Comparison between parent’s and teacher’s rating scales regarding probable presence of ADHD and ADHD scores.

<table>
<thead>
<tr>
<th>Probable presence and subtypes of ADHD</th>
<th>Parent rating scale</th>
<th>Teacher rating scale</th>
<th>Test</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADHD classification</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No (%)(437)*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Negative</td>
<td>333 (13.12%)</td>
<td>339 (39.92%)</td>
<td>McNemar test</td>
<td>1.33</td>
</tr>
<tr>
<td>Positive</td>
<td>11 (31.32%)</td>
<td>11 (31.32%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subtypes of ADHD</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(71) **</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inattention</td>
<td>17.8±13.1</td>
<td>17.8±13.1</td>
<td>Paired t=1.314</td>
<td>0.189</td>
</tr>
<tr>
<td>Hyperactivity</td>
<td>17.8±13.1</td>
<td>17.8±13.1</td>
<td>Paired t=1.50</td>
<td>0.111</td>
</tr>
<tr>
<td>Impulsivity</td>
<td>17.8±13.1</td>
<td>17.8±13.1</td>
<td>Paired t=1.50</td>
<td>0.10</td>
</tr>
<tr>
<td>Combined</td>
<td>17.8±13.1</td>
<td>17.8±13.1</td>
<td>Paired t=1.50</td>
<td>0.10</td>
</tr>
<tr>
<td>Total</td>
<td>35.3±19.35</td>
<td>35.3±19.35</td>
<td>Paired t=1.50</td>
<td>0.10</td>
</tr>
</tbody>
</table>

* 437 students having both parent’s and teacher’s questionnaires

** 71 students with scores suggesting probable presence of ADHD in both teacher’s and parent’s rating scales

This table demonstrates that the prevalence of ADHD of the same students having both the teacher's and the parent's rating scales was not statistically significant. However, the scores for the impulsivity and the combined subtypes were statistically significant.
Figure (5): Comparison between ADHD scores based on parent's and teacher's rating scales

This figure is box plot showing comparison between teacher’s and parent’s rating scales around subtypes of ADHD.
5.1 Association between ADHD and potential risk factors

5.1.1 Relationship between ADHD diagnosis based on the parent's rating scale and risk factors

Table (8): Distribution of the studied subgroup according to ADHD diagnosis and sociodemographic characteristics based on parent's rating scale.

<table>
<thead>
<tr>
<th>Sociodemographic variables</th>
<th>ADHD diagnosis</th>
<th>Positive (n=71)</th>
<th>Negative (n=366)</th>
<th>Total (n=437)</th>
<th>Test</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex*</td>
<td>Male</td>
<td>38 53.5</td>
<td>177 47.6</td>
<td>215 49.3</td>
<td>X² = 1.933</td>
<td>.133</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>33 46.5</td>
<td>189 52.4</td>
<td>222 50.7</td>
<td>X² = 1.135</td>
<td>.285</td>
</tr>
<tr>
<td>Age</td>
<td>&lt;9 years</td>
<td>27 31.3</td>
<td>183 50.0</td>
<td>210 46.1</td>
<td>X² = 3.427</td>
<td>.069</td>
</tr>
<tr>
<td></td>
<td>≥9 years</td>
<td>44 56.9</td>
<td>183 50.0</td>
<td>227 52.1</td>
<td>X² = 1.135</td>
<td>.285</td>
</tr>
<tr>
<td>Residence</td>
<td>Rural</td>
<td>48 67.6</td>
<td>247 67.6</td>
<td>295 67.6</td>
<td>FET = 0.001</td>
<td>1.0</td>
</tr>
<tr>
<td></td>
<td>Urban</td>
<td>33 32.4</td>
<td>119 32.4</td>
<td>152 32.4</td>
<td>X² = 0.5</td>
<td>.47</td>
</tr>
<tr>
<td>Socioeconomic status</td>
<td>Low</td>
<td>37 52.1</td>
<td>76 20.9</td>
<td>113 25.6</td>
<td>FET = 67.60</td>
<td>.001</td>
</tr>
<tr>
<td></td>
<td>Middle</td>
<td>33 47.9</td>
<td>90 29.1</td>
<td>123 28.4</td>
<td>X² = 1.937</td>
<td>.163</td>
</tr>
<tr>
<td></td>
<td>High</td>
<td>1 1.4</td>
<td>44 12.1</td>
<td>45 10.3</td>
<td>X² = 0.001</td>
<td>1.0</td>
</tr>
<tr>
<td>Birth order</td>
<td>1st</td>
<td>11 15.0</td>
<td>76 21.2</td>
<td>87 19.8</td>
<td>X² = 7.00</td>
<td>.007</td>
</tr>
<tr>
<td></td>
<td>Middle</td>
<td>16 22.1</td>
<td>120 33.3</td>
<td>136 30.9</td>
<td>X² = 4.55</td>
<td>.033</td>
</tr>
<tr>
<td></td>
<td>Late</td>
<td>50 72.8</td>
<td>112 30.9</td>
<td>162 37.2</td>
<td>X² = 3.00</td>
<td>.086</td>
</tr>
</tbody>
</table>

*Male to female ratio = 3.35:1

This table illustrates that there were significant differences between ADHD positive and negative students according to socioeconomic status and birth order where prevalence was higher among those from low socioeconomic status and those with late birth order.
Figure (*): Distribution of the studied subgroup according to ADHD diagnosis and sociodemographic characteristics based on parent's rating scale.

This figure shows that the prevalence of ADHD was higher among those from low socioeconomic status and those with late birth order.
Table (7): Distribution of the studied subgroup according to ADHD diagnosis and psychosocial factors based on parent's rating scale.

<table>
<thead>
<tr>
<th>ADHD diagnosis</th>
<th>Psychosocial Variables</th>
<th>Positive (n=71)</th>
<th>Negative (n=366)</th>
<th>Total (n=437)</th>
<th>Test</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>No</td>
<td>%</td>
<td>No</td>
<td>%</td>
<td>No</td>
</tr>
<tr>
<td>Child live with Both parents</td>
<td>59</td>
<td>83.3</td>
<td>30</td>
<td>96.2</td>
<td>89</td>
<td>94.1</td>
</tr>
<tr>
<td>Father only</td>
<td>10</td>
<td>14.3</td>
<td>11</td>
<td>3.0</td>
<td>21</td>
<td>4.8</td>
</tr>
<tr>
<td>Mother only</td>
<td>3</td>
<td>4.8</td>
<td>3</td>
<td>0.8</td>
<td>6</td>
<td>1.3</td>
</tr>
<tr>
<td>Punishment</td>
<td>Hitting</td>
<td>24</td>
<td>3.3</td>
<td>5</td>
<td>0.4</td>
<td>29</td>
</tr>
<tr>
<td></td>
<td>Bad words</td>
<td>19</td>
<td>26.7</td>
<td>70</td>
<td>19.1</td>
<td>89</td>
</tr>
<tr>
<td></td>
<td>Insulting</td>
<td>17</td>
<td>23.9</td>
<td>54</td>
<td>14.0</td>
<td>71</td>
</tr>
<tr>
<td>No</td>
<td>11</td>
<td>15.5</td>
<td>24</td>
<td>7.5</td>
<td>35</td>
<td>7.9</td>
</tr>
<tr>
<td>Parent's relationship</td>
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<td>55</td>
<td>77.2</td>
<td>35</td>
<td>90.9</td>
<td>90</td>
</tr>
<tr>
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<td>Irritable</td>
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<td>18.3</td>
<td>5</td>
<td>1.4</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td>Don’t know</td>
<td>3</td>
<td>4.2</td>
<td>10</td>
<td>2.7</td>
<td>13</td>
</tr>
<tr>
<td>Parent-Child relationship</td>
<td>Good</td>
<td>39</td>
<td>54.3</td>
<td>36</td>
<td>98.4</td>
<td>39</td>
</tr>
<tr>
<td></td>
<td>Irritable</td>
<td>32</td>
<td>45.7</td>
<td>2</td>
<td>1.6</td>
<td>34</td>
</tr>
<tr>
<td>Consanguinity</td>
<td>Yes</td>
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<td>59.0</td>
<td>36</td>
<td>10.8</td>
<td>100</td>
</tr>
<tr>
<td>No</td>
<td>29</td>
<td>40.0</td>
<td>30</td>
<td>84.2</td>
<td>33</td>
<td>77.1</td>
</tr>
</tbody>
</table>
This table demonstrates that the prevalence of ADHD was statistically significant among students living with single parents, those who were punished by hitting, those with bad relationship with parents and between parents and with parent’s consanguinity.
Table (V): Distribution of the studied subgroup according to ADHD diagnosis and psychosocial factors based on parent’s rating scale.

This figure shows that the prevalence of ADHD was higher among students living with single parents, those who were punished by hitting, those with bad relationship with parents and between parents and with parent’s consanguinity
Table (▲): Distribution of the studied subgroup regarding ADHD diagnosis and prenatal risk factors based on parent's rating scale.

<table>
<thead>
<tr>
<th>ADHD diagnosis</th>
<th>Prenatal risk Factors</th>
<th>Positive (n=71)</th>
<th>Negative (n=366)</th>
<th>Total (n=437)</th>
<th>Test</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>No</td>
<td>%</td>
<td>No</td>
<td>%</td>
<td>No</td>
</tr>
<tr>
<td>Hypertension of pregnancy</td>
<td>Yes</td>
<td>10</td>
<td>14.1</td>
<td>4</td>
<td>1.1</td>
<td>14</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>61</td>
<td>85.9</td>
<td>366</td>
<td>98.9</td>
<td>423</td>
</tr>
<tr>
<td>Mother smoking</td>
<td>Yes</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0.2</td>
<td>1</td>
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<tr>
<td></td>
<td>No</td>
<td>33</td>
<td>15.9</td>
<td>333</td>
<td>91.9</td>
<td>333</td>
</tr>
<tr>
<td>Passive smoking</td>
<td>Yes</td>
<td>38</td>
<td>53.5</td>
<td>31</td>
<td>13.9</td>
<td>69</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>33</td>
<td>46.5</td>
<td>333</td>
<td>86.1</td>
<td>366</td>
</tr>
<tr>
<td>Drug intake</td>
<td>No</td>
<td>70</td>
<td>98.6</td>
<td>361</td>
<td>98.7</td>
<td>431</td>
</tr>
<tr>
<td></td>
<td>Don’t know</td>
<td>1</td>
<td>1.4</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

This table shows that there were significant differences between ADHD positive and negative students according to presence of hypertension of pregnancy and passive smoking during pregnancy where prevalence was higher among those whose mother’s had hypertension of pregnancy and exposed to passive smoking during pregnancy.
Table (5): Distribution of the studied subgroup according to ADHD diagnosis and perinatal risk factors based on parent's rating scale.

<table>
<thead>
<tr>
<th>ADHD diagnosis</th>
<th>Positive (n=71)</th>
<th>Negative (n=366)</th>
<th>Total (n=437)</th>
<th>Test</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perinatal risk factors</td>
<td>No</td>
<td>%</td>
<td>No</td>
<td>%</td>
<td>No</td>
</tr>
<tr>
<td>Mode of delivery</td>
<td>NVD</td>
<td>40</td>
<td>56.3</td>
<td>279</td>
<td>76.2</td>
</tr>
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<td></td>
<td>CS</td>
<td>31</td>
<td>43.7</td>
<td>87</td>
<td>23.8</td>
</tr>
<tr>
<td>Prematurity</td>
<td>Yes</td>
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<td>1.4</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
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<td>No</td>
<td>70</td>
<td>98.6</td>
<td>326</td>
<td>99.8</td>
</tr>
<tr>
<td>Cyanosis</td>
<td>Yes</td>
<td>3</td>
<td>4.2</td>
<td>1</td>
<td>0.3</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>68</td>
<td>95.8</td>
<td>335</td>
<td>99.3</td>
</tr>
<tr>
<td>Mother age at time of delivery (years)</td>
<td>Mean±SD</td>
<td>37.5±3.57</td>
<td>36.5±3.84</td>
<td>37.0±3.71</td>
<td>St t test = 1.78</td>
</tr>
<tr>
<td>Weight of child at birth (kg)</td>
<td>Mean±SD</td>
<td>3.139±1.333</td>
<td>3.131±1.393</td>
<td></td>
<td>St t test = 0.3</td>
</tr>
</tbody>
</table>

This table illustrates that the prevalence of ADHD was statistically significant among students who were born by caesarean section and those who had cyanosis after delivery.

Figure (8): Distribution of the studied subgroup regarding ADHD diagnosis and prenatal risk factors based on parent's rating scale
This figure demonstrates that prevalence of ADHD was higher among children whose mothers had hypertension of pregnancy and exposed to passive smoking during pregnancy.

Figure (4): Distribution of the studied subgroup according to ADHD diagnosis and perinatal risk factors based on parent's rating scale
This figure outlines that the prevalence of ADHD was higher among students who were born by caesarean section and those who had cyanosis after delivery.

Table (1) : Distribution of the studied subgroup according to ADHD diagnosis and postnatal risk factors based on parent's rating scale.
This table outlines that there were significant differences between ADHD positive and negative students according to type of feeding, watching TV and head trauma where prevalence was higher among those who were artificially fed, those who watched TV for longer times and those who were exposed to head trauma.

**Figure (11): Distribution of the studied subgroup according to ADHD diagnosis and postnatal risk factors based on parent's rating scale**
This figure shows that the prevalence of ADHD was higher among those who were artificially fed, those who watched TV for prolonged times and those who were exposed to head trauma.

5.1.1. Relationship between hyperactive, inattention and combined subtypes of ADHD based on the parent's rating scale and risk factors
Table (11): Distribution of the studied subgroup according to ADHD subtypes and sociodemographic characteristics based on parent's rating scale.

<table>
<thead>
<tr>
<th>ADHD subtypes</th>
<th>Sociodemographic variables</th>
<th>Hyperactive (n=11)</th>
<th>Inattention (n=15)</th>
<th>Combined (n=36)</th>
<th>Test</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Sex</td>
<td>Male</td>
<td>No</td>
<td>%</td>
<td>No</td>
<td>%</td>
</tr>
<tr>
<td></td>
<td>Male</td>
<td>13</td>
<td>65.0</td>
<td>6</td>
<td>40.0</td>
<td>19</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>7</td>
<td>35.0</td>
<td>9</td>
<td>60.0</td>
<td>17</td>
</tr>
<tr>
<td></td>
<td>Age &lt; 9 years</td>
<td>9</td>
<td>45.0</td>
<td>3</td>
<td>20.0</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>Age ≥9 years</td>
<td>11</td>
<td>55.0</td>
<td>12</td>
<td>80.0</td>
<td>21</td>
</tr>
<tr>
<td></td>
<td>Residence</td>
<td>Rural</td>
<td>12</td>
<td>60.0</td>
<td>12</td>
<td>80.0</td>
</tr>
<tr>
<td></td>
<td>Urban</td>
<td>8</td>
<td>40.0</td>
<td>3</td>
<td>20.0</td>
<td>12</td>
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<td>50.0</td>
<td>8</td>
<td>53.3</td>
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<td>50.0</td>
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<td>5.0</td>
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<td>0.0</td>
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<tr>
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<td>20.0</td>
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<tr>
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<td>Middle</td>
<td>3</td>
<td>15.0</td>
<td>2</td>
<td>13.3</td>
<td>10</td>
</tr>
<tr>
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<td>Late</td>
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<td>65.0</td>
<td>10</td>
<td>36.7</td>
<td>22</td>
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</tbody>
</table>

This table shows that there were no statistically significant differences between subtypes of ADHD regarding sex, age, residence, socioeconomic status and birth order.
Table (11): Distribution of the studied subgroup according to ADHD subtypes and psychosocial factors based on parent's rating scale.

