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Meta-Analysis

Effect of Injecting Drug User on the Risk of Human Immunodeficiency Virus/ Acquired Immuno-Deficiency Syndrome: A Meta-Analysis

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ABSTRACT

Background: The problem of narcotics abuse is drug users through injecting needles. Injecting drug users are any person who uses narcotics, psychotropics and addictive substances by injection. In addition, another understanding states that injecting drug users (IDU) or Injection Drug Users (IDUs) are users of narcotics/drugs with injecting media. Injecting drug use (IDU) is one of the main causes of HIV infection due to sharing of contaminated injection equipment.
Subjects and Method: The meta-analysis was carried out using the PRISMA flowchart and the PICO model. Population = adolescents and adults. Intervention= IDU/Injection Drug User. Comparison= Not an IDU/Injection Drug User. Outcome= HIV/AIDS events. The articles used in this study were obtained from several databases including PubMed, Google Scholar and Scopus. These articles were collected over 3 months. The keywords to search for articles are as follows "IDU (Injection Drug User)" AND "life style" "HIV/ AIDS ". There were 15 studies, 9 cross-sectional and 6 cohort studies published in 2012-2022 that met the inclusion criteria. Analysis was performed with Revman 5.3.
Results: 15 articles with a study design of 9 cross-sectional and 6 cohort studies from Canada, China, Ukraine, Virginia, Nepal, Cambodia, Scotland, Boston and Africa. Studies show that IDUs (Injecting Drug Users) have a 2.17 times risk of developing HIV/AIDS compared to non-IDUs for HIV/AIDS, and these results are statistically significant (aOR= 2.71; 95% CI= 1.22 to 6.02; p= 0.010).
Conclusion: IDU (Injection Drug User) increases the incidence of HIV (Human Immunodeficiency Virus) / AIDS (Acquired Immunodeficiency Syndrome).

Keywords: IDU, life style, HIV/AIDS, Drugs, Meta-Analysis

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BACKGROUND

The spread of Human Immunodeficiency Virus (HIV) among key populations is an important health problem worldwide. Several factors have been shown to increase HIV transmission in many communities around the world. These include practicing safe sex, sharing needles, intravenous drug use, poor cleaning practices and alcohol consumption. Stigma, discrimination and misinformation also play an important role in HIV transmission as they prevent the proper dissemi-

nation of information and the application of the correct prevention methods (Hogan et al., 2021).

Teenagers who use injection drugs have a higher risk of experiencing persistent injection patterns. This study is a comprehensive investigation that identifies the individual, social and structural factors of drug use. This study identified interventions used for narcotics users, namely narcotics, psychotropics and other addictive substances, long-term injections and identified factors supporting the cessation and relapse of narcotics users using injecting drug users as IDUs/Injecting Drug Users Dong et al. (2019).

This study, aimed to analyze and estimate in a meta-analytic manner regarding the influence of injecting drug users' behavior on the incidence of HIV/AIDS in a meta-analytic manner.

SUBJECTS AND METHOD

1. Study Design

Meta-analysis was performed with the PRISMA flowchart using PubMed, Science Direct, and Google Schoolar databases. Keywords used (Injecting Drug User) AND Human Immunodeficiency Virus) AND AIDS (Aquared Immunodeficiency Syndrome).

2. Steps of Meta-Analysis

The meta-analysis was carried out through 5 steps as follows:

1) Formulate research questions using the PICO model (Population: adolescents and adults, Intervention: IDU users, Comparison: non-IDU users, and Outcome: HIV/AIDS events).
2) Search for primary study research articles from electronic databases and libraries, namely PubMed, Science Direct, and Google Scholar.
3) Conduct screening and quality assessment of primary research articles.
4) Extracting and analyzing data into the RevMan 5.3 application.
5) Interpret the results and draw conclusions

3. Inclusion Criteria

Full-text paper research articles using cross-sectional and cohort study designs. The relationship measure used is OR. Analysis using multivariate with adjusted Odds Ratio (aOR). The research subjects were adolescents and adults. Intervention in the form of health education. One of the outcomes is the incidence of HIV/AIDS.

