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NARRATIVE REVIEW

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Prevalence of HIV, hepatitis B virus, hepatitis C virus, drug use, and sexual behaviors among street children in Iran: A systematic review and meta-analysis

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Abstract

Background and Aims: Street children face a disproportionately higher risk of human immunodeficiency virus (HIV), hepatitis B virus (HBV), and hepatitis C virus (HCV) due to high-risk sexual and drug use practices. We aimed to estimate the prevalence of these infections and related risk behaviors among street children in Iran.

Methods: We searched PubMed, Web of Science (ISI), Embase, Scopus, and Google Scholar for the English-language records and Iranian databases, including SID, Magiran, and IRANDOC for the Farsi-language records up to September 18, 2022. Random effects analysis was used to obtain prevalence estimates for each condition. Homogeneity across included studies was assessed using I^2.

Results: We extracted data from 18 eligible studies, representing 5646 children (83.2% boys), with a mean age of 10.2 (range: 5–18). The prevalence of HIV, HBV, and HCV were 0.79% (95% confidence intervals [CIs]: 0.0–5.56), 1.97% (95% CI: 1.01–3.19), and 1.88% (95% CI: 0.74–3.46), respectively. The prevalence of lifetime drug use and sexual abuse was 8.32% (95% CI: 4.83–12.62) and 10.18% (95% CI: 3.02–20.67) among street children, respectively.

Conclusion: The estimated prevalence of HIV, HBV, and HCV among street children in Iran was higher than the estimates in the general population. Moreover, drug use and the experience of sexual abuse were prevalent among this population. These findings suggest the need for targeted prevention programs for street children in Iran.

KEYWORDS

Hepatitis, HIV, Iran, meta-analysis, risk factors, street children

1 | INTRODUCTION

Street children are at elevated risk for behaviors such as drug use and unsafe sexual practices.[1] The families of these children have low socioeconomic status,[2] and poverty is the most common reason for children to work and live on the street.[3] Street children may engage in street crime and sex work by local gangs and criminal groups.[1] They experience a broad range of health and social harms as a result of their environment,[4] including infectious diseases, such as human immunodeficiency virus (HIV), unintentional injuries, violence, mental health disorders, substance use, and underage sexual behavior.[5] They are also more prone to health problems related to sexual behavior (e.g., unprotected sex after using alcohol, unwanted pregnancy, sexually transmitted infections [STIs], and abortion).[6] Substance use increases the risk of sexual behavior among street children.[7] Risk behaviors expose these children to HIV/acquired immunodeficiency syndrome and other STIs as well as other infections like hepatitis B virus (HBV) and hepatitis C virus (HCV).[8]

Barriers such as societal stigma, especially in conservative societies, exacerbate health risks among street children.[9,10] Lack of knowledge about sexual and drug use behaviors further elevates their risk for infections and other high-risk activities.[5,11,12] Moreover, social stigma and poor knowledge dramatically affect their access to health services and lead to an increase in the risk of HIV and other STIs transmission, unwanted pregnancy, and abortion. Policymakers should provide targeted and effective interventions to promote health among street children.[11]

Some different reports reported the wide prevalence of some sexual and drug use behaviors, worldwide.[13] The injection and sexual activities among street children in Ukraine were 15% and 75%, respectively. In Pakistan, cannabis and glue were the most prevalent substances (80% and 73%, respectively), while in Canada, 43% of children had the experience of injecting a drug. In Brazil, more than 50% had been sexually active before 12 years old, having more than three sexual partners in the previous years.[1] In a study in Nepal, the prevalence of HIV infection in street children was 7.6%.[14] A systematic review estimated the prevalence of HCV among Iranian street children at 2.4%.[15]

An estimated 26,000 street children reside in Iran.[16] Studying high-risk behaviors and associated infections can guide policymakers in planning targeted interventions. To the best of our knowledge, there is no systematic review and meta-analysis—except for HCV—on these behaviors and related infections among street children in Iran. We conducted this systematic review and meta-analysis to summarize the existing evidence about the prevalence of HIV, HBV, HCV, and high-risk drug use and sexual behaviors among street children in Iran. The findings can inform strategies for enhancing access to harm reduction services and developing effective HIV prevention and treatment services for this underserved population.

Key points

- Street children in Iran are at a significant risk of human immunodeficiency virus (HIV), hepatitis B virus (HBV), and hepatitis C virus (HCV).
- Drug use was found prevalent among street children in Iran.
- Street children in Iran commonly engage in high-risk sexual practices.
- Prevention programs are needed to reduce the burden of HIV, HBV, and HCV and related risk behaviors among street children in Iran.

