

A systematic review of intravenous drug use related infections among adolescents.

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Abstract

Background: The claim that the use of intravenous medicines is what causes infections, on the other hand, has generated debate throughout the years. For instance, it is highlighted that failing to clean the skin prior to an injection or injecting microorganisms from used or filthy needles might result in various forms of infections [1, 2]. In particular, cellulitis is the most typical infection that drug users get [3]. In addition, soft tissue infections brought on by contaminated needles used for intravenous injection or subcutaneous/intramuscular injection can present as a variety of illnesses with varying degrees of severity, such as cellulitis, abscesses, myositis, and necrotizing fasciitis [4].

Aim: This study is aimed at conducting a systematic review to find out the infections that are traceable to the use of intravenous drugs among adolescents.

Design: systematic review

Data Sources: Systematic search for worldwide published literature from databases like google scholar, Emerald, Elsevier, PubMed, and Science-Direct

Result: 1500 papers were found, 800 were removed because of duplicate data, 500 papers were further removed because they required payment to access them. Furthermore, 150 papers were disregarded due to inaccurate information, and 200 publications were disregarded because they are not necessarily for this research. 50 papers were further removed because of shallow information. Finally, 10 (ten) papers were ultimately included in this research.

Conclusion: The data indicates that adolescents around the world continue to use intravenous drugs at significant rates. The results of this study also confirm that intravenous drugs propagate HIV, other types of hepatitis, osteomyelitis, and endocarditis, and they also pose a risk for those diseases.

Keywords: Infections, intravenous drug use, intravenous injections, Adolescents.

Introduction

Infection prevention measures have been required due to the development of numerous illnesses over the years. Basically, when microorganisms gain entry to a person's body and are able to cause ongoing damage, it implies that an infection has developed [5, 6]. Notably, when an organism gains entrance to a person's body, it is capacitated to feed on that person's tissues for nutrition and colonise that person's body by breeding more organisms of its sort in the person's body [7].

These pathogenic microorganisms, which can multiply quickly once they enter a person's body, are frequently called pathogens. The fungus, bacteria, viruses, nematodes, and parasites are notable examples of these pathogens [8]. These pathogens can

spread the infectious diseases that they most commonly cause. Thus, infections brought on by microorganisms are frequently transmitted from person to person over time [9]; other infections are spread by insects or other animals; and one can acquire additional infections by consuming tainted food or water or by being exposed to organisms in the environment [10, 11].

There are various kinds of infections, according to numerous authors. Bacteria, viruses, fungus, and parasite infections are a few of these infections [12-14]. According to Abd-El-Hack et al. (2020), a bacterial infection happens when bacteria enter the body, multiply, and trigger a reaction in the body [15]. In contrast, viral infections are diseases brought on by microscopic organisms (viruses) that exploit the host's cells to reproduce [16].

Because of this, viral infections frequently result in respiratory and digestive disorders, while viruses can also infect the majority of other body systems [17]. Parasites are creatures that depend on other species, or hosts, to survive, whereas fungal infections happen when one type of fungal microbe gets overabundant in one area of the body and the immune system is unable to fight it off [18, 19].

The factors that lead to various infections have been the subject of a variety of theories. For instance, while some authors assert that one can contract parasites from tainted food or water, a bug bite, or sexual contact [20], other authors also believed that bodily fluids, ingestion, inhalation, and biting are all potential sources of viral infections [21]. Other authors claimed that environmental changes like construction and the introduction of new fungi to an environment are what causes fungal infections, including weakened immune systems, travel to areas where fungi are abundant, and outbreaks of fungi as a result of these changes [22]. Additionally, according to other authors bacterial infections happen when germs enter the body, multiply, and trigger a reaction [15].

The claim that the use of intravenous medicines is what causes infections, on the other hand, has generated debate throughout the years. For instance, it is highlighted that failing to clean the skin prior to an injection or injecting microorganisms from used or filthy needles might result in various forms of infections [1, 2]. In particular, cellulitis is the most typical infection that drug users get [3]. In addition, soft tissue infections brought on by contaminated needles used for intravenous injection or subcutaneous/intramuscular injection can present as a variety of illnesses with varying degrees of severity, such as cellulitis, abscesses, myositis, and necrotizing fasciitis [4]. The use of intravenous medications is confirmed to be a major factor in the causes of infections worldwide as a consequence of the information presented above.

