The Effect of Drug Users on Periodontal Health : Literature Review

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ABSTRACT

Background: *Drug trafficking in the world affects the country and spread to all levels of Indonesian society. Methamphetamine, marijuana, and heroin are the most commonly abused drugs. Drugs cause a lot of bad effects, including the oral cavity. Results of Health Research on the Impact of Drug Abusein 2019, as many as 64.1% of them experienced dental problems and 60.1% of oral cavity disorders. The risk of periodontal disease in drug users is higher than non-users. To determine the effect of the use of methamphetamine, marijuana, and heroin and the most influential drug users on thehealth of periodontal tissues.*
Methods: *Using secondary data obtained through several e-databases, that are Pubmed Central (PMC), SpringerLink, and ResearchGate based on keywords and a predetermined time span.*
Result: *Periodontal disease in drug users is related to xerostomia, oral hygiene, and immunosuppression. The high accumulation of calculus and plaque in drug users due to their low awareness of maintaining oral health and impaired motor function that makes it difficult for aperson to clean his oral cavity, this is indicated by the loss of clinical attachment. Comparison of Bleeding on Probing (BOP) and Clinical Attachment Loss (CAL) values were used as the main variablesto show the parameters of periodontal tissue inflammation in each type of drug (methamphetamine, marijuana, and heroin).*
Conclusion: *There was an effect of methamphetamine, marijuana, and heroin on the health of periodontal tissues including gingivitis and periodontitis. The heroin used by intravenous injection had the most effect on periodontal tissue health compared to methamphetamine and marijuana.*

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INTRODUCTION

Drugs use is an abbreviation of narcotics and drugs, lately its development andtrafficking is very worrying. Drug trafficking in the world affects the country and spread to all levels of Indonesian society.[1] Drugs are chemical substances that can change a person's psychological state such as feelings, thoughts, moods and behavior when they enter the body. This substance can be used orally by ingestion directly, inhaled, intravenous injection, anal insertion, and placed on the wound.[2]

Data published by the United Nations Office on Drug and Crime (UNODC) is noted in 2018 around 269 million people in the worldused drugs.[3] Methamphetamine, marijuana, and heroin are the most widely abused types of drugs in Indonesia. In 2019, BNN succeeded in uncovering cases of drug abuse with a number of evidence of 17.9 tons methamphetamine, followed by 0.017 tons marijuana and 0.023 tons of heroin.[4] The three types of drugs are class 1 narcotics which have a very high potential to cause dependence. Methamphetamine is a stimulant drug that hasa high addictive effect.[5] Heroin is a type of depressant drug substance and has a strong riskof addiction.[6] Marijuana is a dried cannabis sativa plant and psychoactive substances or have adverse effects on the central nervoussystem.[7]

Based on the results of the Health Research on the Impact of Drug Abuse in 2019, 64.1% of them experienced dental problems and 60.1% of oral cavity disorders.[4] Supported by research conducted by Ye et al., stated that drug users can cause dental and oral health problems directly or indirectly, such as dental caries, mucosal infection, and periodontal disease. Several studies have shown that drug users have a higher risk of periodontal disease than those who do not use drugs.[8,7] According to 2016 data from The Global Burden of Disease Study, periodontal disease is the 11th most common disease in the world.[9] Percentage of periodontal disease cases in 2018 in Indonesia was 74.1%.[10]

Along with the high rate of drug abuse, the prevalence of dental and oral disease will be increased, so that it can reduce the quality of oral health, one of which is periodontal health. So the authors are interested in conducting a literature review type of research with the aim of knowing the effect of drugs including methamphetamine, marijuana, and heroin and which ones have the most effect on periodontal health.

LITERATURE REVIEW

Methamphetamine

Another term for shabu namely methamphetamine, is a type of stimulant drug that is highly addictive and can affect the level of neurotransmitters such as noradrenaline, serotonin and dopamine in the central nervous system. Methamphetamine can release greater amounts of dopamine than other stimulants, such as amphetamines and cocaine. As a result, methamphetamine has a strong psychological effect that can last about 12-15 hours.[11] Methamphetamine has a strong potential to cause addiction if a person stops consuming shabu suddenly, withdrawal symptoms will appear or often known as withdrawal.[12]

Marijuana

Marijuana is a cannabis sativa plant that is processed by drying the leaves, stems, seeds and flowers which contain a lot of resin. Another term for marijuana is known as cannabis herb, or weed.[7] Cannabis has more than 400 chemicals, including 60 active chemicals known as cannabinoids. Delta-9-tetrahydrocannabinol or THC is a cannabinoid

that has psychoactive properties, that contains 150 mg of delta-9-tetrahydrocannabinol. The effect of delta-9-tetrahydrocannabinol on the human body is closely related to the dose that a person receives. Cannabis affects the human body system through delta-9- tetrahydrocannabinol which binds to cannabinoid receptors.[13]

