

Sexually Transmitted Diseases and Attention-Deficit/Hyperactivity Disorder: A Systematic Literature Review

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Abstract: Patients with attention-deficit/hyperactivity disorder (ADHD) suffer from inattention, hyperactivity, and impulsivity. Clinicians often assume that the specific difficulties associated with ADHD are bound to affect sexual behaviors, and favor risky sexual behaviors, thereby increasing the frequency of sexually transmitted diseases (STDs). This review provides an up-to-date synthesis of the literature concerning STDs in patients with ADHD. A systematic review of the literature was performed using the PubMed, PsychInfo, and Embase databases, with STDs as the main outcome measure. Patients with ADHD report more STDs than the general population. Results are limited by the small number of existing studies, as well as the heterogeneity of the outcome measures. Findings from this first systematic review of data on STDs in individuals with ADHD suggest that ADHD affects sexual health and sexual behaviors. Clinicians treating patients with ADHD should explore risky sexual behaviors in their patients and raise awareness about the risk of contracting STDs. Further studies are warranted to better evaluate the risk of contracting an STD in patients with ADHD.

Key Words: ADHD, attention-deficit, hyperactivity, risky sexual behaviors, sexually transmitted diseases

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Risky sexual behaviors (RSBs) generally include all sexual activities that increase the risks of negative personal or interpersonal outcomes. Typical RSBs include an increased number of sexual partners, young age at first intercourse, inconsistent use of condoms/birth control methods, sex while consuming drugs, and sex with uncommitted partners (casual sex).^{1–4} In addition, unplanned pregnancy can be a possible outcome of RSBs. Furthermore, many RSBs are

associated with a higher risk of contracting sexually transmitted diseases (STDs).^{5,6} STDs, including syphilis, chlamydia, gonorrhea, trichomoniasis, genital herpes, hepatitis B, human immunodeficiency virus, and human papillomavirus, represent a worldwide major public health problem and may severely impair quality of life.^{7,8} Globally, the age-standardized incidence rate of STDs increased from 2010 to 2019, with some regional differences in the age of the affected population.⁹ The Centers for Disease Control and Prevention estimated that the prevalence of STDs in the U.S. population was 20% in 2018.¹⁰

Attention-deficit/hyperactivity disorder (ADHD) is a neurodevelopmental disorder that begins during childhood and often persists through adulthood. It is characterized by deficits in attention, hyperactivity, and impulsivity including emotional lability and lack of self-control.¹¹ ADHD impacts psychological, social, and behavioral functioning.¹² Three presentations of ADHD have been identified and are described in the Fifth Edition of the *Diagnostic and Statistical Manual of Mental Disorders*: the predominantly inattentive presentation, the predominantly hyperactive and impulsive presentation, and the combined presentation.¹³ Given their high level of impulsivity, poor capacity for self-control, and focus on sensation seeking, patients with ADHD have been shown to face serious impairments in their professional lives, intimate relationships, and general health.¹¹

Compared with the general population, individuals with ADHD more often engage in behaviors, such as smoking, substance use, fast driving, and RSBs, that are associated with a high probability of undesirable outcomes (eg, financial loss and physical injuries).¹⁴ The few nonsystematic reviews on RSBs in the population with ADHD suggest that ADHD may be associated with RSBs, and these reviews include speculation that this association may be explained by hyperactivity-impulsive symptoms and/or inattentive symptoms, as well as academic impairment and family stress and conflicts.^{11,14–17} Some studies have reported that, compared with individuals without ADHD, individuals suffering from ADHD have a higher number of sexual partners,^{3,18} an earlier age at first intercourse,^{3,18} more frequent casual sex, and a higher risk of unprotected sex.² Because the probability of contracting STDs is closely related to RSBs,^{5,6} we hypothesized that STDs could be more frequent in patients with ADHD than in those without ADHD, and we, therefore, conducted a systematic literature review on this topic.