2 | METHODS

This study follows the preferred reporting items for systematic reviews and meta-analyses (PRISMA) guidelines (Supporting Information: A).[17]

2.1 | Search strategy

The search was performed in international (Scopus, PubMed, Web of Sciences, EMBASE), and national (SID, Magiran, and IRANDOC) databases. We also manually searched the references related to each article. Farsi and English language studies were searched from inception to September 18, 2022. The keywords street children, street youth, homeless youth, homeless children, runaway children, runaway youth, shelter youth, Homeless Youth, and Iran were combined using appropriate Boolean operators (Supporting Information: B). We also approached researchers in the field of street children in Iran to include unpublished data. We included unpublished data from a single research for analysis.

2.2 | Inclusion criteria

Studies were eligible for this review if they met the following inclusion criteria: (1) carried out among street children, (2) conducted in Iran, (3) published language was English or Farsi, (4) reported the prevalence of HIV, HBV, HCV, substance use, and sexual behaviors, and excluded reporting with duplicate data, (5) paper published from inception to September 18, 2022. The definition of street children was based on these criteria: children ≤18 years old, who spend a portion or majority of their time, living or working, on the streets. Sexual and drug use behaviors were considered based on self-reporting. Detection of HBV, HCV, and HIV was done using rapid tests and confirmation according to the national HIV guidelines.

2.3 | Screening and data extraction

Naser Nasiri (N. N.) and Hossein Mirzaei (H. M.) performed screening and assessed the title and abstract of studies independently; every disagreement was resolved by consulting with Hamid Sharifi (H. S.). N. N. and H. M. conducted the full-text screening and extracted data on an Excel form that included author name, title, study design, target population, sampling method, sample size, age, sexual behaviors, drug use, and prevalence of HIV, HBV, and HCV.

2.4 | Risk of bias assessment

The Joanna Briggs Institute (JBI) Critical Appraisal tool was used to assess the risk of bias. JBI checklist for prevalence studies includes nine items, for example, Was the sample frame appropriate to address the target population? We calculated the risk of bias in the included studies according to the questions in the JBI checklist. When each question was yes, the grade was equal to 1 and 0 if the answer was no. The final grade was the sum of the grades for all items.

2.5 | Data analysis

We estimated the pooled prevalence and 95% confidence intervals (CIs) for infections (including HIV, HBV, and HCV), drug use (including opium, cannabis, and alcohol), smoking, sexual abuse, and sexual contact. A random-effect model was used to synthesize the results from all studies. Homogeneity across included studies was assessed using I^2.[18] To diagnose heterogeneity, we did sensitivity analyses. All analyses were done using STATA 14.2 software (StataCorp LP).

3 | RESULTS

3.1 | Quality appraisal of the included studies

The included studies, based on the JBI critical appraisal tool, had a score between 1 and 7. In total, 12 out of 17 included studies (70.0%) had a low score (Supporting Information: C).

3.2 | Sensitivity analysis

We did sensitivity analyses for different variables. In some variables like HCV, lifetime opium, and lifetime cannabis the heterogeneity was reduced.[19,20]

3.3 | Characteristics of participants

A total of 26 studies reported the prevalence of HIV, HBV, HCV, drug use, opium, cannabis, alcohol, tobacco smoking, sexual abuse, and sexual contact in street children, but eight studies reported duplicate data, and we removed these studies. Finally, 18 studies were included in this systematic review and meta-analysis,[12,19–34] (Roshanfekr et al., unpublished) (Figure 1).

The mean age of children was 8.48 (range: 5–18). Overall, 4635 out of 5565 (83.2%) of children were self-identified male; 1017 out of 5136 (19.8%) of street children were illiterate (Table 1). The analysis included 6782 street children; children's nationality in six studies was Iranian (n = 2144), while 11 studies recruited both Iranian and children of other nationality, such as Afghanistan, Pakistan, and Iraq (n = 4417).

3.4 | HIV, HBV, and HCV prevalence

The prevalence of HIV was reported in three studies, with a pooled prevalence of 0.79% (95% CI: 0.0–5.56). The range of the reported prevalence of HIV was from 0% to 4.5%. The prevalence of HBV, obtained from five studies, was 1.97% (1.01–3.19) with a range of 0.59%–3.26%. The pooled prevalence of HCV, reported in five studies, was 1.88% (0.74–3.46) with a range of 0%–4.60% (Figure 2).