Cannabinoid receptors (CB) according totheir affinity are divided into CB1 receptors andCB2 receptors. CB1 receptors are located in thebrain and spinal cord, and responsible for psychoactive effects. CB2 receptors are usuallylocated in macrophages in the spleen, immune cells and tissues, and acini cells of thesubmandibular salivary glands which can affect inflammation and immunosuppression.[14] Marijuana is widely abused and whenconsumed in excess doses it can cause health problems. The most frequently used method and the effect is faster by being sucked in.[15]

Heroin

Heroin is a highly addictive illegal drug. A type of narcotic that inhibits the work of the brain and slows down the body's activities. In 1898, heroin was produced as an asthma treatment, cough suppressant and morphine addiction.[16] In 1924, the United States Congress banned the sale, import and manufacture of heroin. Because heroin has the same content as morphine and if it is abused oneof the risks is dependence. The use of heroin can be done in various ways, for example by intravenous injection and suction.[17]

Effect of Drugs on Periodontal Tissue

Periodontal disease in drug users is caused by plaque and calculus due to direct physiological effects such as a lack of attention to oral hygiene.[18] Research by Brown et al., showed that 46% of heroin addicts and 53% of methamphetamine addicts almost never clean the oral cavity, only 42% clean the oral cavity twice a day. 88% of methamphetamine addicts had adequate oral hygiene index while 28% of heroin addicts had poor oral hygiene index.[19] Supported by research conducted by Ma et al., heroin addicts had 96.63% dental calculus, 99.55% experienced gingival bleeding, and among them 33.04% had periodontal pockets.[20] Decreased salivary rate will affect changes in the composition of the saliva itselfso that there is an increased risk of infection inthe oral cavity of drug users such as periodontaldisease. In marijuana addicts, there is gingival plaque formation and an increase in anaerobicbacterial colonies that can increase the occurrence of gingivitis.[15] According to research by Brown et al., due to xerostomia, shabu and heroin addicts experience complaints such as 28% needing drinking water for the swallowing process, 15% having difficulty of chewing and swallowing food.[19]

The effect of weakening the immune system from drug users can cause an increase in the inflammatory process that will also involvethe periodontal tissue, especially during long term abuse. The content of THC or delta-9- tetrahydrocannabinol in marijuana has an immunosuppressive effect on macrophages, Natural Killer (NK) cells, B and T lymphocytes, causing a decrease in host resistance to infection and also increasing the secretion of pro-inflammatory cytokines, namely interleukin (IL)–1.[21] The meth content in methamphetamine can affect the mediator of interleukin (IL)-1β production which is able to weaken the immune system of methamphetamine transmission, resulting in

an increase in the inflammatory process and affectthe periodontal tissue.[18]

Immunosuppressive effects are also shown during the abuse of opioids, one of which is heroin. Effects that occur on immune function include a decrease in the total number of lymphocytes, CD4:CD8 ratio, immunoglobulin concentrations and TNF (tumor necrosis factor) production as well as suppression of natural killer (NK) cell activation.[22] TNF is commonly known as TNF-α (tumor necrosis factor-alpha) is a pro inflammatory cytokine that is closelyassociated with periodontitis. The pathogenesisof infection is characterized by increased levelsof TNF- α which trigger the release of inflammatory mediators.[23]

Keboa et al., concluded that there is a significant relationship between smoking marijuana and poor periodontal status.[24] Exposure to smoke from smoking marijuana continuously will lead to the occurrence of dental irritation, loss of periodontal attachment, increased probing depth, gingival recession and possibly increased severe periodontitis.[25] Supported by research by Thomson et al., 213 marijuana smokers experienced periodontal attachment loss with a depth of 1-4 mm while the group who did not smoked marijuana only 52 people.[26] Periodontal disease in drug users is closely related to a high score of plaque accumulation that results in high levels of plaque accumulation caused by poor oral hygiene as well as xerostomia and exacerbated by suppression of the immune system whereas smoking marijuana allows one of the risk factors for periodontal disease.[27]

METHOD

Research Strategy

The design of this study is a literature review with the data used are secondary data regarding the description of the effect of methamphetamine, marijuana, and heroin on the health of periodontal tissues. The literature search was carried out from November to December 2021 through several e-database thatare Pubmed Central (PMC), SpringerLink, and ResearchGate using keywords ("Drug Abuse" OR "Substance Use" OR “Substance Abuse”) AND (Periodontitis) AND (Periodontal Index OR Bleeding on Probing, Gingival) AND (Attachment Loss, Periodontal OR Loss, Periodontal Attachment).