4. Exclusion Criteria

Articles published before 2012, statistical results reported in bivariate analysis, and in languages other than English.

5. Operational Definition of Variables

IDU Injecting drug use (IDU) sharing of needles, intravenous drug use, poor equipment cleaning practices.

Human Immunodeficiency Virus (**HIV /AIDS**) is a virus that spreads through certain body fluids that attacks the immune system. Acquired Immune Deficiency Syndrome or AIDS is a collection of disease symptoms that arise due to decreased immunity caused by HIV infection. As a result of decreased immunity, the person is very susceptible to various infections (opportunistic infections) which are often fatal.

6. Study Instruments

Quality assessment in this study used a critical appraisal checklist for cross-sectional studies published by the Joanna Briggs Institute. The study cohort assessment was performed by CASP.

7. Data Analysis

The articles in this study were collected using the PRISMA diagram and analyzed using the Review Manager 5.3 application by calculating effect sizes and heterogeneity to determine the combined research model and form the final meta-analysis results.

RESULTS

The search results for articles regarding the effect of IDU use on HIV/AIDS incidence yielded 15 articles with 9 cross-sectional study articles and 6 cohort study articles which can be seen in Figure 1. PRISMA Diagram.

The total articles in the initial search process were 1,100 articles with details of 670 PubMed database articles, 150 Science Direct database articles, and 280 Google Schoolar database articles. Furthermore, 600 duplicated articles were deleted and 500 articles were filtered. From a total of 154 eligible full text articles, 15 were included in the synthesis meta-analysis. Full text articles included in the exclusion criteria are due to the following reasons:

1) Intervention from the study is not law enforcement against IDU users but health education and rehabilitation.
2) The outcome of the study was not rehabilitation, and the outcome was not an HIV/AIDS event but a problem of deviant sexual behavior.
3) Does not include the Adjusted Odds Ratio (aOR) value as the result of multivariate logistic regression or articles with bivariate analysis.

Figure 2. Shows the distribution area of primary study articles in 4 continents, namely 1 article on the African continent (Mozaambeque), 7 articles on the Asian continent (Bangladesh, China, India and Indonesia, Cambodia), 2 articles on the European continent (Romania and Spain), and 1 article Continental America (Canada, Ukraine).