METHODS

We report our findings according to the “Preferred Reporting Items for Systematic Reviews and Meta-

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Analyses” statement.¹⁹ We performed a literature search for publications up to December 15, 2022, on PubMed, PsycInfo, and Embase databases using the combination of keywords: [(sexually transmitted) OR STI OR STD] AND ADHD. No limits, restrictions, or published search filters were used.

Two independent reviewers screened the records, selected them using inclusion criteria, and analyzed the findings. Records were included if they reported both RSBs and ADHD. All original studies were included regardless of their methodology, the size of the research group, and the presence of a control group. Reports were excluded if they did not have data on ADHD and STDs. Reviews, case reports, and conference abstracts were also excluded. Reference lists of the retained studies were hand-searched to identify additional studies. Owing to the considerable heterogeneity of the studies and outcome measures, it was not possible to provide Forest plots. We opted for a narrative approach to synthesize the data from the included studies.

RESULTS

Figure 1 details the study retrieval process. We identified 257 records using a systematic search in the databases. We eliminated 75 duplicates. After selection using inclusion criteria, 53 records were considered for the full-text screen. After selection using exclusion criteria, 8 reports were included in the systematic review. Seven more reports were added by hand-search. The 15 studies included in this review are presented in Table 1.

Fourteen articles described between-subjects studies,^{20–33} and the 15th article described a within-subjects study.³⁴ Thirteen of the between-subjects studies involved a comparison of ADHD versus control populations, and the 14th compared two different young adult ADHD groups.³¹

A key factor differentiating these studies was participant age. Six studies examined children up to adolescents (≤ 19 years of age),^{20,23–25,31,33} and 9 studies examined adult populations, primarily individuals in their 20s,^{21,22,26–28,32,34} although 2 explored age brackets in the 30s²⁹ and 40s.³⁰ Of the adult studies, 3 investigated individuals with childhood-onset ADHD,^{22,27,30} whereas 6 examined adults currently diagnosed with ADHD.^{21,26,28,29,32,34}

Investigation into the frequency of STDs among individuals with ADHD varied, with studies examining lifetime prevalence,^{22,23,27,33,34} period-prevalence,^{26,28,32} and point-prevalence.^{21,29,31} Two other studies measured STD incidences.^{24,30} Among the 6 studies addressing childhood up to adolescence, only 2 showed a significantly higher frequency of STDs in adolescents with ADHD compared with controls.^{23,24} In contrast, among the 8 between-subjects studies in adult populations, 6 reported significantly higher frequencies of STDs in individuals with ADHD,^{21,22,26,29,30,32} whereas 2 did not show any significant difference when compared with controls.^{27,28} The within-group adult study by Hosain et al³⁴ also did not find a significant association between ADHD scores and STD prevalence.

Regarding the initial age when an STD was contracted, one study showed a lower age at initial STD contraction,²⁵ and another study found a significantly lower age of developing STDs in a 2 to 10-year follow-up in the ADHD population compared with controls.²⁴

With regard to the influence of psychostimulant drugs on STD frequency, 2 studies^{24,25} showed that ADHD medications were related to a lower risk of subsequent

STDs. A third study supported the same conclusion regarding medication use, but only for girls among the young adult population who were 18 and 19 years of age.³¹ In addition, in the study by Chen et al,²⁴ short-term use of drug treatments for ADHD decreased the risk of STDs by 31%, whereas long-term use of these treatments decreased it by 41%. Chen et al²⁴ also found that only 16% of adolescents and young adults with ADHD used long-term medication, and as many as 40% did not use medication at all.

