Prevalence of suicidality, depression, post-traumatic stress disorder and anxiety among female sex workers: a systematic review and meta-analysis

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Abstract

Purpose: To assess prevalence of suicidality, depression, post-traumatic stress disorder (PTSD) and anxiety among female sex workers (FSW).

Methods: A systematic review and meta-analysis was performed. Search strategy was performed in MEDLINE, Scopus, Web of Science, EMBASE, Ovid and Cochrane Central Database from inception until March 2020. Considered for inclusion were cross-sectional studies performed on FSW that assessed prevalence of any of the following: suicide attempt or suicidal ideation, depression, PTSD, or anxiety. Five reviewers independently and in duplicate to select all eligible articles in an abstract and full-text screening phase and to moreover extract information from each study. A binomial-normal generalized linear mixed model was employed to estimate prevalence of the conditions.

Results: From 8,035 studies yielded in the search strategy, 55 were included for analysis. The overall prevalence of suicidal ideation and attempt was 27% (95% C.I. 18-39%) and 20% (95% C.I. 13-28%), respectively. Furthermore, overall prevalence of depression and PTSD was 44% (95% C.I. 35-54%) and 29% (95% C.I. 18-44%), respectively. Eleven studies were classified as high quality.

Conclusion: Findings indicate there is an overall high prevalence of suicidality, depression, and PTSD among FSW. Development of accessible large-scale interventions that assess mental health among this population remains critical.

PROSPERO Registration CRD42020196164

Introduction

Worldwide, female sex workers (FSW) represent a highly vulnerable group, frequently exposed to a variety of health hazards, social stigma, violence, and systematic disadvantages (Kessler et al., 2017; Park, J. N., & Decker, M. R., 2019; Zhang et al., 2014). Also important is the intense psychological stress that some endure, commonly associated to adverse work-related conditions. The environment in which female sex workers live usually has one or several sociocultural determinants that could eventually trigger mental, neurological and substance abuse disorders. Some of these are low social support, inadequate housing, workplace and homeplace violence, among other important factors such as experiencing violence since early childhood. It is important to note that these determinants could be related to both their actual condition and the involved psychopathology. Considering these challenges, high rates of psychological and psychiatric morbidity have been reported among them (Abelson, A. et al., 2019; Coetzee, J. et al., 2018; Patel, et al. 2016; Rael, C. T., & Davis, A., 2017).

Previous studies have found associations between HIV-related risk behavior and mental health diseases (Fang, Chuang, & Al-Rae, 2019; Shen et al., 2016; Štulhofer et al, 2017). Moreover, several studies have evaluated depression, anxiety, post-traumatic stress disorder (PTSD) and suicidality in FSW. However, discrepant results suggest that the prevalence of these conditions on FSW remains controversial (MacLean, S. et al. 2018; Ortblad, K. F. et al., 2020; Su, S. et al., 2014; Teixeira, A. & Oliveira, A., 2017; White, D. et al., 2016; Poliah, V., & Paruk, S., 2017).

With the growing body of evidence, a synthesis of the available scientific literature could provide a broader and clearer perspective regarding mental health of FSW. With the previous being said, the objective of this study is to estimate the prevalence of suicidality, depression, PTSD, and anxiety among FSW by performing a meta-analysis from studies that stem from more than 25 different countries across 5 continents.

Methods

This systematic review and meta-analysis adhered to the Meta-analysis of Observational Studies in Epidemiology (MOOSE) statement (Online Resource 1) and a protocol was registered on the International Prospective Register of Systematic Reviews (PROSPERO) (Registration number: CRD42020196164) (Stroup et al., 2000).

Eligibility criteria

Longitudinal and cross-sectional studies of any language were considered eligible if they met the following criteria: a) their study population was FSW of any age, nationality or working venue; b) they performed an assessment for depression, anxiety, PTSD or stress-related symptoms through a validated rating scale, or evaluated for suicidal ideation or suicidal attempts by direct questions, and c) reported the proportion of these outcomes (in the case of outcomes evaluated by numeric rating scales, according to a pre-specified cut-off point). Studies reporting composite outcomes were excluded.

Search Strategy

An experienced librarian (LEGL) performed a systematic search strategy on MEDLINE, Scopus, Web of Science, EMBASE, Ovid and Cochrane Central Database from each database inception date until March 2020 without language restriction. Search strategy was comprised of Medical Subject Headings (MeSH) terms and specific keywords involving population (female sex workers) and outcomes of interest (depression, anxiety, post-traumatic stress disorder, suicide ideation and attempt). Grey literature was assessed on opengrey.eu and ntis.gov. The full search strategy is available in Online Resource 2-Search strategy.

Study selection process

The selection process was performed in an independent and duplicated manner by five experienced reviewers (JMMA, PCLC, FCN, HdLG. and AFGM) on Distiller Systematic Reviews (Evidence Partners) software and was divided into a title/abstract and full-text screening phase. Each phase was pre-piloted to ensure the understanding of the selection criteria and to assess the inter-rater agreement. During the title/abstract screening phase, any disagreement between

reviewers was passed on to the full-text phase where disagreements were resolved by consensus or intervention of another reviewer. Any non-English published article was translated by study authors.