3.5 | Prevalence of drug use, alcohol consumption, and smoking

Among the included studies, 14 studies reported the lifetime prevalence of drug use with a pooled prevalence of 8.32% (4.83–12.62); nine studies reported the lifetime prevalence of alcohol use [pooled prevalence: 9.57% (5.03–15.34). Nine studies reported the lifetime prevalence of tobacco smoking [pooled prevalence: 23.06% (14.72–32.62)], three studies reported lifetime prevalence of cannabis [pooled prevalence: 1.54% (0.96–2.24)], three studies reported lifetime prevalence of opium [pooled prevalence: 2.24% (1.54–3.06)], and three studies reported lifetime prevalence of heroin use [pooled prevalence: 6.36% (0.05–19.49)] (Figure 3).

3.6 | Sexual behavior prevalence

Seven studies reported the lifetime prevalence of sexual abuse. The pooled prevalence was 10.18% (3.02–20.67); sexual intercourse was reported in seven studies with a pooled prevalence of 11.08% (4.78–19.52) (Figure 4). Foroughi et al., in a study carried out in 2012–2013, reported that 28.5% of street children in Tehran used condoms in their last sex act.[32] Roshanfekr et al., in a study during the same period, reported that 37.7% of street children in Tehran used condoms during sexual intercourse.[33]

4 | DISCUSSION

The estimated pooled prevalence of HIV, HBV, and HCV among Iranian street children was 0.79% (95% CI: 0.0–5.56), 1.97% (1.01–3.19), and 1.88% (0.74–3.46), respectively. Around 8.32% (4.83–12.62) of street children in Iran had experienced drug use. This study estimated that the prevalence of tobacco smoking and alcohol was 23.06% (14.72–32.62) and 9.57% (5.03–15.34), respectively. We estimate that 10.18% (3.02–20.67) of street children experience sexual abuse. This review has demonstrated that street children constitute a vulnerable population for HIV, HBV, and HCV in Iran. The engagement in high-risk behaviors, including substance use,