Certain studies have also shown that the risk of patients with ADHD developing an STD is further increased by different conditions, including a higher number of sexual partners,³⁰ alcohol and cannabis use,³² and psychiatric comorbidities,^{23,24,26} particularly substance use disorders,^{24,26} depressive disorders, bipolar disorder, personality disorders, psychotic disorders, and eating disorder.²⁶

DISCUSSION

Frequency of Sexually Transmitted Diseases and Age When Attention-Deficit/Hyperactivity Disorder First Contracted

A majority of the studies we reviewed showed that various frequencies of STDs (lifetime prevalence, point-prevalence, period-prevalence, and incidence) are increased in ADHD populations compared with control groups.^{21–24,26,29,30,32} Only 5 studies reported findings indicating a nonsignificant difference in the data.^{20,23,27,28,33} It is noteworthy that, with the exception of the study by Akmatov et al,²⁰ these studies with nonsignificant findings were all performed in small samples ($n < 500$ per diagnosis group). On the contrary, the studies showing a significant difference were mainly performed in large samples ($n > 1000$ per diagnosis group).^{21,24,26,32} Although the study by Akmatov et al²⁰ was conducted in a large number of patients ($\sim 250,000$), it was not included in our discussion because it involved participants between 5 and 14 years of age, an age at which the vast majority have not yet had sexual intercourse.

Overall, these data support the notion that individuals with ADHD, or those who have suffered from childhood ADHD, are at greater risk for developing STDs than the general population. In addition, there are indications that the age when an STD is initially contracted is lower in people suffering from ADHD than in the general population.^{24,25}

Influence of Psychostimulant Drugs on the Risk of Contracting an Sexually Transmitted Disease

Two studies^{24,25} also showed that patients with ADHD treated with psychostimulant drugs had a significantly lower risk of developing STDs. Only the study by Rao et al³¹ showed no significant reduction in the risk of contracting an STD, whether with regular or occasional use of psychostimulants. However, the results of that study must be treated with caution, because they were obtained in a modest cohort of fewer than 2000 patients. In contrast, the 2 studies that showed a reduction in the risk of developing STDs with medication use were carried out in populations of 17,898²⁴ and 58,685 patients.²⁵ Chen et al²⁴ found a very weak adherence to psychostimulant drugs in individuals with ADHD, which is in line with the results of other studies on adherence to psychostimulant drugs.^{35–37}