Data collection process

All five reviewers independently and in duplicate extracted data from included articles to a previously standardized web-based form. Extracted data included only summary estimates. The following variables were extracted: first author, year of publication, country, and sex work legal status where study was performed, number of participants, age, sex work setting and percentage of HIV positive participants, above mean drug use or exposure to physical/sexual violence compared to general population (United Nations, 2020; WHO, 2020). For scales evaluating depression, anxiety or PTSD, data on whether it was self-reported or rater-administered was obtained as well as cut-off points to determine diagnosis when it applied. For scales that evaluated symptom severity rather than diagnosis, moderate and/or high levels of symptoms were considered as a positive screening for the evaluated outcome. Suicidality was evaluated as direct questions regarding suicidal ideation or attempt during any specific time span. Regarding outcomes of interest, absolute number and proportions were directly extracted or calculated with a simple cross multiplication when either of those was missing. Discrepancies at this stage were resolved by consensus or through intervention of another reviewer.

Quality Assessment

Quality of individual studies was rated by five reviewers (JMMA, PCLC, FCN, HLG, AFGM) independently and in duplicate using the Appraisal Tool for Cross Sectional Studies (AXIS), a 20-item critical appraisal instrument developed to assess standard of quality of reporting by cross-sectional studies (Downes, Brennan, Williams, & Dean, 2016). AXIS evaluates quality design (clarity of objectives, design, and rationale for sample size), reporting (consistency between methodology, reported results and conclusions, incorporated measures to account for non-responders) and declaration of funding sources, conflicts of interest and statement of informed consent attainment. Discrepancies were resolved by consensus or arbitration of another reviewer. Since no evidence regarding score classification has been described, a score of 17-20 was classified as high quality, 14-17 as moderate quality and ≤ 13 as low quality.

Data Synthesis

Although we consider that our analysis is meant to estimate the pooled proportion rather than the pooled prevalence, we will use the latter term throughout the manuscript for practical purposes. Numeric data was reported as central tendency and dispersion measures, categorical data as frequencies and percentage. Data integration is comprised of a qualitative synthesis and a quantitative synthesis (meta-analysis) where pooled prevalence for each outcome is reported. To estimate prevalence, we used a binomial-normal model for meta-analysis of prevalence via a Generalized Linear Mixed Model (GLMM) (Stijnen, Hamza, & Ozdemir, 2010). Prevalence estimates were reported as binomial proportions with 95% confidence intervals. Heterogeneity was assessed with the I^2 statistic and Kendall rank correlation coefficient. Levels between 25-50% were considered as low, 50-75% as moderate and $>75\%$ as substantial heterogeneity. Statistical significance was classified as a p value $< .05$. Meta-analysis was performed in R statistical software version 4.0.2.

Subgroup and sensitivity analysis

Subgroup analyses were performed by stratifying studies according to sex-work setting (studies performed on streets only, studies performed on combined settings) and sex-work legal status on country where study was performed (legal, partially legal, illegal) (Studies IoD; ProCon, 2020). Moreover, sensitivity analyses were performed by stratifying studies according to their quality (high, moderate, low), sample size (higher than 220, lower or equal than 220) and sampling method (adequate sampling method, inadequate sampling method). We selected a cut-off point of 220 participants for sample size sub-analysis since it was estimated as the median number of samples. Sampling was considered as appropriate if study reported enough information to generate a conclusion, recruited participants in numerous sites and used any of the following sampling methods: quota, respondent-driven, snowball, peer-referral or probabilistic.

Results

A total of 8,035 references were screened by title and abstract from which 155 were passed to full-text screening phase. Ultimately, a total of 55 studies, which were performed across 28 countries and 5 continents met the inclusion criteria (Figure 1) (See Table 1 for studies that met inclusion criteria).

Mean/median age of participants ranged between 20.2 and 38.6 years. A total of 8 (14.5%) studies recruited participants only from the streets, 2 (3.6%) only from brothels and the rest of them (81.8%) recruited them on either a mixed setting or did not provide enough information. Thirteen studies (23.6%) provided information on proportion of HIV positive participants where it ranged between 2% and 100%. Above mean drug use and exposure to physical or sexual violence when compared to general population parameters was observed in most studies. Full details regarding study characteristics and outcome measures are available on Table 1.

Eleven studies (20%) were classified as possessing high quality. Moreover, 33 (60%) and 11 (20%) studies possessed moderate and low quality, respectively. Some consistently deficient domains across studies were sample size justification, categorization and description of non-responders (See Table 1 for the overall quality; see Online Resource 2-Table 1 for full assessment).