In order to learn more about the infections that can be linked to the use of intravenous drugs by teenagers, this research set out to perform a systematic review on this basis. In this study, the debate over whether intravenous drug use, particularly in adolescents, leads to infections will be further explored. In order to accomplish its goal, the research will filter articles from various databases, including Google Scholar, Elsevier, ScienceDirect, and Emerald, to discover high-quality publications that will enable its author to answer the questions the study is trying to address. In addition, further subcategories will carry out the Quality Assessment The standard of the articles that will be included in this study will be determined using the CASP checklist. Furthermore, subsequent chapters from the ten (10) papers that were taken into account in this study will also explore how intravenous drugs contribute to infections among teenagers, and suggestions for additional research will be provided.

Aim of the study

This study is aimed at conducting a systematic review to find out the infections that are traceable to the use of intravenous drugs among adolescents.

Methods

Literature searches.

The number of published articles used in this study was ten (10) as can be seen in Figure 1. The selection process for these publications from the collection of published literature on the topic of intravenous psychoactive drugs was also described in Figure 1, which provided further details. Figure 1 also included details of all the papers that were not chosen, as well as a list of additional justifications for not choosing those papers.

This study developed search phrases to assist the researcher in locating high-quality sources for the investigation. The key terms "Infections and intravenous medications" and "Types of infections traceable to intravenous injections" were among those utilised in the search strategy to find papers for this study.

When the aforementioned search terms were utilised on various databases, including Elsevier, Google Scholar, Emerald, PubMed, and ScienceDirect, in order to find high-quality publications for this study, 1500 results were returned. Out of the first 1500 publications discovered, 800 were eliminated because of duplicated data and the fact that some of the articles were not peer reviewed. It was necessary to pay for some publications that dealt with the use of intravenous drugs and infection. As a result, out of the 700 publications that were left, 500 published articles were further disregarded because the author of this research had to pay for the articles in order to access them from the original databases. As a result, only 200 of the publications that were discovered are freely accessible and helpful for the systematic review procedure for this research, according to the previous.

150 papers out of the 200 were eliminated because they contained information that appeared to be inaccurate. Since they were not appropriate for the current study, 30 more publications were deleted. Continued removal of 10 articles was done so because they appeared to include information that was shallow and lacked the data strength necessary to answer the study's research goals.

The author of this study conducted a very thorough search and rigorous screening, and after all unnecessary articles were eliminated, 10 (ten) publications were taken into consideration and included in this study. All the aforementioned is done to ensure that the papers are of a high caliber and address the study's goals.

Notably, when looking for them using the search terms recommended in this study, great effort was taken to make sure the papers discovered fulfilled the inclusion criteria for this analysis. Before anything else, the researcher made sure that every article selected for this study addressed subjects like "Infections and intravenous drugs" and "Types of infections traceable to intravenous injections" among adolescents. All of the articles used were peer-reviewed works, the researcher also made sure of that. All the publications were published in English because that language is the official one of the researcher's institutions, so the authors made sure of that. As part of the inclusion criteria for these studies, publications that only recently (within the last 10 years) contained quantitative and qualitative analysis and study are also considered (2013-2023).