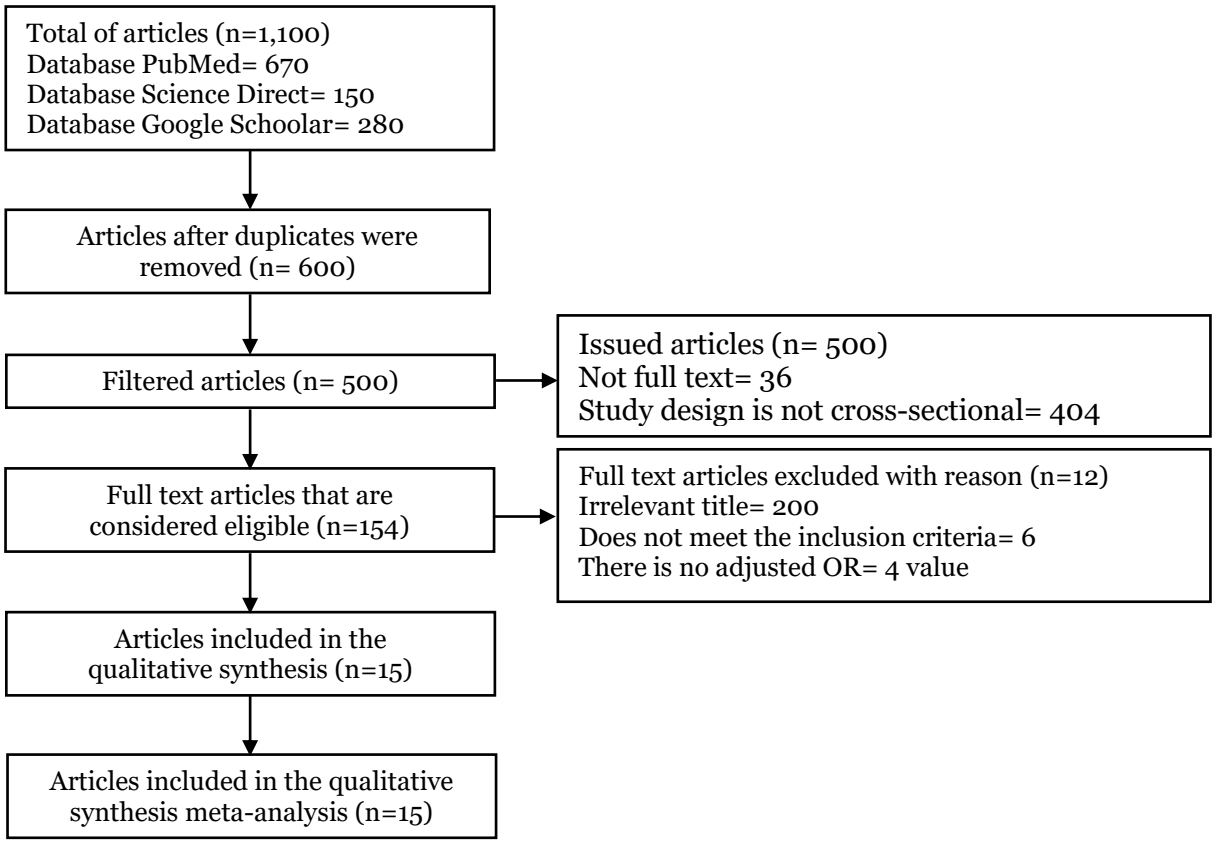

Figure 1. PRISMA Flowchart

Figure 2. Map of study area on injecting drug user on the risk of human immunodeficiency virus/ acquired immunodeficiency syndrome

Assessment of study quality was carried out quantitatively and qualitatively, this study used a critical appraisal checklist cross-sectional study (Joanna Briggs Institute, 2017). Critical appraisal which consists of 8 questions. Each "yes" answer is given a score of 2, "unclear" answer is given a score of 1 and "no" answer is given a score of 0.

Table 1 shows the assessment of study quality by checklist of cross-sectional studies. Based on the answers from the quality assessment, the total score of the answers ranged from 15 to 16 scores, this indicates that the quality of the article is feasible for meta-analysis.

The study descriptions in Table 2. show the assessment of study quality by the checklist of cohort studies. Based on the answers from the quality assessment, a total score of 23 to 24 was obtained. There were 9 cross-sectional articles and 6 cohort studies with a total sample of 7,166 IDU users.

Table 1. Results of the quality assessment from studies of injecting drug user on the risk of human immunodeficiency virus/ acquired immunodeficiency syndrome with cross-sectional design

Studies	Question Criteria								Total
	1	2	3	4	5	6	7	8	
Allen et al. (2022)	2	2	2	2	2	2	2	2	16
Bragazi et al. (2021)	2	2	2	2	2	2	2	2	16
Cyntia et al. (2019)	2	2	2	2	2	2	2	2	16
Hogan et al. (2021)	2	2	2	2	2	2	2	2	16
Sopheb et al. (2018)	2	2	2	2	2	2	2	2	16
Streed et al. (2022)	2	2	2	2	2	2	2	2	16
Tout et al. (2019)	2	2	2	2	2	2	2	2	16
Mao et al. (2021)	2	2	2	2	2	2	2	2	16
Treyner et al. (2020)	2	2	2	2	2	2	2	2	16

Description of the question criteria:

1 = Were the criteria for inclusion in the sample clearly defined?
2 = Were the research subjects and settings described in detail?
3 = Is exposure measured in a valid and reliable way?
4 = What are the standard criteria used for objective condition measurement?
5 = Were confounding factors identified?
6 = Was a strategy for dealing with confounding factors stated?
7 = Are the results measured in a valid and reliable way?
8 = Has proper statistical analysis been used?

