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The issue of recreational use of sildenafil

Krystian Wdowiak^{1*}, Agnieszka Maciocha², Julia Wąż³, Aleksandra Witas¹,

Justyna Drogoń¹, Weronika Chachaj¹, Paulina Słomka¹, Edyta Gwóźdź²,

Dawid Konieczko³, Ewa Gardocka⁴

¹ Faculty of Medicine, Medical University of Lublin, Lublin, Aleje Raławickie 1, 20-059 Lublin, Poland

² Faculty of Dentistry, Medical University of Lublin, Lublin, Aleje Raławickie 1, 20-059 Lublin, Poland

³ Faculty of Medicine, Medical University of Silesia, Wrocław, wybrzeże Ludwika Pasteura 1, 50-367 Wrocław, Poland

⁴ Faculty of Dentistry, Medical University of Silesia, Wrocław, wybrzeże Ludwika Pasteura 1, 50-367 Wrocław, Poland

Krystian Wdowiak [KW]: krystianrrwdowiak@gmail.com; ORCID: <https://orcid.org/0000-0001-6579-3695>

Agnieszka Maciocha [AM]: maciochaaga8@gmail.com; ORCID: <https://orcid.org/0009-0008-3752-332X>

Julia Wąż [JW]: julia.waz02@gmail.com; ORCID: <https://orcid.org/0009-0000-2626-538X>

Aleksandra Witas [AW]: aksandra.w@gmail.com; ORCID: <https://orcid.org/0000-0002-4082-2653>

Justyna Drogoń [JD]: justyna123456789101112@gmail.com; ORCID: <https://orcid.org/0000-0002-3848-2186>

Weronika Chachaj [WC]: weronkachachaj9@o2.pl; ORCID: <https://orcid.org/0009-0005-6346-4878>

Paulina Słomka [PS]: paulina.slomka.10@gmail.com; ORCID: <https://orcid.org/0009-0004-7606-1982>

Edyta Gwóźdź [EGw]: edyta.gwozdz2000@gmail.com; ORCID: <https://orcid.org/0009-0007-2571-5466>

Dawid Konieczko [DK]: dpkkonieczko@gmail.com; ORCID: <https://orcid.org/0009-0002-3853-5847>

Ewa Gardocka [EGa]: e.gardocka04@gmail.com; ORCID: <https://orcid.org/0009-0005-2677-915X>

*Correspondence: krystianrrwdowiak@gmail.com

Summary

Introduction and purpose

Erectile dysfunction (ED) is defined as the inability to achieve and maintain an erection sufficient for satisfactory sexual intercourse. Sildenafil is one of the most popular medications used to treat ED, but in recent years, there has been a growing trend of recreational use of this drug, particularly among younger individuals, which can lead to numerous negative health consequences. The aim of this article is to provide an overview of the recreational use of sildenafil, especially among younger individuals.

State of knowledge

Sildenafil primarily affects the smooth muscle of the blood vessels in the corpora cavernosa, facilitating the achievement and maintenance of an erection. The most common side effects of sildenafil include headaches, dizziness, facial flushing, nausea, muscle pain, and nasal congestion. A relatively rare but potentially severe side effect of sildenafil is priapism. It is noted that those using sildenafil recreationally often have multiple sexual partners, as the drug helps them prolong sexual encounters. Studies show that sildenafil is used by groups that should have no problem achieving sexual satisfaction. The use of the drug in combination with alcohol and other substances is noticeable.

Conclusions

Recreational use of sildenafil appears to be an increasingly common behavior among young men who do not have difficulties achieving or maintaining an erection. There are no studies yet that specifically examine the recreational use of sildenafil among women. It is necessary to conduct further research to better understand the prevalence of this phenomenon and to identify the factors that predispose individuals to engage in recreational use of sildenafil.

Key words: sildenafil; viagra; recreational

Introduction

Erectile dysfunction (ED) is defined as the inability to achieve and maintain an erection sufficient for satisfactory sexual intercourse [1]. ED is a common condition, though its exact prevalence on a global scale is challenging to estimate. By the late 20th century, it was believed that approximately 150 million men worldwide suffered from ED, and this number was predicted to more than double by 2025 [2]. These estimates are likely conservative, as

many individuals with ED do not seek professional help [3]. The prevalence of ED varies with age, affecting at least 5% of men aged 18–39, 20–40% of men aged 40–59, and 44–70% of older adults, though these percentages vary significantly depending on the population studied [1,4]. Researchers agree, however, that the global prevalence of ED appears to be increasing over time [1,4,5].