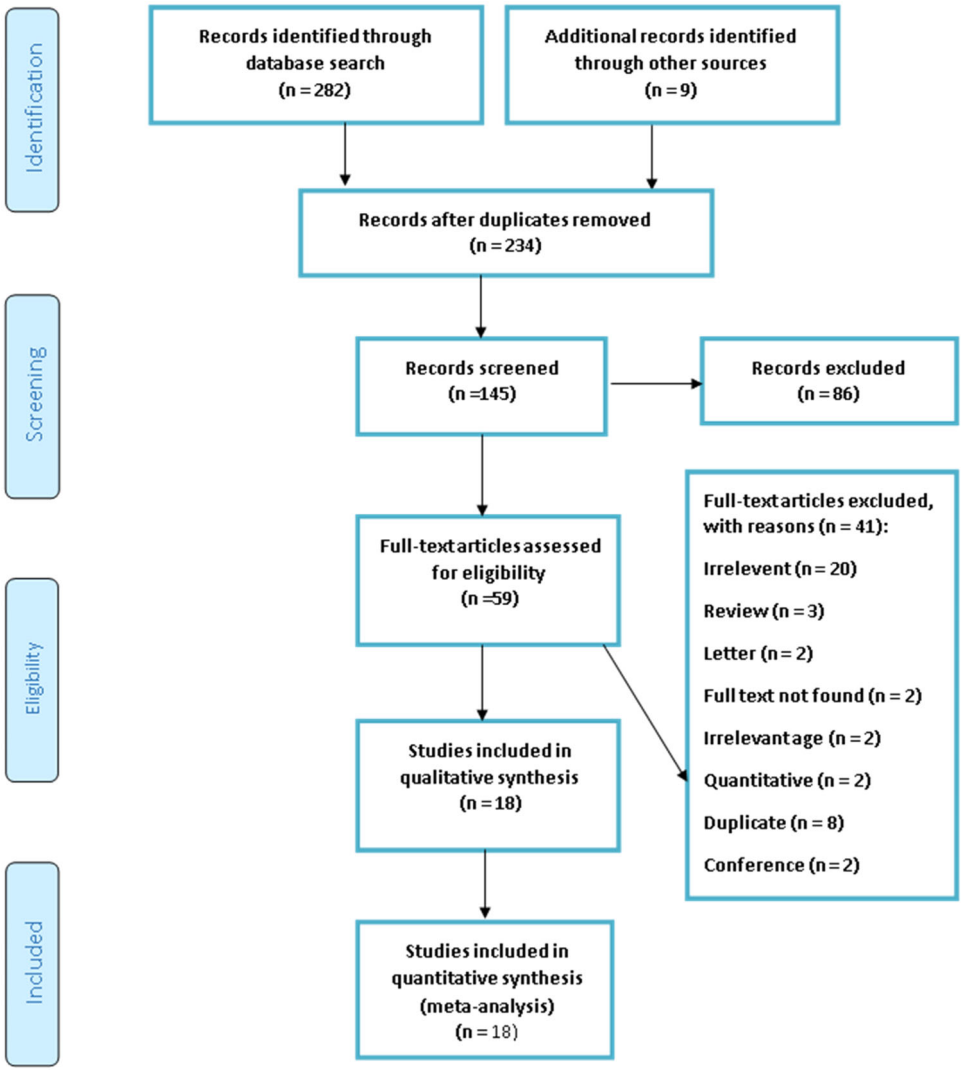

FIGURE 1 Flowchart of studies included in the systematic review of prevalence of human immunodeficiency virus (HIV), hepatitis B virus (HBV), hepatitis C virus (HBC), and substance use and sexual risk behaviors among street children in Iran.

along with the occurrence of sexual abuse, places street children at an elevated risk of contracting HIV and STIs. The findings emphasized the urgent need for targeted interventions aimed at mitigating associated harm with these high-risk behaviors.

The estimated pooled prevalence of HIV in this study was 0.79%. The reported prevalence of HIV among adult homeless in Iran varied from 0.3% in southeastern Iran[35] to 6.5% in western Iran.[36] The higher prevalence of HIV among adult homeless in Iran could be related to their age and the associated higher risk for HIV infection. Among three studies that assessed HIV infection, two selected registered children in the Street Children Supportive Organization and reported a prevalence of 0.0%. One study with time–location sampling reported the prevalence of HIV at 4.5%. Differences in registered children may lead to bias and underestimation of results. Both this study and prior research indicate a higher HIV prevalence among the homeless than in Iran's general population (≤0.003%).[37] To achieve the 95-95-95 goals for the control of HIV in 2030 in Iran, it is necessary to consider these marginalized populations, assess their health-related problems, and include them in the HIV control and prevention programs. HIV control programs in Iran mainly provided services for female sex workers and people who inject drugs.[38] However, some other population groups, like homeless people, experience unsafe sexual or injection behaviors and could reach the provided services. Current services do not adequately address the unique needs of high-risk groups like street children.

The estimated pooled prevalence of HBV and HCV was 1.97% and 1.31%, respectively. The pattern of the HBV and HCV prevalence varied among different areas of the country. For example, the prevalence of HBV was 0.98% in Lorestan and 2.7% in Zahedan. However, the prevalence of HCV ranged from 13% in Zahedan to 31.27% in Lorestan.[35,36] After starting the HBV vaccination program for children, in 1993, the prevalence of HBV has a decreasing pattern.[39] Included studies that were done before 2010 reported a high prevalence of HBV (around or more than 3.0%); however, the