<table>
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<tr>
<th>ADHD subtypes</th>
<th>Psychosocial Variables</th>
<th>Hyperactive (n=11)</th>
<th>Inattention (n=15)</th>
<th>Combined (n=36)</th>
<th>Test</th>
<th>P</th>
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</tr>
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<td>Both parents</td>
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</tr>
<tr>
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</tr>
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<td>Father only</td>
<td>1</td>
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<td>3.3</td>
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</tr>
<tr>
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<td></td>
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</tr>
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<td>Mother only</td>
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</tr>
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</tr>
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<td>Punishment</td>
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</tr>
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<td>Parent-Child relationship</td>
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</tr>
</tbody>
</table>

This table demonstrates that there were no significant differences between subtypes of ADHD according to child living with, type of punishment, type of parent relationship, type of relationship between parent and child and consanguinity.
Table (13): Distribution of the studied subgroup according to ADHD subtypes and prenatal risk factors based on parent's rating scale.

<table>
<thead>
<tr>
<th>Prenatal risk Factors</th>
<th>ADHD subtypes</th>
<th>Hyperactive (n=70)</th>
<th>Inattention (n=19)</th>
<th>Combined (n=36)</th>
<th>Test</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>No</td>
<td>%</td>
<td>No</td>
<td>%</td>
<td>No</td>
</tr>
<tr>
<td>Hypertension of pregnancy</td>
<td>Yes</td>
<td>5</td>
<td>71.4</td>
<td>1</td>
<td>7.7</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>15</td>
<td>73.6</td>
<td>14</td>
<td>73.7</td>
<td>33</td>
</tr>
<tr>
<td>Passive smoking</td>
<td>Yes</td>
<td>9</td>
<td>35.1</td>
<td>7</td>
<td>33.3</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>11</td>
<td>55.1</td>
<td>8</td>
<td>53.3</td>
<td>14</td>
</tr>
<tr>
<td>Drug intake</td>
<td>No</td>
<td>20</td>
<td>100</td>
<td>14</td>
<td>93.3</td>
<td>36</td>
</tr>
<tr>
<td></td>
<td>Don’t know</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>6.7</td>
<td>0</td>
</tr>
</tbody>
</table>

This table shows that there were no significant differences between subtypes of ADHD regarding presence of hypertension of pregnancy, passive smoking during pregnancy and drug intake.

Table (14): Distribution of the studied subgroup according to ADHD subtypes and perinatal risk factors based on parent's rating scale.
This table shows that there were no significant differences between subtypes of ADHD according to mode of delivery, prematurity, cyanosis, mother age at time of delivery and weight of child at birth.

Table (15): Distribution of the studied subgroup according to ADHD subtypes and postnatal risk factors based on parent's rating scale.
This table shows that there were no significant differences between subtypes of ADHD regarding type of feeding, watching TV and head trauma.

**.**.**.**Relationship between ADHD diagnosis based on the teacher's rating scale and risk factors

**Table (16):** Distribution of the studied subgroup according to ADHD diagnosis and sociodemographic characteristics based on teacher's rating scale.
<table>
<thead>
<tr>
<th>Sociodemographic Variables</th>
<th>ADHD diagnosis (n=437)</th>
<th>Test</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Positive (n=11)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>%</td>
<td>No</td>
</tr>
<tr>
<td>Sex</td>
<td>Male</td>
<td>47</td>
<td>53.3</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>41</td>
<td>46.7</td>
</tr>
<tr>
<td>Age</td>
<td>&lt; 9 years</td>
<td>30</td>
<td>33.3</td>
</tr>
<tr>
<td></td>
<td>≥ 9 years</td>
<td>58</td>
<td>60.9</td>
</tr>
<tr>
<td>Residence</td>
<td>Rural</td>
<td>82</td>
<td>59.1</td>
</tr>
<tr>
<td></td>
<td>Urban</td>
<td>32</td>
<td>40.9</td>
</tr>
<tr>
<td>Socioeconomic Status</td>
<td>Low</td>
<td>57</td>
<td>44.0</td>
</tr>
<tr>
<td></td>
<td>Middle</td>
<td>57</td>
<td>53.4</td>
</tr>
<tr>
<td></td>
<td>High</td>
<td>5</td>
<td>40.0</td>
</tr>
<tr>
<td>Birth order</td>
<td>1st</td>
<td>13</td>
<td>71.7</td>
</tr>
<tr>
<td></td>
<td>Middle</td>
<td>17</td>
<td>82.7</td>
</tr>
<tr>
<td></td>
<td>Late</td>
<td>33</td>
<td>57.2</td>
</tr>
</tbody>
</table>

This table illustrates that the prevalence of ADHD was statistically significant among students who aged ≥ 9 years, those from low socioeconomic status and those with late birth order.

**Figure (11): Distribution of the studied subgroup according to ADHD diagnosis and sociodemographic characteristics based on teacher's rating scale**
This figure demonstrates that the prevalence of ADHD was higher among students who aged $\geq 9$ years, those from low socioeconomic status and those with late birth order.

Table (17): Distribution of the studied subgroup according to ADHD diagnosis and psychosocial factors based on teacher's rating scale.
<table>
<thead>
<tr>
<th>Psychosocial Variables</th>
<th>(n=68)</th>
<th>(n=349)</th>
<th>(n=437)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Child live with</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Both parents</td>
<td>74</td>
<td>84.1%</td>
<td>337</td>
</tr>
<tr>
<td>Father only</td>
<td>11</td>
<td>12.5%</td>
<td>21</td>
</tr>
<tr>
<td>Mother only</td>
<td>3</td>
<td>3.6%</td>
<td>2</td>
</tr>
<tr>
<td>Punishment</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hitting</td>
<td>26</td>
<td>29.0%</td>
<td>3</td>
</tr>
<tr>
<td>Bad words</td>
<td>19</td>
<td>21.7%</td>
<td>3</td>
</tr>
<tr>
<td>Insulting</td>
<td>20</td>
<td>22.7%</td>
<td>4</td>
</tr>
<tr>
<td>No</td>
<td>24</td>
<td>27.1%</td>
<td>230</td>
</tr>
<tr>
<td>Parent's relationship</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Good</td>
<td>73</td>
<td>83.0%</td>
<td>333</td>
</tr>
<tr>
<td>Irritable</td>
<td>13</td>
<td>14.8%</td>
<td>5</td>
</tr>
<tr>
<td>Don’t know</td>
<td>2</td>
<td>2.3%</td>
<td>11</td>
</tr>
<tr>
<td>Parent-Child Relationship</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Good</td>
<td>55</td>
<td>64.0%</td>
<td>344</td>
</tr>
<tr>
<td>Irritable</td>
<td>33</td>
<td>37.5%</td>
<td>5</td>
</tr>
<tr>
<td>Consanguinity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>50</td>
<td>59.8%</td>
<td>50</td>
</tr>
<tr>
<td>No</td>
<td>28</td>
<td>33.3%</td>
<td>299</td>
</tr>
</tbody>
</table>

This table shows that there were significant differences between ADHD positive and negative students according to child living with, type of punishment, parent's relationship, parent-child relationship and consanguinity where prevalence was higher among those living single parent, those who were punished by hitting, those with bad relationship with parents and between parents and with parent’s consanguinity.
Figure (11): Distribution of the studied subgroup according to ADHD diagnosis and psychosocial factors based on teacher's rating scale.

This figure shows that prevalence of ADHD was higher among those living single parent, those who were punished by hitting, those with bad relationship with parents and between parents and with parent’s consanguinity.
Table (1\(^\wedge\)): Distribution of the studied subgroup according to ADHD diagnosis and prenatal risk factors based on teacher's rating scale.

<table>
<thead>
<tr>
<th>ADHD diagnosis</th>
<th>Positive (n=(^\wedge\wedge))</th>
<th>Negative (n=(^\wedge\wedge))</th>
<th>Total (n=(^\wedge\wedge\wedge))</th>
<th>Test</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prenatal risk</td>
<td>No</td>
<td>%</td>
<td>No</td>
<td>%</td>
<td>No</td>
</tr>
<tr>
<td>Hypertension of pregnancy</td>
<td>Yes</td>
<td>11</td>
<td>12.5</td>
<td>3</td>
<td>30.9</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>77</td>
<td>87.5</td>
<td>32</td>
<td>99.1</td>
</tr>
<tr>
<td>Mother smoking</td>
<td>Yes</td>
<td>10</td>
<td>11.1</td>
<td>1</td>
<td>11.1</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>88</td>
<td>100</td>
<td>348</td>
<td>99.9</td>
</tr>
<tr>
<td>Passive smoking</td>
<td>Yes</td>
<td>45</td>
<td>51.1</td>
<td>44</td>
<td>14.7</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>43</td>
<td>48.9</td>
<td>305</td>
<td>85.3</td>
</tr>
<tr>
<td>Drug intake</td>
<td>No</td>
<td>77</td>
<td>98.9</td>
<td>344</td>
<td>98.6</td>
</tr>
<tr>
<td></td>
<td>Don’t know</td>
<td>1</td>
<td>1.1</td>
<td>0</td>
<td>1.4</td>
</tr>
</tbody>
</table>

This table demonstrates that the prevalence of ADHD was statistically significant among those whose mothers had hypertension of pregnancy and exposed to passive smoking during pregnancy.
Table (1.5): Distribution of the studied subgroup according to ADHD diagnosis and perinatal risk factors based on teacher's rating scale.

<table>
<thead>
<tr>
<th>ADHD diagnosis</th>
<th>Perinatal risk factors</th>
<th>Positive (n=68)</th>
<th>Negative (n=349)</th>
<th>Total (n=417)</th>
<th>Test</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mode of delivery</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>NVD</td>
<td>63</td>
<td>60.2</td>
<td>319</td>
<td>$X^2 = 9.12$</td>
<td>0.003</td>
</tr>
<tr>
<td></td>
<td>CS</td>
<td>35</td>
<td>39.8</td>
<td>331</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Prematurity</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>1</td>
<td>1.1</td>
<td>1</td>
<td>FET=</td>
<td>4.03</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>87</td>
<td>98.9</td>
<td>336</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cyanosis</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>3</td>
<td>3.4</td>
<td>4</td>
<td>$X^2 = 12.06$</td>
<td>0.004</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>85</td>
<td>96.6</td>
<td>333</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mother age at time of delivery</td>
<td>Mean±SD</td>
<td>33.0±13.3</td>
<td>37.0±13.7</td>
<td>St t test</td>
<td>2.16</td>
</tr>
<tr>
<td></td>
<td>Weight of child at birth</td>
<td>Mean±SD</td>
<td>3.9±0.4</td>
<td>3.6±0.3</td>
<td>St t test</td>
<td>0.620</td>
</tr>
</tbody>
</table>

This table illustrates that there were significant differences between ADHD positive and negative students according to mode of delivery, cyanosis and mother age at time of delivery where the prevalence was higher among those who were born by caesarean section, those who had cyanosis after delivery and children of older mothers.
Figure (13): Distribution of the studied subgroup according to ADHD diagnosis and prenatal risk factors based on teacher's rating scale

This figure shows that the prevalence of ADHD was higher among those whose mothers had hypertension of pregnancy and exposed to passive smoking during pregnancy.
Figure (14): Distribution of the studied subgroup according to ADHD diagnosis and perinatal risk factors based on teacher's rating scale

This figure outlines that prevalence of ADHD was higher among those who were born by caesarean section and those who had cyanosis after delivery.
Table (11): Distribution of the studied subgroup according to ADHD diagnosis and postnatal risk factors based on teacher's rating scale.

<table>
<thead>
<tr>
<th>ADHD diagnosis</th>
<th>Postnatal risk Factors</th>
<th>Positive (n=11)</th>
<th>Negative (n=349)</th>
<th>Total (n=437)</th>
<th>Test</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>No</td>
<td>%</td>
<td>No</td>
<td>%</td>
<td>No</td>
</tr>
<tr>
<td>Feeding</td>
<td>Breast feeding</td>
<td>88</td>
<td>75.9</td>
<td>199</td>
<td>84.8</td>
<td>287</td>
</tr>
<tr>
<td></td>
<td>Artificial</td>
<td>70</td>
<td>28.4</td>
<td>31</td>
<td>8.9</td>
<td>101</td>
</tr>
<tr>
<td></td>
<td>Both</td>
<td>4</td>
<td>0.7</td>
<td>22</td>
<td>6.3</td>
<td>26</td>
</tr>
<tr>
<td>Watching TV</td>
<td>Yes</td>
<td>87</td>
<td>64.8</td>
<td>61</td>
<td>17.2</td>
<td>148</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>31</td>
<td>30.2</td>
<td>288</td>
<td>82.8</td>
<td>319</td>
</tr>
<tr>
<td>Head trauma</td>
<td>Yes</td>
<td>43</td>
<td>58.9</td>
<td>30</td>
<td>10.7</td>
<td>73</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>40</td>
<td>53.5</td>
<td>278</td>
<td>89.7</td>
<td>318</td>
</tr>
<tr>
<td></td>
<td>Don’t know</td>
<td>4</td>
<td>0.7</td>
<td>32</td>
<td>10.3</td>
<td>46</td>
</tr>
</tbody>
</table>

This table shows that the prevalence of ADHD was statistically significant among those who were artificially fed, those who watched TV for longer times and those who were exposed to head trauma.
Figure 15: Distribution of the studied subgroup according to ADHD diagnosis and postnatal risk factors based on teacher's rating scale

This figure shows that the prevalence of ADHD was higher among those who were artificially fed, those who watched TV for longer times and those who were exposed to head trauma.
### Relationship between hyperactivity, inattention and combined subtypes of ADHD based on the teacher's rating scale and risk factors

Table (11): Distribution of the studied subgroup according to ADHD subtypes and sociodemographic characteristics based on teacher's rating scale.

<table>
<thead>
<tr>
<th>ADHD subtypes</th>
<th>Sociodemographic variables</th>
<th>Hyperactive (n=11)</th>
<th>Inattention (n=16)</th>
<th>Combined (n=51)</th>
<th>Test</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>No</td>
<td>%</td>
<td>No</td>
<td>%</td>
<td>No</td>
</tr>
<tr>
<td>Sex</td>
<td>Male</td>
<td>17</td>
<td>81.0</td>
<td>7</td>
<td>4.0</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>4</td>
<td>19.0</td>
<td>9</td>
<td>56.0</td>
<td>8</td>
</tr>
<tr>
<td>Age</td>
<td>&lt; 9 years</td>
<td>7</td>
<td>33.3</td>
<td>9</td>
<td>31.1</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>≥ 9 years</td>
<td>14</td>
<td>66.7</td>
<td>12</td>
<td>68.9</td>
<td>21</td>
</tr>
<tr>
<td>Residence</td>
<td>Rural</td>
<td>11</td>
<td>52.4</td>
<td>3</td>
<td>18.8</td>
<td>32</td>
</tr>
<tr>
<td></td>
<td>Urban</td>
<td>10</td>
<td>47.6</td>
<td>1</td>
<td>11.2</td>
<td>18</td>
</tr>
<tr>
<td>Socioeconomic Status</td>
<td>Low</td>
<td>8</td>
<td>38.1</td>
<td>7</td>
<td>43.7</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td>Middle</td>
<td>12</td>
<td>57.6</td>
<td>8</td>
<td>50.0</td>
<td>24</td>
</tr>
<tr>
<td></td>
<td>High</td>
<td>1</td>
<td>4.8</td>
<td>0</td>
<td>0.0</td>
<td>3</td>
</tr>
<tr>
<td>Birth order</td>
<td>1st</td>
<td>5</td>
<td>23.8</td>
<td>3</td>
<td>18.8</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>Middle</td>
<td>1</td>
<td>4.8</td>
<td>1</td>
<td>6.3</td>
<td>14</td>
</tr>
<tr>
<td></td>
<td>Late</td>
<td>10</td>
<td>47.6</td>
<td>11</td>
<td>57.3</td>
<td>17</td>
</tr>
</tbody>
</table>

This table shows that there were statistically significant differences between subtypes of ADHD and gender (hyperactive type more prevalent in males and inattention type more prevalent in females).
Figure (16): Distribution of the studied subgroup according to ADHD subtypes and sex based on teacher's rating scale

This figure demonstrates that hyperactive type was more prevalent in males and inattention type was more prevalent in females.
Table (11): Distribution of the studied subgroup according to ADHD subtypes and psychosocial factors based on teacher's rating scale.