Sildenafil is one of the most popular medications used to treat erectile dysfunction and is also used to treat pulmonary hypertension [6]. In recent years, there has been a growing trend of recreational use of this drug, particularly among younger individuals, which can lead to numerous negative health consequences [7].

Objective

The aim of this article is to provide an overview of the recreational use of sildenafil, especially among younger individuals.

Material and methods of research

A review of available studies on the PubMed platform (<https://pubmed.ncbi.nlm.nih.gov/>) was conducted. The search focused on articles with free full-text access using keywords such as "sildenafil," "Viagra," and "recreational," primarily regarding the recreational use of this drug. The focus was on publications from the last 10 years; however, in cases where a particular issue was not addressed in recent literature, older publications were referenced.

Discussion

Mechanism of Action, Indications for Use, and Availability of Sildenafil

Sildenafil is a selective inhibitor of phosphodiesterase type 5 (PDE5) [6,8]. Blocking PDE5 results in the accumulation of cGMP in cells, leading to increased protein kinase activity, which is responsible for phosphorylating various proteins in smooth muscle cells [6]. These processes cause a decrease in intracellular calcium concentration, the release of potassium ions, and the deactivation of myosin light chain kinase, ultimately resulting in the relaxation of smooth muscle cells [6]. Sildenafil primarily affects the smooth muscle of the blood vessels in the corpora cavernosa, facilitating the achievement and maintenance of an erection [6], and the smooth muscle of pulmonary vessels, leading to a reduction in pulmonary pressure [9].

Sildenafil has two FDA-approved indications: erectile dysfunction [10] and WHO Group I pulmonary hypertension [11]. It is also used off-label for secondary Raynaud phenomenon [12], female sexual arousal disorder [13], and altitude-induced hypoxemia [14].

The availability of sildenafil preparations varies by country. In some, it is available only by prescription, while in others it can be purchased over-the-counter [7,15]. Researchers note the relatively easy access to the drug, even in countries where it is prescription-only, due to lenient enforcement of regulations on illegal sales and numerous websites issuing online prescriptions [7].

Adverse Effects

The most common side effects of sildenafil include headaches, dizziness, facial flushing, nausea, muscle pain, and nasal congestion [16]. These adverse effects occur in a few percent of users, with their frequency correlating with the dose of the drug [16].

In some individuals, sildenafil can cause (usually reversible) changes in color vision [17] and hearing loss, which may sometimes be irreversible [18].

Certain studies suggest that recurrent nosebleeds may be linked to chronic sildenafil use [6,19], particularly when taken alongside anticoagulants, especially vitamin K antagonists. The impact of sildenafil on gastrointestinal bleeding risk in anticoagulated patients has not yet been fully evaluated [6]. Due to its systemic vasodilatory effects, sildenafil can interact dangerously with hypotensive drugs, especially nitrates [6,7,20]. This combination can lead to serious cardiovascular complications, such as aortic dissection [7,20].

Sildenafil is primarily metabolized by CYP3A4, and caution should be exercised regarding potential interactions with inhibitors and inducers of this enzyme [21]. CYP3A4 inhibitors, such as ritonavir, can dangerously increase sildenafil concentrations in the blood, leading to a higher risk of adverse effects [6]. Conversely, CYP3A4 inducers can reduce sildenafil's effectiveness, which is particularly concerning when used for pulmonary hypertension [22].

A relatively rare but potentially severe side effect of sildenafil is priapism, a prolonged, painful erection lasting more than four hours [6,7]. The risk of priapism increases in individuals with penile anatomical deformities or certain conditions such as sickle cell anemia [6]. Delayed treatment of priapism can result in ischemia, potentially leading to penile amputation [23].

There is also a risk of psychological dependence on sildenafil [7]. Frequent recreational use can undermine confidence in the ability to achieve satisfactory erections without the drug, creating a cycle of reliance on continued use [24].