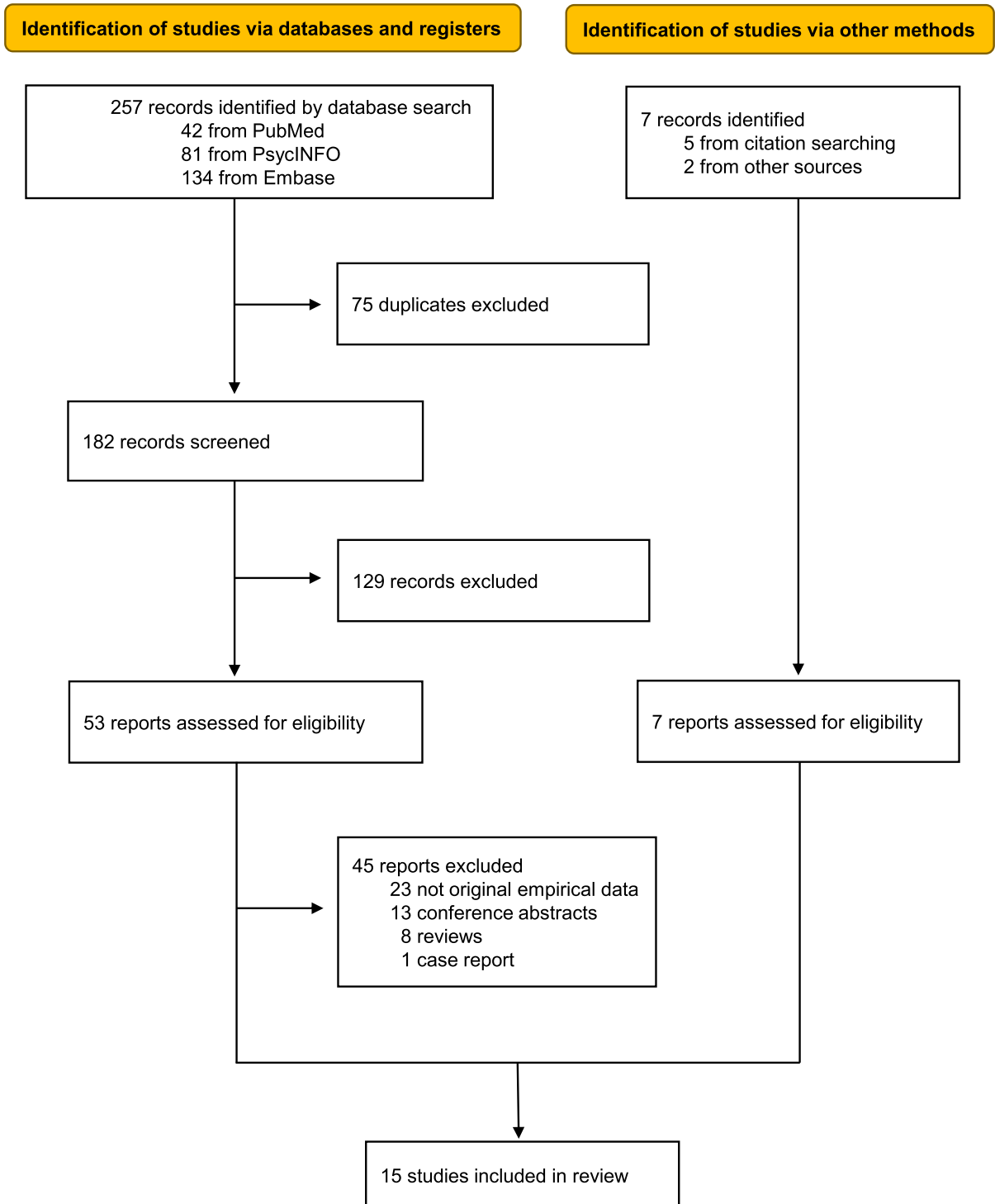


FIGURE 1. Flowchart of literature search. According to the “Preferred Reporting Items for Systematic Reviews and Meta-Analyses” statement¹⁹ (for more information, visit www.prisma-statement.org).

Hypotheses Linking Increased Sexually Transmitted Disease Frequency and Attention-Deficit/Hyperactivity Disorder

Although most of the studies we reviewed suggest a link between ADHD symptoms and an increased risk of

contracting STDs, only Chen et al²⁴ has developed a substantiated hypothesis concerning this link. Given the significantly higher frequency of STDs in patients with ADHD and the significantly lower risk of STDs when patients were taking psychostimulant drugs found in their

