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HIV related stigma associated with social support, alcohol use disorders, depression, anxiety, and suicidal ideation among people living with HIV: a systematic review and meta-analysis

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Abstract

Background: Stigma is a social phenomenon known to have a negative impact on the lives of people living with HIV (PLWH). However, defining HIV-related stigma (HRS) is difficult because of the intersection it has with structural inequalities, and cultural differences, discrimination by health care providers that measure stigma among PLWH. HIV/AIDS has been characterized as a traumatic experience and PLWH may experience stigma which can cause negative mental health disorders and experiences, including emotional distress, shame, depression, anxiety, suicidal ideation. A systematic review of the evidence on the mental disorders of PLWH is currently lacking. This study aimed to analyze the association between HRS and social support, alcohol use disorders and mental health disorders and experiences (depression, anxiety, and suicidal ideation) among PLWH.

Methods: In accordance with Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) this study searched PubMed, Scopus, Web of sciences, PsycInfo, SciELO and Cochrane library electronic databases to identify publications between January 1992 and August 2020 that discussed social support, alcohol use disorders, mental health disorders and experiences (i.e., depression and anxiety and suicidal ideation) associated with HRS. Pooled Odds Ratios (ORs) were utilized at a 95% confidence level, and as sampling methods differed between articles pooled estimates used a random effects model.

Results: Twenty-two studies with 9548 participants met the eligibility criteria. No association was observed between HRS and alcohol use disorders. PLWH who had higher levels of social supports were less likely to report HRS. Participants who had been diagnosed with anxiety were 1.89 times more likely to report HRS, while those diagnosed with depression were 1.61 times more. Respondents who reported suicidal ideation also were 1.83 times more likely to report HRS.

Conclusions: This meta-analysis supports that HRS has a detrimental association with anxiety, depression and suicidal ideation, but social support protects against HRS in PLWH. Applying interventions which focus on the mental

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health disorders of PLWH may decrease HRS. Provision of social support by practitioners, combined with mental health treatment and assessments, and designing methods to identify stigma at different stages of illness are warranted.

Keywords: Stigma, Anxiety, Suicidal ideation, Depression

Background

Stigma and discrimination are among the major issues confronted by people living with HIV (PLWH) [1, 2]. HIV-related stigma (HRS) has been specified as discrediting and discriminating against PLWH [3]. PLWH often face stigma [4, 5]. Types of stigma that PLWH may experience include perceived, enacted, anticipated and internalized stigma [4, 6]. Perceived stigma is defined by the discrimination experienced by PLWH, and may include prejudicial attitudes from people in the society [7]. Enacted stigma includes any externally stigmatizing reaction that may lead to the unfairly or negative treatment to stigmatized individuals [8], anticipated stigma, is the negative treatments that people believe the others may do if their stigmatized condition is proved [9] and internalized stigma is the agreement with negative stereotypes and self-negative societal attitudes of the persons [10]. Discrimination against people with HIV can be considered one form of human rights violation. Other violations include the rights to health, the right to work, the right to have a family, the right to privacy, the right to insurance and social security [11]. PLWH may also be faced with limits or denial of access to health care [12].

Stigma may originate from misunderstandings about HIV transmission and from judgmental attitudes towards those social groups that are affected by HIV [13–15]. Studies have reported HIV discrimination in health-care settings including denial of care or treatment, HIV testing without adequate consent, confidentiality violations, negative beliefs and other humiliating practices by healthcare workers [16, 17].

Previous studies reported that PLWH who had HRS experiences indicated lower levels of perceived social support [18, 19]. Social support is defined as the procurement of psychological and material resources by people in their social network [20]. According to the reports, social resources are also accessible for PLWH who are more vulnerable to stigma, this has public health consequences since social support is associated with powerful health advantages for these people [21]. The benefits include less depression [22], positive health behaviors such as adherence to treatments [23], improved quality of life [24], and slower disease progression [25].

HIV/AIDS has been characterized as a traumatic experience and PLWH may experience stigma which can cause mental health disorders and experiences, including

emotional distress [26–28], shame [29], depression [30], anxiety [31, 32] and suicidal ideation [33, 34]. Depression, anxiety, and suicidal ideation may have negative influences on HIV treatment and adherence, and the prognosis of HIV infection [35, 36]. PLWH are 7–36 times more likely to experience suicidal ideation and attempt compared to the general public [37, 38]. Studies concerning health outcomes associated with HIV stigma, reported that alcohol use is increased among patients with HIV who experienced greater stigma [39, 40]. Alcohol use disorders among people with HIV-related stigma is a major concern knowing that high alcohol use is associated with numerous harmful consequences such as risky sexual behaviors that may increase the likelihood of HIV transmission [41–43]. Also, PLWH who have alcohol use disorders are approximately 50–60% less likely to be adherent to antiretroviral therapy (ART) [42]. Moreover, studies confirmed that alcohol use disorders are associated with lower CD4 cell count [44], higher cigarette smoking [45], substance use disorders [45], depression disorder [46], anxiety disorder [47] and suicidal ideation [48] among PLWH.