Suicide ideation was assessed by 18 studies (32.7 %) evaluating 8,107 individuals where independently of temporality, a prevalence of 27% (95% CI 18-39%; $I^2 = 98.9\%$; $n = 8,107$) was obtained. Moreover, suicide ideation during the year prior to the survey and ever in their lifetime occurred in 21% (95% CI 10-37%; $n = 4,366$; $I^2 = 98.9\%$) and 34% (95% CI 21-50%; $n = 3,741$; $I^2 = 98.1\%$) of participants, respectively (See Online Resource 2-Figure 1 for overall prevalence).

Suicide attempt was assessed in 16 studies (29%) evaluating 6,166 individuals. General prevalence of suicide attempt according to the reported evidence was of 20% (95% CI 13-28%; $n = 6,166$; $I^2 = 97.6\%$). Analysis by temporality, suicide attempt during the last year and ever in their lifetime occurred in 13% (95% CI 9-18%; $n = 2,614$; $I^2 = 91.1\%$) and 25% (95% CI 15-38%; $n = 3,552$; $I^2 = 97.8\%$) of participants (See Online Resource 2-Figure 2 for overall prevalence).

Forty studies (72.7%) evaluated depression in 17,581 individuals where a pooled prevalence of 44% (95% CI 35-54%; $n = 17,581$; $I^2 = 99.1\%$) was obtained. Studies were divided according to if the scale was self-reported or rater-administered and prevalence of 48% (95% C.I. 38-58%; $n = 16,642$; $I^2 = 99.2\%$) and 28% (95% CI 13-51%; $n = 939$; $I^2 = 96.8\%$) were found for each, respectively (See Online Resource 2-Figure 3 for overall prevalence).

Fifteen studies (27.2%) evaluated PTSD as an outcome on 3,042 individuals. General prevalence of 29% (95% CI 18-44%; $n = 3,042$; $I^2 = 98.06\%$) was obtained. When subdivided by patient-reported or rater-administered scales, prevalence of 32% (95% CI 20-48%; $n = 2,318$; $I^2 = 97.8\%$) and 24 (95% CI 8-54%; $n = 724$; $I^2 = 97.3\%$) were obtained, respectively (See Online Resource 2-Figure 4 for overall prevalence).

Twelve studies (21.8%) evaluated outcomes encompassing anxiety related diagnoses. Due to the observation of significant heterogeneity between anxiety diagnoses (generalized anxiety disorder, obsessive compulsive disorder, phobias, etc.), pooled analysis of this outcome was not performed, and results are reported qualitatively on Table 2.

Stratification of studies according to sex work site and legal status of sex work on the country where study was performed revealed a higher prevalence of overall PTSD among street-only sex workers when compared to non-street sex workers or samples with combined settings (59% [95% C.I. 50.7-66.8%; $n = 1,174$; $I^2 = 82.5\%$ vs. 18.6% [95% C.I. 10.3-31.3%; $n = 1,868$; $I^2 = 96.4\%$]; $p < .001$). Furthermore, studies that were performed on countries where sex work is partially legal reported higher prevalence of overall PTSD when compared to countries where sex work practice is legal (61% [95% C.I. 53.2-68.3%; $n = 1,274$; $I^2 = 83.03\%$] vs. 12.9% [95% C.I. 8.6-19.1%; $n = 1,260$; $I^2 = 85.4\%$]; $p < .001$). No statistically significant differences were observed among these subgroups regarding depression, suicide ideation and suicide attempt (Extended results on Online Resource 2 Table 2-5).

Studies with inappropriate sampling methods reported a higher prevalence of suicide ideation when compared to studies with appropriate ($n, \%$) sampling methods (43.1% [95% CI 31.6-55.3%; $n = 758$; $I^2 = 89.2\%$] vs. 18.9% [95% CI 10.3-32.2%; $n = 7,349$; $I^2 = 99.2\%$]; $p = .026$). No significant differences were found when performing sensitivity analyses according to sample size, study quality or sampling methods across outcomes (Extended results on Online Resource 2, Tables 2-5).

Discussion

FSW are an extremely vulnerable group susceptible to intense psychological stress derived from multiple health, social, economic, and legal barriers where the exposure to different types of violence during their lifetime also plays a key role in the psychopathology of mental health disorders (Romans et al., 2001; Rössler et al., 2010; H. L. Surratt & Kurtz, 2012). It comes as no surprise that prevalence for psychiatric symptoms marginally surpasses that of the general population. In addition to the previously mentioned, when comparing them to other similarly vulnerable populations, especially considering trauma-exposed populations, proportions of depression and PTSD are still higher among FSW (Morina, Stam, Pollet, & Priebe, 2018).