TABLE 1 Characteristic of included studies ($N = 18$).

References	Years	City	Study design	Sampling method	Definition of street children	*n*	No of boys (girls)	Age mean or range	No of illiterate children	Nationality
Vahdani et al.[21]	2006	Tehran	Cross sectional	NR	NR	102	39 (63)	10.1	NR	Iranian = 16, Afghan = 79
Ahmadkhaniha et al.[23]	2007	Tehran	Cross sectional	Children's Rights Society	NR	87	56 (31)	11	40	Refuge = 68
Fallah et al.[24]	2008	Tehran	Cross sectional	NR	NR	203	196 (7)	*R* = 7–8	61	Iranian = 129, Afghan = 71, Pakistani = 2, Iraqi = 1
Ataei et al.[25]	2009	Isfahan	Cross sectional	Nonprobability	NR	399	271 (128)	12.62	NR	Iranian = 156, Afghan = 222
Ahmadkhaniha et al.[26]	2010	Tehran	Cross sectional	multistage sampling	Yes	576	491 (88)	13.4	NR	NR
Nokhodian et al.[27]	2012	Isfahan	Cross sectional	Nonprobability	NR	348	228 (120)	12.97	129	Iranian = 154, Afghan = 189, Other = 3
Baratvand et al.[19]	2013	Ahvaz	Cross sectional	Snowball sampling	NR	28	NR	14.5	15	NR
Afshani et al.[28]	2013	Isfahan	Cross sectional	Nonprobability	NR	122	92 (30)	*R* = 5–14	14	NR
Khaniha et al.[29]	2014	Tehran	Cross sectional	Multistage sampling	Yes	579	949 (90)	13.4	NR	NR
Ansari et al.[30]	2015	Zahedan	Cross sectional	Snowball sampling	Yes	216	216	12.5	NR	NR
Dejman et al.[31]	2015	Tehran	Cross sectional	Time–location sampling	Yes	275	203 (72)	NR	NR	Iranian = 154, Pakistani and Afghan = 94
Foroughi et al.[32]	2016	Tehran	Cross sectional	Time–location Sampling	Yes	1000	NR	15.62	NR	NR
Naemabadi et al.[20]	2019	Alborz, Tehran	Cross sectional	Convenience sampling	Yes	339	183 (156)	12.83	11	Afghan = 339
Roshanfekr[33]	2019	Tehran	Cross sectional	Time–location sampling	Yes	289	215 (74)	NR	69	Refuge = 107
Roshanfekr et al.[34]	2020	Tehran[a]	Cross sectional	Time–location sampling	Yes	856	729 (81)	13.8	361	Iranian = 391, Refuge = 423
Motazedian et al.[12]	2020	Shiraz	Cross sectional	NR	Yes	329	285 (44)	13.46	18	Iranian = 167, Refuge = 161
Jarahi et al.[22]	2021	Mashhad	Cross sectional	Convenience sampling	NR	98	70 (28)	13.8	1	NR
Roshanfekr et al. (unpublished)	2022	Ardabil[b]	Mixed method	Time–location sampling	Yes	1038	906 (132)	13.6	234	Iranian = 623, Afghan = 356