To our knowledge no study has conducted systematic reviews and meta-analysis concerning the association between HRS and social support, alcohol use disorders and mental health disorders and experiences (depression, anxiety, and suicidal ideation). Two previous meta-analysis studies on HRS have been published, Logie and Gadalla investigated the demographic factors associated with HRS [1] and Rueda et al. [3] considered HRS together with specific health outcomes such as quality of life and physical health. The present study is distinct from the previous studies in several aspects. The first difference is that rather than considering all aspects of physical and mental health this study specifically examines social support, alcohol use disorders and mental health disorders and experiences including, depression, anxiety, and suicidal ideation. The second difference is that the findings of this study are more generalizable as it used an odds ratio (OR) approach controlling for confounding as compared to previous research which was conducted using a correlational approach which cannot illustrate causal relationships. Given this, a better understanding of the outcomes of stigma on social support, alcohol use disorders and mental health disorders and experiences may improve HIV treatment management

strategies including enhanced coping strategies, compliance, and adherence to treatment for PLWH. The aims of the present study were to investigate the association between HRS and social support, alcohol use disorders and mental health disorders and experiences (depression, anxiety, and suicidal ideation) among PLWH. The study hypothesizes that: HRS is inversely associated with social support whereas, HRS is positively associated with alcohol use disorders and mental health disorders and experiences among PLWH.

Methods

Search strategy and study selection

We conducted a systematic search of databases (PubMed, Scopus, Web of sciences, PsycInfo, SciELO and Cochrane library) for peer-reviewed papers published between January 1992 and August 2020. Each database was searched for mesh and non-mesh terms concerning HIV/AIDS and stigma (Table 1). Studies were selected from across four WHO regions—including 12 studies from Region of the Americas ($n=5581$ participants), one from the European Region ($n=381$ participants), three from the African Region ($n=1380$ participants) and six from the Western Pacific Region ($n=9877$ participants). The USA had the highest number of included studies (nine studies, 3717 participants). Considering the World Bank country income levels, our sample includes 11 studies ($n=5350$) from high-income countries, 9 studies ($n=11,224$) from an upper middle income country, and 2 studies ($n=645$) from low income economic countries.

Inclusion/exclusion criteria

In this meta-analysis, we included observational studies (i.e., cross-sectional and cohort studies exploring the association between HRS and social support, alcohol use disorders and mental health disorders and experiences (depression, anxiety, and suicidal ideation) among PLWH. Characteristics that we considered for inclusion and exclusion criteria are shown in the Table 2.

Screening and data extraction

To facilitate the process of selection, we used a Newcastle–Ottawa Scale (NOS) [49] recommended by the Cochrane Collaboration [50] addressing the selection criteria (Table 3). First, we reviewed the titles and abstracts of the selected studies. Second, to determine the studies' general applicability for review, we retrieved and evaluated the full-texts of the collected papers. Two independent researchers conducted all the above-mentioned stages. Reviewers resolved any disagreements by consensus. Implementing κ -statistic, we measured inter-rater reliability at 0.65, highlighting substantial agreement between the reviewers. Data extraction included:

publication year, the study location, the author's name, the design of the study, the statistical analysis method, the study sample size, the key statistical data and any outcome measures.

Quality appraisal

The quality appraisal tool was derived from the NOS [51–53]. We rated each study in terms of exposure, outcome, and comparability with a scale of very good, good, satisfactory and unsatisfactory quality domains as suggested by the Newcastle–Ottawa Scale. This scale consists of three domains (selection, comparability and exposure/outcome) and each domain included 3, 1 and 1 item respectively. Selection domain: (a) representativeness of the exposed group, (b) selection of the non-exposed group, and (c) ascertainment of exposure. Comparability domain is referring to comparability of groups on the basis of the design or analysis and exposure/outcome domain is referring to assessment of outcome. If a publication had each item, it got a score or star. A maximum of five for the quality scores was obtained by adding the items. Publications with a total score of 0–2, 3, 4 and 5 points were recorded as “unsatisfactory,” “satisfactory,” “good” or “very good” respectively. Eventually, a very good, good and satisfactory quality comparability domain score identified the studies after controlling for ≥ 1 potential sociodemographic confounder characteristic (e.g., age, gender, income level), and unadjusted potential confounds (e.g., bivariate analysis). Two independent researchers assessed the quality of the included articles.

Instruments

Berger Stigma Scale [54], HIV Stigma Measure [55], Internalized AIDS-Related Stigma Scale [56], and Demi-HIV Stigma Scale were the most frequently applied tools for measuring HIV-related stigma. The scales, including the Center for Epidemiologic Studies Depression Scale and the Brief Symptom Inventory (BSI) depression subscale [57], the BSI anxiety subscale [57], state anxiety [58], and the Symptom Check List-90-R [59], were employed to measure depression and anxiety. The Social Support Questionnaire [60] and the Medical Outcomes Study—Social Support Subscale [61] were employed to measure social support. Alcohol use disorders was assessed by the Alcohol Use Disorders Test (AUDIT) questionnaire [62] and participants were asked if they had ever thought to suicide.