Quality Assessment

The quality of the published articles used in this research was assessed using eight quality criteria. The first two of these eight quality requirements are: (1) Reliable, repeatable case definition; and (2) Appropriate sampling method (e.g., random, cluster) (3) The target population must be identified; (4) Confidence intervals or standard errors must be disclosed; (5) The measurement method must be adequate; and (6) Efforts must be made to reduce observer bias. The study statistics are adequate for both the sample size (>300 individual intravenous drug users) and response rate (>66%). The researcher highlighted that the search terms for this study were "prevalence of intravenous psychoactive drug use among adolescents," "causes of adolescents' use of intravenous psychoactive drugs," and "effect of intravenous psychoactive drug use on adolescents." Each study categorized these factors as categorical or continuous. The 10 (ten) included papers were subjected to the CASP checklist after the quality evaluation, and scores were assigned based on the studies' overall scores, which varied from 1 to 8 (see the Appendix). There are three options for the CASP checklist's responses: "Yes," "neither yes nor no," and "0." The checklist was very helpful in directing the researcher to pick only the greatest articles from the best sources. The information gleaned and used from the studies is of high quality, valid, and reliability, which in turn facilitates the researcher's quest to archive the research goals and objectives at the same time, according to the CASP's quality score of 91% when it was used to evaluate the quality of the articles included in this study.

Data Synthesis

In this study, a technique for synthesizing qualitative data was employed. A study of aggregated data was not possible due to the important outcome measures' significant variability. When analysing the study's results, the sample size, volume of data, bias risk, and level of heterogeneity/homogeneity were taken into account. If there were two primary studies, the following preference criteria were taken into consideration:

- Access to qualitative information or findings
- Maximum SIGN rating (A quality assessment tool for systematic reviews)
- more recent publication date
- Additional research and observations

In certain cases, the post-study analysis was made public in extra articles. In these cases, both papers served as the researcher's guidelines for data extraction.

Results

The search phrases were used on databases like ScienceDirect, PubMed, Google Scholar, Emerald, and Elsevier, and they turned up about 1500 papers. Due to duplicate data and other concerns, including the articles' lack of peer review, 800 publications out of 1500 had to be removed. 500 of the remaining 700 articles were deleted and excommunicated because they were unavailable for free access from the original databases utilised for the searches on intravenous psychoactive use among teenagers. Furthermore, 150 papers were disregarded due to inaccurate information, and 200 publications were disregarded since they were not pertinent to the current study. Due to the requirement for deeper and more

data to satisfy the study's research objectives, 50 publications from the previously gathered list were disregarded. Ten (eleven) papers were ultimately included in this review after a thorough search and screening to ensure the study's goals and objectives were not compromised.



Figure 1: The PRISMA Flow diagram for the study (Source: authors computation, 2023).

Discussion

The ten (10) publications that were taken into account in this study were discussed from every viewpoint in order to find solutions for illnesses linked to teenagers' use of intravenous injection. A comprehensive analysis of the use and the types of infections linked to intravenous injection use among teenagers, also collected from the included studies in a method that addresses the research objectives, was conducted to provide an answer to the study's goal. It's crucial to keep in mind that outside publications assist the debate in order to achieve the purpose of critical analysis and to prevent biases of any assertions made in these articles.

The main focus of this study's topic will be the types of infections that teenagers who use intravenous injection are said to be susceptible to. The human immune virus, hepatitis, osteomyelitis, and endocarditis will be the infections to which this research's discussion will be directed out of the 10 (ten) publications that make up this study. The reasons for the previous statement are that these disorders were covered in the included articles.

Intravenous drugs and Human immunodeficiency virus

One of the illnesses that has been the subject of the greatest research is HIV. The terrifying Human immunodeficiency Virus has so been the subject of a number of documented facts. For instance, it is widely acknowledged that the HIV virus targets and negatively affects the immune system [23, 24]. The human immunodeficiency virus, or HIV, which is also known as CD4 cells, assaults immune cells [25]. Because it affects the immune

system, additional illnesses and disorders are more likely to occur and have a more negative effect. Sadly, without medical attention, the infection may worsen and reach stage 3 HIV, or AIDS [26].

The risk and reasons why HIV are so common have been discussed by a number of authors over time. For instance, according to some writers, intercourse with an HIV-positive individual who is acutely infected can increase the risk of transmission by up to 2% (or once every 50 exposures) [27]. For responsive anal sex, over 20% (corresponding to one transmission every five exposures) and receptive vaginal intercourse, respectively [27]. On the other hand, there is little comprehensive study on the usage of intravenous medications. The purpose of this study is to determine whether intravenous drug usage can contribute to adolescents developing HIV. Little or no information exists regarding whether or not using intravenous drugs causes or predisposes one to HIV.