Inclusion and Exclusion Criteria

In the literature selection, English articles were used with study designs including cross sectional, comparative, and cohort studies as well as research samples consuming methamphetamine, marijuana, and heroin. The selected articles are the articles that measure Clinical Attachment Loss (CAL) and Bleeding on Probing (BOP) with limitations on article publication within the last 10 years (2012-2021) and can be accessed in full text in PDF format.The author excludes articles with the subject having a history of systemic disease and articlesin the form of reviews or systematic reviews and case reports.

Literature Review Stages

The article screening process uses Microsoft Excel 2019 software. Multiple titles were obtained from the three databases to obtain 179 articles that passed the title duplication selection stage. The next screening was carried out based on the title, abstract and keywords, and 160 articles did not pass the screening. The remaining 19 articles were then selected byreading the full article and looking at the inclusion, exclusion criteria and

limiting the search year from 2012 to 2021 until the remaining three articles. Three articles were obtained which were then analyzed in anarrative way.

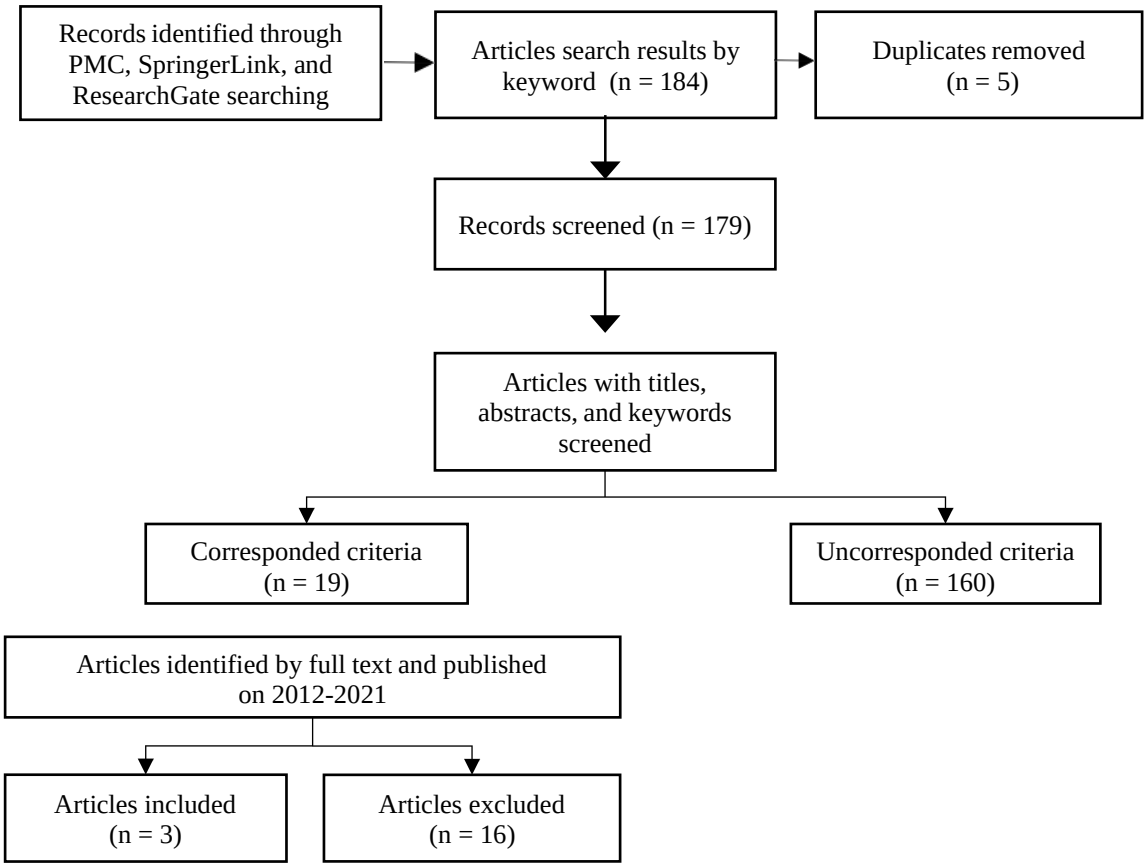

Figure 1. *Literature Review Stages*

RESULT

Article searches have been carried out onseveral e-databases that are Pubmed Central (PMC), SpringerLink, and ResearchGate based on keywords and the last 10 years. Selected three articles relevant to this research. One 2015 article obtained through the e-database is SpringerLink. There are two articles obtained through the e-database that are PMC and ResearchGate, both of which were published in 2019. The description of the screening results for each article can be seen in more detail in **table 1**.

Table 1. Article Descriptive Characteristics

Author	Publication Year	Source	Study Design	Location
Rommel et al.,[29]	2015	SpringerLink	Case control	Jerman, Eropa
Spolsky et al.,[30]	2019	PMC	Cohort	California, Amerika
Al Bush[31]	2019	ResearchGate	Cross sectional	Suriah, Asia

Table 2 describes the research subjects in detail such as the number of samples, age range, and typesof drugs used as subjects in the study from the three selected publication articles.