Statistical methods summary

The meta-analysis was carried out by generating pooled odds ratios (OR) and 95% confidence intervals (CIs) on identifying social support, alcohol use disorders and

Table 1 Search strategy

| PubMed search | | |
|---------------|--|-------------|
| Search number | Query | Item founds |
| #17 | (((((Social Support[MeSH Terms]) OR (Alcohol Drinking[MeSH Terms]) OR (Depression[MeSH Terms]) OR (Anxiety[MeSH Terms]) OR (Suicidal Ideation[MeSH Terms])) AND (HIV[MeSH Terms]) AND ((((((Social Stigma[MeSH Terms]) OR (stigma[Title/Abstract]) OR (shame[MeSH Terms]) OR (Self Disclosure[MeSH Terms]) OR (Self Concept[MeSH Terms]) OR (Negative Self-Image[Title/Abstract]) OR (blame[Title/Abstract]) OR (feel guilty[Title/Abstract])) AND (people who lived with HIV[Title/Abstract]) AND (people living with HIV [Title/Abstract]) | |
| #16 | (((((Social Stigma[MeSH Terms]) OR (stigma[Title/Abstract]) OR (shame[MeSH Terms]) OR (Self Disclosure[MeSH Terms]) OR (Self Concept[MeSH Terms]) OR (Negative Self-Image[Title/Abstract]) OR (blame[Title/Abstract]) OR (feel guilty[Title/Abstract]) | |
| #15 | feel guilty[Title/Abstract] | |
| #14 | blame[Title/Abstract] | |
| #13 | Negative Self-Image[Title/Abstract] | |
| #12 | Self Concept[MeSH Terms] | |
| #11 | Self Disclosure[MeSH Terms] | |
| #10 | shame[MeSH Terms] | |
| #9 | people who lived with HIV[Title/Abstract] | |
| #8 | stigma[Title/Abstract] | |
| #7 | Social Stigma[MeSH Terms] | |
| #6 | HIV[MeSH Terms] | |
| #5 | Suicidal Ideation[MeSH Terms] | |
| #4 | Anxiety[MeSH Terms] | |
| #3 | Depression[MeSH Terms] | |
| #2 | Alcohol Drinking[MeSH Terms] | |
| #1 | Social Support[MeSH Terms] | |
| Scopus search | | |
| | TITLE (social AND support) | |
| #1 | TITLE (alcohol AND drinking) | |
| #2 | TITLE (depression) | |
| #3 | | |
| #4 | TITLE (hiv) | |
| #5 | TITLE (social AND stigma) | |
| #6 | TITLE (stigma) | |
| #7 | TITLE (people AND who AND lived AND with AND hiv) | |
| #8 | TITLE (people AND living AND with AND hiv) | |
| #9 | TITLE (self AND disclosure) | |
| #10 | TITLE (self AND concept) | |
| #11 | TITLE (negative AND self-image) | |
| #12 | TITLE (feel AND guilty) | |
| #13 | (TITLE (social AND stigma)) OR (TITLE (stigma)) | |
| #14 | (TITLE (people AND who AND lived AND with AND hiv)) OR (TITLE (living AND with AND hiv)) | |
| #15 | (TITLE (social AND support)) OR (TITLE (alcohol AND drinking)) OR (TITLE (depression)) OR (TITLE (anxiety)) OR (TITLE (suicidal AND ideation)) OR (TITLE (self AND disclosure)) OR (TITLE (self AND concept)) OR (TITLE (negative AND self-image)) OR (TITLE (blame)) OR (TITLE (feel AND guilty)) | |
| #16 | ((TITLE (social AND support)) OR (TITLE (alcohol AND drinking)) OR (TITLE (depression)) OR (TITLE (anxiety)) OR (TITLE (suicidal AND ideation)) OR (TITLE (self AND disclosure)) OR (TITLE (self AND concept)) OR (TITLE (negative AND self-image)) OR (TITLE (blame)) OR (TITLE (feel AND guilty))) AND (TITLE (hiv)) AND ((TITLE (people AND who AND lived AND with AND hiv)) OR (TITLE (people AND living AND with AND hiv))) | |

Table 1 (continued)

| Cochrane search | |
|-------------------------|---|
| ID | Search |
| #1 | MeSH descriptor: [Social Support] explode all trees |
| #2 | MeSH descriptor: [Alcohol Drinking] explode all trees |
| #3 | MeSH descriptor: [Depression] explode all trees |
| #4 | MeSH descriptor: [Anxiety] explode all trees |
| #5 | MeSH descriptor: [Suicidal Ideation] explode all trees |
| #6 | MeSH descriptor: [HIV] explode all trees |
| #7 | MeSH descriptor: [Social Stigma] explode all trees |
| #8 | (stigma):ti (Word variations have been searched) |
| #9 | (people who lived with HIV):ti (Word variations have been searched) |
| #10 | (Living with HIV):ti (Word variations have been searched) |
| #11 | MeSH descriptor: [Shame] explode all trees |
| #12 | MeSH descriptor: [Self Disclosure] explode all trees |
| #13 | MeSH descriptor: [Self Concept] explode all trees |
| #14 | (Negative Self-Image):ti (Word variations have been searched) |
| #15 | (blame):ti (Word variations have been searched) |
| #16 | (feel guilty):ti (Word variations have been searched) |
| #17 | #9 OR #10 |
| #18 | #1 OR #2 OR #3 OR #4 OR #5 |
| #19 | #7 OR #8 OR #11 OR #12 OR #13 OR #14 OR #15 OR #16 |
| #20 | #18 AND #6 AND #17 AND #19 |
| #21 | #18 AND #17 AND #19 |
| Web of knowledge | |
| #19 | #18 AND #17 AND #16 Indexes = SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, BKCI-S, BKCI-SSH, ESCI, CCR-EXPANDED, IC Timespan = All years |
| #18 | #9 OR #8 Indexes = SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, BKCI-S, BKCI-SSH, ESCI, CCR-EXPANDED, IC Timespan = All years |
| #17 | #15 OR #14 OR #13 OR #12 OR #11 OR #10 Indexes = SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, BKCI-S, BKCI-SSH, ESCI, CCR-EXPANDED, IC Timespan = All years |
| #16 | #5 OR #4 OR #3 OR #2 OR #1 Indexes = SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, BKCI-S, BKCI-SSH, ESCI, CCR-EXPANDED, IC Timespan = All years |
| #15 | T1 = (feel guilty) Indexes = SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, BKCI-S, BKCI-SSH, ESCI, CCR-EXPANDED, IC Timespan = All years |
| #14 | T1 = (blame) Indexes = SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, BKCI-S, BKCI-SSH, ESCI, CCR-EXPANDED, IC Timespan = All years |
| #13 | T1 = (Negative Self-Image) Indexes = SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, BKCI-S, BKCI-SSH, ESCI, CCR-EXPANDED, IC Timespan = All years |
| #12 | T1 = (Self Concept) Indexes = SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, BKCI-S, BKCI-SSH, ESCI, CCR-EXPANDED, IC Timespan = All years |
| #11 | T1 = (Self Disclosure) Indexes = SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, BKCI-S, BKCI-SSH, ESCI, CCR-EXPANDED, IC Timespan = All years |
| #10 | T1 = (Shame) Indexes = SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, BKCI-S, BKCI-SSH, ESCI, CCR-EXPANDED, IC Timespan = All years |