[a]Mashhad, Karaj, Kermanshah, Zahedan, and Bandar Abbas cities.

[b]Isfahan, Karaj, Tehran, Mashhad, Bojnord, Ahvaz, Zahedan, Qom, Sanandaj, Kerman, Golestan, Khoramabad, Amol, Bandarabas.

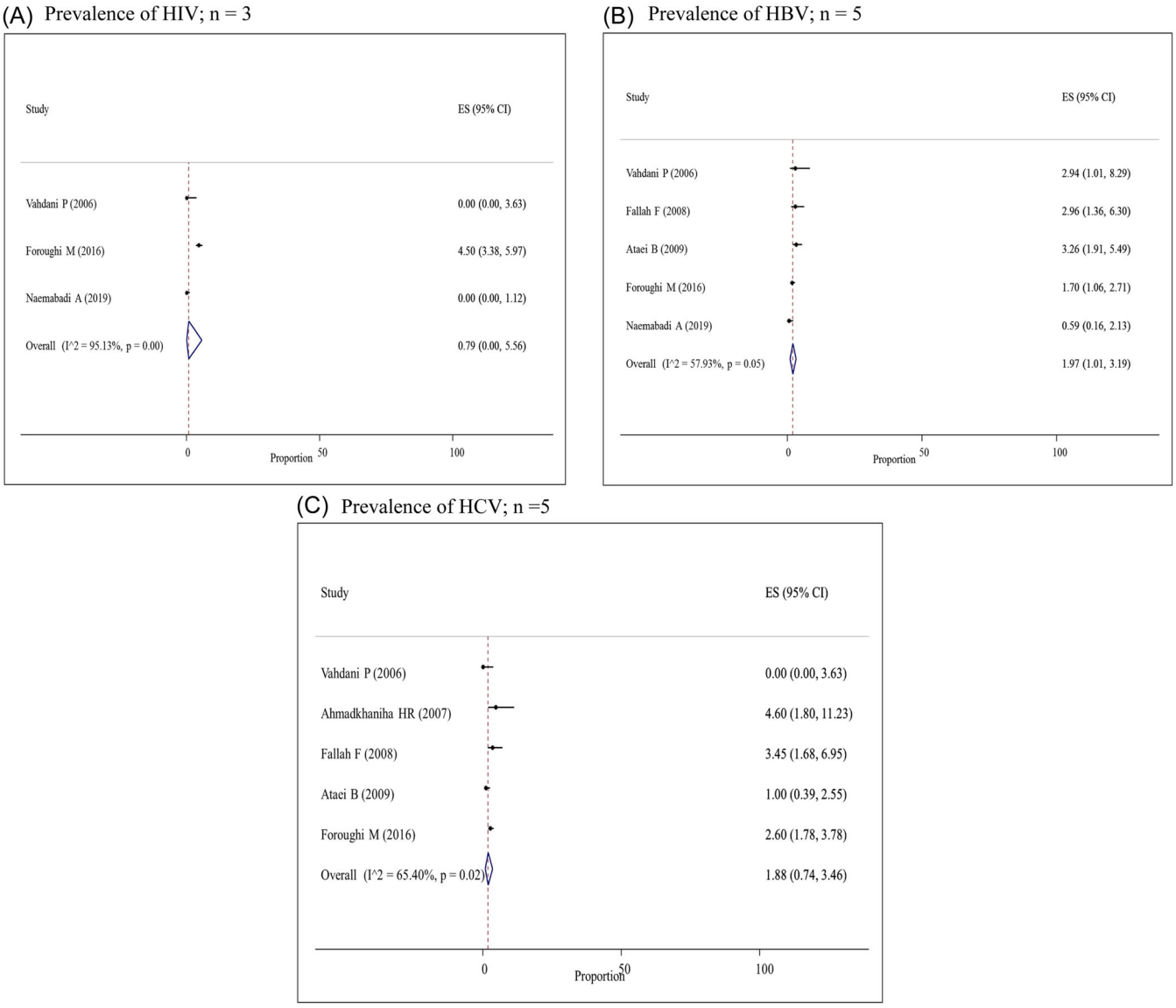

FIGURE 2 Prevalence of human immunodeficiency virus infection (A), hepatitis B virus infection (B), and hepatitis C virus infection (C) among street children in Iran.

prevalence of HBV in studies between 2016 and 2019 was less than 1.0%. This reduction could be related to the vaccination against HBV among recent participants. Despite the decreasing trend for the HBV prevalence, it remains higher than that of the same age cohort in the general population (0.7%).[39] However, the prevalence of HCV is related to age, and those with a higher age are at a higher risk of infection.[35] The prevalence of HCV among street children was also considerably higher than in the Iranian general population (0.3%).[40] The higher prevalence of HCV among street children can be due to a higher prevalence of high-risk behaviors like drug injection or unprotected sexual behavior.[41] In recent years, there has been an efficient method for the HCV cure.[42] In this regard, it is recommended to include street children as a target population for HCV care inside the country. Moreover, in other harm reduction services, street children's needs should be in priority for healthcare providers.

The estimated lifetime prevalence of drug use, smoking, and alcohol consumption was 8.32%, 23.06%, and 9.57%, respectively. A systematic review estimated the pooled prevalence of drug use, smoking, and alcohol in Iranian adolescents (i.e., 14–19 years), in the general population to be 16.8%, 14.7%, and 25.30%, respectively.[43] Deprivation, fear, despair of the future, living environment, nerve pressure, and many other factors lead to the use of a substance in street children. Drug use, smoking, and alcohol use in street children are associated with many factors including child abuse, increased unprotected sex, multiple sexual partners,[5] exchanging sexual, sexual intercourse, and inconsistent condom use.[7,13] These behaviors can expose children to HIV and other STIs.[13] Focus and programming for drug use, smoking, and alcohol can also prevent HIV and STIs among this group. Policymakers and the government need to consider street children as one of the groups at high risk of drug and alcohol use. It is