Answer score description:

0 = No
1 = Can't tell
2 = Yes

Table 2. Results of the quality assessment from studies of injecting drug user on the risk of human immunodeficiency virus/ acquired immunodeficiency syndrome with cohort design

Studies	Question Criteria												
	1	2	3	4	5	6	7	8	9	10	11	12	Total
Dong et al. (2019)	2	2	2	2	2	2	2	2	1	2	2	2	23
Jiang et al. (2019)	2	2	2	2	2	2	2	2	2	2	2	2	24
El- Akkada et al. (2021)	2	2	2	2	2	2	2	2	2	2	2	2	24
Kuznetsova et al. (2019)	2	2	2	2	2	2	2	2	2	2	1	2	23
Jenete et al. (2022)	2	2	2	2	2	2	2	2	2	2	2	2	24
Pearce et al. (2020)	2	2	2	2	2	2	2	2	2	2	2	2	24

Description of the question criteria:

1 = Does the cohort study address the clinical problem clearly?
2 = Were the cohorts (study subjects in both exposed and non-exposed groups) selected in the right way?
3 = Is IDU exposure measured clearly to minimize bias?
4 = Were outcomes (HIV/AIDS incidence status) accurately measured to minimize bias?
5 = Did the researcher identify all important confounding factors? Did the researcher account for confounding factors in the design and/or analysis?
6 = Does the research subject complete the research time in full? Were the research subjects followed up for a sufficiently long time? and reliable?
7 = Are the results of this study reported in the aOR?
8 = How is the presence of the results?
9 = Can the results be trusted
10 = Are the results applicable to the local (local) population?
11 = Are the results of this study compatible with the available evidence?
12 = What are the implications of this research for practice?

Answer score description:

0 = No

1 = Can't tell
2 = Yes

Table 3. Summary of primary study articles with each PICO (N= 7,466)

Author	Country	Stusy Design	Sample	P	I	C	O
Allen et al. (2022)	Virginia	Cohort	255	Teens and adults	IDU	Not IDU	HIV/AIDS incidence
Bragazzi et al. (2021)	Canada	Cohort	103	Teens and adults	IDU	Not IDU	HIV/AIDS incidence
Cyntia et al. (2019)	Mozambique	Cohort	267	Teens and adults	IDU	Not IDU	HIV/AIDS incidence
Dong et al. (2019)	Canada	Cohort	1,150	Teens and adults	IDU	Not IDU	HIV/AIDS incidence
Jiang et al. (2018)	China	Cohort	1	Teens and adults	IDU	Not IDU	HIV/AIDS incidence
Jeanate et al. (2021)	Vancover	Cohort	666	Teens and adults	IDU	Not IDU	HIV/AIDS incidence
Kuznetsova et al. (2019)	Ukraine	Cross-sectional	2,134	Teens and adults	IDU	Not IDU	HIV/AIDS incidence
Streed et al. (2022)	Boston	Cross-sectional	1,105	Teens and adults	IDU	Not IDU	HIV/AIDS incidence
Trayner et al. (2020)	Scotland	Cross-sectional	61	Teens and adults	IDU	Not IDU	HIV/AIDS incidence
Pearce et al. (2020)	Canada	Cross-sectional	125	Teens and adults	IDU	Not IDU	HIV/AIDS incidence
Sopheab et al. (2018)	Cambodia	Cross-sectional	20	Teens and adults	IDU	Not IDU	HIV/AIDS incidence
El- Akkada et al (2021)	Canada	Cross-sectional	1,120	Teens and adults	IDU	Not IDU	HIV/AIDS incidence
Hogan et al (2021)	Nepal	Cross-sectional	8	Teens and adults	IDU	Not IDU	HIV/AIDS incidence
Mao et al (2021)	China	Cross-sectional	51	Teens and adults	IDU	Not IDU	HIV/AIDS incidence
Tout et al (2019)	Cambodia	Cross-sectional	400	Teens and adults	IDU	Not IDU	HIV/AIDS incidence