Table 1 (continued)

| Web of knowledge | |
|-------------------------|---|
| #9 | Tl = (Living with HIV) Indexes = SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, BKCI-S, BKCI-SSH, ESCI, CCR-EXPANDED, IC Timespan = All years |
| #8 | Tl = (people who lived with HIV) Indexes = SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, BKCI-S, BKCI-SSH, ESCI, CCR-EXPANDED, IC Timespan = All years |
| #7 | Tl = (Stigma) Indexes = SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, BKCI-S, BKCI-SSH, ESCI, CCR-EXPANDED, IC Timespan = All years |
| #6 | Tl = (Social Stigma) Indexes = SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, BKCI-S, BKCI-SSH, ESCI, CCR-EXPANDED, IC Timespan = All years |
| #5 | Tl = (Suicidal Ideation) Indexes = SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, BKCI-S, BKCI-SSH, ESCI, CCR-EXPANDED, IC Timespan = All years |
| #4 | Tl = (Anxiety) Indexes = SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, BKCI-S, BKCI-SSH, ESCI, CCR-EXPANDED, IC Timespan = All years |
| #3 | Tl = (Depression) Indexes = SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, BKCI-S, BKCI-SSH, ESCI, CCR-EXPANDED, IC Timespan = All years |
| #2 | Tl = (Alcohol Drinking) Indexes = SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, BKCI-S, BKCI-SSH, ESCI, CCR-EXPANDED, IC Timespan = All years |
| #1 | Tl = (Social Support) Indexes = SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, BKCI-S, BKCI-SSH, ESCI, CCR-EXPANDED, IC Timespan = All years |
| PsycINFO search | |
| | ("Social Support" OR "Alcohol Drinking OR Depression OR" Anxiety" OR "Suicidal Ideation") AND ("Shame" OR "Self-Disclosure" OR "Self-Concept" OR "Negative Self-Image" OR "blame" OR "feel guilty") AND ("people who lived with HIV" OR "Living with HIV") |
| Scielo search | |
| | Social Support [Title words] or Alcohol Drinking [Title words] or Depression [Title words] or Anxi- ety [Title words] or Suicidal Ideation [Title words] and Shame [Title words] or Self-Disclosure [Title words] or Self-Concept [Title words] or Negative Self-Image [Title words] or blame [Title words] or feel guilty [Title words] and people who lived with HIV [Title words] or Living with HIV [Title words] |

mental health disorders and experiences including, depression, anxiety, suicidal ideation related to HRS among PLWH. The OR was calculated applying a 2×2 table, and $OR < 1$ indicated a positive association between independent variables and HRS. An $OR > 1$ indicates a protective association between variables. An inverse variance weighting was implemented to compute summary effect sizes; these values were indicated by regression coefficients for the multivariate analyses.

Moreover, there was a variation in true effect sizes among the studies with random effects models; thus, a random-effects model was employed to conduct model selection and publication bias meta-analyses. Accordingly, we considered two uncertainty sources; within-study sampling error and between-study variance. The

large Cochran's Q statistics with small p-values and large I^2 statistics were employed to suggest the heterogeneity in true effect sizes across the articles. The meta-analysis for studies that consisted of ≥ 10 articles were assessed in terms of publication bias for a specific outcome variable. Publication bias was evaluated by Funnel plots, trim-and-fill analysis, and Rosenthal's fail-safe number.