To the best of our knowledge, this is the largest meta-analysis to examine the prevalence of depressive symptoms in FSW, and the only one regarding anxiety, PTSD, and suicidal behavior. Furthermore, our analysis encompasses results from studies performed on more than 25 countries worldwide, which provides a global perspective on this important topic. Our results highlight the significantly elevated prevalence of psychiatric morbidity in FSW. Depressive symptoms were the most amply studied with a pooled prevalence of 44% from 40 studies and 17,581 subjects. This is staggeringly higher compared to the general population (12.9%) (Lim et al., 2018). A previous review obtained an estimate of 62%, although this result was based on only 4 studies (Yuen et al., 2016). Regardless, the occurrence of depressive symptoms is still alarmingly elevated, irrespectively of self-reported or rater-administrated instrument use. Similarly, the prevalence of other outcomes was higher in FSW when compared to general population: PTSD (29.3% vs 11.1%), suicidal ideation (26.9% vs 9.2%) and attempts (19.7% vs 2.7) (Nock et al., 2008; Spottswood, Davydow, & Huang, 2017). Although a quantitative analysis was not possible for anxiety due to diversity of anxiety-related diagnoses, results from the included studies ranged from 8% to 61.4% (Devóglío, Corrente, Borgato, & Godoy, 2017; Iaisuklang & Ali, 2017).

As part of our subgroup analyses, we observed higher proportions of PTSD among street-based sex workers when compared to other setting (bars, venues, hotels, etc). This phenomenon could be explained due to lack of access to health services, work-related stigma, illegal status, and more importantly exposure to higher rates of workplace violence among FSW working in these settings; however, several other factors could also be associated into this observation. Another interesting finding in our subgroup analysis was also related to PTSD, where we observed higher rates of it among studies that were performed in countries where sex work is partially legal compared to completely legal (61.9% vs 12.9%, $p < .001$). FSW who work in countries where sex work is not legal may be more prone to being exposed to different types of violence, social and cultural stigma, as well as lack of access to health services (Romans et al., 2001; Rössler et al., 2010; H. L. Surratt & Kurtz, 2012).

The proportion of violence in every study included in this review was above the general proportion of violence against women established by the WHO (World Health Organization, 2020). Violence endured by FSW is constant and prolonged as it occurs in an everyday setting (home, work, public spaces, etc). Perpetrators are usually family members, friends, strangers, intimate partners, clients, peers and even health care workers. Although not generalizable for the entire FSW population, this is a major distinction from other traumatic environments which could elevate rates of PTSD among them (Evens et al., 2019).

Among the included studies, there was a highly consistent presence of perpetuating interpersonal trauma among FSW, including sexual abuse and physical assault. Most studies reported a history of childhood physical, emotional, psychological, and sexual violence, where there also was a significant correlation between these variables and a current diagnosis of PTSD. The proportion of affected individuals was reported to be as high as 82% in some cohorts. Hence, in

addition to current work and domestic violence, history of complex childhood trauma as frequently observed among the studies in this systematic review may be another heavy contributing factor to the pooled prevalence for PTSD and other stress-related symptoms in our meta-analysis, in which interpersonal trauma plays a more critical role compared to non-interpersonal and context trauma. The previous hypothesis being supported from findings in several studies involving participants with a history of exposure to childhood violence, neglect, and sexual abuse (Roxburgh, Degenhardt & Copeland, 2006; Coetzee et al. 2018; Dorahy et al. 2009).

The predicament of FSW in these different countries is not the same; most are victims of gender-based violence, but possibilities of protection vary considerably between countries. The same holds for stigma and family support.

In the interpretation of our results, it is important to consider that mental health issues for FSW are present across cultures. Sex work is a profession that is practiced worldwide and as evidenced in our review, the included references come from more than 25 countries and 5 continents. The manifestation of mental health in general among this population could vary depending on their country of origin as well as their country of residence and work for the following considerations: legal status regarding the profession, cultural perceptions of sex work and mental illness or psychological symptoms, access to physical and mental health services as well as to legal services, country economic status, among others. Adverse circumstances regarding some of the previously mentioned could negatively affect the working environment surrounding sex work and directly elevate rates of stigmatization, gender based and workplace violence among them. Also, noting that cultural factors could influence and affect the reporting of mental health problems should also be considered in the design of much needed implementation strategies to promote mental health treatment among this vulnerable population. These strategies should be individualized based on each country and culture due to some of the previously mentioned aspects.

Another significant issue is the high HIV prevalence among FSW (Paz-Bailey, Noble, Salo, & Tregear, 2016). Evidence suggests a relation between poor mental health and HIV-risk behaviors such as unprotected vaginal or oral sex, IV drug use, sex under the influence of alcohol or drugs, and syringe exchange, etc (Grosso et al., 2019; Lau et al., 2010; Rogers, Lemstra, & Moraros, 2015; Sagtani et al., 2013; Shen & Zou, 2016; Ulibarri et al., 2013). Depression, for example, may increase HIV-risk behaviors due to several factors such as impairment in cognitive function, decreased impulse control, reduced motivation, and increased fatalism. Moreover, following Beck's theory of depression, negative thoughts and feelings surround how depressed people perceive themselves and could ultimately influence their behavior and prevent them from making rational decisions, which will often be based on emotions (Khan et al., 2009; Seth et al., 2011). Regarding PTSD, two main mechanisms have been described to be involved in the process of impulsive and risky behaviors. The first one is an impairment in emotion regulation, a multi-component construct composed by lack of acceptance, difficulties in engaging in goal-directed behaviors when distressed, difficulty in impulse control, limited access to effective emotion regulation strategies, lack of emotional awareness and clarity. The second one is impulsivity, as it is a well-established correlate of risky behaviors such as the addressed in our review (Strom et al., 2012; Tull et al., 2014).