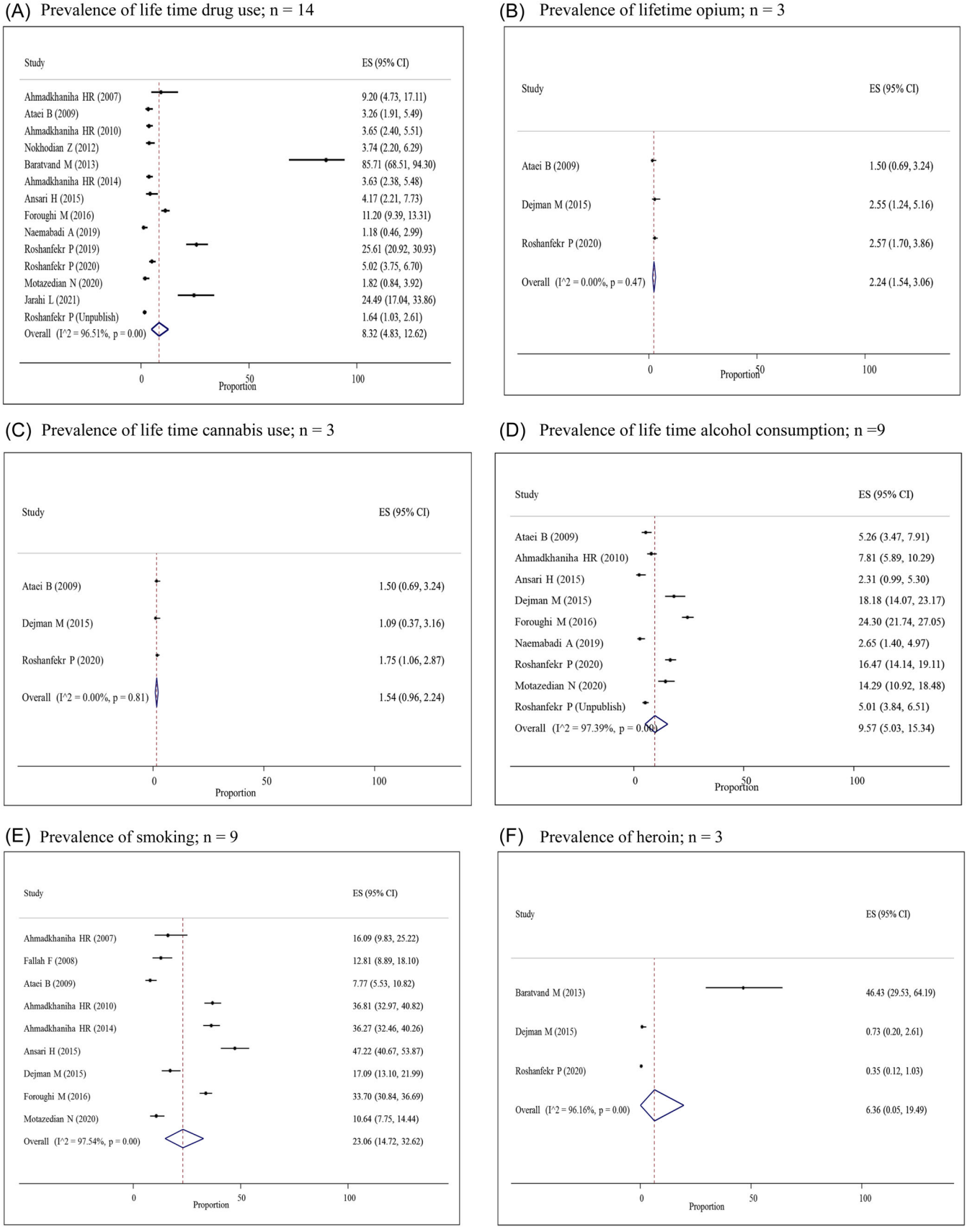

FIGURE 3 Prevalence of drug use (A), opium (B), cannabis (C), alcohol (D), tobacco smoking (E), and heroin (F) among street children in Iran.

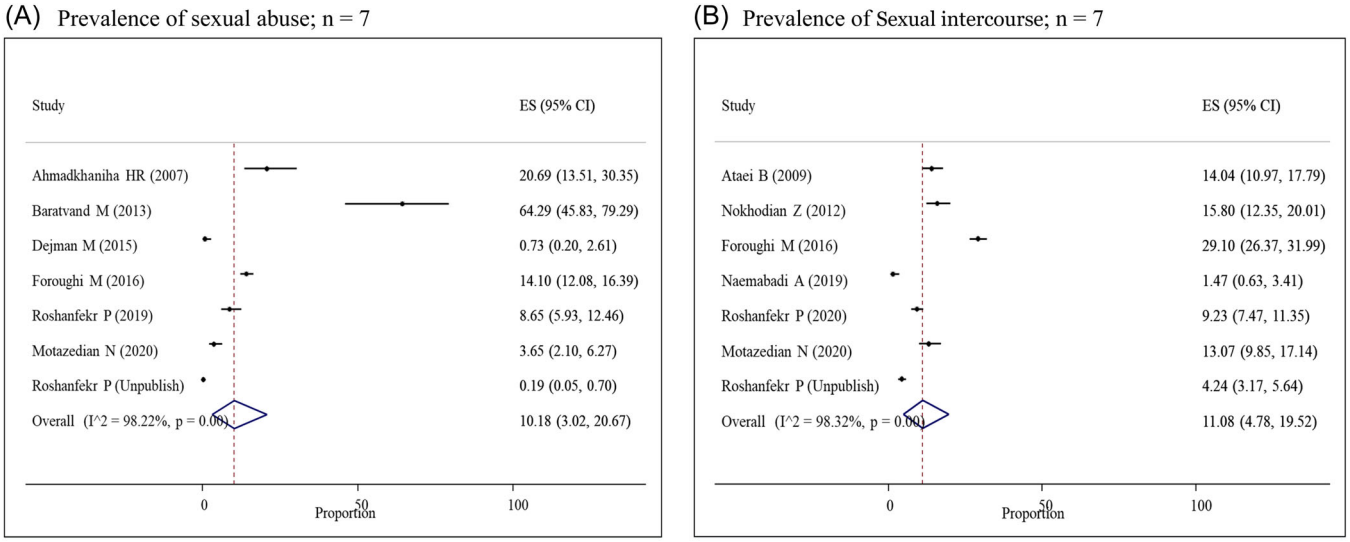

FIGURE 4 Prevalence of sexual abuse (A) and sexual intercourse (B) among street children in Iran.

necessary for the government to raise awareness and provide psychological and social support to street children. Policymakers should program to decrease and manage these behaviors to succeed in other programs, especially HIV.