Results:

Study characteristics

The study selection process is shown in Fig. 1. 9,548 papers were found through 6 databases with additional manual searches of the reference lists of selected articles which is presented in Fig. 1 illustrating each stage of

Table 2 Inclusion and exclusion criteria

| Inclusion criteria | Exclusion criteria |
|--|---|
| Study had to be published in English (between January 1992 and August 2020) | Study did not consider any systematic reviews and meta-analysis |
| Study had to have the sample constitute of people living with HIV as the main condition | Study did not consider any qualitative research |
| Study had to document HIV-related stigma as a factor associated with social support, alcohol use disorders, and common and serious mental disorders e.g., depression, anxiety, suicidal ideation | |
| Study had to have multivariable analysis as analytic methods | |

Table 3 Risk of bias assessment using Newcastle–Ottawa scale

| Study | Selection (***) | Comparability (*) | Exposure/ outcome (*) | Method of assessment | Quality assessment | Quality assessment score |
|-----------------------------|-----------------|-------------------|-----------------------|--|--------------------|--------------------------|
| Levi-Minzi and Surratt [71] | *** | * | * | Newcastle–Ottawa scale adapted for cross-sectional studies | Very good | 5 |
| Emlet et al. [67] | ** | * | * | Newcastle–Ottawa scale adapted for cross-sectional studies | Good | 4 |
| Turan et al. [77] | *** | * | * | Newcastle–Ottawa scale adapted for cross-sectional studies | Very good | 5 |
| Li et al. [72] | *** | * | * | Newcastle–Ottawa scale adapted for cross-sectional studies | Very good | 5 |
| Zhang et al. [82] | * | * | * | Newcastle–Ottawa scale adapted for cross-sectional studies | Satisfactory | 3 |
| Zhang et al. [80] | *** | * | * | Newcastle–Ottawa scale adapted for cross-sectional studies | Good | 4 |
| Courtenay–Quirk et al. [66] | ** | * | * | Newcastle–Ottawa scale adapted for cross-sectional studies | Good | 4 |
| Zeng et al. [79] | * | * | * | Newcastle–Ottawa scale adapted for cross-sectional studies | Satisfactory | 3 |
| Li et al. [106] | *** | * | * | Newcastle–Ottawa scale adapted for cross-sectional studies | Very good | 5 |
| Lambert et al. [65] | ** | * | * | Newcastle–Ottawa scale adapted for cross-sectional studies | Good | 4 |
| Felker-Kantor et al. [69] | ** | * | * | Newcastle–Ottawa scale adapted for cross-sectional studies | Good | 4 |
| Ferlatte et al. [70] | ** | * | * | Newcastle–Ottawa scale adapted for cross-sectional studies | Satisfactory | 3 |
| Fekete et al. [68] | *** | * | * | Newcastle–Ottawa scale adapted for cross-sectional studies | Very good | 5 |
| Galvan et al. [18] | ** | * | * | Newcastle–Ottawa scale adapted for cross-sectional studies | Good | 4 |
| Akena et al. [63] | ** | * | * | Newcastle–Ottawa scale adapted for cross-sectional studies | Satisfactory | 3 |
| Lee et al. [30] | *** | * | * | Newcastle–Ottawa scale adapted for cross-sectional studies | Good | 4 |
| Pearson et al. [74] | ** | * | * | Newcastle–Ottawa scale adapted for cross-sectional studies | Good | 4 |
| Burke et al. [64] | * | * | * | Newcastle–Ottawa scale adapted for cross-sectional studies | Satisfactory | 3 |
| Rael and Hampanda [76] | ** | * | * | Newcastle–Ottawa scale adapted for cross-sectional studies | Good | 4 |
| Turan et al. [78] | ** | * | * | Newcastle–Ottawa scale adapted for cross-sectional studies | Good | 4 |
| Peltzer and Ramlagan [75] | *** | * | * | Newcastle–Ottawa scale adapted for cross-sectional studies | Very good | 5 |
| Zhang et al. [81] | *** | * | * | Newcastle–Ottawa scale adapted for cross-sectional studies | Very good | 5 |

the study selection process. Of 9548 potentially relevant studies retained for screening, 401 were selected for full-text assessment, and 22 met the eligibility criteria for the review [18, 30, 63–82].

The meta-analysis included seven studies [67, 71, 72, 77, 80–82] that examined the association between social support and HIV related stigma among PLWH. Three studies were completed in high-income countries [67, 71, 77], and four studies were from upper middle-income countries [72, 80–82]. Studies were completed between 2014 and 2018, and the sample sizes ranged from 203 to 2987. All of four studies used a cross-sectional design. Three studies [69, 81, 82] evaluated the association of alcohol use disorders on HIV related stigma among PLWH. These studies had alcohol use disorders as an exposure variable and HIV related stigma among PLWH as an outcome variable. The studies were completed between 2016 and 2019 with sample sizes between 380 and 2987. Two studies were conducted in upper middle income countries [81, 82] and one in the USA (high income country) [69]. All the considered studies used cross-sectional analysis and evaluated the association of alcohol use disorders as a current measure using participant self-report.

Seventeen studies [18, 30, 63–65, 67–69, 71, 74–76, 78–82] examined the association of depression on HIV related stigma among PLWH. Eight studies were conducted in high-income countries [18, 30, 65, 67–69, 71, 78], seven studies in upper middle-income countries [64, 75, 76, 79–82], one study from a lower middle income country [74] and one study was conducted in a low income country [63]. Data were collected between 2002 and 2019 and the sample sizes of the studies ranged from 181 to 2987 participants and all studies were cross-sectional. Six studies [30, 69, 73, 80–82] examined the association between anxiety and HIV related stigma among PLWH. Two studies [30, 69] were conducted in high-income countries and four in an upper middle income countries [73, 80–82]. The dates of studies ranged from 2002 to 2019, and the sample sizes were between 239 and 2987. All six studies used a cross-sectional design. Two studies [66, 70] examined the association between suicidal ideation and HIV related stigma among PLWH. Both of them were conducted in high-income countries [66, 70]. The dates of studies ranged from 2006 to 2017, and the sample sizes were between 456 and 673. Both studies used a cross-sectional design to recruit participants.