Understanding the complex relation between the abovementioned is substantial for promoting health policies and effective interventions for HIV-prevention and mental health treatment on this population. Behavioral, social, and community-empowerment interventions have shown promising results on reducing rates of risk behaviors and even the incidence of HIV and other sexually transmitted diseases. These interventions should be considered in the process of developing future health policies for vulnerable populations such as FSW (Chow et al., 2015; Kerrigan, Fonner, Stromdahl, & Kennedy, 2013).

Strengths from this review include a systematic approach to identify and synthesize all available evidence from the most frequent and debilitating mental disorders worldwide, with over 8,000 screened references (Gu et al., 2010; Hilary L Surratt et al., 2005; Wang et al., 2007). Moreover, we only included studies whose outcomes were evaluated with a validated scale which provides more validity to our results. Although we presented the general pooled prevalence for each outcome, subgroup analyses were also provided for self-reported and rater-administered instruments, sex work legal status based by country, work setting, sample size and methods, study quality and time presentation for suicidal behavior. This stratification allows for a more comprehensive analysis on the implications for each outcome and for finding sources of heterogeneity. We also decided to implement a Generalized Linear Mixed Method for meta-analysis due to evidence indicating misleading results from the back-transformation to the original prevalence when using the inverse of the Freeman-Tukey double arcsine transformation (Schwarzer & Chaimaitelly, 2019).

The present review is subject to some limitations. The most important one is that when evaluating study quality, we identified that studies consistently did not justify sample size or report non-response rate and the characteristics of non-responders. Moreover, nearly a third of the included studies employed inadequate sampling methods and study quality could be a source of bias in our results. As FSW comprise a heterogeneous and hard-to-reach population, this potentially leads to selection bias and non-representativeness, consequently affecting the interpretation of the results. Additionally, we acknowledge that the results may not fully reflect the real prevalence and rather represent pooled proportions from observational studies. Another important consideration is that the real prevalence may be overestimated since most measures were obtained through screening instruments. Also, although we carefully evaluated each article for this issue, we acknowledge that participant repetition could be present as some studies might have been performed using the same population cohorts; however, by summing up participants only by outcome instead of overall, the probability of this scenario being present was diminished. We consider that these matters do not hinder the observed results as they highlight the alarmingly high occurrence of psychiatric morbidity in FSW, most probably related to violence exposure, comorbidities, and the multidimensional barriers they face.

An important topic to address is the consistently high heterogeneity throughout the analysis. Although our subgroup and sensitivity analysis did not provide sufficient explanations, the unexplained heterogeneity could be the result of three main factors. Firstly, FSW have a great diversity of social, working, economic, political, and more importantly, cultural circumstances. Moreover, stigma associated with sex work itself also varies across settings and countries, as has been previously reported (Sawicki et al., 2019). As a result, some FSW could be at greater risk of mental health problems compared to others. Secondly, clinimetrics employed to measure outcomes varied considerably across studies. Although evidence suggests strong positive correlations between many of them, we still consider this a source of heterogeneity (Smarr & Keefer, 2011; Titov et al., 2011). Finally, the observational nature of the studies is another

potential source. However, it is highly expected to observe high heterogeneity in prevalence meta-analyses, and this topic should be addressed in future research on meta-analytical methods.

As a conclusion, high prevalence of depression, PTSD, suicidal ideation, and attempt was observed among FSW. Although results could be overestimated due to usage of screening scales, prevalence is still higher when compared to other literature. Understanding the critical impact of poor mental health on this population, its triggers as well as its relationship with HIV-risk behaviors is crucial in the design of new strategies that promote access to physical and mental health services for them. There is an urgent need for FSW to be empowered and demand adequate health access as well as to enforce their human rights and be provided with not only the former but also with decent living conditions and important factors such as workplace protection and access to legal help to prevent the onset of the studied conditions. In the process diminishing risk factors for HIV-risk behaviors while promoting human and decent life and work conditions for this population. Government agencies and institutions should prioritize this as a global health problem.

Declarations

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Conflicts of Interest

The authors do not have any conflicts of interest to state.

Ethics Approval

Not applicable

Consent to participate

Not applicable

Consent for publication

All authors have reviewed the final version of this manuscript and authorize its submission & publication.

Availability of Data and Material

Data used in the present study will be made available upon request to the corresponding author.

Code Availability

Not applicable.