<table>
<thead>
<tr>
<th>ADHD subtypes</th>
<th>Hyperactive (n=11)</th>
<th>Inattention (n=15)</th>
<th>Combined (n=51)</th>
<th>Test</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No</td>
<td>%</td>
<td>No</td>
<td>%</td>
<td>No</td>
</tr>
<tr>
<td>Child live with</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Both parents</td>
<td>19</td>
<td>90.5</td>
<td>12</td>
<td>80.0</td>
<td>43</td>
</tr>
<tr>
<td>Father only</td>
<td>1</td>
<td>4.8</td>
<td>2</td>
<td>14.3</td>
<td>8</td>
</tr>
<tr>
<td>Mother only</td>
<td>1</td>
<td>4.8</td>
<td>1</td>
<td>6.7</td>
<td>1</td>
</tr>
<tr>
<td>Punishment</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hitting</td>
<td>10</td>
<td>90.9</td>
<td>3</td>
<td>20.0</td>
<td>13</td>
</tr>
<tr>
<td>Bad words</td>
<td>3</td>
<td>33.3</td>
<td>4</td>
<td>26.7</td>
<td>12</td>
</tr>
<tr>
<td>No</td>
<td>6</td>
<td>54.5</td>
<td>2</td>
<td>13.3</td>
<td>10</td>
</tr>
<tr>
<td>Insulting</td>
<td>4</td>
<td>36.4</td>
<td>6</td>
<td>40.0</td>
<td>12</td>
</tr>
<tr>
<td>Parent's relation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Good</td>
<td>10</td>
<td>90.9</td>
<td>13</td>
<td>86.7</td>
<td>40</td>
</tr>
<tr>
<td>Irritable</td>
<td>1</td>
<td>4.8</td>
<td>1</td>
<td>6.7</td>
<td>11</td>
</tr>
<tr>
<td>Don’t know</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>6.7</td>
<td>1</td>
</tr>
<tr>
<td>Parent-Child relationship</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Good</td>
<td>11</td>
<td>52.4</td>
<td>12</td>
<td>80.0</td>
<td>34</td>
</tr>
<tr>
<td>Irritable</td>
<td>10</td>
<td>47.6</td>
<td>3</td>
<td>20.0</td>
<td>20</td>
</tr>
<tr>
<td>Consanguinity</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>13</td>
<td>61.9</td>
<td>9</td>
<td>60.0</td>
<td>28</td>
</tr>
<tr>
<td>No</td>
<td>8</td>
<td>38.1</td>
<td>6</td>
<td>40.0</td>
<td>24</td>
</tr>
</tbody>
</table>

This table outlines that there were no significant differences between subtypes of ADHD according to child living with, type of punishment, type of parent relationship, type of relationship between parent and child and consanguinity.
Table (13): Distribution of the studied subgroup according to ADHD subtypes and prenatal risk factors based on teacher's rating scale.

<table>
<thead>
<tr>
<th>ADHD subtypes</th>
<th>Hyperactive (n=21)</th>
<th>Inattention (n=15)</th>
<th>Combined (n=51)</th>
<th>Test</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No</td>
<td>%</td>
<td>No</td>
<td>%</td>
<td>No</td>
</tr>
<tr>
<td>Hypertension of pregnancy</td>
<td>Yes</td>
<td>6</td>
<td>28.6</td>
<td>1</td>
<td>6.7</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>15</td>
<td>71.4</td>
<td>14</td>
<td>93.3</td>
</tr>
<tr>
<td>Passive smoking</td>
<td>Yes</td>
<td>10</td>
<td>47.6</td>
<td>5</td>
<td>33.3</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>11</td>
<td>52.4</td>
<td>10</td>
<td>66.7</td>
</tr>
<tr>
<td>Drug intake</td>
<td>No</td>
<td>21</td>
<td>100</td>
<td>15</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>Don’t know</td>
<td>0</td>
<td>0.0</td>
<td>0</td>
<td>0.0</td>
</tr>
</tbody>
</table>

This table illustrates that there were no statistically significant differences between subtypes of ADHD regarding presence of hypertension of pregnancy, passive smoking during pregnancy and drug intake.
Table (14): Distribution of the studied subgroup according to ADHD subtypes and perinatal risk factors based on teacher's rating scale.

<table>
<thead>
<tr>
<th>ADHD subtypes</th>
<th>Hyperactive (n=11)</th>
<th>Inattention (n=15)</th>
<th>Combined (n=51)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No</td>
<td>%</td>
<td>No</td>
</tr>
<tr>
<td>Mode of delivery</td>
<td>NVD</td>
<td></td>
<td>CS</td>
</tr>
<tr>
<td></td>
<td>11</td>
<td>53.3</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>46.7</td>
<td>5</td>
</tr>
<tr>
<td>Prematurity</td>
<td>Yes (3rd)</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>24</td>
<td>100</td>
</tr>
<tr>
<td>Cyanosis</td>
<td>Yes</td>
<td>1</td>
<td>4.8</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>20</td>
<td>95.2</td>
</tr>
</tbody>
</table>

This table shows that there were no statistically significant differences between subtypes of ADHD according to mode of delivery, prematurity and cyanosis.

Table (15): Distribution of the studied subgroup according to ADHD subtypes and postnatal risk factors based on teacher's rating scale.
This table illustrates that there were no statistically significant differences between subtypes of ADHD regarding type of feeding, watching TV and head trauma.
Discussion

ADHD is the most common psychiatric disorders of childhood which presents with inattention, hyperactivity, impulsivity or combined that leads to academic underachievement and behavior problems (American Academy of Pediatrics, 2011). This study aimed at estimating the prevalence of ADHD among the primary school children in Al Qalyubia Governorate, to investigate the relationship between ADHD and potential risk factors and to outline a comprehensive program for the prevention and control of ADHD among the primary school children.

A cross sectional study was conducted on primary school children in Al Qalyubia Governorate. Data on ADHD were collected using the teacher rating scale and parent rating scale (El-Noby, 2014). A number of risk factors that were suggested to be related to ADHD were also investigated. A teacher questionnaire was completed for 933 students. Of these, 333 had completed a parent questionnaire. The poor response regarding the parent’s questionnaire might be attributed to illiteracy, negligence or lack of knowledge about ADHD among parents.

ADHD is commonly detected at primary school children which may give a chance for early diagnosis and early intervention (Younis, 2014).

1.1 Prevalence of ADHD

The estimated prevalence of ADHD in the published literature is related to study methodology, diagnostic criteria and demographic characteristics of the population, such as ethnicity, gender and age (Cuffe et al., 2011). Prevalence depends on the person evaluating the symptoms, such as the parent, teacher or child (Polanczyk and Jensen, 2014).
This study revealed that the prevalence of ADHD was \(\frac{33.12}{933}\) out of students based on teacher rating scale and \(\frac{33.32}{333}\) out of students based on parent rating scale (Tables 1 and 4). The prevalence of ADHD for those students was \(\frac{31.32}{333}\) based on teacher rating scale (Table 5). This finding agreed with that reported by Younis, (1111) who found that the prevalence of ADHD among primary school children aged \(3-12\) years in Menofia governorate, Egypt was \(\frac{39.92}{1111}\) based on ADHD Rating Scale filled by teachers. Similarly, Paulo et al., (1119) found that the prevalence of ADHD in children aged \(3-12\) years in Brazilian Amazon was \(\frac{33.52}{1119}\) based on the parent rating scale designed from DSM IV criteria.

However, this result was higher than that detected in the cross sectional comparative study performed by Farahat et al., (1114). They found that the prevalence of ADHD among primary school children aged \(3-12\) years in Menoufia governorate was \(\frac{3.92}{1114}\), based on parent’s and teacher’s scales and confirmed by psychological assessment. In Minia city, Egypt a cross sectional study was performed by Soliman et al., on preschool and school children aged \(3\) to \(12\) years. It revealed that the prevalence rate of ADHD was \(\frac{3.52}{1111}\) based on the modified Arabic version of the Connors, a Stanford Binnet test version, EEG and routine laboratory workup. Similarly, Bianchini et al., (1113) found that the prevalence of ADHD in Italian students aged \(5-15\) years was \(\frac{32}{1113}\) using the screening rating scale for teachers followed by a specific clinical-diagnostic assessment. Also, Amiri et al., (1111) reported that the prevalence rate of ADHD among elementary students aged \(3-12\) years in Tabriz (Iran) was \(\frac{9.32}{1111}\). They used Conner's teacher rating scale followed by an interview with children who had high score on the Conner's teacher rating scale.
The higher prevalence rate in the present study may be attributed to the use of a screening tool only for detection of ADHD. The lower prevalence rates reported in other studies may be due to using different screening tools followed by specific diagnostic measures.

This study revealed that the prevalence of ADHD based on parent rating scale was lower than teacher rating scale. However, this finding was not statistically significant. These different ratings might be attributed to parents being more tolerant of disruptive behaviour and unwilling to report problems to avoid stigmatization. Similar findings were reported by Pierrehumbert et al., (1116) who found no significant difference in the prevalence of ADHD symptoms in school-aged Swiss children between parent and teacher evaluations (8.1% and 9.1% respectively). Willcutt, (1111), in a meta-analysis of 13 studies of children and adolescents over the period between 1993 and 2010, found that the prevalence of ADHD based on parent rating was lower than the prevalence of ADHD based on teacher rating scale (8.1% and 9.1% respectively). Also, Thabet et al., (1116) found that the prevalence of ADHD based on parent rating was lower than that based on teacher rating scale (10% and 18% respectively). Their cross sectional study was conducted on children aged 3-15 years in Palestine.

However, Eapen et al., (119) found that the prevalence of ADHD based on parent rating was higher than that based on teacher rating scale (18.1% and 8.1% respectively). Their study was conducted on children aged 5-18 years in United Arab Emirates. Soma et al., (1119) found that the prevalence of ADHD symptoms in children aged 3-7 years in Japan was higher in parent survey (11.1%) than the teacher survey (6.6%).
The reported higher prevalence rates based on parent rating scale than that based on teacher rating scale might be due to that parents may expect their children to be well-behaved, thus evaluating their behavior more strictly. Also, children tend to behave more freely at home than at school which might lead the observers to conclude children were more symptomatic of ADHD (Soma et al., 2016).

The fact that more detection of the cases in school age children by teacher rather than by parents is probably attributed to that the teacher plays an important role in the assessment process, providing information on academic history and performance, social relations and general everyday functioning, thus playing a very important part in the screening for ADHD (Sciutto et al., 2019 and Zentall, 2017). Also parents lack the knowledge about this disorder. So, they wait until detection by school teachers or the occurrence of complications such as conduct disorder or scholastic underachievement (Younis, 2019).

This study revealed that the most frequent clinical type of ADHD was the combined type followed by hyperactive impulsive type and inattention type (Tables 1 and 4). This finding agreed with several studies that found the combined type is the most common type as Cardo et al., (2017) who found that the hyperactive subtype was 1.3%, the inattention subtype was 1.1% and the combined subtype was 1.4% in children aged 2-11 years in Island of Mallorca. Similarly, Bianchini et al., (2019) found that the prevalence was 6.8% for combined type, 9.2% for inattention type and 14.6% for hyperactivity type in cases aged 5-15 years in Italy. In Saudi Arabia a cross sectional study was performed by Al Hamed et al., (2018) on children aged 3-13. It revealed that the prevalence of combined ADHD was 18.3%, hyperactivity-impulsivity was 17.4% and inattention subtype
was \%\%\% using the modified Arabic version of the Attention Deficit Disorders Evaluation Scale (ADDES) school version and parent’s questionnaire.

This result disagreed with Soliman et al., (2011) who found that the prevalence of hyperactive impulsive subtype was \%\%, followed by combined subtype \%\% then inattentive subtype \%\% in children aged 3-17 years in Minia city, Egypt. Also, Gul et al., (2011) found that the hyperactive/impulsive prevalence was \%, the inattentive subtype was \%\% and the combined subtype was \%. Their study was conducted on children aged 3-17 years in Trabzon, Turkey.

While, Homidi et al., (2011) found that the prevalence of inattention subtype was \%, the hyperactive subtype was \%\% and that of combined subtype was \%\% in school children aged 3-17 in Jeddah, Saudi Arabia. Similarly, Willcutt, (2011) found that the inattention type was the most common subtype in all samples.

In this study the combined subtype followed by the hyperactive subtype was more prevalent than inattention subtype. This might be attributed to increase observation of hyperactive child in our country more than the inattention type in which the hyperactive child usually considered as a source of troubles in his family and the reverse for inattention subtype who are usually discovered later on after school entry (El-Tallawy et al., 2011).

\section*{Association between ADHD and risk factors}

The current study revealed that there was no statistically significant difference between males and females regarding prevalence of ADHD
(Tables 6 and 16). This finding agreed with Rashed et al., (1994) who found that there was no significant difference between males and females (19.7% for males and 19.5% for females) concerning prevalence of ADHD. Their cross sectional study was conducted on children aged 3-8 years in Alexandria governorate, Egypt.

Previous studies reported significant difference between males and females as Farid et al., (1111) who found that ADHD was significantly higher in males than females approximately 7 times more common in boys (19.9% in boys and 19.6% in girls). Their cross sectional study was conducted on children aged 3-11 years in Cairo, Egypt. Also, Huss et al., (1111) found that there was a significant difference between males and females regarding prevalence of ADHD (19.7% for males and 19.8% for females). Their cross sectional was conducted on children and adolescents aged 7-11 years in Germany. Similarly, Bener et al., (1111) found that ADHD was significantly higher in males (19.7%) than females (19.8%) in their cross sectional study that was conducted in Qatar.

The result of this study revealed that the hyperactive subtype was more prevalent in males while the inattention subtype was more prevalent in females (Table 11). This finding agreed with Farid et al., (1111) who found that hyperactivity and combined subtypes of ADHD were higher among males (19.9% for hyperactivity and 19.7% for combined type), while inattention subtype was higher among females (19.5%) in Cairo, Egypt. Shooshtary et al., (1111), in a systematic review of literature of 11 studies in Iran, found that hyperactive subtype was more prevalent in males (19.7% for males and 19.7% for females) and inattentive subtype was more prevalent in females (19.8% for girls and 19.7% for males).
This study revealed that there were significant differences between positive students of ADHD and negative students regarding age (Table 1) as the proportion of positive students aged $\geq 9$ years was significantly higher compared to negative students. This result agreed with Al Hamed et al., (1111) who found that school males of age groups 9 to less than 11 years showed a statistically significant higher prevalence for the three subtypes of disorders (11.4% for combined, 11.7% for hyperactivity/impulsivity and 11.3% for inattention) than males of age groups 11 to less than 9 years (11.6%, 11.6% and 11.7% respectively) while school males of age groups 11-13 years had the lowest prevalence of all three disorders (11.3%, 11.3% and 11.5% respectively) in Saudi Arabia. Similarly, Willcutt, (1111) found in a meta-analysis that the overall prevalence of ADHD was highest in preschool (10.5%) and elementary school samples (11.4%), which then declined in samples of adolescents (11.0%). Along with this, Huss et al., (1111) found that prevalence rates increased from 1.5% during preschool ($\leq 5$ years) to 5.3% during primary school age ($6-10$ years) and further rise to 1.1% at $11-13$ years of age then the prevalence rate declines to 0.7% in adolescents ($14-17$ years) in Germany.