Using the 10 (ten) publications that were the focus of this study as a starting point. The author's work was included in the study of Degenhardt et al. (2017) on "Global Prevalence of Injecting Drug Use and Sociodemographic Characteristics and Prevalence of HIV, HBV, and HCV in People Who Inject Drugs [28]". Peer-reviewed databases were thoroughly searched by the authors during the investigation. The authors claimed that intravenous drug usage had increased by 31 countries and was now documented in 179 of the 206 countries or territories, accounting for 99% of those between the ages of 15 and 64 (mostly in sub-Saharan Africa and the Pacific Islands). According to the authors, 33.0% (24.3%–42.0%) of PWID mostly inject stimulants, while 82.9% (76.6–88.9) of PWID primarily inject opioids. Furthermore, according to the authors, 57.9% (50.5%–65.2%) of PWID had a history of incarceration, 21.7% (15.8–27.9) had recently experienced homelessness, and 27.9% (20.9%–36.8%) of PWID worldwide were younger than 25.

Additionally, Choopanya et al. (2013), who do study on "Antiretroviral prophylaxis for HIV infection in injecting drug users in Bangkok, Thailand" (the Bangkok Tenofovir Study) [29]. From 17 drug rehab centres in Bangkok, Thailand, the authors recruited volunteers for the study. Aged 20 to 60, HIV-negative, and admitting to taking drugs the year prior, participants had to meet the eligibility requirements. 2413 subjects were enrolled between June 9, 2005, and July 22, 2010, with 1204 receiving the drug tenofovir and 1209 receiving a placebo, according to the author's claims. At the time of enrollment, two participants had HIV, and 50 others contracted it.

Sharing needles, syringes, or other injecting equipment puts persons at a significant risk of contracting or spreading HIV and other illnesses, to name a few [30]. Approximately one in ten HIV diagnoses are given to drug users who inject [31]. Because of the aforementioned, sterile syringe programmes (SSPs) can help PWID stay healthy by facilitating access to syringes, which can help avoid HIV and other health issues. These programmes can also offer a whole range of services, including assistance in reducing substance abuse, HIV testing and referrals to hepatitis B, hepatitis C, and hepatitis B treatment, information on how to deal with an overdose, and other preventive services.

Intravenous drugs and Hepatitis

Inflammation of the liver is generally referred to as hepatitis [32]. Inflammation of the liver can be brought on by a variety of viruses (viral hepatitis), substances, drugs, alcohol, some genetic abnormalities, or an overactive immune system that unintentionally assaults the liver (autoimmune hepatitis) [33]. Hepatitis A, B, C, D, and E are the principal agents of the five viruses that result in the various types of viral hepatitis.

The prevalence of HBV infection is about one-third of the global population [34]. In this community, about 5% of people are chronic carriers, and 25% of these carriers go on to acquire significant liver conditions like chronic hepatitis, cirrhosis, and hepatocellular carcinoma [35, 36]. The question of what predisposes people to hepatitis has been explored by certain authors, and many authors have expressed their varied perspectives. Poor hygienic conditions; residing in a home with an infectious individual, for example, were suggested by several authors [37, 38]. One of the risk factors for hepatitis, according to other scientists, is having a sexual relationship with someone who has an acute hepatitis A infection [39, 40].

Taking a look at the 10 (ten) articles that were part of the research by Degenhardt et al. (2016) reveals that the authors' study, "Estimating the burden of illness attributable to injecting drug use as a risk factor for HIV, hepatitis C, and hepatitis B," focused on this topic [41]. In their study, the authors modeled the burden of HIV, HBV, and HCV (including the burden of cirrhosis and liver cancer), at the national, regional, and international levels. The authors used a cohort method that recalibrated each individual intravenous drug user's history of intravenous drug use as well as the cumulative risk of HBV and HCV due to intravenous drug use to estimate the contribution of injecting drug use (Intravenous drug use) to HBV and HCV disease burden. The authors asserted that an estimated 1008 million DALYs in 2013 were linked to prior intravenous drug use-related exposure to HIV, HBV, and HCV, a four-fold increase since 1990. In 2013, it was estimated that intravenous drug use contributed to 41% (7.05 million, 588 million to 815 million) of DALYs due to HCV, 11% (216 000, 101 000–338 000), and 391% (5.88 million to 8.15 million) of DALYs owing to HBV. Whatever the case, intravenous drug use significantly increases the burden of disease on a global scale. Effective preventative and therapeutic measures are so necessary. These significant health burden factors need to be ramped up.

