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REVIEW

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ADHD Symptoms in Females of Childhood, Adolescent, Reproductive and Menopause Period

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ABSTRACT

Background: The attention-deficit/hyperactivity disorder (ADHD) was initially considered a male disorder. As it has recently been shown, however, its presentation in girls is a topic of increasing scientific interest and research. There have been quite a few studies so far showing the differences in the symptoms between genders and the progression of the condition depending on the individual's profile. However, there are some special characteristics in the female gender, including neuropathology and hormonal factors, that play a decisive role in understating ADHD in women. Although it is known that the symptoms in ADHD girls are overshadowed by those of the impulsive and hyperactive boys, an effort was made in this study to highlight ADHD symptoms in women from childhood to menopause.

Objective: Taking into account the small but significant differences in the development of ADHD in women, this literature review aims at identifying the special characteristics of ADHD symptoms in all stages of a woman's life from childhood to menopause. Being aware of these signs is important to provide the best quality of health care in ADHD women. **Methods:** A review of the literature was conducted through the databases on the occurrence of ADHD symptoms in girls, adolescents, women of childbearing age and women in menopause. **Results:** ADHD and its comorbid disorders affect the female sex throughout its life. The hormonal fluctuations and transitional periods of life seem to influence the symptoms of ADHD more. **Conclusion:** Higher awareness is thus required by health professionals about ADHD behavioural characteristics in girls, adolescent girls and women in their productive period or in menopause to identify the special signs defining the disease, to treat them early and protect the women's mental health.

Key words: attention-deficit/hyperactivity disorder, ADHD in girls, ADHD in female adolescent, ADHD in reproductive period, ADHD in menopause period.

1. BACKGROUND

The attention-deficit/hyperactivity disorder (ADHD) is one of the most frequent neuropsychiatric disorders of childhood, characterized by attention, hyperactivity and impulsiveness problems. There are 2 different ADHD subtypes: a) predominantly inattentive presentation. The person is very difficult to organize their work, pay attention to details or follow orders; the person is easily distracted and forgets. b) Hyperactive-impulsive. The person fidgets a lot and talks nonstop; they are hyperactive and impulsive resulting in many accidents c) Combined presentation. The symptoms of the above subtypes coexist in this category (1).

2. OBJECTIVE

This literature review aims at identifying the special characteristics of ADHD symptoms in all stages of a woman's life from childhood to menopause. Being aware of these signs is important to provide the best quality of health care in ADHD women.

To identify the special characteristics of ADHD symptoms in all stages of a woman's life from childhood to menopause, in order to provide the best quality of health care in ADHD women. The attention-deficit/hyperactivity disorder (ADHD) is one of the most frequent.

Sex Hormones and Brain

It has been proven that gender hormones act on the central nervous system and affect the neural circuits in the fetal period. While men have bigger brain volume compared to women, there

are very significant differences in the 2 genders. Men have bigger amygdale and hypothalamus while women have larger hippocampus. Estrogen receptors are located in the hypothalamus while androgen receptors in the amygdale (2).

Hormone fluctuations of the transitional periods in a woman's life affect brain functions, such as the brain's architecture, metabolism and hematosi. For example, there are some indications that estrogens in postmenapausal women increase the peripheral cerebral blood flow (3). It is necessary therefore to take into account the role of sex hormones in brain function. Natural hormonal changes in the menstrual cycle phase, postpartum period, perimenopause and menopause but also the external hormonal use such as combined oral contraception and hormonal therapy at menopause constitute critical variables and are significant to be taken into account (4).

Gender differences in ADHD

Evidence suggests that the prevalence of ADHD is greater in males than females. Furthermore, ADHD is more commonly diagnosed in adult males compared to adult females (5). There are significant differences between the genders in the manifestation of ADHD symptoms in adolescence. Parents and educators are usually unaware that symptoms in girls are different from the ones in boys. ADHD girls are not usually hyperactive. On the contrary, they tend to have increased attention deficit as part of the disorder. Girls also are more possible to suffer from low self-esteem, underachievement and anxiety and depression disorders compared to boys and are more likely to start smoking or get pregnant while still in middle or high school (6). On the other hand, boys suffer from hyperactivity, higher impulsivity, delinquent behaviors while the disorder seems to greatly prevail (7) (Table 1).

FEMALES	MALES
Attention-deficit part	Higher impulsivity
Low selfesteem	Delinquent behaviors
Underachievement	More often imprisoned
Depression and anxiety disorders	Higher prevalence
Start smoking or get pregnant while still in middle or highschool	Hyperactivity

Table 1. Main differences between ADHD symptoms in male and female adolescences

3. PATIENTS AND METHODS

Demographic and social characteristics

Patient opinion on information regarding their current health condition, smoking habits, were collected through 21 item questionnaire which was specially designed for the purposes of the study. Patient clinical data such as diagnosis was obtained from patients' files. Symptoms in the attention deficit ADHD subtype in girls can be daydreaming in the class, anxiety or grief, inattention, shyness, problems in keeping friendly relations, recrimination. In the impulsive type, symptoms can be expressed with excessive talking, nervousness, domineeringness, risk taking and unable to

keep up with work load.