This result disagreed with Jenahi et al., (1111) who found that the prevalence of ADHD decreased with age (1.6% at age $\leq 3$ years, 1.2% at age 3-11 years, and 1.1% at age $\geq 12$ years). Their cross sectional study was conducted on children and adolescents aged $\leq 15$ years in Saudi Arabia. Similarly, Bener et al., (1111) found that more children in the age group of $\leq 9$ years (13.5%) had a high score for ADHD symptoms than in that of 10-11 years (8.4%) in schoolchildren aged $\leq 12$ in Qatar.
The increased prevalence of ADHD in elder children can be explained by increasing teacher expectation as the child become older and the child expected to behave in certain manner as a result inattentive – hyperactive symptoms are not tolerated by the teacher, as the child grow co-morbid disorder start to appear which result in greater impairment also as a result of increasing demand in their environments, children start to show greater impairment (eg. school failure) (Younis, 2011).

The current study revealed that the prevalence of ADHD among the urban students of the total sample was statistically significant than among the rural ones using the teacher’s rating scale (Table 1). However, the students having both the teacher’s and parent’s rating scale showed no statistically significant difference regarding residence (Tables 2 and 3). This result agreed with Eapen et al., (2011) who found that there was no significant difference between rural and urban areas (1.5% vs. 1.3%). Similarly, Huss et al., (2011) found that there was no significant difference in ADHD diagnosis between rural and urban children and adolescents aged 3–17 years in Germany. Also, Fleitlich- Bilyk and Goodman, (2014) did not find significant different in the prevalence rates of ADHD among groups of children ascertained from private, rural and urban schools in southeast of Brazil.

Nowadays no culture difference between urban and rural areas and the environmental factors which contributed to the appearance of symptoms are now present in rural areas. These might bring the prevalence of ADHD in urban and rural areas similar.

The present study showed a significant difference between positive students and socioeconomic status (tables 4 and 5) as the proportion of positive students in low socioeconomic was significantly higher compared
to negative students. This result is supported by Bishry et al., (1117) in their cross sectional study that was conducted on students aged 12-15 years old in Eastern Cairo, Egypt. They found that there was significant difference between ADHD diagnosis and low socioeconomic status (P< 0.05) (~7% in cases and 1.5% in controls). Soliman et al., (1111) found that there was a significant difference between cases of ADHD and control group as regard socioeconomic status in Minia city, Egypt. Similarly, Bener et al., (1111) found that there was significant difference between ADHD cases regarding socioeconomic status (P< 0.01) and considered poor socioeconomic condition as the main contributor for ADHD. Also, Huss et al., (1117) found that ADHD was more frequently reported for subjects with low socioeconomic status (~3% for low socioeconomic state, ~5% for middle socioeconomic state and ~7% for high socioeconomic state).

Studies in Colombia, Germany, Iran, Australia, and the United States indicated that individuals from low socioeconomic status environments were 1.5–4 times more likely to meet criteria for ADHD than individuals from families with high socioeconomic status (Pineda et al., 1999; Graetz et al., 1111; Costello et al., 1111; Froehlich et al., 1117; Dopfner et al., and Amiri et al., 1111). This result disagreed with El-Tallawy et al., (1117) who found that there was no significant difference as regard social status between cases of ADHD and controls. Their study was conducted on students aged ~12-15 years in Assuit city, Egypt. Similar results were reported in previous studies (Canino et al., 1114; Waschbusch et al., 1117 and Zwirs et al., 1117). Moreover Frey et al., (1119) reported that ADHD was detected in families with high social status in which the child was spoiled.
This study revealed that there were significant differences between positive students and negative students regarding birth order (Table 1) as the proportion of positive students among children who were late birth order was higher than negative students. This result agreed Al Hamed et al., (2011) who found that the prevalence of the disorder was higher if the child was the 3th one in the family compared with the first-born child (33.3% for combined, 31.3% for hyperactivity/impulsivity and 33.3% for inattention vs. 10.4%, 8.4% and 10.4% respectively).

The higher prevalence rate among the late birth order might be attributed to mothers might be old with decreased interesting in rearing their last child. The old age of some mothers led to some medical complications especially chromosomal aberrations of the last child with associated abnormal behaviors.

This result disagreed with Soliman et al., (2011) who found that there was significantly higher percent in the first birth order (P<0.05) (33.1%) in comparison to control group (4.7%). Similarly, El-Tallawy et al., (2012) found that there was significantly higher percent (P<0.01) in the first birth order (4.7%) in comparison to control (14.7%). Meanwhile, Farid et al., (2011) found no significant difference between cases and controls with respect to birth order (first 35.1% vs. last born 31.3%).

The higher prevalence rate among the first birth order might be attributed to deficiency in experiences of mothers in dealing with their first baby may lead to disorders in activity and attention. First birth child has a special position in some families that may act as one of the risk factors for ADHD (e.g. over protection and spoiling). First birth child may be liable to some troubles during pregnancy and labor such as, lack of prenatal care;
narrow pelvis may be in primigravida more than multigravida that may lead to difficult labor or complication of labor (El-Tallawy et al., 1975).

The current study revealed that there were significant differences between positive and negative students regarding whom the child living with (Table 17), as the proportion of positive students lived with single parent was significantly higher compared to negative students. This finding agreed with Farid et al., (2011) who found that there was significant difference between ADHD and children living with single parent (P<0.05) as cases of ADHD were more prevalent in non intact families (living apart from both parents) (18.9% for cases and 6% for controls). Correspondingly, Al Hamed et al., (2011) found that the prevalence of hyperactivity-impulsivity disorder was statistically significant higher (P<0.05) among children living with single parents than those living with both parents (16.9% vs. 14.7%). Along with this, Bu-Haroon et al., (2014) found that there was a significant difference between a higher score of ADHD and children being raised by a single parent in the United Arab Emirates.

The increased risk of ADHD among children who were living with a single parent compared to those who were living with both parents can be explained by children whose parents were divorced do not get proper attention and care from their parents and this leads to a higher incidence of ADH symptoms (Bener et al., 2015).

In this study there were significant differences between positive and negative students regarding the type of punishment as the proportion of positive students who were punished by hitting, bad words and insulting was significantly higher than negative students. There were significant differences between positive and negative students regarding type of relationship between parent and child as the percentage of positive
students who had irritable relationship with their parents was higher than negative students (Tables \( \text{v} \) and \( \text{v} \)).

This result agreed with Bishry et al., (\( \text{v} \cdot \text{v} \)), who found that there was statistically significant difference between ADHD cases and controls regarding exposure to parental aggression and abuse (P<\( \cdot \cdot \cdot \cdot \cdot \cdot \cdot \) \( \text{v} \cdot \text{v} \cdot \text{v} \% \) parental aggression and \( \text{v} \cdot \text{v} \cdot \text{v} \% \) parental abuse of the patient group compared with \( \text{v} \cdot \text{v} \% \) and \( \text{v} \cdot \text{v} \% \) for control group). They also found that there was statistically significant difference between cases and controls regarding exposure to cold family relations and criticism \( \text{v} \cdot \text{v} \cdot \text{v} \% \) of the patient group compared with only \( \text{v} \cdot \text{v} \% \) of the control group (P<\( \cdot \cdot \cdot \cdot \cdot \cdot \cdot \)).

In Southeastern Brazil a cohort study was performed by Pires et al., (\( \text{v} \cdot \text{v} \)) on schoolchildren. It revealed that children who suffered verbal abuse from their mother had prevalence \( \text{v} \cdot \text{v} \) times higher than those who were not exposed to this situation in the last year. Also, Carroll et al., (\( \text{v} \cdot \text{v} \)) found that ADHD subjects were more likely to have emotional abuse than controls (P<\( \cdot \cdot \cdot \cdot \cdot \cdot \cdot \) \( \text{v} \cdot \text{v} \cdot \text{v} \% \) in cases and \( \text{v} \cdot \text{v} \% \) in controls). Their case-control study was conducted in China.

In the current study there were significant differences between positive and negative students regarding type of relationship between parents (Tables \( \text{v} \) and \( \text{v} \)) as high percentage of positive students had irritable parent relationship compared to negative students. This finding agreed with Bener et al., (\( \text{v} \cdot \text{v} \)) who found that there was significant difference (P<\( \cdot \cdot \cdot \cdot \cdot \cdot \cdot \)) between ADHD cases (\( \text{v} \cdot \text{v} \% \) regarding poor relationship between parents and considered poor relationship between parents as the main contributors for ADHD. Similarly, Carroll et al., (\( \text{v} \cdot \text{v} \)) found that there was significant difference between ADHD cases regarding the
presence of family conflicts between adult family members/relatives (P = 0.011) (33.4% for cases and 33.6% for controls).

The higher prevalence of ADHD between those who had parents with irritable relationship may be explained as those parents did not provide sufficient support for optimal development of their child (*Bener et al.*, 2011).

In the current study there was significant difference between positive and negative students regarding consanguinity (*Tables* 7 and 17) as more than half of positive ADHD students had consanguineous parents compared to negative students. This result agreed with *Bishry et al.*, (2011) who found that consanguineous parents were more significantly prevalent (P=0.01) among ADHD patients (33.4%) than among controls (33.6%) in Eastern Cairo, Egypt. Similarly, *Khoushabik et al.*, (2011) found that consanguinity of parents showed significant difference (P<0.01) between cases of ADHD and controls and considered consanguinity marriage as a risk factor of ADHD. Their case control study was conducted in Tehran.

This finding disagreed with *El-Tallawy et al.*, (2011) who found that there were no significant differences between cases of ADHD and control group regarding consanguinity in Assiut city, Egypt. Moreover, *Bener et al.*, (2011) found that consanguinity rate in Qatar was suspected to be related to the high prevalence rate of ADHD in children (11.1%), but logistic regression analysis did not yield a significant association between consanguinity and ADHD in children.

It was suggested that pregnancy problems including hypertension during pregnancy were potential risk factors of ADHD (*Biederman and*
Faraone, \( \cdot \cdot \cdot \)). In this study there were significant differences between positive students having ADHD and those without regarding history their mothers were suffering from toxemia of pregnancy (\textit{Tables} \(^{\wedge}\) \textit{and} \(^{\wedge}\)) as the proportion of positive students whose mothers had hypertension during pregnancy was higher compared to negative students. This finding agreed with Sasaluxnanon and Kaewpornsawan, \( \cdot \cdot \cdot \cdot \) who found, in a hospital-based study of ADHD cases and controls among Thai children, that there was a statistically significant difference between pregnancy complications and ADHD (P<\(\cdot\cdot\cdot\cdot\)).

This result disagreed with Farid et al., \(\cdot\cdot\cdot\cdot\) who found that there was no significant difference between cases and controls with respect to antenatal hazards (\(\%\) for cases and \(\%\) for controls).

It was suggested that maternal smoking during pregnancy was considered one of the most common risk factors for ADHD (Thapar et al., \(\cdot\cdot\cdot\cdot\)). In this study there were significant differences between positive students and negative students regarding mother exposure to cigarette smoking during pregnancy (\textit{Tables} \(^{\wedge}\) \textit{and} \(^{\wedge}\)). As more than half of positive students had mother exposed to cigarette smoking during pregnancy compared to negative students (\(\%\)).

This result disagreed with Farid et al., \(\cdot\cdot\cdot\cdot\) who found that there was no significant difference between cases (\(\%\)) and controls (\(\%\)) regarding maternal exposure to cigarette smoking during pregnancy.

It was suggested that drug intake during pregnancy predisposes to ADHD (Liew et al., \(\cdot\cdot\cdot\cdot\)). In this study no one reported drug intake during pregnancy (\textit{Tables} \(^{\wedge}\) \textit{and} \(^{\wedge}\)). In New Zealand a cohort study was performed by Thompson et al., \(\cdot\cdot\cdot\cdot\) on school aged children. They
found that children of mothers who used acetaminophen during pregnancy were at increased risk of ADHD. Meanwhile, Valdimarsdottir et al., (1116) found that there was no significant association between having ADHD and the use of medication during pregnancy.

In this study there were no significant differences between positive ADHD and negative students regarding prematurity (Tables 5 and 19). This result agreed with Soliman et al., (1111) who found no statistical significant difference between ADHD cases and control group regarding gestational age (≠ for cases and ≠ for controls). Also, Al Hamed et al., (1111) found no significant difference between the duration of pregnancy and all three subtypes of ADHD.

In the current study there were significant differences between positive students and negative students regarding mode of delivery (Table 19) as the proportion of positive students who were born by caesarean section was higher compared to negative students. This finding is supported by Valdimarsdottir et al., (1116) in their retrospective study of children referred for suspected ADHD to a university hospital in Iceland. They found that there was statistically significant difference between ADHD regarding history of caesarean section (P=1.113).

This result disagreed with Al Hamed et al., (1111) who found that there was no statistically significant difference between all three subtypes of ADHD regarding type of delivery.

In this study there were no significant differences between positive students of ADHD and negative students regarding child weight at birth (Tables 5 and 19). This result agreed with Farid et al., (1111) who found that there was no significant difference between cases (≠ and ≠) and
controls (1\%\%) with respect to birth weight. Similarly, Valdimarsdottir et al., (1116) found that there was no statistically significant difference between ADHD and birth weight.

In the current study there were significant differences between positive students and negative students regarding mother age at time of delivery (Table 19). The result of this study disagreed with Farid et al., (1111) who found that there was no significant difference between cases and controls with respect to parents' age at child's birth (maternal or paternal).

The present study revealed that there were significant differences between positive students and negative students regarding type of feeding (Table 10) as the proportion of positive students who were artificially fed was higher compared to negative students. This result agreed with Soliman et al., (1111) who found that there was statistically significant difference between cases of ADHD (1\%\%) and control group (3\%) regarding bottle feeding (P<.05). Accordingly, El-Tallawy et al., (1115) found a significant difference among children with ADHD (1\%\%) than the control group regarding artificial feeding (P<.05). Al Hamed et al., (1111) found that a significantly higher proportion of school boys with inattention was among those who had bottle feeding than breastfeeding (11\%\% vs. 14\%\%, P=.03).

The association between artificial feeding and ADHD could be attributed to the deprivation from warmth feeling and contact with mother during breast feeding (El-Tallawy et al., 1115).

In this study there were significant differences between positive students and negative students regarding watching TV (Table 10) as more than
half of positive students watch too much TV compared to negative students.

This result agreed with Chan and Rabinowitz, (1116) who found that there was a significant difference between the intense symptoms of ADHD or inattention and those who play more than one hour of Internet video games (P<0.0001). Their cross-sectional study was conducted on adolescents and their parents in Vermont using a modified Young's Internet Addiction Scale (YIAS) filled by students and Conners' Parent Rating Scale (CPRS) filled by parents. Similarly, Yoo et al., (1114) who found that there was a significant difference between the level of ADHD symptoms and the severity of Internet addiction in children. Their study was conducted on elementary school students using the Young's Internet Addiction test and DuPaul's attention deficit hyperactivity disorder (ADHD) rating scale filled by parents and teachers.