Finally, the prevalence of sexual abuse was 10.18%. Studies reported a prevalence of sexual abuse in street children that ranged from 4% to 71.6% in different countries.[6,7,44] Street children have sexual intercourse for many reasons like exchanging money, peer pressure, alcohol influence,[6] exposure to risky sexual behavior, and various health problems. Coercive sex is common in street children, and older street children commonly force younger children to have vaginal or anal sex. While street children have misconceptions about the transmission of HIV and other STIs, they usually do not use condoms during sexual intercourse[45] for many reasons, including perceived reduction of sexual pleasure, negligence to use a condom, cost, and being ashamed to buy.[46] Roshanfekr et al., in a study in Tehran, reported that only 37.7% of street children use a condom in their sexual activities.[33] Further, street children start sexual activity at a low age.[5] and risk having multiple sex partners at a lower age, while condom use also decreases in street children of a lower age.[7] Risky sexual behavior exposes children to HIV and other STIs.[45] It seems that age, poverty, peer pressure, and low education expose street children to high-risk sexual behaviors and convert them into a high-risk group for transmitting HIV, and other STIs. Thus, focusing on these groups and programs for low harm of sexual activity can increase success in the 95-95-95 goal and control HIV in 2030.

This is the first study in which we tried to summarize the available evidence on the prevalence of several behaviors and infections among street children in Iran; however, our study has some limitations. First, the number of studies in some situations was low. For example, HIV estimates were based on only three studies. Hence, we could not conduct a subgroup analysis. quality of the included studies was somehow low. Third, the studies confine to a few cities (e.g., Tehran, Shiraz, and Zahedan) and may not be representative of Iranian street children in all of Iran. Nevertheless, the population of street children is low in smaller cities and rural areas.

5 | CONCLUSION

Our findings indicate that in Iran's street children population, the prevalence is one in 125 for HIV, one in 55 for HBV, and one in 76 for HCV. Additionally, one in 12 children reported drug use, while one in four admitted to smoking. One out of 10 children had the experience of alcohol consumption, and one out of nine children had experienced sexual abuse. Street children in Iran are at a higher risk for the studied infections and behaviors than other children. Targeted health intervention plans must be provided by policymakers to promote education and prevent high-risk behaviors among street children. Increased support from policymakers is essential for both researchers and street children to identify the root causes of substance use and mitigate risky behaviors. Furthermore, Iran's harm reduction programs must be tailored to meet the specific needs of this at-risk group.

AUTHOR CONTRIBUTIONS

Naser Nasiri: Conceptualization; data curation; formal analysis; investigation; methodology; project administration; software; validation; visualization; writing—original draft. **Polychronis Kostoulas**: Conceptualization; methodology; supervision; validation; writing—review and editing. **Payam Roshanfekr**: Data curation; formal analysis; investigation; methodology; software; validation; visualization; writing—review and editing. **Ali Asghar Kheirkhah Vakilabad**: Investigation; writing—review and editing. **Mehrdad Khezri**: Data curation; formal analysis; investigation; methodology; software; validation; visualization; writing—review and editing. **Hossein Mirzaei**: Data curation; formal analysis; investigation; methodology;

software; validation; visualization; writing—review and editing. **Ali Sharifi**: Data curation; investigation; validation; visualization; writing—original draft. **Hamid Sharifi**: Conceptualization; investigation; methodology; project administration; supervision; validation; visualization; writing—review and editing.

CONFLICT OF INTEREST STATEMENT

The authors declare no conflict of interest

DATA AVAILABILITY STATEMENT

All authors have read and approved the final version of the manuscript. Manuscript guarantor had full access to all of the data in this study and takes complete responsibility for the integrity of the data and the accuracy of the data analysis. The data supporting the findings can be requested from the corresponding author (Hamid Sharifi: hsharifi@kmu.ac.ir).

ETHICS STATEMENT

This study earned the ethics code of Iranian ethics committees with the number IR.KMU.REC.1400.432.

TRANSPARENCY STATEMENT

The lead author Hamid Sharifi affirms that this manuscript is an honest, accurate, and transparent account of the study being reported; that no important aspects of the study have been omitted; and that any discrepancies from the study as planned (and, if relevant, registered) have been explained.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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