TABLE 1. STDs in ADHD in the 15 Selected Studies

Study	Study design	Participants	N (patients)	Age (y)	Sex	ADHD assessment	STD assessment	Results and main considerations
Akmatov et al (2021) ²⁰	BS	C-ADHD Controls	258,662	5-14 5-6: 6.5% 7-8: 17.2% 9-10: 26% 11-12: 26% 13-14: 24.3% Mean: 20.24	—	ICD-10	ICD-10	Late syphilis OR: 9.00, CI: 0.56-143.9 (ns) Chancroid OR: 9.00, CI: 0.56-143.9 (ns) Trichomoniasis OR: 9.00, CI: 0.56-143.9 (ns) Other predominant STD OR: 0.87, CI: 0.27-2.85 (ns)
Argenyi et al (2021) ²¹	BS	ADHD Controls	3541	Mean: 20.24	~30% males	Self-report	Self-report	STD point-prevalence: 3.38% vs 2.53% ($P < 0.05$)
Barkley et al (2006) ²²	BS	C-ADHD Controls	149	Mean: 21.1	91% males	CPRS WWPARS	Clinical assessment	STD lifetime prevalence: 17% vs 4% ($P = 0.006$)
Caye et al (2016) ²³	BS	C-ADHD Controls	393	11	63.9% males	SDQ Parent and self-report	Self-report	STD lifetime prevalence: 2.9% vs 2.6% (ns)
	BS	ADHD Controls	492	18-19	39% males	DSM-5	Self-report	STD lifetime prevalence: 5.3% vs 2.2% ($P < 0.001$)
Chen et al (2018) ²⁴	BS	ADHD-WC Controls	256	18-19	44.9% males	DSM-5	Self-report	STD lifetime prevalence: 4.7% vs 1.9% ($P = 0.004$)
	BS	ADHD Controls	17,898	12-38	80.4% males	ICD-9	Clinical assessment	STD incidence at follow-up between 2 y and 10 y: 1.2% vs 0.4% ($P < 0.001$) Adjusted* OR: 3.36, CI: 2.69-4.21 ($P < 0.001$) Age when developing STD during follow-up: 20.5 vs 21.9 ($P < 0.001$) ADHD medication reduces the risk of STD ($P < 0.001$) ADHD medication reduces the risk of STD in males ($P < 0.001$)
Chorniy and Kitashima (2016) ²⁵	BS	ADHD Controls	58,685	3-18	66% males	ICD-9 criteria	Clinical assessment	Age at first STD: 14.46 vs 16.02 ADHD medication reduces Risk of STD (3.6%) Health care costs for STDs by \$10.34/y
Chung et al (2019) ²⁶	BS	ADHD Controls	59,371	≥ 18	51% males	ICD-9 or ICD-10	Clinical assessment	STD period-prevalence in 9 y: 9.26% vs 4.33% ($P < 0.001$) Adjusted† OR: 1.289, CI: 1.25-1.33 ($P < 0.01$)
Flory et al (2006) ²⁷	BS	C-ADHD Controls	175	18-26	100% males	DSM-IV	Self-report	STD lifetime prevalence: 4% vs 1.8% ($P = 0.28$)
Huggins et al (2015) ²⁸	BS	ADHD Controls	44	Mean: 20.2	45% males	CAARS K-SADS	HSBQ	STD period-prevalence in 1 y: Male: 0% vs 0% (ns) Female: 0% vs 7.1% (ns)
Pandiyani et al (2021) ²⁹	BS	ADHD Controls	31	Mean: 34.4	100% females	ASRS WURS	Clinical assessment	STD point-prevalence: 45.1% vs 26.1% ($P = 0.03$)
Ramos Olazagasti et al (2013) ³⁰	BS	C-ADHD Controls	135	Mean: 41.4	100% males	DSM-IV	Self-report	STD incidence in 11-20 (mean 16.4) y: 15% vs 7% ($P = 0.03$)