In contrast, Bioulac et al., (1111) reported that there was no significant difference for the frequency or duration of video game play was found between ADHD children and controls. Their case control study was conducted on ADHD children and controls aged 3-11 years in France.

There were significant differences between positive students of ADHD and negative students regarding presence of head trauma (Table 11) as the proportion of positive students who were exposed to head trauma was higher compared to negative students. This finding agreed with Bishry et al., (1113) who found that logistic regression analysis yield a significant association between head trauma and ADHD in children and considered head trauma one of the risk factors associated with ADHD. Also, El-Tallawy et al., (1112) found that there was a significant difference
regarding head trauma ($P<0.015$) among children with ADHD than the control group.

The association between ADHD and trauma can be due to head trauma may lead to minor damage in the central nervous system which may be either anatomically, biochemical or even in distribution of blood circulation in the brain which leads to appearance of ADHD among those children (El-Tallawy et al., 2015).

\subsection*{\textbf{Study limitations}}

- Reluctance and lack of cooperation of parents in filling the questionnaires, in spite of sending explanatory letters with students.
- The present study doesn’t include private schools.
- Although the tool used in this study was a good measure for mass screening it resulted in a higher prevalence rate that need further confirmation by other measures.
V. Conclusion

From the present study, it can be concluded that ADHD presents a public health problem among primary school children in Al Qalyubia Governorate. Its prevalence was 33.12% based on teacher’s rating scale and 33.32% based on parent’s rating scale. ADHD was associated with many risk factors as low socioeconomic status, late birth order, living with single parent, punishing children by hitting, irritable parent’s relationship, irritable parent-child relationship, consanguinity, toxemia of pregnancy, mother exposure to passive smoking during pregnancy, children born with caesarean section, cyanosis, artificial feeding, watching too much TV and head trauma.
\textbf{^*Recommendations*}

This study revealed that prevalence of ADHD was $33.12\%$ based on teacher rating scale and $33.32\%$ based on parent rating scale. It was found that ADHD is associated with a number of modifiable risk factors like mother exposure to cigarette smoking during pregnancy, type of feeding, watching TV and head trauma. One of the objectives of this study was to outline a comprehensive program for the prevention and control of ADHD among the primary school children.

\textbf{Objectives:}

\checkmark-Decrease the prevalence of ADHD and its burden

\checkmark-Control the modifiable risk factors

\checkmark-Follow up the program

\textbf{Priorities:}

\checkmark- Designing a health education program for primary prevention of ADHD.

\checkmark- Integration of mental health service including ADHD prevention and control within primary health care (family medicine) services and within school health service with suitable guidelines for screening, early detection and management.

On the light of this study, analysis of the prevailing situation among primary school children in Al Qalyubia governorate using SWOT (Strength, Weakness, Opportunities and Threats) analysis technique revealed a number of strength points and certain points of weakness and threats that we should work to overcome them.
Strength points and opportunities:

1. School teachers are well educated so they can be trained for early pick-up of suspected cases for referral and diagnosis.

2. Availability of social worker and school health visitor in school who can contacts parents of suspected cases and make referral of suspected cases.

3. The majority of students live with both parents and has good parent's relationship, this provide the emotional support needed for children.

4. Legislation for use of seatbelts to prevent accidents as head trauma is considered one of the risk factors of ADHD.

5. Availability of MMR vaccines.

6. Presence of school health service.

7. Parents council meetings are good opportunity for health education of parents about risk factors and prevention.

Weakness and threats:

1. Some parents don't seek medical care for fear of stigmatization of mental disorder.

2. High percentage of parents were illiterate or of lower level of education.

3. Certain risk factors cannot be prevented like genetic factors.

4. Overcrowdness in classroom.

5. Increase aggression in homes as most of students is punished by hitting and insulting.
The resources of the program will be:

\(-\) Human resources:

**Technical skillful group:** Well-trained physicians and psychiatrists should conduct lectures, workshops and seminars to provide information about ADHD problems as well as guidelines for screening, early detection and management of ADHD.

\(-\) Non-Human resources:

**Pamphlets, posters, etc:** are necessary to provide information about ADHD.

**Budget:** A special budget has to be planned to cover the needed expenses, it could be obtained from the ministry of education, ministry of health and Al Qualyobia governorate.

**Time:** Ongoing activity because the program will be integrated with other health services.

\-\-\- Health education program for ADHD prevention:

\-\-\- Objectives:

a- Increasing knowledge of ADHD, its risk factors, clinical picture and burden
b- Change faulty behavior like smoking of mothers and fathers, spending of children many hours in watching TV and video games which can predispose to ADHD.
c- Motivate people to follow sound behavior like establishing positive parent/teacher-child relationship.


\subsection{1.1.1. \textbf{Target group}}: child, family, the general practitioners and the teachers.

\subsection{1.1.2. \textbf{Educator (sender)}}: 
- Clinicians and psychiatrists
- School health visitor, nurses and social workers
- Community leaders

\subsection{1.1.3. \textbf{Message}}: this include messages to parent, teacher, school personals and general practitioners

\subsection{1.1.4. Messages for parents and child}

\textbf{a- Messages for mother care during pregnancy:}

- Optimal medical attention and nutrition during pregnancy
- Avoid alcohol, cigarette use and drug use during pregnancy and lactation
- Mothers should reduce exposure to environmental toxins, such as lead and mercury
- It is recommended to avoid stress

\textbf{b- Messages during labour and early life:}

- Optimal obstetric care and avoidance of brain damage from anoxia and premature birth
- Early recognition and treatment of postpartum depression
- Optimal nutrition for the infant, child and lactating mother
- Prompt pediatric management to neonatal jaundice, hypoglycemia, febrile illness, convulsions and thyroid dysfunction

\textbf{c- Messages for child care:}

- Inoculations for viral diseases
- Prevention of head injuries, accidental drug ingestion and other poisonings
- Use of seatbelts in cars
- Promoting exercise
Parents should test and treat for lead exposure and poisoning in early childhood.

Avoid active and passive TV and video exposure during the first 3 years and limiting it afterward.

Parents should provide well-structured and healthy emotional home environment

To increase attention of the child, build with blocks, do puzzles together and reading

Providing children with healthy diets.

Spend enough time with your child each day

Use positive reinforcement when your child behaves well

Explain bad behavior to your child clearly and provide negative consequences for bad behavior

Parent should be trained to use behavior therapy techniques with their child (Token economy systems and Response-cost programs)

- Token economy systems: these involved giving students tokens (e.g., poker chips) when they display appropriate behavior

- Response-cost programs: it involved giving a specific number of points at the start of each day. When a rule was broken (i.e., a problem behavior is displayed) points were taken away. Thus, to maintain their points and receive reinforcement, child had to avoid displaying inappropriate behaviors.

1.4. Messages for teachers

-School teachers should be trained on child behavior management, including anger management and rewarding appropriate behavior such as being friendly and polite behaving with classmates.

-Teacher training to use behavior therapy techniques with students (Token economy systems, Response-cost programs and Time out)
Time out: it involved removing the student from classroom activities. For example, if a student is displaying aggressive or disruptive behaviors to receive attention from peers, removing the student from his or her peers (i.e., time-out) would be effective.

1.1.4.3. Messages to all school personnel, head teacher up to ministry of education

a- Optimal teacher-pupil ratio in classrooms is required to lessen distractibility and facilitates learning.

b- Task duration: can be used to accommodate to a student’s short attention span, academic assignments should be brief and immediate feedback regarding accuracy provided. For example, long projects can be broken up into smaller parts.

c- Novelty: increasing the novelty and interest level of tasks through enhanced stimulation (e.g., color, shape, and texture). Teachers can use novelty in the classroom by bolding important elements of written directions, using brightly colored paper, animation, or even different intonations when giving instructions or teaching a lesson.

d- Choice: allowing students a choice of activities can help to reduce disruptive behaviors, increase on-task behavior and task completion.

e- Avoid distractions: by placing the student in close proximity to the teacher and away from high traffic areas can reduce distractions and increase attention (e.g., seating the student away from activity centers, mobiles, doorways and windows). Eliminating irrelevant and highly desirable distractions such as toys or cartoons from the work area is also an effective modification.
1.1.4. Messages for general practitioners:
Collaboration between psychiatrists and general practitioners is needed aiming at developing comprehensive management including early prevention, or intervention, diagnosis and treatment.

1.1.5. Methods of health education:
1. Face to face communication (lectures, group discussion and counseling). To be conducted at primary health care, schools and at time of parents council meetings.
2. Posters, brochures, pamphlets and booklets are necessary to provide information about the disorder and its risk factors (the manual printed material).
3. Sequential congresses and workshops should be held to inform general physicians and specialists of new about ADHD management.

1.1. Integration of mental health within primary health care (family medicine) services and within school health service.

Integration is used to refer to a package of preventive and curative health interventions for a particular population group.

Objectives:
1. Safe time and resources
2. Early detection and management of cases

This integration is valuable as the majority of people seek primary health care service and when it is integrated within school health service as one of routine screening tests, it allow early detection and management of cases as the students are subjected to comprehensive medical examination at school entry, $1^{st}$ primary school, $1^{st}$ preparatory and $1^{st}$
secondary schools. Also some parents don't seek medical care for fear of stigmatization of mental disorder but when mental health is integrated in school health service it will allow early pick up cases, follow up the cases and the progress of the treatment.

It can be achieved by

1. Integration of mental health within the curriculum of medical students

2. Training of general practitioners and school health doctors and raising their clinical attention and surveillance for early and rapid referral for psychiatric assessment and treatment. It can be achieved by workshops, conference and continuous medical education.

3. Availability of medical treatment in primary health service and school health service.

Evaluation and maintenance of the program

The program should be evaluated to determine if it had achieved its objectives and to identify any obstacles to overcome it.

Who evaluates?

1. Physician in school and primary health services
2. Teachers, social workers and school health visitors
3. Parents

How to evaluate?

1. Calculating indicators as prevalence of ADHD
2. Conducting survey


9. Summary

ADHD is the most common psychiatric disorders of childhood which presents with inattention, hyperactivity, impulsivity that leads to academic underachievement or behavior problems.

There are three different types of ADHD depending on which types of symptoms are strongest in the individual. These are inattention, hyperactivity–impulsivity and combined inattentive/hyperactive impulsive subtype (combined ADHD).

No single factor has been identified as the cause of ADHD. ADHD is thought to be the result of complex interactions between genetic, environmental and neurobiological factors.

This study aimed at assessing the prevalence rate of ADHD among a sample of the primary school children in Al Qalyubia Governorate, to investigate the relationship between ADHD and potential risk factors and to outline a comprehensive program for the prevention and control of ADHD among the primary school children.

Subjects & Methods:

It is a cross sectional comparative study that was conducted on primary school children in Al Qalyubia Governorate. The field work was carried out during the 3rd term of the academic year 2013/2014.

The subjects of the study were recruited using the multi-stage sampling technique which involved dividing Al Qalyubia Governorate into clusters of ten districts. Two districts were chosen by simple random sample (Shibin Al-Qanater and Tukh). From each district two primary schools were included in the study; one rural and one urban by simple random sample. Each school was divided into strata reference to different
grades then one class from each grade was chosen by simple random sample.

933 male and female students were recruited to be assessed by our tools. For each student, a teacher questionnaire was filled in by the corresponding class teacher and a parent questionnaire (parent rating scale, socioeconomic score and risk factors questionnaires) was sent in student’s bag to be filled in by parents. However, only 333 students returned the parent questionnaires.

Results:

This study revealed that the prevalence of ADHD in a sample of primary school children aged (3-13 years) in Al Qalyubia Governorate was 33.12\% based on teacher rating scale and 33.32\% based on parent rating scale.

The result of this study revealed that 53.32\% of ADHD children presented with combined type of ADHD, 35.92\% presented with hyperactive-impulsive type and 33.32\% presented with inattention type.

In this study there was no significant difference between males and females regarding prevalence of ADHD. While there was significant relationship between ADHD subtypes and gender as the hyperactive type was more prevalent in males while the inattention type was more prevalent in females.

This study showed that there were significant differences between positive students of ADHD and negative students regarding age as the proportion of positive students aged ≥5 years was significantly higher compared to negative students.

The prevalence of ADHD was found to be higher among children from low socioeconomic level, late birth order, exposed to hitting and had
consanguinous parents. The proportion of children with ADHD was higher in those living with single parent, had irritable parent’s relationship, irritable parent-child relationship, whose mothers had hypertension of pregnancy and exposed to passive smoking during pregnancy, were born by caesarean section and had cyanosis compared to ADHD negative children. In addition, children who were fed artificially, watching too much TV and exposed to head trauma were more likely to be ADHD positive.

**Conclusion:**

ADHD presents a troublesome public health problem among primary school children in Al Qalyubia Governorate. The link between ADHD and a number of risk factors including passive smoking, type of feeding, watching TV and head trauma indicate collaborative efforts to control these risk factors and to decrease the prevalence of ADHD.

**Recommendations:**

This study revealed that ADHD is a real a problem of public concern that calls for a program to overcome it. This program based on two pillars

1. Designing a health education program for primary prevention of ADHD
2. ADHD prevention and control should be properly integrated within primary health care services with suitable guidelines for screening, early detection and management

\健康教育程序用于ADHD预防

Health education is an important element in ADHD management strategies. It should focus on:

a. Increasing knowledge of ADHD and its risk factors, clinical picture and burden
b- Change faulty behavior like smoking, spending many hours in watching TV and video games which can predispose to ADHD.
c- Motivate people to follow sound behavior like establishing positive parent/teacher-child relationship.

Target group: child, family, general practitioners and the teachers.

Educator (sender):
- Clinicians and psychiatrists
- School health visitor, nurses and social workers
- Community leaders

Message: this include messages to parent, teacher, school personals and general practitioners

Integration of mental health within primary health care (family medicine) services and within school health service.

Integration is used to refer to a package of preventive and curative health interventions for a particular population group.

This integration is valuable as the majority of people seek primary health care service and when it is integrated within school health service as one of routine screening tests, it allow early detection and management of cases as the students are subjected to comprehensive medical examination at school entry, €th primary school, $st preparatory and $st secondary schools. Also some parents don't seek medical care for fear of stigmatization of mental disorder but when mental health is integrated in school health service it will allow early pick up cases, follow up the cases and the progress of the treatment.
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Introduction

Attention-Deficit/Hyperactivity Disorder (ADHD) is the most common neurobehavioral disorder of childhood which is characterized by persistent hyperactivity, impulsivity and inattention (Cunningham and Jensen, 2011).

ADHD prevalence rates range from 5.92% to 3.32% in children and adolescents (Willcutt, 2011). The prevalence rate of ADHD among school-age children varies considerably across different studies and populations (Taylor et al., 2014). A meta-analysis, conducted on ADHD reported a worldwide prevalence rate of 5.32% (Polanczyk et al., 2017). In 2015, the National Survey of Children’s Health (NSCH) reported that the prevalence rate of a parent-reported diagnosis of ADHD among children aged 3 to 17 years in the United States was estimated to be 9.52% (Centers for Disease Control and Prevention (CDC) - United States, 2017).

In Egypt, it was found that the prevalence of ADHD among children of 3–33 years old from the Delta region applying the Diagnostic and Statistical Manual of Mental Disorders 4th edition (DSM-IV) and Conner’s Rating Scales (CRS) was 31.32% (El Haggar et al., 2016). However, a study of 8 primary school children in Cairo estimated the prevalence rate of ADHD as 3.92% using the Dupaul scale (based on DSM-IV) (Farid et al., 2011).