Furthermore, Page et al. (2013) published their study "Injection Drug Use with Hepatitis C Virus Infection in Young Adult Injectors [42]. Utilizing Evidence to Inform Comprehensive Prevention, the authors approached their research. The results of this study showed that the hepatitis C virus (HCV) viral epidemic is still running strong in the United States and around the world, and the incidence rates are still very high, especially among young adults who use injection drugs. The authors further argued that recent HCV outbreaks in young adults in primarily suburban and rural parts of the United States have appeared and may be contributing to a rise in HCV.

Intravenous drugs and osteomyelitis.

An infection of the bone is called osteomyelitis [43]. Evidently, infections can move from adjacent tissue or travel through the circulation to a bone [44]. Additionally, if a wound makes the bone susceptible to bacteria, infections can start in the bone itself [45].

In their study titled "Burkholderia cepacia complex, Cervical Osteomyelitis in an Intravenous Drug User," Li and Messer (2018) [46]. The researchers used a case study to approach their research, and they concluded that while Gram-negative vertebral osteomyelitis infections are on the rise as a result of increased intravenous drug use, they nonetheless remain relatively uncommon. The authors of the study also include a cervical osteomyelitis caused by Burkholderia cepacia complex in a user of intravenous drugs. A 68-year-old man with neck pain from a minor trauma presented to the emergency room in the case study that the research's authors employed. The patient approved of actively using methamphetamine and heroin intravenously. The cervical spine was imaged using CT and MRI, and the C5-C6 vertebral bodies showed degenerative alterations that were consistent with osteomyelitis. The patient also has Burkholderia cepacia complex. According to these authors' findings, Burkholderia cepacia complex should be taken into account as one of the pathogenic causes of pyogenic vertebral osteomyelitis, especially in individuals who utilize intravenous drugs.

Additionally, the author of Schmitt (2017) studied osteomyelitis for his research project [47]. The research found that in people who use injectable medicines, two major routes—hematogenous and inoculation—by which organisms can seed the bones can occur. Due to the variety of vascular locations that injection drug users have access to, inoculation osteomyelitis may involve less typical sites of infection. These include the pubic symphysis, the clavicle and sternoclavicular joints, and others. Notably, the osteomyelitis treatment in this clinical environment follows the guidelines for other groups. In these individuals, the location of care and the method of medicine delivery should be carefully evaluated. In conclusion, those who use injection drugs run a higher chance of contracting M-tuberculosis, which can infect bone, particularly in the thoracic spine.

Morso, in the study "Infectious Diseases and Injection Drug Use: Public Health Burden and Response" by Levitt et al. (2020) [48]. In order to decrease IUD-associated infections, the authors focused on preventing the initiation of IDU, integrating treatment for IDU-associated infections with MOUD to assist PWID stop injecting, implementing preventive measures like vaccination and prophylaxis for IDU-associated bacterial infections, connecting PWIDs to social services that address underlying factors that lead to or perpetuate drug use, and promoting safer injection techniques, including the provision of steroid injection devices. According to the research, a new approach to the public health crisis brought on by opioid and other IDU use as well as the associated infectious diseases must concentrate on all facets of disease prevention and control, while also enhancing disease surveillance and ensuring access to integrated treatment and care. Furthermore, in order to mobilize the science, resources, and resolve needed to address the challenges ahead, the public health and healthcare communities may work together.