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Author Contributions

Dr. Millán contributed to the conceptualization, data curation, statistical analysis, methodology, administration, validation & supervision of the study. Dr. Carranza contributed to the data curation, methodology, administration, supervision & validation of the study. Dr. de León contributed to the data curation, methodology & supervision of the study. Dr. Leyva contributed to the methodology, administration, provided software and resources & validation in the present study. Dr. Guerrero contributed to the methodology, administration, supervision & validation of the present study. Dr. Barrera contributed to the data curation process, statistical analysis, methodology, provided resources and software for this study. Ms. Garza contributed to the methodology & provided resources and software for the present study. Dr. Saucedo contributed to the conceptualization, methodology, administration, provided resources, validation & supervision of the present study. All authors participated in the drafting process of the manuscript and have reviewed and approved its final version for submission & publication.

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Tables

Table 1: Study and population characteristics												
Author, year	Country	Status	N	Age	Site	HIV (+) (n, %)	Above mean drug use ^g	Above mean exp. to violence ^f	Quality	Depression	Anxiety	PTSD
Abelson et al (2019)	Cameroon	I	2165	30.1 (23-36) ^e	NR	526/2158 (24.4)	Yes	Yes	Moderate	PHQ-9 ≥10	NR	NR
Alegría et al (1994)	Puerto Rico	I	127	32 ^b	Mixed	35 (27.5)	Yes	NR	Low	CES-D 20 ≥16	NR	NR
Berger et al (2018)	Swaziland	I	325	26.1 (6.2) ^a	Mixed	222/319 (69.6)	Yes	Yes	Moderate	NR	NR	NR
Burnette et al (2008)	United States	PL	816	31.56 (6.0) ^a	NR	54 (6.6)	Yes	NR	Moderate	NR	NR	NR
Cange et al (2019)	Burkina Faso	PL	696	26 (18–59) ^c	Mixed	NR	NR	Yes	High	NR	NR	NR
Chen et al (2017)	China	I	457	25.15 (5.9) ^a	Mixed	NR	NR	NR	Moderate	CES-D 20 ≥16	NR	NR
Coetzee et al (2018)	South Africa	I	508	31 (25-37) ^c	NR	NR	NR	Yes	High	CES-D 20 ≥21	NR	PTSD-8/DSM-IV
Cwikel et al (2003)	Israel	L	55	22.8 (4.4) ^a	Brothel	NR	Yes	Yes	Moderate	CES-D 20 ≥16	NR	PCL-17 ≥51
Cwikel et al (2004)	Israel	L	47	22.3 (2.8) ^a	NR	NR	NR	Yes	Low	CES-D 20 ≥16	NR	PCL-17 ≥52
Daalder et al (2013)	Netherlands	L	123	33.5(9.2) ^a	Mixed	NR	NR	Yes	Moderate	NR	NR	SRIP ≥53
Devoglio et al (2017)	Brazil	L	83	26.8 (6.3) ^a	NR	NR	Yes	NR	Moderate	HADS	HADS	NR
Eller et al (2003)	Nepal	I	98	20.2 (13-39) ^f	NR	98 (100)	NR	NR	Moderate	CES-D 20 ≥16	SCL-AS	NR
Farley et al (2005)	Canada	PL	100	28 (13-49) ^f	Mixed	NR	NR	Yes	Moderate	NR	NR	DSM-IV
Ghose et al (2013)	India	L	100	23 ^b	Mixed	100 (100)	NR	NR	Moderate	HADS	HADS	NR
Gilchrist et al (2005)	Scotland	L	176	NR	NR	NR	Yes	Yes	Low	CIS-R ≥18	CIS-R ≥18	NR
González-Forzeza (2014)	Mexico	L	103	28 (6.7) ^a	Mixed	NR	NR	NR	Low	MINI	NR	NR
Grosso et al (2019)	Burkina Faso & Togo	PL	1383	NR	NR	NR	NR	NR	Low	NR	NR	NR
Gu et al (2014)	China	I	200	33.9 (5.3) ^a	Mixed	NR	NR	NR	Moderate	CDAS-DS ≥14	NR	NR
Gunn et al (2015)	United States	PL	24	42.5 ^d	Mixed	NR	Yes	NR	Moderate	NR	BSI-A	NR
Hengartner et al (2015)	Bangladesh	L	259	23.2 (6.7) ^a	Mixed	NR	Yes	Yes	High	MH-CIDI	MH-CIDI	MH-CIDI
Hong et al (2007)	China	I	454	23.5 (5.1) ^a	Mixed	NR	NR	NR	Moderate	NR	NR	NR
Hong et al (2007)	China	I	278	23.5 (5.1) ^a	NR	NR	NR	NR	Moderate	CES-D ≥16	NR	NR
Hong et al (2010)	China	I	310	22.5 (3.9) ^a	Mixed	NR	NR	NR	Moderate	CES-D ≥16	NR	NR
Hong et al (2013)	China	I	1022	24.9 (6.7) ^a	Mixed	NR	Yes	Yes	Moderate	CES-D ≥16	NR	NR
Iaisuklang et al	India	L	100	29.5	Mixed	NR	Yes	Yes	Low	MINI	MINI	MINI