Rao et al (2021) ³¹	WS	ADHD	9752	17	65.6% males	ICD-9 or ICD-10 Using >1 medication at 17 y	ICD-9 or ICD-10	STD point-prevalence: 1.9%
	—	—	4466	18	65.6% males	—	—	STD point-prevalence: 1%
	—	—	3061	19	65.2% males	—	—	Female 2% vs male 0.5% ($P < 0.001$) STD point-prevalence: 1.8%
	BS	AM-ADHD NAM- ADHD	1144 3322	18	—	ICD-9 or ICD-10 Using >1 medication at 17 y	ICD-9 or ICD-10	Female 4.2% vs male 0.5% ($P < 0.001$) STD point-prevalence: 1% vs 1% ($P = 0.860$)
	—	AM-ADHD NAM- ADHD	583 2478	19	—	—	—	STD point-prevalence: 1.5% vs 1.9% ($P = 0.609$)
	BS	MU- ADHD NMU- ADHD	1719 2747	18	—	ICD-9 or ICD-10 Using >1 medication at 17 y	ICD-9 or ICD-10	STD point-prevalence: 0.8% vs 1.3% ($P = 0.080$) In females only: $P < 0.007$ Adjusted‡ OR: Female: 0.39, CI: 0.19-0.83 (significant) Male: 1.15, CI: 0.41-3.26 (ns)
Rohacek et al (2022) ³²	—	MU- ADHD NMU- ADHD	1485 1576	19	—	—	—	STD point-prevalence: 1.6% vs 2% ($P = 0.465$) Adjusted‡ OR: Female: 0.70, CI: 0.37-1.28 (ns) Male: 1.57, CI: 0.44-5.57 (ns)
	BS	ADHD Controls	3232	Mean: 20.4	41% males	Self-report	Self-report	STD period-prevalence in 1 y: 4.5% vs 3.3% ($P = 0.005$) Predictors of STD among ADHD: Alcohol use × ADHD ($P = 0.003$) Binge drinking × ADHD ($P < 0.001$) Cannabis use × ADHD ($P < 0.001$)
Rokeach and Wiener (2018) ³³	BS	ADHD Controls	30	Mean: 15.7	60% males	DSM-IV-TR CPRS	HSBQ	STD lifetime prevalence: 0% vs 0% (ns)
Hosain et al (2012) ³⁴	WS	ADHD	462	Mean: 23.9	100% females	ASRS	SERBAS	Association between STD lifetime prevalence and ADHD symptom score: Adjusted§ OR: 1.03, CI: 0.94-1.13 (ns)

*Adjusted for demographics, comorbidities, and ADHD medication.

†Adjusted for demographics and comorbidities.

‡Adjusted for sex, race/ethnicity, and median census block-level household income.

§Adjusted for sociodemographics.

ADHD indicates attention-deficit/hyperactivity disorder; ADHD-WC, attention-deficit/hyperactivity disorder without comorbidities; AM-ADHD, adherent-to-medication attention-deficit/hyperactivity disorder; ASRS, Adult ADHD Self-Report Scale; BS, between-subjects; CAARS, Conners Adult ADHD Rating Scale; C-ADHD, childhood attention-deficit/hyperactivity disorder; CPRS, Conners Parent Rating Scale; DSM, *Diagnostic and Statistical Manual of Mental Disorders*; DSM-IV-TR, *Diagnostic and Statistical Manual of Mental Disorders*, fourth edition, text revision; HSBQ, Health and Sexual Behavior Questionnaire; ICD, International Classification of Diseases; K-SADS, Schedule for Affective Disorders and Schizophrenia for School-Age Children; MU-ADHD, medication-use attention-deficit/hyperactivity disorder; NAM-ADHD, nonadherent-to medication attention-deficit/hyperactivity disorder; NMU-ADHD, nonmedication-use attention-deficit/hyperactivity disorder; ns, nonsignificant; OR, odds ratio; SDQ, Strengths and Difficulties Questionnaire; SERBAS, Sexual Risk Behavior Assessment Schedule; STD, sexually transmitted disease; TR, text revision; WS, within-subjects; WURS, Wender Utah Rating Scale; WWPARS, Werry-Weiss-Peters Activity Rating Scale.

study, Chen et al²⁴ hypothesized that these differences are explained by impulsivity, as well as different executive dysfunctions such as inattention, and that psychostimulant drugs, by decreasing these symptoms, also decrease STDs. The authors based their hypothesis on studies showing that impulsivity and executive dysfunctions increase the risk of RSBs and contracting an STD in different populations, and on studies reporting that psychostimulant drugs decrease impulsivity and executive dysfunctions. In addition, they emphasized the role of psychiatric comorbidities, especially substance use disorders, which are common in ADHD. Indeed, these comorbidities were found to increase the susceptibility to having unprotected sex and using intravenous substances, which in turn increase the risk of contracting STDs.²⁴