Recreational Use of Sildenafil Among Young Men

A study by Delate et al. reported a dynamic increase in sildenafil interest among men aged 18–45, a group not typically affected by erectile dysfunction [20]. In a study by Bechara et al. [25], involving around 300 young men, nearly one in five reported using sildenafil recreationally, often in combination with alcohol or other substances. Similar results were found by the research team led by Makwana [25]. Harte et al. [25] conducted a survey of over 2,700 U.S. students, with 5% of respondents reporting sildenafil use (or similar drugs) at least once, and $\frac{3}{4}$ of this group used it recreationally. Atsbeha et al. conducted a study characterizing individuals purchasing sildenafil in local pharmacies, observing that most customers were young, and two-thirds of the purchases were for recreational purposes. However, this study had limitations, primarily a small sample size of only 65 participants and a narrow geographical scope [7].

Many researchers [7,25] noted that those using sildenafil recreationally often have multiple sexual partners, as the drug helps them prolong sexual encounters, making them appear more attractive. The potential for longer sexual performance may appeal to young men without erectile dysfunction, which might explain the drug's recreational use [25,26]. However, a study by Mondaini et al. [27] found no differences in erection quality between healthy young men who took sildenafil or a placebo. A limitation of this study was its small sample size (60 participants) and the use of only a single dose of sildenafil (25 mg). This suggests a need for further research to better understand sildenafil's effects on sexual function in young men without erectile dysfunction.

Prospects for Sildenafil Use in Women

Research on the effects of sildenafil on female sexual function has been ongoing for years [28]. The drug's potential positive impact on female sexual function may be due to its inhibition of PDE5, leading to greater clitoral and labial engorgement and increased vaginal lubrication during sexual arousal [28-30]. However, study results have been inconsistent [29].

Berman et al. [31] conducted a study involving 202 postmenopausal women with sexual arousal disorder, finding that sildenafil positively impacted their sexual function, provided they did not suffer from sexual desire disorders. The study's strength lies in its inclusion of various sildenafil dosages, though a limitation was its focus on older women.

Studies by Caruso et al. [32] and Nurnberg et al. [33] examined sildenafil's effects on sexual function in women with arousal disorders caused by diabetes and antidepressant use,

respectively. Both studies found a beneficial effect of sildenafil compared to placebo, though both had small sample sizes (36 and 49 participants, respectively).

In contrast, Basson et al. [29] conducted a study involving 577 premenopausal women and 204 postmenopausal women diagnosed with sexual arousal disorder, finding no differences in sexual function between those receiving placebo and sildenafil. However, the authors suggested that sildenafil may improve sexual function in women with specific underlying causes of arousal disorders, aligning with previous studies [29]. It's worth noting that in the Basson study, only about half of the participants' primary sexual dysfunction was arousal-related, which may have influenced the results.

The side effects of sildenafil in women appear to be similar to those in men [28-33].

Conclusions

Recreational use of sildenafil appears to be an increasingly common behavior among young men who do not have difficulties achieving or maintaining an erection [7]. While the use of the drug is generally considered safe [6], due to its potential interactions with numerous substances, it may lead to serious complications [24,34]. The potential negative consequences of using sildenafil could be mitigated through better public education about the drug. Many researchers also suggest [7] that the distribution of this drug should be more strictly regulated. The prevalence of recreational sildenafil use among young men remains relatively under-researched, and the studies conducted so far have several limitations. There are no studies yet that specifically examine the recreational use of sildenafil among women. However, given the potential sexual benefits that could be associated with its use, it is reasonable to assume that such behavior may not be uncommon. Therefore, it is necessary to conduct further research to better understand the prevalence of this phenomenon among both men and women and to identify the factors that predispose individuals to engage in recreational use of sildenafil.

Author's contribution:

Conceptualization: K.W., A.M.; methodology: K.W., A.M.; software: K.W., A.M., J.W., A.W.; formal analysis: K.W., A.M., J.W., A.W.; investigation: K.W., A.M., J.W., A.W., J.D., W.C.; resources: K.W., A.M., J.W., A.W., P.S., E.Gw.; data curation: K.W., A.M., J.W., A.W., D.K., E.Ga. ; writing - rough preparation: K.W., A.M., J.W., A.W., J.D., W.C., P.S., E.Gw., D.K., E.Ga.; writing - review and editing: K.W., A.M., J.W., A.W., J.D., W.C., P.S., E.Gw., D.K., E.Ga.; visualization:K.W., A.M., A.W.; supervision: K.W., A.M.; project

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