Results of the meta-analysis

We assessed the association between HRS and social support, alcohol use disorders and mental health disorders and experiences (depression, anxiety, and suicidal ideation) among PLWH (see Table 4). Plots 2–6 represent the results found.

The association of HRS and alcohol use disorders among PLWH

As illustrated in Fig. 2, alcohol use disorders do not have any association on HRS among PLWH (OR=1.69, 95% CI 0.53–2.84). The overall heterogeneity was 99.9%.

The association of HRS and social support among PLWH

The association of HRS and social support among PLWH are presented in Fig. 3. Those who had greater HRS were 0.96 times less likely to report higher social support (OR=0.96, 95% CI 0.94, 0.99) and the heterogeneity is about 66.9% (Fig. 3).

The association of HRS and anxiety among PLWH

Figure 4 presents the forest plot outlining the association of HRS and anxiety among PLWH. As illustrated in Fig. 4, HRS was positively associated with anxiety among the participants. The heterogeneity statistic is 64.4%, and the pooled effect size implies an association. PLWH reporting HRS were 1.89 times more likely to also report anxiety (OR, 1.30; 95% CI 1.16–1.43).

The association of HRS and depression among PLWH

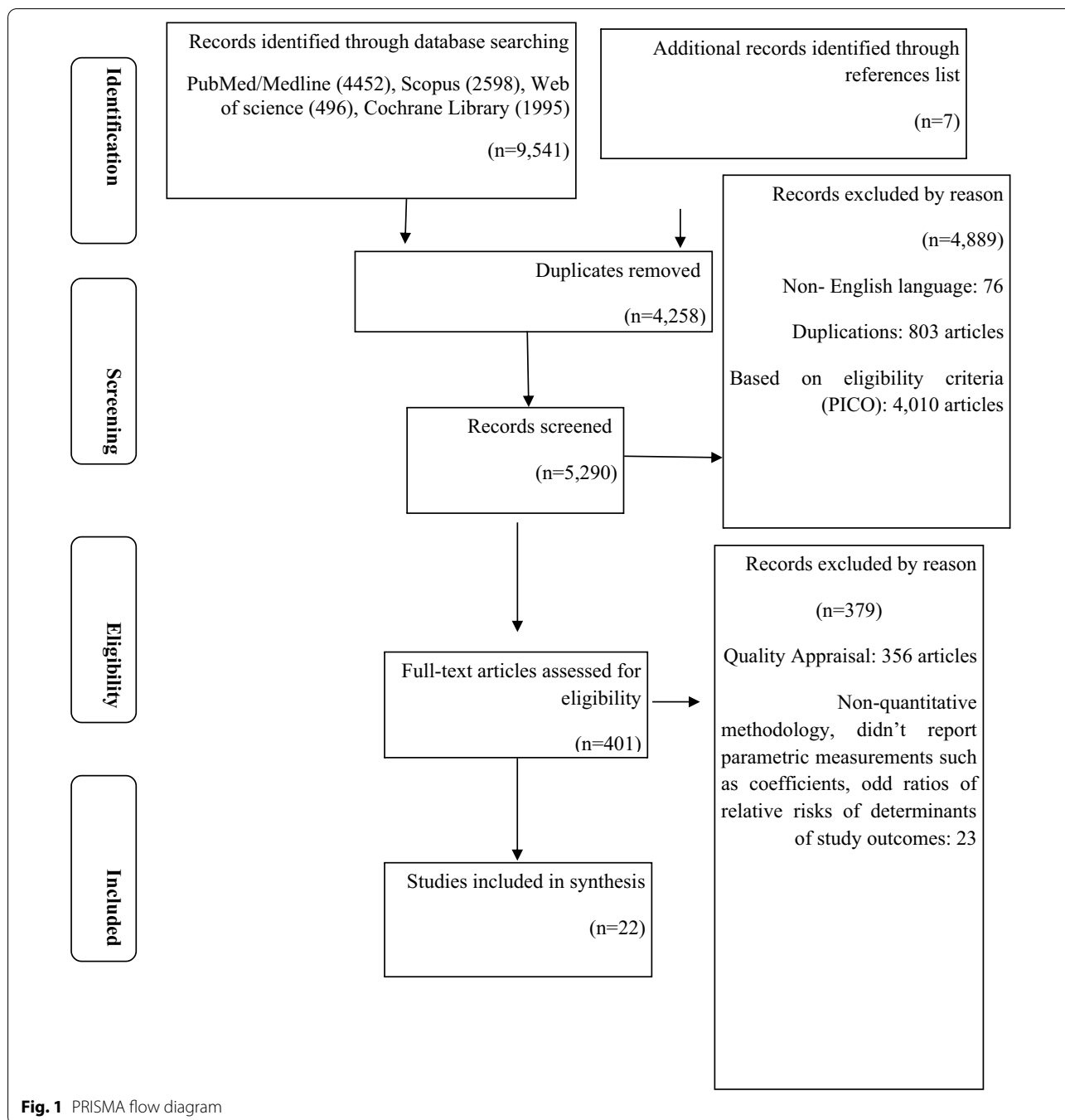
The association of HRS and depression among PLWH are presented in Fig. 5 and show a positive association. Those PLWH living with HRS were 1.61 times more likely to report depression (OR=1.61, 95% CI 1.38, 1.83) and the heterogeneity is 97.7%.