Tabel 4. Adjusted Odds Ratio (aOR) study of injecting drug user on the risk of HIV/AIDS with cross-sectional design

Studies	OR	95%CI	
		Lower Limit	Upper Limit
Allen et al. (2022)	2.26	0.84	6.08
Bragazi et al. (2021)	1.79	1.61	1.99
Cyntia et al. (2019)	67.50	58.60	77.74
Hogan et al. (2021)	2.22	1.20	4.11
Sopheb et al. (2018)	4.10	1.53	10.99
Streed et al. (2022)	1.47	1.21	1.79
Tout et al. (2019)	3.80	1.36	10.62
Mao et al. (2021)	6.60	0.70	62.23
Treyner et al. (2020)	3.16	1.93	5.17

Tabel 5. Adjusted Odds Ratio (aOR) study of injecting drug user on the risk of human immunodeficiency virus/ acquired immunodeficiency syndrome with co-hort design

Studies	OR	95%CI	
		Lower Limit	Upper Limit
Dong et al. (2019)	1.63	1.19	2.23
Jiang et al. (2019)	2.12	1.10	4.07
El- Akkada et al. (2021)	1.16	1.06	1.27
Kuznetsova et al. (2019)	1.31	1.13	1.52
Jenete et al. (2022)	5.28	1.80	15.49
Pearce et al. (2020)	0.55	0.30	1.01