The hypothesis by Chen et al²⁴ is partially in line with the hypothesis by Isaksson et al³⁸ about the impact of ADHD on RSBs in general, based on the hallmarks of ADHD (inattention, impulsivity, and hyperactivity) but also on substance use, other psychiatric comorbidities, and interpersonal factors. The primary distinction between these two theoretical frameworks is that Chen et al²⁴ give equal importance to impulsivity and executive dysfunctions, whereas Isaksson et al³⁸ in line with their own results, prioritize inattention and emphasize impulsivity less. Isaksson et al³⁸ suggest employing a multisystemic framework including the individual with ADHD (eg, behavior and attitude), the family system (eg, parent-child relationship), and the extrafamilial systems (eg, peer pressure). Concerning the association between inattention and RSBs, they suggest that difficulties organizing and planning behaviors, distractibility, and forgetfulness might impair the capacity to predict the consequences of sexual activities and increase the probability of engaging in RSBs.³⁸ In this sense, Spiegel and Pollak³⁹ recently showed that ADHD symptoms were correlated with a more positive perception of the benefits of RSBs, but not with a less negative perception of the risks of RSBs. This suggests that individuals with ADHD may perceive exaggerated benefits in engaging in RSBs. High levels of inattention in individuals with ADHD predict difficulties in dealing with intimacy and relationships, favoring a more pessimistic view of intimate relationships.⁴⁰ This prevents individuals with ADHD from maintaining stable relationships and raises the risk of having multiple sexual partners and other RSBs.^{34,40} With regard to the association between impulsivity/hyperactivity and RSBs, Isaksson et al³⁸ proposed that difficulty inhibiting impulses and the tendency to become involved in reward and sensation-seeking behaviors, associated with poor social skills and substance use, are also at the core of RSBs.

Implications for Attention-deficit/Hyperactivity Disorder Clinical Care

The results of this review lead us to recommend that psychiatrists who treat ADHD make their patients aware of the risk of STDs and that better adherence to medication is a protective factor for STDs. Besides the usual safe sex recommendations, and due to their increased risk of substance use, patients with ADHD should also be specifically made aware of the negative impacts of substance use on sexual safety. Practitioners who follow patients with ADHD and substance use disorders should warn their patients about the increased risk of STDs and the importance of treatment. Future studies should consider the influence of sex, age, nature of ADHD symptoms, as

well as psychiatric comorbidities, on the risk of STDs in patients with ADHD. Furthermore, the effectiveness of other treatments such as psychotherapy in preventing STDs in patients with ADHD should be carefully evaluated. Interventions aimed at reducing RSBs should include exploring the bias in the risk-benefit analysis of engaging in RSBs. Moreover, it would be important to explore the mechanisms involved in the individual perceptions of RSBs.

Limitations

An important limitation of this review concerns the heterogeneity in the assessments of ADHD and STDs, particularly the measures of STD frequency (incidence, point-prevalence, period-prevalence, lifetime prevalence), which prevents a proper meta-analysis. In addition, the study samples are heterogeneous in size and characteristics (eg, involving various ages and sex ratios), which may create a potential bias in the conclusions.

The scientific literature shows that the period of adolescence is characterized by increased impulsivity and a higher propensity for risk-taking behaviors compared with adulthood,^{41,42} which could result in a greater frequency of STDs in adolescents. Regarding this issue, another limitation of this review was that it was impossible to undertake a formal comparison between STD frequency in adolescent and adult populations with ADHD because the heterogeneity of the samples across reports precluded the extraction of relevant data for such a comparison.

CONCLUSION

This article presents the first systematic review of STDs among patients with ADHD. We show that individuals with ADHD are more at risk for STDs than those without ADHD. This higher risk is mainly associated with the symptoms of ADHD, but also with substance use disorders and other psychiatric comorbidities. Our results highlight the importance of increasing awareness among clinicians working in the field and the need for additional research to better understand which interventions could help patients with ADHD manage the risk of STDs.

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