The association of HRS and suicidal ideation among PLWH

As illustrated in Fig. 6, HRS has a positive association on suicidal ideation among PLWH. The heterogeneity statistic is about 2.0%, and the pooled effect size implies a relative neutral association. Those respondents who reported HRS were 1.83 times more likely to have had suicidal ideation (OR=1.83, 95% CI 1.24, 2.41). See Fig. 6.

Publication bias

According to publication bias test, a significant publication bias among studies was noted. The publication bias was significant in social support ($C = -3.61$, P value < 0.001), alcohol use disorders ($C = -3.32$, P value $= 0.052$) and in mental health disorders and experiences subgroup including depression ($C = 34.60$, P value $= 0.02$), anxiety ($C = 2.56$, P value $= 0.027$) and suicidal ideation ($C = 4.18$, P value $= 0.15$) (See Table 5). Begg's test and Egger's test showed evidence of publication bias (Begg's test: $P < 0.001$; Egger's test: $P < 0.001$). Therefore, metatrim analysis was performed in order to remove the effect



of publication bias on the pooled OR (OR = 0.17, 95% CI 0.13–0.21).

Discussion

This meta-analysis reports on the association between HRS and social support, alcohol use disorders and mental health disorders and experiences (depression, anxiety, and suicidal ideation) among PLWH. A positive

association was found between HRS and increased levels of depression, anxiety, suicidal ideation, and a negative association between social support and stigma.

Social support has a significant role in the psychological adjustment of people who have HIV/AIDS. PLWH who receive poor social support may encounter more difficulty adjusting to psychological issues by themselves. Previous studies showed that those PLWH with poor

Table 4 Main characteristics of the studies selected

| Author | Participants | Year of publish | Sample size | Year of implementation | Country | Design | Quality of the evidence |
|-----------------------------|--------------|-----------------|-------------|------------------------|---------------|---------------|-------------------------|
| Levi-Minzi and Surratt [71] | PLWHA | 2014 | 503 | 2014 | USA | Cross-section | Very Good |
| Emlet et al. [67] | PLWHA | 2014 | 960 | 2013 | Canada | Cross-section | Good |
| Turan et al. [77] | PLWHA | 2018 | 203 | 2018 | USA | Cross-section | Very Good |
| Li et al. [72] | MSM | 2016 | 266 | 2014 | China | Cross-section | Very Good |
| Zhang et al. [82] | PLWHA | 2018 | 2987 | 2012–2015 | China | Cross-section | Satisfactory |
| Zhang et al. [80] | PLWHA | 2016 | 2987 | 2012–2013 | China | Cross-section | Good |
| Courtenay–Quirk et al. [66] | MSM | 2006 | 456 | 2006 | USA | Cross-section | Good |
| Zeng et al. [79] | PLWHA | 2018 | 411 | 2013 | China | Cross-section | Satisfactory |
| Li et al. [106] | PLWHA | 2018 | 239 | 2014 | China | Cross-section | Very Good |
| Lambert et al. [65] | PLWHA | 2019 | 355 | 2018 | USA | Cross-section | Good |
| Felker-Kantor et al. [69] | PLWHA | 2019 | 380 | 2015–2017 | USA | Cross-section | Good |
| Ferlatte et al. [70] | MSM | 2017 | 673 | 2014–2015 | Canada | Cross-section | Satisfactory |
| Fekete et al. [68] | PLWHA | 2018 | 181 | 2017 | USA | Cross-section | Very Good |
| Galvan et al. [18] | PLWHA | 2010 | 283 | 2005–2010 | USA | Cross-section | Good |
| Akena et al. [63] | PLWHA | 2012 | 368 | 2012 | Uganda | Cross-section | Satisfactory |
| Lee et al. [30] | PLWHA | 2002 | 268 | 2002 | USA | Cross-section | Good |
| Pearson et al. [74] | PLWHA | 2009 | 277 | 2009 | Mozambicans | Cross-section | Good |
| Burke et al. [64] | PLWHA | 2015 | 381 | 2012–2013 | Russia | Cross-section | Satisfactory |
| Rael and Hampanda [76] | PLWHA | 2016 | 231 | 2014 | Mexico | Cross-section | Good |
| Turan et al. [78] | PLWHA | 2017 | 1356 | 2014–2016 | USA | Cross-section | Good |
| Peltzer and Ramlagan [75] | PLWHA | 2011 | 735 | 2007–2008 | South African | Cross-section | Very Good |
| Zhang et al. [81] | PLWHA | 2016 | 2987 | 2012–2013 | China | Cross-section | Very Good |