al (2017)				(6.9) ^a								
Jung et al (2012)	South Korea	IL	1073	28.7 (5.8) ^a	Brothel	NR	NR	NR	High	NR	NR	NR
Lau et al (2010)	China (Hong Kong)	I	293	NR	Mixed	NR	Yes	NR	High	CES-D ≥ 16	NR	NR
Ling et al (2007)	China	I	89	36 ^b	Streets	NR	NR	NR	Moderate	NR	NR	NR
MacLean et al (2018)	Malawi	L	200	24 (22-28) ^c	Mixed	138 (69)	NR	NR	High	PHQ-9 ≥ 10	NR	PCL-C
Ortblad et al (2020) ^g	Uganda & Zambia	I	1925	26.6 (6.5) ^a	Mixed	NR	NR	NR	Moderate	PHQ-9 ≥ 10	NR	NR
Pandiyan et al (2012)	India	L	100	31.7 (7.9) ^a	NR	2 (2)	Yes	NR	Low	GHQ	GHQ	NR
Park et al (2019)	United States	PL	220	35.7 (8.9) ^a	Streets	NR	Yes	Yes	Moderate	NR	NR	PCL-5 ≥ 33
Patel et al (2015)	India	L	1986	29.2 (5.3) ^a	Mixed	NR	NR	NR	High	PHQ-2 ≥ 3	NR	NR
Patel et al (2016)	India	L	2400	31 (5.8) ^a	Mixed	NR	NR	NR	High	PHQ-2 ≥ 3	NR	NR
Poliah et al (2017)	South Africa	IL	150	NR	NR	NR	NR	Yes	Moderate	PHQ-9 ≥ 5	NR	NR
Rael et al (2017)	Dominican Republic	L	349	27.5 (6.7) ^a	Mixed	NR	NR	NR	Moderate	CES-D 10 ≥ 10	NR	NR
Ranjbar et al (2019)	Iran	I	48	30.9 ^b	Streets	NR	NR	Yes	Moderate	SCID	SCID	NR
Roberts et al (2018)	Kenya	L	283	33.5 (27.2-40.6) ^c	Mixed	NR	NR	Yes	Moderate	PHQ-9 ≥ 10	NR	PCL-C ≥ 30
Rogers et al (2015)	Canada	PL	217	NR	Mixed	NR	NR	NR	Moderate	CES-D 20 ≥ 16	NR	NR
Rossler et al (2010)	Switzerland	L	193	32.1 (18-63) ^f	Mixed	NR	NR	Yes	Moderate	MH-CIDI 2·1	MH-CIDI 2·1	MH-CIDI 2·1
Roxburgh et al (2006)	Australia	PL	72	34 (8.8) ^a	Streets	NR	Yes	Yes	Moderate	BDI ≥ 29	NR	CIDI
Sagtani et al (2013)	Nepal	I	210	NR	NR	NR	NR	Yes	High	CES-D 20 ≥ 16	NR	NR
Semple et al (2020)	Mexico	L	426	33.8 (8.0) ^a	Mixed	NR	NR	NR	High	BDI-II ≥ 20	NR	NR
Shahmanesh et al (2009)	India	L	326	NR	Mixed	84 (25.8) ^g	Yes	Yes	Moderate	NR	NR	NR
Shen et al (2016)	China	I	653	NR	Mixed	4 (0.6)	No	NR	Moderate	GHQ-12 ≥ 6	NR	NR
Su et al (2014)	China	I	1022	NR	NR	NR	Yes	NR	Moderate	NR	NR	NR
Surratt et al (2005)	United States	PL	278	35.2 ^b	Streets	52 (18.7) ^g	Yes	Yes	Moderate	BDI-II ≥ 20	BAI	TSI ≥ 5
Surratt et al (2012) ^h	United States	PL	562	39.31 (8.5) ^a	Streets	103 (18.3) ^g	Yes	Yes	Moderate	GAIN ≥ 6	GAIN ≥ 6	GAIN ≥ 5
Teixeira et al (2017)	Portugal	L	52	38.7 (10.3) ^a	Streets	NR	Yes	Yes	Low	NR	NR	NR
Ulibarri et al (2013)	Mexico	L	624	33.7 (8.4) ^a	Mixed	NR	NR	Yes	High	CES-D 10 ≥ 10	NR	NR
Valera et al (2001)	United States	PL	42	29.5 (10.3) ^a	Streets	1 (2.4) ^g	Yes	Yes	Low	NR	NR	PCL-17