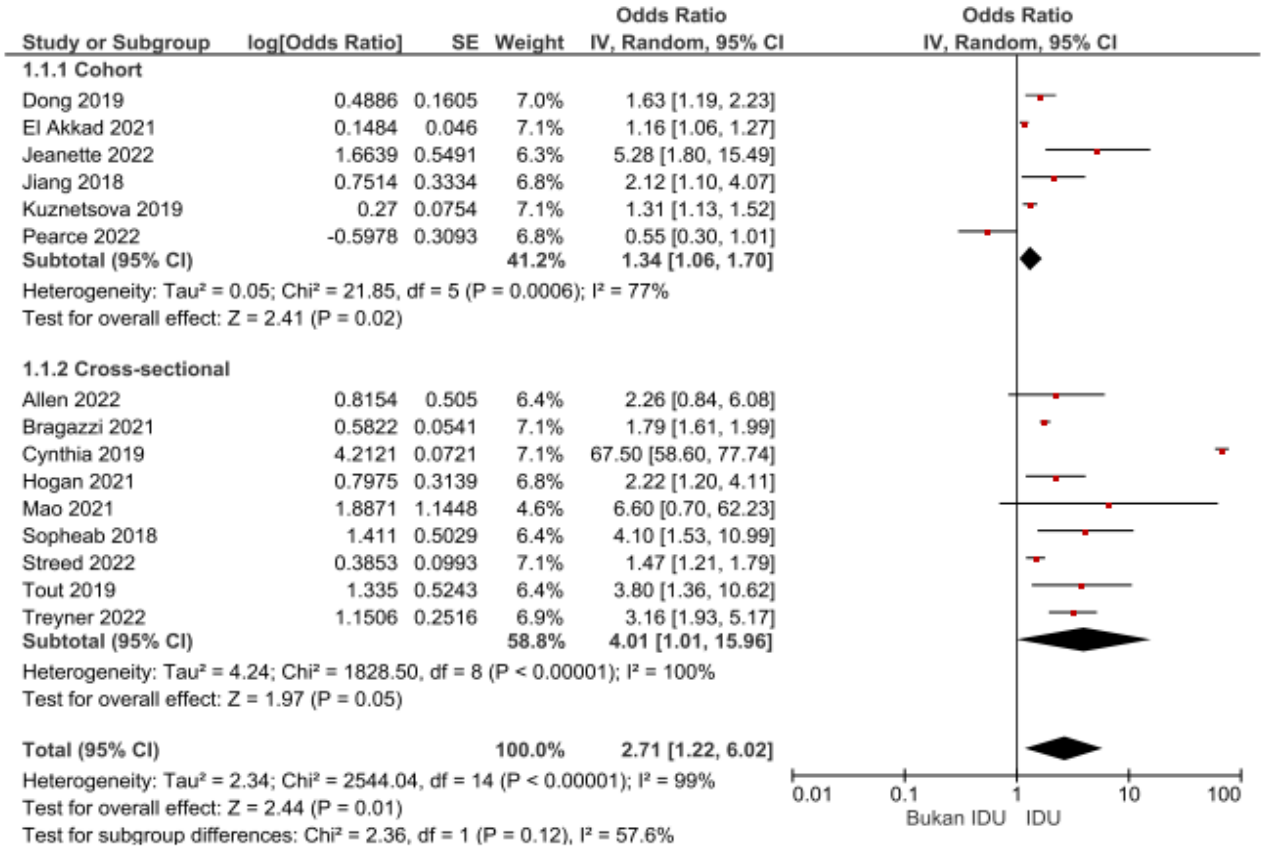

Figure 3. Forest Plot of the influence of IDUs on the incidence of HIV/AIDS

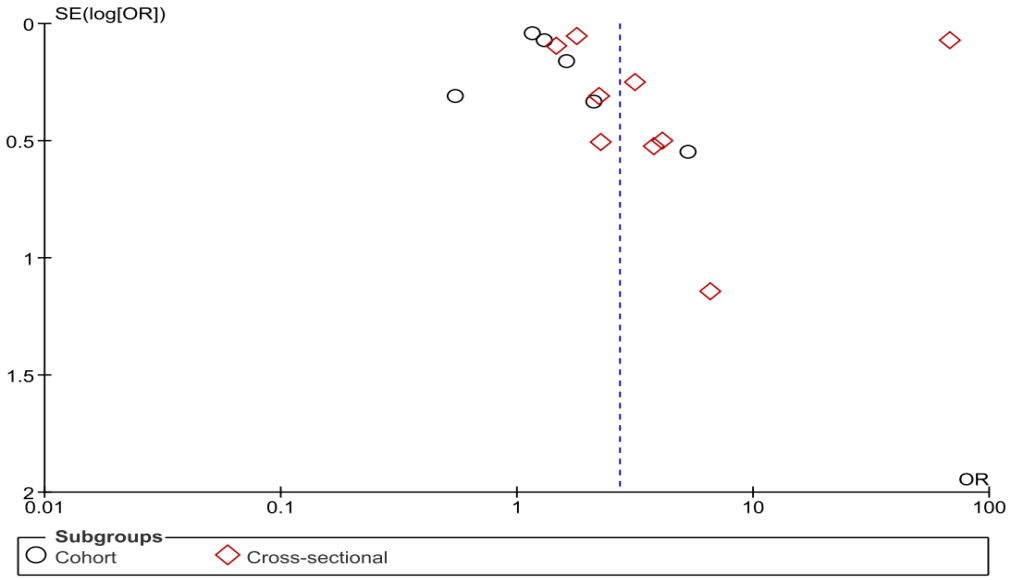

Figure 4. Funnel plot of the influence of IDUs on the incidence of HIV/AIDS

The forest plot in Figure 3 shows that IDU/ Injecting Drug Users have a risk of 2.44 times compared to non-IDU/Injecting Drug Users, and these results are statistically significant (aOR= 2.71; 95% CI= 1.22 to 6.02; p= 0.010). The heterogeneity of the research data shows I^2= 99% so that the distribution of the data is stated to be heterogeneous so that the analysis uses the Random Effect Model (REM).

The funnel plot in Figure 4 shows that the distribution of effect estimates between studies is not symmetrical, that is, there is more distribution to the left of the vertical line of the average effect estimates than to the right. Thus this funnel plot shows that there is no publication bias, because the distribution of effect estimates is more to the right of the vertical line, the average effect estimate in the funnel plot is the same as the average effect estimate which is located to the right of the forest plot.