No single etiology has been identified for ADHD and findings are consistent with a multi-factorial hypothesis, the condition is thought to be caused by a complex combination of environmental, genetic and biological factors (Barkley, 2011). A number of risk factors related to prenatal and perinatal circumstances, genetics and neurobiological deficits may contribute to the patho-physiology of ADHD (Barkley, 2011).
Children with ADHD are more likely to display several behavior disorders including Conduct Disorder (CD), Oppositional Defiant Disorder (ODD), major affective disorders and anxiety disorders and to develop other neuropsychological disorders including learning disabilities (Costello et al., 1113). About 31% to 31% of children with ADHD have a specific learning disability such as reading or spelling disabilities, writing disorders and arithmetic disorders (Me Gough et al., 1115).

Diagnosis of ADHD must be observable in at least two settings such as home, school or community (James and Alcott, 1117). The teacher is most often the first person to make a referral for assessment for ADHD because they play an important role in the assessment process, providing information on academic history and performance, social relations and general everyday functioning, thus playing a very important part in the screening for ADHD (Sciutto et al., 1115 and Zentall, 1116).

A multimodal treatment concept is recommended for ADHD in which the administration of psycho stimulants is combined with educational and behavioral therapeutic measures. (Brock et al., 1119).

The rational of the current study is to determine the magnitude of the problem of ADHD among the primary school students in Al Qalyubia Governorate and to develop a comprehensive program to alleviate the size and impacts of this problem.
Aim of the Work

Goals:-

The goals of this study are to demonstrate the size of the problem of ADHD in primary school children and to help in the prevention of ADHD amongst the primary school children.

The specific objectives of the study are:-

1. To determine the prevalence rate of ADHD among a sample of the primary school children in Al Qalyubia Governorate.
2. To study the distribution of the different clinical types of ADHD in the primary school children.
3. To develop a comprehensive program for the prevention and control of ADHD amongst the primary school children.
Subjects and Methods

I-Technical design:

This is a cross sectional study that will be conducted on primary school children in Al Qalyubia Governorate. The field work will be carried out during the academic year 2013/2014.

Inclusion criteria

- Both genders.
- Age between 3-17 yrs.

Exclusion criteria

- Neurological handicapping.

Sampling:

The subjects of the study will be recruited using the multi-stage sampling technique which involves dividing Al Qalyubia Governorate into clusters of ten districts (Banha - Khanka - Qaha - Qalyub - Shabin Al-Qanater - Shubra El-Kheima - Tukh - Al Kanater Al Khairia - KafrShukr – Al-Khosoas). Of these, two districts will be chosen by simple random sample. From each district two primary schools will be included in the study; one rural and one urban by simple random sample. Each school will be divided into strata reference to different grades then one class from each grade will be chosen by simple random sample.

II -Operational design:

Ethical consideration:

- An approval from the Research Ethics Committee in Benha faculty of medicine will be obtained
- An approval from all the participants in the study will be obtained after the aim of the study is explained.
• All data included in the study will be confidential and the information will be only used for the research purpose.

**Tools of Data collection:**

1. Personal interview will be conducted between the research investigator and the teacher of each class to explain the items of the questionnaire.

2. Short history will be collected from the student including (name – age - gender - educational stage - residence)

3. Data on ADHD will be collected using the rating scale of Dr. Mohamed El-Noby ADHD based on DSM-IV. This scale comprised 33 items. Of these 33 items are for the inattention symptoms and 33 items for the hyperactivity/impulsivity symptoms. Responses to questions on symptoms were coded as 1, 2 and 3 corresponding to doing this behavior seldom, occasionally or always (El-Noby, 1115).

4. A number of the risk factors that were suggested to be related to ADHD in the published literature including socio-demographic characteristics of the child, family history of ADHD, living with both parents or single-parent; parents' education and occupation; parents' age at child's birth; mother's exposure to smoking during pregnancy. Pregnancy, labour and postnatal complications will be asked. Also inquiry about daily time spent on watching television, internet or video games and the child's medical history will be investigated by a parent questionnaire that will be sent in students’ bags to be filled by parents. (Farid et al., 1111).

III - Administrative design:
An approval from the Educational Administration of Al Qalyubia Governorate will be obtained.

IV-Statistical design:

The collected data will be summarized and presented using suitable tables and graphs. Qualitative data will be demonstrated in terms of proportions and quantitative data will be summarized as mean ± Standard Deviation (SD) if normally distributed and as median and range if skewed. The data will be analysed using suitable statistical methods.
References


الملخص العربي

المقدمة:

يعد اضطراب نقص الانتباه و فرط الحركة اضطراب السلوك العصبي الأكثر شيوعا في مرحلة الطفولة و يتميز هذا المرض بأعراض تدور في محورين: الأول هو نقص الانتباه، والثاني هو الحركة المفرطة والاندفاعية.

تختلف معدلات انتشار اضطراب نقص الانتباه و فرط الحركة بين الدراسات والشعوب المختلفة.

و قد بلغ معدل انتشاره بين الأطفال في سن المدرسة 5.3% في جميع أنحاء العالم في عام 2007. في حين ذكرت هيئة المسح الوطني لصحة الأطفال في الولايات المتحدة أن معدل انتشاره بين الأطفال الذين تتراوح أعمارهم بين 4-17 سنة إلى أن 9.5% في نفس العام. أما في مصر، فقد وجد أن معدل انتشاره بين الأطفال من الفئة العمرية 7-12 سنة من منطقة الدلتا هو 4.07%. و في دراسة أخرى أجريت على 31197 من أطفال المدارس الابتدائية في القاهرة بلغ معدل انتشاره 7.77%.

لا يوجد سبب بعيد يفسر أن تعزى إليه الإصابة باضطراب فرط الحركة وتقيده الانتباه. ولكن، هناك عدد من العوامل التي قد تساهم في حدوثه أو تفاقمه، وهي تشمل العوامل العاطفية والبيئية و البيولوجية.

وتمكنت مهنية دراسة هذا المرض في أنه يعد أحد أهم أسباب اضطرابات التحصيل الدراسي للأطفال في سن المدرسة. و يتميز اضطراب نقص الانتباه و فرط الحركة بوجود احتمالية عالية لحدوث أمراض مصاحبة منها اضطراب السلوك، أو مرض العناية المناهض، أو أمراض صعوبات التعلم، هذا بالإضافة إلى الأمراض النفسية مثل الاكتئاب.

يجب ملاحظة أعراض اضطراب نقص الانتباه و فرط الحركة في أكثر من مكان مثل المنزل أو المدرسة. و في معظم الأحيان يكون المعلم هو أول شخص يمكنه ملاحظة الأعراض. لذلك يلعب المعلم دورا هاما في عملية التقييم، وتوفر المعلومات عن التاريخ الأكاديمي والأداء، والعلاقات الاجتماعية وسير الحياة اليومية عامة، وبالتالي يلعب دورا هاما جدا في الكشف عن هذا الاضطراب.

تتضمن طرق العلاج مزيجا من المناشط النفسية مع التدبير العلاجية التربوية والسلوكية.
و تهدف الدراسة إلى إظهار حجم مشكلة اضطراب نقص الانتباه و فرط الحركة بين أطفال المدارس الابتدائية بمحافظة القيروانية. كما تشمل الدراسة وضع برنامج شامل للوقاية والسيطرة على اضطراب نقص الانتباه و فرط الحركة بين أطفال المدارس الابتدائية.

طريقة البحث:

1- دراسة مقطعية وصفية بين طلاب المدارس الابتدائية في محافظة القيروانية. و يتم إجراء الجزء الميداني منها خلال العام الدراسي 2013-2014.

عينة البحث:


أدوات الدراسة:

1. المقابلة الشخصية بين الباحث و المعلم المختص بكل فصل لشرح ببنود الاستبيان.

2. استمارة لكل طالب تشمل المعلومات الشخصية (الاسم - العمر - النوع - المرحلة التعليمية - محل الإقامة).

3. مقياس تقييم اضطراب نقص الانتباه و فرط الحركة للمؤلف الدكتور مجد نوبي. يتألف هذا المقياس من 42 بندًا. 13 من هذه البنود هي لأعراض نقص الانتباه و 29 بندا لأعراض الحركة المفرطة والإندفاعية.

4. استبيان يرسل في حقائب الطلاب ل😊 بإستعمال ألياف الأورام و يشمل على عوامل الخطر التي يمكن أن تكون متعلصة باضطراب نقص الانتباه و فرط الحركة و تشتمل سن الأم عند الولادة، تعرض الأم للしっかりと أثناء الحمل، تعرض لمشاكل أثناء الحمل و الولادة، نشأة الطفل مع كلا الوالدين أو أحدهم فقط، المستوى التعليمي للوالدين و وظائفهما، تناول
الأطعمة التي تحتوي على مواد حافظة و الوقت الذي يقضيه الطفل في مشاهدة التلفزيون، والإنترنت أو ألعاب الفيديو.

تحليل البيانات:

سوف يتم تحليل البيانات باستخدام الأساليب الإحصائية المناسبة.
اختبار اضطراب الانتباه المصحوب بالنشاط الزائد
(الصورة المدرسية)

إعداد
دكتور

محمد النوبى
محمد علي
قسم الصحة النفسية
كلية التربية جامعة الأزهر
فرع القاهرة

عزيزي المدرس:

يحتوى هذا الاختبار على مجموعة من العبارات التي يتضح من خلالها سلوك الطفل في البيئة المدرسية، والرجاء من سيداتكم التكرم بقراءة العبارات بعناية محددين مدى انتباق كل واحد منها على الطفل وذلك من خلال وضع علامة (√) أمام الاستجابة التي تنطبق على ذلك الطفل من الاستجابات الثلاثة (أ أو ب أو ج) الموجودة أسلف كل عبارة بحيث تكون تلك الاستجابات ملائمة لسلوك الطفل.

مع تقبل شكرى و امتناني

الباحث

بيانات الطفل

اسم المستجيب/الاسم:
علاقاته بالطفل/المدرسة:
الفصل/النوع: ذكر (أثى ( )
تاريخ التقييم/
السن/اليوم: شهر سنة
1- يخطئ في الواجبات المدرسية التي يكلفه بها المعلم حتى و لو كانت بسيطة.
   أ- يقوم بهذا السلوك بصورة منتظمة
   ب- يقوم بهذا السلوك بصورة ممتعة
   ج- نادراً ما يقوم بهذا السلوك

2- يشرد بذته (يصرح) أثناء شرح المعلم للدرس.
   أ- يقوم بهذا السلوك بصورة منتظمة
   ب- يقوم بهذا السلوك بصورة ممتعة
   ج- نادراً ما يقوم بهذا السلوك

3- يحمل في المعلم عندما يسأله سؤال بصورة تنم عن عدم الفهم لما يقوله المعلم.
   أ- يقوم بهذا السلوك بصورة منتظمة
   ب- يقوم بهذا السلوك بصورة ممتعة
   ج- نادراً ما يقوم بهذا السلوك

4- ينتقل من لعبة أو نشاط معين (رياضى أو دراسي) لآخر دون استكماله أو إنهائه مع زملائه.
   أ- يقوم بهذا السلوك بصورة منتظمة
   ب- يقوم بهذا السلوك بصورة ممتعة
   ج- نادراً ما يقوم بهذا السلوك

5- ينتقل من الصفحة التي بها الدرس الذي يشرحه المعلم إلى صفحات أخرى دون التركيز فيما يشرحه المعلم.
   أ- يقوم بهذا السلوك بصورة منتظمة
   ب- يقوم بهذا السلوك بصورة ممتعة
   ج- نادراً ما يقوم بهذا السلوك

6- يأخذ وقتاً طويلاً عندما يطلب المعلم منه كتابة الشرح الموجود على السبورة و ينقله بصورة أخطاء.
   أ- يقوم بهذا السلوك بصورة منتظمة
   ب- يقوم بهذا السلوك بصورة ممتعة
   ج- نادراً ما يقوم بهذا السلوك
7- يفقد أدواته (أقلامه أو كراساته أو كتبه) بالمدرسة في الفصل أو في فناء المدرسة:

لا يستطيع تذكر مكانها.

أ- يقوم بهذا السلوك بصورة منتظمة
( )

ب- يقوم بهذا السلوك بصورة متجددة
( )

ج- نادراً ما يقوم بهذا السلوك
( )

8- ينسى إحضار أدواته المدرسية (كتبه أو أقلامه أو كراساته) إلى المدرسة.

أ- يقوم بهذا السلوك بصورة منتظمة
( )

ب- يقوم بهذا السلوك بصورة متجددة
( )

ج- نادراً ما يقوم بهذا السلوك
( )

9- يجد المعلم صعوبة في فهم ما يريد الطفل قوله لانتقاله من موضوع آخر غير مرتبط ببعضه.

أ- يقوم بهذا السلوك بصورة منتظمة
( )

ب- يقوم بهذا السلوك بصورة متجددة
( )

ج- نادراً ما يقوم بهذا السلوك
( )

10- لا يتباع التعليمات المعلم في ضرورة النظر للشرح والتركيز فيه.

أ- يقوم بهذا السلوك بصورة منتظمة
( )

ب- يقوم بهذا السلوك بصورة متجددة
( )

ج- نادراً ما يقوم بهذا السلوك
( )

11- يجد صعوبة في فهم شرح المعلم حتى في حالة التكرار وإعادة الدروس.

أ- يقوم بهذا السلوك بصورة منتظمة
( )

ب- يقوم بهذا السلوك بصورة متجددة
( )

ج- نادراً ما يقوم بهذا السلوك
( )

12- يمكت فتره طويلة عندما يطلب منه المعلم إحضار شيء من خارج الفصل.

أ- يقوم بهذا السلوك بصورة منتظمة
( )

ب- يقوم بهذا السلوك بصورة متجددة
( )

ج- نادراً ما يقوم بهذا السلوك
( )

13- يبتلع يميناً ويساراً بدون سبب أثناء شرح المعلم للدرس.

أ- يقوم بهذا السلوك بصورة منتظمة
( )

ب- يقوم بهذا السلوك بصورة متجددة
( )

ج- نادراً ما يقوم بهذا السلوك
( )
14 - يبدو عند انتقاله من تخته إلى تختة أخرى في الفصل و كأنه يفز
أ - يقوم بهذا السلوك بصورة منتظمة
ب - يقوم بهذا السلوك بصورة مقطعة
ج - نادراً ما يقوم بهذا السلوك

15 - يتحرك داخل الفصل والمدرسة بهدوء و بدون نشاط (هدف).
أ - يقوم بهذا السلوك بصورة منتظمة
ب - يقوم بهذا السلوك بصورة مقطعة
ج - نادراً ما يقوم بهذا السلوك

16 - لا يستقر ولا يجلس في مكانه في الفصل بثبات لمدة طويلة.
أ - يقوم بهذا السلوك بصورة منتظمة
ب - يقوم بهذا السلوك بصورة مقطعة
ج - نادراً ما يقوم بهذا السلوك

17 - يتعثر أدواته المدرسية (كتاب أو أقلامه أو كرساته) على تخته في الفصل.
أ - يقوم بهذا السلوك بصورة منتظمة
ب - يقوم بهذا السلوك بصورة مقطعة
ج - نادراً ما يقوم بهذا السلوك

18 - يحرك تخت الفصل من أماكنها و يجعل المكان فوضي.
أ - يقوم بهذا السلوك بصورة منتظمة
ب - يقوم بهذا السلوك بصورة مقطعة
ج - نادراً ما يقوم بهذا السلوك

19 - يجب الطفل على استماع المعلم بإجابات خاطئة قبل استكمالها.
أ - يقوم بهذا السلوك بصورة منتظمة
ب - يقوم بهذا السلوك بصورة مقطعة
ج - نادراً ما يقوم بهذا السلوك

20 - يتعجل ولا ينتظر دوره أثناء لعبه مع زملائه في فناء المدرسة (الحوض).
أ - يقوم بهذا السلوك بصورة منتظمة
ب - يقوم بهذا السلوك بصورة مقطعة
ج - نادراً ما يقوم بهذا السلوك
21- يتسرع في الدفاع عن أحد زملائه أمام المعلم ثم يتضح ان زميله كان مخططاً.