Other characteristics are problems with times of transitions, difficulty in adaptation, lack of friendly relations and immaturity (8). ADHD is very often considered the "boys' disorder" as the number of ADHD boys is almost double in boys compared to girls. ADHD, though, is expressed differently in girls. Hyperactivity and impulsiveness, which are two of the most well-known ADHD symptoms, are not so common in girls and this is why they can be wrongly diagnosed.

The percentages of low self-esteem and emotional disorders, such as anxiety and major depression, are more frequently found in ADHD girls compared to boys.

4. RESULTS AND DISCUSSION

In particular, in a population-based study of 10 to 11 year old children, girls scored lower than boys with ADHD on the mental well-being, self-esteem and relationship to parents (9). Low self-esteem in childhood can remain up to adulthood and as a result, women with their negative self-image suffer more than men (10) (Table 2).

With regard to inattention, it is less frequently observed by the educators because it is not considered intrusive and does not disturb the smooth performance of the class, and, therefore, there are fewer possibilities to refer the girl for treatment, while the possibility of referral to a special therapist depends on the severity of the symptoms. Another reason for which girls are not easily detected with ADHD is related to the behavioural gender differences at school. Girls seem to be more responsible in completing their school tasks because girls are encouraged in our culture to be more socially conscious. Moreover, girls wish to please their parents more than boys are expected to perform better at school (11). Girls are referred to an expert with the consent of their parents who compare the girls with other girls whereas educators compare them with the boys in the class (12). The experts' opinion must be asked of course when there are genetic or environmental factors responsible for ADHD. Studies in first-degree relatives with ADHD have shown 2 to 8 times higher risk for ADHD to be manifested in other family members (13). Therefore, girls with a history of perinatal disorders must be closely monitored for ADHD symptoms (14). Other factors that can contribute to insufficient ADHD diagnosis and non-referral for treatment of ADHD girls are the presence of comorbid psychiatric disorders (depression /anxiety) (15, 16) which are responsible for the internalization of the symptoms, the presence of a comorbid compulsive-compulsive disorder, which is often accompanied by a perfectionist behaviour (17) and the lack of aggressiveness which is more obvious in boys than in girls (18). The diagnosis and proper treatment of ADHD in childhood plays a decisive role for the development of antisocial behaviours in adulthood. Moreover, it seems that the worse the psychosocial functionality of ADHD adult women, the worse, we assume, were the symptoms in childhood (19).

ADHD in adolescent females

There is strong evidence that ADHD children have a difficult psychosocial development, and, therefore, a mal-adjusted adolescence. The signs providing such a condition comprise substandard academic achievement, difficulty

in interpersonal relationships with the family and peers, injuries and comorbidity with other psychiatric disorders (20) (Table 2). The development of the brain, especially of the frontal lobe relating to executive function skills, such as solving problems, solution of conflicts and control of impulses, occurs in adolescence and continues up to the age of 25 years. However, in ADHD people, the development of this brain region is delayed, and as a result the lack of the above skills induces anxiety and aggressive or dysfunctioning behaviour (21). Inattention, which is the usual characteristic in ADHD girls, is linked to fewer disorganizing symptoms compared to the ones of the hyperactive subtype characterizing boys and as a result, adolescent girls in their overwhelming majority remain undiagnosed. Furthermore, this period includes additional challenges for the girls, such as low self-esteem, social pressures, expectations of maturity by parents and educators and, finally, sexual concerns. Studies have shown that, due to low self-esteem, adolescent girls with ADHD are many times driven to seek validation via the sexual attention of others (8). Therefore, ADHD girls run 2 times more risk for pregnancy compared to their peers without ADHD (22).

ADHD during the reproductive period

This is an increasing belief that the possibility of ADHD girls to still have the disorder in their adulthood is big (23). The mean age of ADHD diagnosis in women that have not been diagnosed in childhood is 36 to 38 years of age, because of a comorbidity or their children being diagnosed with ADHD (24, 25). Before that, they are usually wrongly diagnosed with mood or anxiety disorder. Even if they are secondary conditions, their treatment does not reach the root of the problem, which is ADHD (24). Studies show that the first two weeks of the menstrual cycle are smoother for ADHD women than the other two, when the progesterone levels increase. During the third and fourth week, called the luteal phase, progesterone decreases the beneficial effects of estrogens on the brain, possibly decreasing the effectiveness of the medication as well (26). There is the belief that ADHD women present more severe premenstrual symptoms than women without ADHD (27) (Table 2). It seems though that per os contraceptives improve ADHD symptoms in many women minimizing hormonal fluctuations. Three weeks of taking estrogen contraceptives followed by a week with progesterone only seem to be especially useful in decreasing the symptoms (24).