White et al (2016)	Kenya	L	405	NR	Mixed	405 (100)	NR	Yes	Moderate	PHQ-9 ≥10	NR	NR
Witte et al (2010)	Mongolia	I	48	28 ^b	NR	NR	NR	NR	Low	BSI-DS	NR	NR
Yang et al (2005)	China	I	40	23.9 (3.0) ^a	NR	NR	Yes	NR	Moderate	CES-D 20 ≥16	NR	NR
Zehnder et al (2019)	Switzerland	L	60	38.4 (11.7) ^a	Mixed	NR	NR	NR	Low	MINI	NR	NR

a: Mean (standard deviation); b: Only mean reported; c: Median (interquartile range); d: Only median; e: Mean (interquartile range); f: Mean (range); Sex work include streets, bars, brothels, entertainment establishments, karaoke bars, massage parlors, restaurants, barbershops, hair-washing rooms, mini hotels, dance guest houses, saunas, parlours, cabarets, etc.; g: Any study that reported any type of drug use independently of its frequency with a proportion over 7.5% was mean drug use, the cutoff-point of 7.5% was decided due to it being the upper interval of the prevalence of drug use observed in the average population according to Nations Office of Drugs and Crime (UNDOC) 2020 estimates; f: Any study that reported any type of physical or sexual violence independently of its frequency over 35% was considered as above the mean for violence exposure, cutoff point was decided according to World Health Organization (WHO) statistics on prevalence against women; g: Article did not report absolute number for given variable and was therefore calculated from the reported proportion; h: Data was originally in groups and was pooled into a general sample by authors

CES-D: Center for Epidemiological Studies Depression Scale; MINI: International Neuropsychiatric Interview; PHQ: Patient Health Questionnaire; GHQ: General Health Questionnaire; BDI: Beck Depression Inventory; GAIN: Global Appraisal Individual Needs; BSI-DS: Brief Symptom Inventory-Depression Subscale; HADS: Hospital Anxiety and Depression Scale; Chinese Depression Anxiety Stress Scale-Depression Subscale; SCID: Structured Clinical Interview DSM-IV; CIS-R: Clinical Interview Schedule-Revised; MH Health Composite International Diagnostic Interview; GHQ: General Health Questionnaire; HADS: Hospital Anxiety Depression Scale; SCL-AS: Symptoms Checklist-AS; CIS-R: Clinical Interview Schedule-Revised; BSI-A: Brief Symptom Interview-Anxiety; WHO MH-CIDI: WHO Mental Health Composite International Diagnostic Interview; GAIN: The Global Appraisal Individual Needs; MINI: International Neuropsychiatric Interview; SCID DSM-IV: Structured Clinical Interview for DSM-IV; BAI: Beck Anxiety Inventory; PTSD-8: Post Traumatic Stress Disorder-8; PCL-17: PTSD Checklist 17 Item scale; SRIP: Self Rating Inventory for PTSD; MH-CIDI: World Health Organization Mental Health Composite International Diagnostic Interview; GAIN: The Global Appraisal Individual Needs; MINI: International Neuropsychiatric Interview; PCL-C: PTSD Checklist for DSM-5; PTSD Checklist for DSM-5; NHMWB/CIDI: National Mental Health and Wellbeing version of the Composite International Diagnostic Interview; TSI: Trauma Symptom Inventory; PCL: PTSD Checklist; LY: Last year; NR: Not Reported

Table 2: Prevalence of anxiety symptoms and related disorders

Author, year	N	Scale	Cut-off value	Prevalence (n, %)
Pandiyan et al (2012)	100	GHQ	NR	42 (42)
Devoglio et al (2017)	83	HADS	NR	51 (61.4)
Eller et al (2003)	98	SCL-AS	NR	4 (4) ^a
Gilchrist et al (2005)	176	CIS-R	≥18	106 (60)
Gunn et al (2015)	24	BSI-A	≥13	8 (33) ^a
Hengartner et al (2015)	259	MH-CIDI	NR	54 (20.8)
Surratt et al (2012)	562	GAIN	≥7	230 (40.9) ^a
Iaisuklang et al (2017)	100	MINI	NR	8 (8)
Ranjbar et al (2019)	48	SCID	NR	11(22.9) ^b
Rossler et al (2010)	193	MH-CIDI 2-1	NR	65 (33.7)
Surratt et al (2005)	278	BAI	≥16	147 (52.9) ^a
Ghose et al (2013)	100	HADS	≥8	44 (44) ^a

a: Reporting of absolute number is missing and was therefore calculated from the reported percentage; b: Reporting of percentage is missing and was therefore calculated from the reported absolute number

GHQ: General Health Questionnaire; HADS: Hospital Anxiety Depression Scale; SCL-AS: Symptoms Checklist-90-R Anxiety Subscale; CIS-R: Clinical Interview Schedule-Revised; BSI-A: Brief Symptom Interview-Anxiety; WHO MH-CIDI: WHO Mental Health Composite International Diagnostic Interview; GAIN: The Global Appraisal Individual Needs; MINI: International Neuropsychiatric Interview; SCID DSM-IV: Structured Clinical Interview for DSM-IV; BAI: Beck Anxiety Inventory

Figures

Figure 1

Study selection flow diagram

Figure 2

Pooled prevalence of suicide ideation, suicide attempt, depression and post-traumatic stress disorder (PTSD) among included studies