Human Immunodeficiency Virus (HIV) is a type of virus that infects white blood cells which causes a decrease in human immunity. Acquired Immune Deficiency Syndrome (AIDS) is a collection of symptoms that a rise due to decreased immunity caused by HIV infection. HIV sufferers need treatment with antiretrovirals (ARVs) to reduce the amount of HIV virus in the body so that it does not enter the AIDS stage, while people with AIDS need ARV treatment to prevent opportunistic infections with various complications (Kemenkes RI, 2020).

Estimated combined effect of IDU/ Injecting Drug User on the incidence of HIV/ AIDS was processed using RevMan 5.3 with the generic inverse variance method. This method is used to analyze data in the form of rate, time to event, hazard ratio, ordinal scale, adjusted estimate, difference in average (difference of mean), or the average ratio (ratio of mean).

RESULTS

Injecting drug use (IDU) is a major cause of HIV infection due to sharing of contaminated injecting equipment. Among people who inject drugs (PWID), HIV can be transmitted through sexual contact and injection-related risk behavior, and injection related transmission is considered the dominant route in most settings. In addition to detoxification medication, a good social support network is needed with the community at its core. In our study, women, the elderly, minorities, low education were exposed to the HIV risks associated with IDU. Indicated prevention strategies should target relevant sub-populations in an environment (Zhang et al., 2021).

IDU Injecting Drug User behavior is a trigger factor for HIV/AIDS, this is in accordance with the research of Dong et al. (2019) with the research title Trajectories of injection drug use among people who use drugs in Vancouver, Canada, 1996-2017: Growth mixture modeling using data from prospective cohort studies. In this study drug use identified the impact of injection drug use on individual health and social hazards to be significant. Globally, in this study, there were 1.3 million injecting needle users in the illegal use of narcotics. Dependence on the use of substances on narcotics causes economic, educational and social losses in society.

HIV/AIDS sufferers based on Kuznetsova et al. (2019) in research Linking intravenous drug users to treatment through non-governmental organizations in Ukraine: how well is it working. The study used the cohort study method, conducted on 8,927 subjects. This study aims to explain the performance of the differential model that connects IDU and HIV care and sufferers. The goal of sustainable development is to end the endemic of HIV/AIDS by 2030. To prevent HIV transmission and improve the survival of IDU, they must know their status as HIV sufferers.

The results of this study are in line with the research of Hogan et al. (2021) with the title Trends and determinants of HIV transmission among men who inject drugs in the Pokhara Valley, Nepal: analysis of cross-sectional studies. HIV is a global health problem, especially in developing countries. The findings in this study indicate that the determinants of HIV behavior among disabled men in Porkha are users of unsterile needles. This is directly proportional to individual education on the potential for drug use. Increasing knowledge and access to health workers is an action to minimize the incidence of HIV. Drug addiction treatment programs need the role and innovation of the government in strengthening future intervention strategies.

The forest plot in Figure 2 shows that IDU/Injecting Drug Users have a risk of 2.44 times compared to non-IDU/Injecting Drug Users, and these results are statistically significant (aOR= 2.71; 95% CI= 1.22 to 6.02; p=0.010). The heterogeneity of the research data shows I^2= 99% so that the spread of the data is stated to be heterogeneous.

The funnel plot in Figure 3 shows publication bias with an overestimate effect which is characterized by an asymmetric distribution between the right and left plots. There are 9 plots on the right, 6 plots on the left. The plot on the right of the graph shows a standard error (SE) between 0 and 1.50. The plot on the left of the graph shows a standard error (SE) between 0 and 2.00.

The limitation of this research is that there is research bias because it only uses 3 databases, namely Google Scholar, PubMed, and Science Direct, thus ignoring research from other databases. As well as language bias where the selected articles are only published in English, thus ignoring articles published in other languages.

AUTHOR CONTRIBUTION

Lusiana Dewi Saputri as the main researcher who chose the topic, conducted a search for data collection in this study. Vitri Widiyaningsih and Hanung Prasetya contribute to review of research documents.

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CONFLICT OF INTEREST

There is no conflict of interest in this study.

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