Table 2. Characteristics of Research Subjects

Author	Samples	Age	Gender
Rommel et al.,[29]	100	-	F/M
Spolsky et al.,[30]	406	18-30 years	F/M
Al Bush[31]	100	21-64 years	M

Note: F, Female; M, Male; (-), Not rated/explained

Table 3 displays the results of BOP and CAL measurements on methamphetamine, marijuana and heroin users, found from the three selected articles.

Table 3. Comparison of BOP and CAL measurements of drug users

Author	Drug Type	BOP	CAL
Rommel et al.,[29]	Methamphetamine	39,6%	-
Spolsky et al.,[30]	Methamphetamine	-	2,66
Al Bush[31]	Marijuana/ Heroin	60,05%/66,59 %	4,43/4,70

Note: BOP, Bleeding on Probing; CAL, Clinical Attachment Loss

DISCUSSION

In general, there are two types of diseases that attack the health of the periodontal tissues including gingivitis and periodontitis. Gingivitis is characterized by inflammation thatonly affects the gingiva, while continued inflammation of the gingiva to the underlying supporting tissues is called periodontitis.[23] Periodontal disease in drug users is closely related to xerostomia, oral hygiene, and immunosuppression.[27]

Research conducted by Rommel et al, stated that methamphetamine users had a higherprevalence of gingivitis and periodontitis than non-methamphetamine users. In his research, itwas found that there was a lot of plaque due to poor oral hygiene after examining theApproximal space Plaque Index (API).[28] This research is in line with Al Bush, that a number of heroin users have a lower frequency of brushing their teeth than marijuana users, thus triggering an increase in the percentage of Bleeding on Probing (BOP) of heroin users.[31] According to the study of Saini et al, it was stated that the high prevalence of periodontal disease was closely related to the high accumulation of calculus and plaque in drug users which was characterized by clinical attachment loss. The high accumulation of plaque and calculus deposits is due to poor oral hygiene and xerostomia.[32]

Measurements of Bleeding on Probing (BOP) and Clinical Attachment Loss (CAL) were used as the main variables to show the parameters of periodontal tissue inflammation in each type of drug (methamphetamine, marijuana, and heroin). BOP examination by placing a periodontal probe into the gingival sulcus and probing carefully. CAL was defined as the distance from the cementoenamel junction (CEJ) to the base of the pocket.[33] The mean of Clinical Attachment Loss (CAL) among heroin users was slightly higher than

marijuana users (CAL = 4.70 and 4.43) with a total of 78 heroin users and 22 marijuana users.[31] Research conducted by Spolsky et al, showed the results of CAL examination, the average of HIV-negative methamphetamine users was 2.66 with a total of 406 subjects and as many as 87.4% of them had ≥4 mm clinical attachment loss and 48.07% had ≥6 mm clinical attachment loss.[30]

In Al Bush's study, it was found that the overall BOP percentage of heroin users was higher than marijuana users (BOP = 66.59% and 60.05%) with 78 subjects and 22 marijuanausers using heroin.[31] Research by Rommel et al., stated that the BOP percentage of methamphetamine users was 39.6% with a totalof 100 subjects.[28] Al Bush found a correlation between the method of drug users and the results of the BOP examination, so that intravenous injection heroin users had a higher BOP index than users who inhaled smoke of heroin and smoking marijuana (BOP = 76.41%, 59.12% and 60.05%, respectively P = 0.04).[31] This is supported by the study of Shetty et al., who found that intravenous drug users had worse oral hygiene than user who inhale the smoke of the drugs.[34]

Compared with other ways of use, intravenous injection produces the fastest drug effect because the drug reaches the brain through the circulatory system and then stimulates α -adrenergic receptors causing vasoconstriction of blood vessels which will cause a decrease in blood supply to the salivary glands. Disruption of salivary gland function causes reduced of saliva or xerostomia, if not treated will increase periodontal disease.[29]Drugs that are injected intravenously, the onsetof effect is about 10-15 seconds. The bioavailability of intravenous drug users is 100%, while other methods of use such as oral,inhaled, anal insertion and others generally decrease due to incomplete absorption.[11] The method has the highest toxicity potential because it produces a fast and strong effect that will increase the risk addiction and possible overdose. In general, the rapid emergence of euphoria due to use in this way will provide a strong stimulus to use it again in order to maintain the euphoria of drug users.[34]

CONCLUSION

There was an effect of methamphetamine, marijuana, and heroin on the health of periodontal tissues including gingivitis and periodontitis. The heroin used by intravenous injection had the most effect on periodontal tissue health compared to methamphetamine and marijuana.

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