ADHD during the perinatal period

There are not many studies so far evaluating ADHD progression in pregnancy, but the hormonal changes of this period seem to have some impact on the disease course. Pregnancy and the Childbirth create a sense of disequilibrium in most mothers. Although the most important ADHD symptoms in pregnancy decrease due to estrogen increases, women seem to have more attention distraction symptoms as they focus on maternity and their new role (28). In the postnatal period, however, estrogen levels radically decrease, which also decreases dopamine levels resulting in a depressive mood (Table 2). Common characteristic of ADHD pregnant women are comorbid psychiatric disorders and low self-esteem (29), while mothers with clinical or sub-clinical ADHD symptoms seem to be more

vulnerable (30). In a recent research related to ADHD results in pregnancy and labor, women diagnosed with ADHD at any stage of pregnancy had 20- 30% more chances to have a cesarean section; also their babies had an equally increased percentage for support to start breathing or to be taken into a neonatal unit (31). In another study of the Centers for Disease Control and Prevention (CDC) on the impacts of pharmacotherapy in pregnancy, it was found out that an increasing number of pregnant women take medication for ADHD. Women having taken ADHD medication in the first trimester of pregnancy had more possibilities to give birth to a neonate with genetic anomalies (gastroschisis, omphalocele, transverse limb deficiency) compared to women that have not taken ADHD medication (32). Limited data also exist for the use of medication by the mothers during breastfeeding. As the use of stimulants at the end of pregnancy can negatively affect fetus development, the exposure of babies via the maternal milk could possibly affect the development of babies and have an adverse impact on their appetite and sleep (33). Postpartum women with ADHD are very possible to present a deterioration of their symptoms after labour with the presentation of depressive symptoms. The new challenges of mothers in the postnatal period affect functional skills, skills that ADHD women were already trying to achieve throughout their lives. If they have chosen to stop their medications, ADHD symptoms can come back. ADHD symptoms are similar to those of depression and the symptoms of anxiety are shadowed by the ones of ADHD (34). Many women in the postpartum period are diagnosed as having depression because clinicians may not know the special characteristics of ADHD in women and may focus on comorbid disorders. Unfortunately, many women with ADHD receive treatment for other disorders but not for ADHD. Semple et al, proposed in 2011 to check women in the perinatal period for depression but also for ADHD symptoms (29).

ADHD in menopause period

As above shown, during her life a woman can experience various normal hormonal changes starting from pre-adolescence up to menopause. During perimenopause and menopause, estrogen and progesterone levels decline (35) and ADHD becomes more severe (36). Perimenopause occurs in the years leading up to menopause. It may take a few months or 10 years, though the average amount of time is 4 years. During this period, estrogen levels decline, and ovaries stop releasing eggs. Menopause occurs immediately after this phase (36). The decline of estrogens that until then affected the release of neurotransmitters serotonin and dopamine induces various changes in the biochemistry of the brain. Dopamine deficiency is responsible for the presentation of ADHD symptoms whereas serotonin deficiency leads to depressive mood (Table 2). Given thus that dopamine is the trademark of ADHD, this additional change can lead to even greater difficulties with focusing and concentration (37, 38). As postmenopausal women run a higher risk of osteoporosis and cardiovascular conditions, they also have to face the potentially changing psychiatric disorders that can make the solution of the problem more difficult (39); whereas it is considered more possible for postmenopausal women also suffering from ADHD to be

more vulnerable to the mood disorders of menopause (27).

5. CONCLUSION

ADHD is an underdiagnosed and undertreated disorder in females of all age with frequent coexistence of psychiatric disorders. Deficient ADHD diagnosis in girls and women can be due partly to a special profile of non-noisy symptoms (inattention – low self-esteem) compared to the impulsiveness/hyperactivity of boys. Higher awareness is thus required by health professionals about ADHD behavioural characteristics in girls, adolescent girls and women in their productive period or in menopause to identify the special signs defining the disease, to treat them early and protect the women's mental health. The protection of women's mental health contributes to the improvement of public health in general.

- **Patient Consent Form:** All participants were informed about subject of the study..
- **Author's Contribution:** E.A. and N.R. gave substantial contributions to the conception or design of the work. E.A., and E.O., had a part in article preparing for drafting or revising it critically for important intellectual content. N.R. and A.P. gave final approval of the version to be published and agreed to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.
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