Intravenous drugs and endocarditis

An infection of the inner lining of the heart's chambers and valves known as endocarditis can be fatal [49]. The most common cause of endocarditis is an infection brought on by bacteria, fungus, or other organisms that attack and harm heart tissue as soon as they enter the bloodstream. Artificial heart valves, damaged heart valves, and other cardiac problems, including utilizing intravenous medications, increase your risk of developing endocarditis [50].

According to Straw et al. (2019), even after surgery, long-term outcomes are poor in intravenous drug users who have infectious endocarditis [51]. The authors used a prospectively acquired database to identify the PWID treated for IE between 1 January 2006 and 31 December 2016. Patients with predisposed IVDU had a dismal prognosis following an incident of IE. Surgery can treat hemodynamic and embolic problems, but this difficult patient population requires a more comprehensive treatment. Additionally, PWID-IE had poor long-term outcomes after that. According to Straw et al. (2019), there was a 21% mortality rate in a group of 280 PWID-IE patients over an undetermined duration of follow-up. The 2- and 5-year survival rates were found to be 79% and 59%, respectively, in a cohort of 29 PWID who underwent surgery for IE. Wolchok et al. (2021) reported that 13 (45%) patients died during a median follow-up period of 22 (0-84) months [52]. In the PWID group, survival was likewise reported by Dahlman et al. (2018) to be 91%, 78%, 47%, and 41% at 30 days, 1 year, 5 years, and 10 years, respectively [53]. Straw et al. (2019) found that all 5 PWID who underwent heart surgery had passed away after 3.3 years when comparing PWID patients with non-PWID patients.

Also, Rudasill et al. (2019) in their study "Clinical Outcomes of Infective Endocarditis in Injection Drug Users" [54]. The National Readmissions Database (NRD) was examined by the researchers for IE instances between January 2010 and September 2015 as part of the study. According to this study's findings, there were 27,432 (22.2%) IDU-IE cases and 96,344 (77.8%) non-IDU-IE cases in the survey-weighted sample. According to the samples, the percentage of IE patients with IDUs rose from 15.3% to 29.1% between 2010 and 2015. IDU-IE was not linked with a reduction in 30-day readmission (23.8% vs. 22.9%) but was associated with a lower death rate (6.8% vs. 9.6%) at the index hospitalization. IDU-IE patients under medical management had longer LOS. In addition, there was a rise in the use of intravenous drug misuse (4.3% vs. 0.7%) that was associated with an increase in readmissions for endocarditis (18.1% vs. 5.6%).

Additionally, in the study conducted by Colville et al. in 2015 under the title "Infective endocarditis in intravenous drug users: a review article" [55]. The use of intravenous drugs is the single biggest risk factor for right-sided IE, according to the authors, who claimed that there has been a noticeable shift in these risk variables over the past few decades. The authors also stated that due to the variety of presentations and the existence of comorbidities that decrease the host's immune response, clinicians must maintain a high clinical suspicion in the diagnosis of IE in IVDUs. As a result, IE should be seen as a spectrum of ailments whose symptoms and treatment options depend on a variety of

variables, from the physical location and type of the involved valve to the behavioural and social characteristics of the patient, which are crucial in the management of intravenous drug abuse.

Conclusion/Recommendation

In order to learn more about the infections that can be linked to teenagers' use of intravenous drugs, this study set out to perform a systematic review. In order to reach its goal, the research culled publications from a variety of databases, including Google Scholar, Elsevier, ScienceDirect, and Emerald, to discover high caliber works that would aid the study's author in answering the questions it set out to investigate.

The data indicates that adolescents around the world continue to use intravenous drugs at significant rates. The results of this study also confirm that intravenous drugs propagate HIV, other types of hepatitis, osteomyelitis, and endocarditis, and they also pose a risk for those diseases. As only databases, such as Elsevier, Google Scholar, Emerald, PubMed, and Science-Direct, were utilised in this investigation, only those databases may be used in future studies. We should learn more about intravenous psychoactive drug use among teenagers in future studies by taking into account databases that were not used in this one. Additionally, the author only took into account research that was published in the recent 10 years, published in English, and qualitative in nature (2013-2023). Future studies should broaden their reach to examine subjects that the inclusion criteria for this one barred them from doing [57].

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