أ- يقوم بهذا السلوك بصورة منتظمة  
( )
ب- يقوم بهذا السلوك بصورة مقطعة  
( )
ج- نادراً ما يقوم بهذا السلوك  
( )

22- يقاطع زملائه أثناء حديثهم مع المعلم أو مع بعضهم.

أ- يقوم بهذا السلوك بصورة منتظمة  
( )
ب- يقوم بهذا السلوك بصورة مقطعة  
( )
ج- نادراً ما يقوم بهذا السلوك  
( )

23- يحض زملائه (يتدخل) في اللعب زملائه دون رغبة منهم.

أ- يقوم بهذا السلوك بصورة منتظمة  
( )
ب- يقوم بهذا السلوك بصورة مقطعة  
( )
ج- نادراً ما يقوم بهذا السلوك  
( )

24- يتهم زملائه بأخذ أدواته (كتبه أو كراسيه أو أقلامه) ثم سرعان ما يكتشف أنه

نسيها بمكان ما.

أ- يقوم بهذا السلوك بصورة منتظمة  
( )
ب- يقوم بهذا السلوك بصورة مقطعة  
( )
ج- نادراً ما يقوم بهذا السلوك  
( )
اختبار اضطراب الانتباه المصحوب بالنشاط الزائد

( الصورة الأسرية )

إعداد
دكتور محمد بن محمد
قسم الصحة النفسية
كلية التربية جامعة الأزهر
فرع الدقهلية

التعليمات:
عزيزي الأب أو الأم أو ولي الأمر:

يحتوي هذا الاختبار على مجموعة من العبارات التي يختبر من خلالها سلوك الطفل في البيئة الأسرية، والرجاء من سياكم التكرم بقراءة العبارات بعناية محدودين مدى انتباق كل واحدة منها على الطفل وذلك من خلال وضع علامة (١٠) أمام الاستجابة التي تتناسب على ذلك الطفل من الاستجابات الثلاثة (أ، ب، أو ج) الموجودة أسفل كل عبارة بحيث تكون تلك الاستجابات ملائمة لسلوك الطفل.

مع تقبل شكريّاتي
الباحث
بيانات الطفل

اسم المستجيب/ الاسم
علاقته بالطفل/ المدرسة
النوع: ذكر ( )
أنثى ( )
( ) سن / شهر / سنة تاريخ التقييم

- يخطئ في الأعمال التي يكلفه أحد الوالدين ( الأب أو الأم ) بآدائها حتى ولو كانت بسيطة: مثل كسره للأطباوض أو الأكواب عند إحضارها لها
أ - يقوم بهذا السلوك بصورة منتظمة
ب - يقوم بهذا السلوك بصورة متفحصة
ج - نادراً ما يقوم بهذا السلوك

2 - يشرد بنظراته إلى أخوته أو إلى الكراسي أو الأبواب أو إلى اللوحات المعلقة في المنزل عندما يخاطبه أحد الوالدين (الأب أو الأم)
أ - يقوم بهذا السلوك بصورة منتظمة
ب - يقوم بهذا السلوك بصورة متفحصة
ج - نادراً ما يقوم بهذا السلوك

3 - يحملق في أحد الوالدين (الأب أو الأم) بصورة تتم عن عدم الفهم عندما ينهبه إلى خطأ ارتكبه
أ - يقوم بهذا السلوك بصورة منتظمة
ب - يقوم بهذا السلوك بصورة متفحصة
ج - نادراً ما يقوم بهذا السلوك

4 - ينتقل من لعبة أو نشاط معين (رياضى أو دراسي) لأخر دون استكماله أو إنهائه
أ - يقوم بهذا السلوك بصورة منتظمة
ب - يقوم بهذا السلوك بصورة متفحصة
ج - نادراً ما يقوم بهذا السلوك

5 - يجد أحد الوالدين صعوبة في فهم ما يريد الطفل قوله لانتقاله من موضوع إلى آخر لابتدأ به
أ - يقوم بهذا السلوك بصورة منتظمة
ب - يقوم بهذا السلوك بصورة متفحصة
ج - نادراً ما يقوم بهذا السلوك
6- يتسم المكان الذي يوجد به الطفل بالشعورانية وعدم الترتيب
أ- يقوم بهذا السلوك بصورة منتظمة ( )
ب- يقوم بهذا السلوك بصورة مقطعة ( )
ج- نادرا ما يقوم بهذا السلوك ( )

7- يفقد أدواته ( كراساته أو كتبه أو أفلامه أو ملابسه الرياضية ) بالمدرسة أو بالشارع ولا يستطيع تذكر مكانها
أ- يقوم بهذا السلوك بصورة منتظمة ( )
ب- يقوم بهذا السلوك بصورة مقطعة ( )
ج- نادرا ما يقوم بهذا السلوك ( )

8- يأخذ وقتا طويلا في الإجابة عندما يستفسر منه أحد الوالدين ( الأب أو الأم ) عن شيء ما في المنزل
أ- يقوم بهذا السلوك بصورة منتظمة ( )
ب- يقوم بهذا السلوك بصورة مقطعة ( )
ج- نادرا ما يقوم بهذا السلوك ( )

9- يجد صعوبة في فهم ما يطلبه أحد الوالدين ( الأب أو الأم ) منه حتى في حالة تكرار أهدامه للتعليمات
أ- يقوم بهذا السلوك بصورة منتظمة ( )
ب- يقوم بهذا السلوك بصورة مقطعة ( )
ج- نادرا ما يقوم بهذا السلوك ( )

10- ينسى إحضار الأشياء التي يكلفها أحد الوالدين ( الأب أو الأم ) بشرانها من البقال أو من السوق
أ- يقوم بهذا السلوك بصورة منتظمة ( )
ب- يقوم بهذا السلوك بصورة مقطعة ( )
ج- نادرا ما يقوم بهذا السلوك ( )
١١- يمكث (يغيث) فترة طويلة لكي يحضرشيء طلبه منه أحد الوالدين (الأب أو الأم) من خارج المنزل

أ- يقوم بهذا السلوك بصورة منظمة
ب- يقوم بهذا السلوك بصورة مقطعة
ج- نادرا ما يقوم بهذا السلوك

١٢- يشيرده ذنه (يشرح) أثناء حديث أحد الوالدين (الأب أو الأم) معه

أ- يقوم بهذا السلوك بصورة منظمة
ب- يقوم بهذا السلوك بصورة مقطعة
ج- نادرا ما يقوم بهذا السلوك

١٣- يتلقت يمينا ويسارا بدون سبب أثناء عمله لواجباته المدرسية

أ- يقوم بهذا السلوك بصورة منظمة
ب- يقوم بهذا السلوك بصورة مقطعة
ج- نادرا ما يقوم بهذا السلوك

١٤- يبدو عند انتقاله من حجرته إلى حجرة أخرى بالمنزل وكأنه يقفز

أ- يقوم بهذا السلوك بصورة منظمة
ب- يقوم بهذا السلوك بصورة مقطعة
ج- نادرا ما يقوم بهذا السلوك

١٥- يتحرك داخل المنزل بعشوائية وبدون سبب (هدف)

أ- يقوم بهذا السلوك بصورة منظمة
ب- يقوم بهذا السلوك بصورة مقطعة
ج- نادرا ما يقوم بهذا السلوك

١٦- يبشر كتابه وأدواته المدرسية وملابسه في حجرته

أ- يقوم بهذا السلوك بصورة منظمة
ب- يقوم بهذا السلوك بصورة مقطعة
ج- نادرا ما يقوم بهذا السلوك
17- يحرك أثاث المنزل من مكانه ويجعل المكان فوضى
أ- يقوم بهذا السلوك بصورة منتظمة
ب- يقوم بهذا السلوك بصورة مقطعة
ج- نادرا ما يقوم بهذا السلوك

18- يخاطب أكثر من أخ له في وقت واحد
أ- يقوم بهذا السلوك بصورة منتظمة
ب- يقوم بهذا السلوك بصورة مقطعة
ج- نادرا ما يقوم بهذا السلوك

19- يرد (يجيب) على استفسارات أحد والديه (الأب أو الأم) قبل استكمالها بإجابات خاطئة
أ- يقوم بهذا السلوك بصورة منتظمة
ب- يقوم بهذا السلوك بصورة مقطعة
ج- نادرا ما يقوم بهذا السلوك

20- يتعجل ولا ينتظر دوره أثناء لعبه مع أخوته أو أقاربه أو جيرانه
أ- يقوم بهذا السلوك بصورة منتظمة
ب- يقوم بهذا السلوك بصورة مقطعة
ج- نادرا ما يقوم بهذا السلوك

21- يسرع في الدفاع عن أحد أخوته أمام والديه ثم يكتشف أن أخوه كان مخطئا
أ- يقوم بهذا السلوك بصورة منتظمة
ب- يقوم بهذا السلوك بصورة مقطعة
ج- نادرا ما يقوم بهذا السلوك
22. يقاطع أخوته أثناء حديثهم مع أحد والديهم (الأب أو الأم)
   أ- يقوم بهذا السلوك بصورة منتظمة (   )
   ب- يقوم بهذا السلوك بصورة متقطعة (   )
   ج- نادراً ما يقوم بهذا السلوك (   )

23. يقحم نفسه (يتدخل) في ألعاب أخوته دون رغبة منهم
   أ- يقوم بهذا السلوك بصورة منتظمة (   )
   ب- يقوم بهذا السلوك بصورة متقطعة (   )
   ج- نادراً ما يقوم بهذا السلوك (   )

24. يتهم أخوته أو أقاربه أو جيرانه بأخذ أدواته أو لعبة ثم سرعان ما يجد أنه
   نسيها بمكان ما
   أ- يقوم بهذا السلوك بصورة منتظمة (   )
   ب- يقوم بهذا السلوك بصورة متقطعة (   )
   ج- نادراً ما يقوم بهذا السلوك (   )
1- المستوى التعليمي للأب و الأم:

- الأب ً أمي (لا يقرأ ولا يكتب) □ تعليم ثانوي (عام، دبلوم) □ تعليم جامعي □ حاصل على دراسات عليا

- الأم أمي (لا يقرأ ولا يكتب) □ تعليم ثانوي (عام، دبلوم) □ تعليم جامعي □ حاصل على دراسات عليا

2- بيانات العائلة:

- محل الإقامة □ مدينة □ قرية □ مركز

- عدد أفراد الأسرة (والدين والأبناء) □ أقل من 5 □ أكثر من أو يساوي 5

- عدد أفراد الأسرة الذين لهم دخل □ فرد واحد □ أكثر من أو يساوي 3

- المستوى التعليمي للإخوة (الأكبر من 5 سنوات سواء تعليم حكومي أو خاص):
  □ كل الإخوة سيذهبوا أو ذهبو إلى (المدرسة/الجامعة)
  □ أكثر من نصف الإخوة سيذهبوا أو ذهبو إلى (المدرسة/الجامعة)
  □ أقل من نصف الإخوة سيذهبوا أو ذهبو إلى (المدرسة/الجامعة)
  □ لم يذهب أحد من الإخوة إلى (المدرسة/الجامعة)

- الدخل المالي للأسرة:
  □ مجرد كاف لقضاء الاحتياجات اليومية
  □ كاف لقضاء الاحتياجات اليومية والطوارئ
  □ قادر على الاستثمار والادخار منه

- هل تقتفي الأسرة أي مبالغ دعم حكومي؟ □ نعم □ لا

- هل تدفع الأسرة ضرائب؟ □ نعم □ لا

3- وظيفة الأب والأم:

- الأب ً عمّ □ غير عمّ □ عامل بدوغبير محترف □ عامل محترف □ مزارع
  □ مجال التجارة والأعمال الحرة □ موظف/شيفر متخصص □ متخصص

- الأم ً أمّ □ غير أمّ □ عامل بدوغبير محترف □ عمل محترف □ مزارع
  □ مجال التجارة والأعمال الحرة □ موظفة/شيفر متخصصة □ متخصصة

4- ممتلكات الأسرة
- إذا كان الولد مريضاً، كيف كان السبب؟ 
- إذا كان الولد مريضاً، أخبروني بتفاصيله.

- كيف تبدو العلاقة بين الوالدين؟ 
- كيف تبدو العلاقة بين والد وأم الطفل؟ 
- هل هناك صلة بين الوالدين؟ 
- هل هناك صلة بين والد وأم الطفل؟ 

- أثناء مرحلة الحمل في الطفل:

- هل تتضمن وسائل التعلم؟ 
- هل يوجد نظام صرف صحي في المنزل؟ 
- هل يوجد نظام دفع للمرحاض؟ 
- هل يوجد نظام دفع للهوائيات؟
هل حدثت مشاكل لألم أثناء الحمل في الطفل؟ □ الإصابة بالحصبة □ الإصابة بالحصبة الألمانية □ نقص هرمون الغدة الدرقية □ الإصابة بالجردوى المائية □ ارتفاع ضغط الدم □ لا □ لا أعلم

هل كانت الأم مدخنة أثناء الحمل في الطفل؟ □ نعم □ لا □ لا أعلم

هل كانت الأم مقيمة مع مدخن أثناء الحمل في الطفل؟ □ نعم □ لا □ لا أعلم

هل تعاطت الأم أي أدوية أثناء الحمل دون استشارة الطبيب؟ □ نعم □ لا □ لا أعلم

15 - ولادة الطفل:

هل كانت ولادة الطفل مبكرة؟ □ نعم (الشهر السابع) □ نعم (الشهر الثامن) □ لا □ لا أعلم

هل حذفت مضاعفات (تعميدا) أثناء ولادة الطفل؟ □ استعمال الجفط □ ولادة متعثرة (استغرقت أكثر من 20 ساعة) □ إصابة رأس الطفل أثناء الولادة □ لا □ لا أعلم

ما هو وزن الطفل عند الولادة؟ .............................................

ما هو سن الأم عند ولادة الطفل؟ .............................................

ما هي نوع ولادة الطفل؟ □ ولادة طبيعية □ ولادة قصيرة □ لا أعلم

16 - ما بعد ولادة الطفل:

ما نوع رعاية الطفل؟ □ رعاية طبيعية □ رعاية صناعية □ رعاية طبيعية و صناعية □ لا أعلم

هل يقضي الطفل وقت طويل في مشاهدة التلفاز أو الكمبيوتر؟ □ نعم □ لا □ لا أعلم

إذا كانت إجابة السؤال السابق بنعم فما هو متوسط عدد الساعات؟

هل تغير وجه الطفل بعد الولادة للون الأزرق؟ □ نعم □ لا □ لا أعلم

هل سقط الطفل على رأسه أثناء فترة الطفولة؟ □ نعم □ لا □ لا أعلم
DSM-IV Diagnostic Criteria for Attention-Deficit Hyperactivity Disorder
(American Psychiatric Association, \( ^* \cdot \cdot \cdot )

A. Either (\(^1\)) or (\(^2\)):

(\(^1\)) Six (or more) of the following symptoms of inattention have persisted for at least \(^3\) months to a degree that is maladaptive and inconsistent with developmental level:

**Inattention**

a. Often fails to give close attention to details or makes careless mistakes in schoolwork, work, or other activities

b. Often has difficulty sustaining attention in tasks or play activities

c. Often does not seem to listen when spoken to directly

d. Often does not follow through on instructions and fails to finish schoolwork, chores, or duties in the workplace (not due to oppositional behavior or failure to understand instructions)

e. Often has difficulty organizing tasks and activities

f. Often avoids, dislikes, or is reluctant to engage in tasks that require sustained mental effort (such as schoolwork or homework)

g. Often loses things necessary for tasks or activities (e.g., toys, school assignments, pencils, books, or tools)

h. Is often easily distracted by extraneous stimuli

i. Is often forgetful in daily activities

(\(^2\)) Six (or more) of the following symptoms of hyperactivity-Impulsivity have persisted for at least \(^3\) months to a degree that is maladaptive and inconsistent with developmental level:
**Hyperactivity**

a. Often fidgets with hands or feet or squirms in seat

b. Often leaves seat in classroom or in other situations in which remaining seated is expected

c. Often runs about or climbs excessively in situations in which it is inappropriate (in adolescents or adults, may be linked to subjective feelings of restlessness)

d. Often has difficulty playing or engaging in leisure activities quietly

e. Is often "on the go" or often acts as if "driven by a motor"

f. Often talks excessively Impulsivity

g. Often blurts out answers before questions have been completed

h. Often interrupts or intrudes on others (e.g., butts into conversations or games)

**B.** Some hyperactive-impulsive or inattentive symptoms that caused impairment were present before age 3 years.

**C.** Some impairment from the symptoms is present in two or more settings (e.g., at school [or work] and at home).

**D.** There must be clear evidence of clinically significant impairment in social, academic, or occupational functioning.

**E.** The symptoms do not occur exclusively during the course of a pervasive developmental disorder, schizophrenia, or other psychotic disorder and are not better accounted for by another mental disorder (e.g., mood disorder, anxiety disorder, dissociative disorder, or a personality disorder).
ICD-10 Diagnostic Criteria for Hyperkinetic Disorders (World Health Organization, 1991)

**Note:** The research diagnosis of hyperkinetic disorder requires the definite presence of abnormal levels of inattention, hyperactivity, and restlessness that are pervasive across situations and persistent over time and that are not caused by other disorders such as autism or affective disorders.

**Gl. Inattention.**
At least six of the following symptoms of inattention have persisted for at least 3 months, to a degree that is maladaptive and inconsistent with the developmental level of the child.

(1) Often fails to give close attention to details, or makes careless errors in schoolwork, work, or other activities;
(4) Often fails to sustain attention in tasks or play activities;
(5) Often appears not to listen to what is being said to him or her;
(6) Often fails to follow through on instructions or to finish schoolwork, chores, or duties in the workplace (not because of oppositional behavior or failure to understand instructions);
(2) Is often impaired in organizing tasks and activities;
(3) Often avoids or strongly dislikes tasks, such as homework, that require sustained mental effort;
(4) Often loses things necessary for certain tasks or activities, such as school assignments, pencils, books, toys, or tools;
(5) is often easily distracted by external stimuli;
(6) is often forgetful in the course of daily activities

**G. Hyperactivity.** At least three of the following symptoms of hyperactivity have persisted for at least 3 months, to a degree that is maladaptive and inconsistent with the developmental level of the child

(1) Often fidgets with hands or feet or squirms on seat;
(2) Leaves seat in classroom or in other situations in which remaining seated is expected
(3) Often runs about or climbs excessively in situations in which it is inappropriate (in adolescents or adults, only feelings of restlessness may
be present);
(1) Is often unduly noisy in playing or has difficulty in engaging quietly in leisure activities;
(2) Exhibits a persistent pattern of excessive motor activity that is not substantially modified by social context or demands.

G7. Impulsivity. At least one of the following symptoms of impulsivity has persisted for at least 3 months, to a degree that is maladaptive and inconsistent with the developmental level of the child;
(1) Often blurts out answers before questions have been completed;
(2) Often fails to wait in lines or await turns in games or group situations;
(3) Often interrupts or intrudes on others (e.g., butts into others' conversations).
(4) Often talks excessively without appropriate response to social constraints.

G4. Onset of the disorder is no later than the age of 3 years.

G5. Pervasiveness. The criteria should be met for more than a single situation, e.g., the combination of inattention and hyperactivity should be present both at home and at school, or at both school and another setting where children are observed, such as a clinic. (Evidence for cross-situational will ordinarily require information from more than one source; parental reports about classroom behavior, for instance, are unlikely to be sufficient.)

G6. The symptoms in G4-G7 cause clinically significant distress or impairment in social, academic, or occupational functioning.

G8. The disorder does not meet the criteria for pervasive developmental disorders, manic episode, depressive episode, or anxiety disorders.
ملخص الرسالة باللغة العربية

بعد اضطراب نقص الانتباه وفرط الحركة من الاضطرابات النفسية الأكثر شيوعاً في مرحلة الطفولة و يميز هذا المرض بآرائه تدور في محورين: الأول هو نقص الانتباه، والثاني هو الحركة الامجادة والاندفاعية و الذي يؤدي إلى تدني التحصيل الدراسي أو مشاكل في السلوك. هناك ثلاث أنواع لهذا الاضطراب: نقص الانتباه، فرط الحركة والاندفاعية والنوع الثالث يجمع بين نفس الانتباه وفرط الحركة.

لا يوجد سبب معين يمكن أن تعزى إليها الإصابة باضطراب نقص الانتباه وفرط الحركة.

ولكن، هناك عدد من العوامل التي قد تسهم في حدوثه أو تفاقمه، وهي تشمل العوامل الوراثية و البيئية و البيولوجية.

بجب ملاحظة أعراض اضطراب نقص الانتباه و فرط الحركة في أكثر من مكان مثل المنزل أو المدرسة. و يتم تشخيص هذا الاضطراب عن طريق نواع من الأدوات التشخيصية الرئيسية هما: التصنيف الدولي للاضطرابات العقلية والسلوكية المراجعة العاشرة والدليل التشخيصي والإحصائي للاضطرابات العقلية الطبعة الرابعة.

تتضم الطرق العلاج مزيجًا من المنتجات النفسية مع التدابير العلاجية التربوية والسلوكية.

بعد العلم هو أول شخص يمكنه ملاحظة الآراء حيث يقوم العلم بتوفير المعلومات عن التاريخ الأكاديمي والأداء والعلاقات الاجتماعية وسير الحياة اليومية عامة و بالتالي يلعب العلم دوراً هاماً في الكشف عن هذا الاضطراب بينما الأم عادة ما تنتظر إلى المعرفة حول هذا الاضطراب ولذلك يتاخر اكتشاف الحال. أيضاً، فإنها تنتظر حتى يتم الكشف عنها من قبل المعلم أو حتى حدوث مضاعفات مثل اضطرابات السلوك وتأخر التحصيل الدراسي.

أهداف الدراسة:

تهدف هذه الدراسة إلى إظهار حجم مشكلة اضطراب نقص الانتباه و فرط الحركة بين عينة من أطفال المدارس الابتدائية بمحافظة القليوبية. وذلك عن طريق حساب معدل انتشار اضطراب نقص الانتباه وفرط الحركة. كما تهدف إلى معرفة العلاقة بين هذا المرض وعوامل
الخطر المحتملة. كذلك تهدف هذه الدراسة إلى وضع برنامج شامل للوقاية والسيطرة على
المرض.

طريقة البحث

تم هذا البحث عن طريق اجراء دراسة مقطعية مقارنة بين طلاب المدارس الإبتدائية في
محافظة القيروانة. وقد تم إجراء الجزء الميداني منها خلال العام الدراسي 2013-2014.

عينة البحث:

تم إجراء الدراسة باستخدام تقنية أخذ العينات متعددة المراحل التي تتضمن على تقسيم
محافظة القيروانة إلى عشر مراكز. تم اختيار مركزين كعينة عشوائية (طوط وشبين القاطر).
ومن كل مركز تم اختيار مدرستين ابتدائيتين، واحدة من النافذون و الأخرى من المدينة كعينة
عشوائية. وتم تقسيم كل مدرسة إلى طبقات طبقاً إلى الصفوف المختلفة ثم تم اختيار فصل واحد
من كل صف كعينة عشوائية.

شملت هذه الدراسة 96 طالب من طلاب المدارس الإبتدائية تتراوح أعمارهم ما بين (6-
12 عاما). من الذكور والإناث. ولكل طالب، تم ملء استبيان اضطراب نقص الانتباه و فرط
الحركة (نسخة المدرس) من قبل مدرس الفصل واستبيان للي الامر (اضطراب نقص الانتباه و
فرط الحركة (النسخة الإسرية) ، واستبان الحالات الاجتماعية والاقتصادية وعوامل الخطر) وتم
ارسالها في حقيقة الطالب على أن تملأ من قبل الوالدين. ومع ذلك، عاد فقط 437 استبيان من
النسخة الإسرية.

أدوات الدراسة:

1. المقابلة الشخصية بين الباحث والمعلم المختص بكل فصل لشرح بنود الاستبيان.
2. استمارة لكل طالب تشمل المعلومات الشخصية (الاسم - العمر - النوع - المرحلة
  التعليمية - محل الإقامة).
3. مقياس تقييم اضطراب نقص الانتباه و فرط الحركة للدكتور جيم نوبي (نسخة
  المدرس). وتم ملأ الاستبيان بواسطة مدرس الفصل. يتألف هذا المقياس من
  24 بند. 12 من هذه البنود هي لأعراض نقص الانتباه و 12 بندًا لأعراض الحركة
  المفرطة والإندفاعية.
4. استبيان تم إرساله في حقائب الطلاب ليلماً بواسطة أولياء الأمور و يشمل على مقياس تقدير اضطراب نقص الانتباه و فرط الحركة لدكتور هيثم النوبلي (النسخة الأسرية) بالإضافة إلى استبيان الحالة الاجتماعية والاقتصادية وعوامل الخطر التي يمكن أن تكون متصلة باضطراب نقص الانتباه و فرط الحركة.

وتتم جدولة وتحليل البيانات باستخدام برنامج الحزمة الإحصائية للعلوم الاجتماعية واستخدمت الاختبارات الإحصائية المناسبة.

نتائج الدراسة:

وقد أظهرت هذه الدراسة أن معدل انتشار اضطراب نقص الانتباه و فرط الحركة في عينة من أطفال المدارس الإبتدائية الذين تتراوح أعمارهم بين (6-12 سنة) في محافظة القليوبية كان 21.8% على أساس مقياس تصنيف المعلمين و 16.2% على أساس مقياس تصنيف الوالدين.

كشفت نتائج هذه الدراسة أن 52.7% من الأطفال الذين يعانون اضطراب نقص الانتباه و فرط الحركة لديهم النوع المشترك ، 25.9% لديهم نوع فرط الحركة والاندفاعية و 21.4% لديهم نوع نقص الانتباه.

في هذه الدراسة لم يكن هناك فرق ذو دلالة إحصائية بين انتشار اضطراب نقص الانتباه و فرط الحركة بين الجنسين. في حين كان هناك فروق ذات دلالة إحصائية بين أنواع اضطراب نقص الانتباه و فرط الحركة والجنس حيث كان نوع فرط الحركة والاندفاعية أكثر انتشاراً في الذكور بينما كان نوع نقص الانتباه أكثر انتشاراً في الإناث.

وأظهرت هذه الدراسة أن أعلى نسبة لانتشار حالات اضطراب نقص الانتباه و فرط الحركة بين الأطفال الذين هم في سن التاسعة أو أكبر.

ولقد وجدت اختلافات كبيرة بين الطلاب الإيجابيين لاضطراب نقص الانتباه و فرط الحركة والطلاب السلبيين حيث كان معدل الانتشار أعلى بين من هم من مستوى اجتماعي واقتصادي منخفض، وذوي الترتيب المنخفض، الذين يعيشون مع أحد الوالدين، ومن يعانون من الضرب، وأطفال الأسر التي تعاني من اضطراب العلاقة بين الوالدين أو من حول واعدين وطلاب، ومن نجده لديهم صلة قرابة بين الانبوين أو اصابة الأم بارتفاع ضغط الدم أثناء الحمل، أو
تعرضها للتدخين السلبي، أو الولادة القيصرية، كما كان الأطفال الذين تعرضوا للذرقة بعد الولادة أو تم ارضاهم صناعياً الذين يكثرون من مشاهدة التلفزيون أو تعرضوا لإصابات في الرأس أكثر عرضة للإصابة باضطراب نقص الانتباه وفرط الحركة.

الاستنتاج:

بعد اضطراب نقص الانتباه وفرط الحركة مشكلة صحية هامة بين أطفال المدارس الإبتدائية في محافظة القليوبية. حيث كشفت هذه الدراسة أن معدل انتشار اضطراب نقص الانتباه وفرط الحركة كان 21.8% على أساس مقياس تصنيف المعلمين و 16.2% على أساس مقياس تصنيف الوالدين. كما ارتبط هذا المرض مع العديد من عوامل الخطر مثل التدخين السلبي، الرضاعة الصناعية ، الأكثر من مشاهدة التلفزيون والإصابة بصدمات الرأس وإن التعامل مع عوامل الخطر هذه يحتاج إلى جهود تعاونية للسيطرة على هذه العوامل وتقليل انتشار اضطراب نقص الانتباه وفرط الحركة.

التوصيات:

أوصلت هذه الدراسة إلى التوصيات الآتية:

1- تصميم برنامج للتوعية عن اضطراب نقص الانتباه وفرط الحركة وكيفية الوقاية منه.

ويعد التثقيف الصحي عنصر مهم للوقاية من اضطراب نقص الانتباه وفرط الحركة. ويعتمد على

أ− زيادة المعرفة عن اضطراب نقص الانتباه وفرط الحركة وعوامل الخطر والإعراض.

ب− تغيير السلوك الخاطئ مثل التدخين والمكوث ساعات طويلة في مشاهدة التلفزيون وألعاب الفيديو التي يمكن أن تؤدي إلى الاصابة بهذا المرض.

ج− تحفيز الناس على اتباع السلوك السليم مثل تحسين العلاقة بين الوالدين والطفل وبين الطفل والمعلم.

2− إدراج الصحة النفسية ضمن الرعاية الصحية الأولية أو ضمن خدمات طب الأسرة وضمن خدمة الصحة المدرسية.
معدل انتشار اضطراب نقص الانتباه و فرط الحركة لعينة من أطفال المدارس الإبتدائية بمحافظة القليوبية توطئة للحصول على درجة الماجستير في الصحة العامة

مقدمة من الطبيبة/ إيمان محمد حامد عجوة

بكالوريوس الطب والجراحة. جامعة بنها
معيدة بقسم الصحة العامة و طب المجتمع
كلية الطب جامعة بنها

تحت إشراف

أ.د. إيمان عبد الفتاح البيطار

استاذ الصحة العامة
قسم الصحة العامة و طب المجتمع
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أ.د. سعاد درويش الجندي

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قسم الصحة العامة و طب المجتمع
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د. هناء السيد بيومى

مدرس الصحة العامة
قسم الصحة العامة و طب المجتمع
كلية الطب
جامعة بنها

د. منى أحمد العوضى

مدرس الصحة العامة
قسم الصحة العامة و طب المجتمع
كلية الطب
جامعة بنها

كلية الطب
جامعة بنها

2015