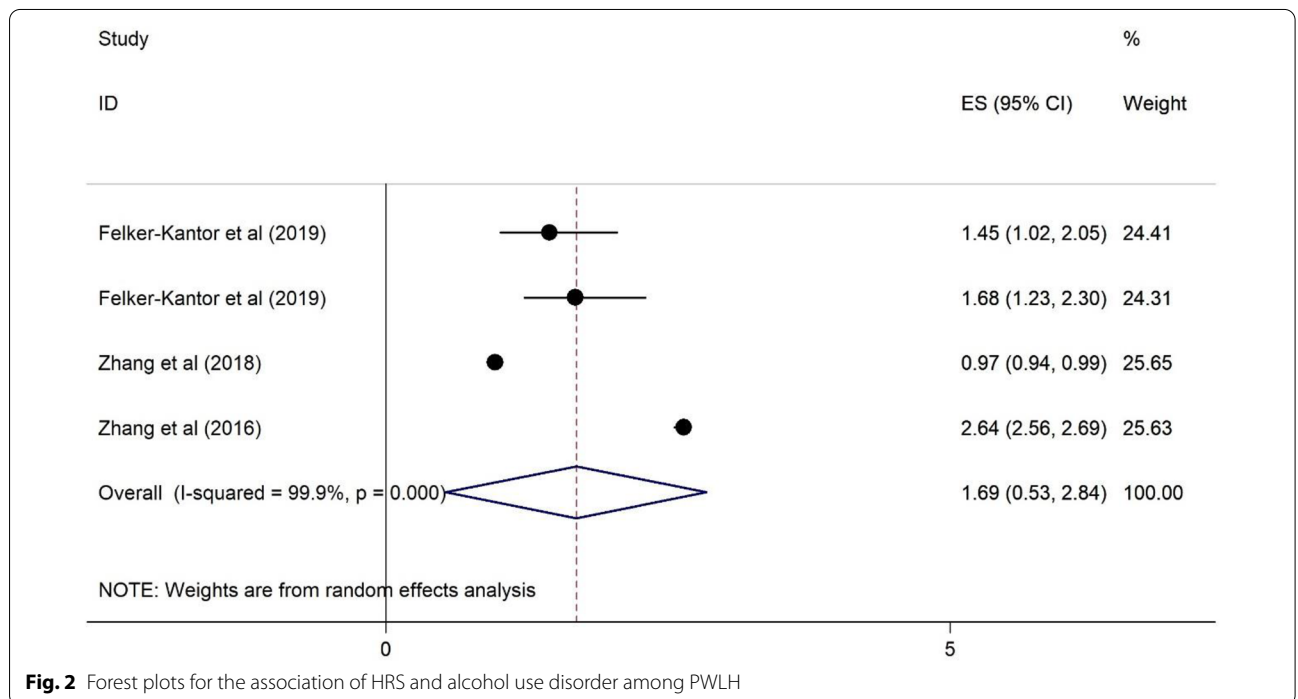


Fig. 2 Forest plots for the association of HRS and alcohol use disorder among PWLH

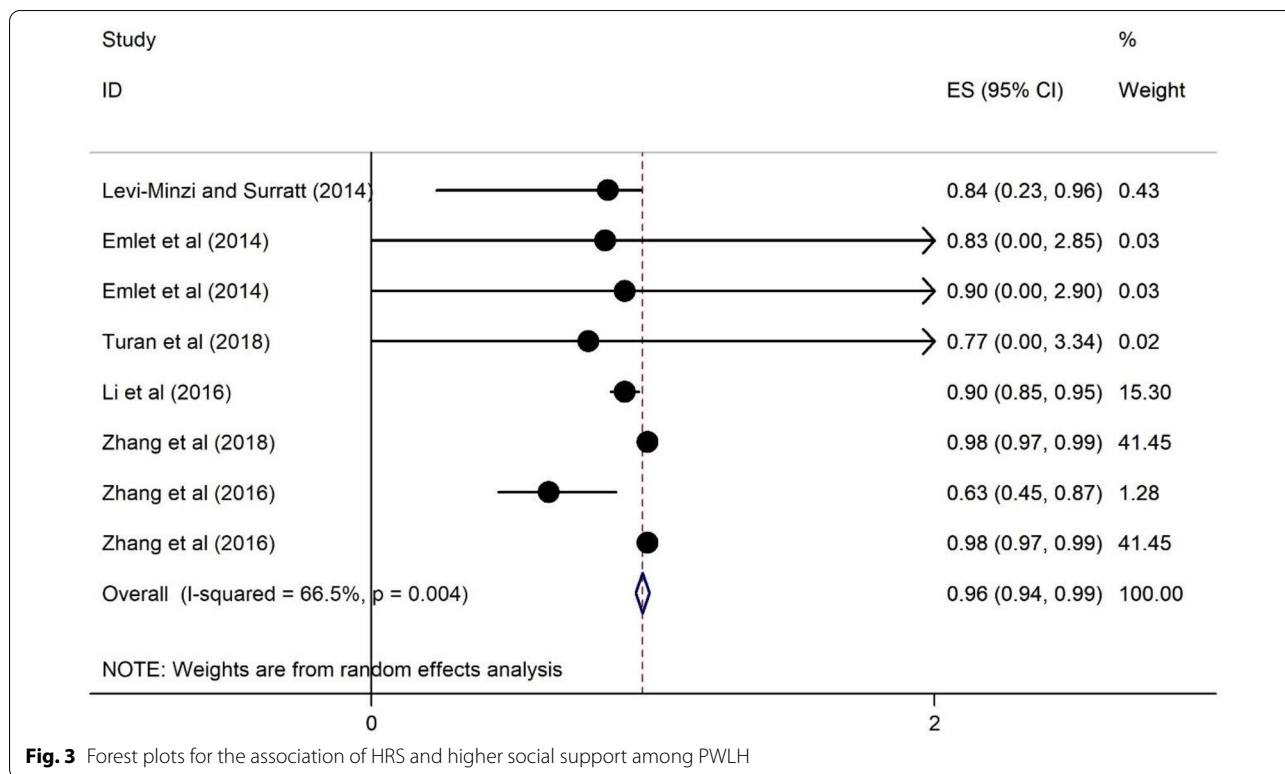


Fig. 3 Forest plots for the association of HRS and higher social support among PWLH

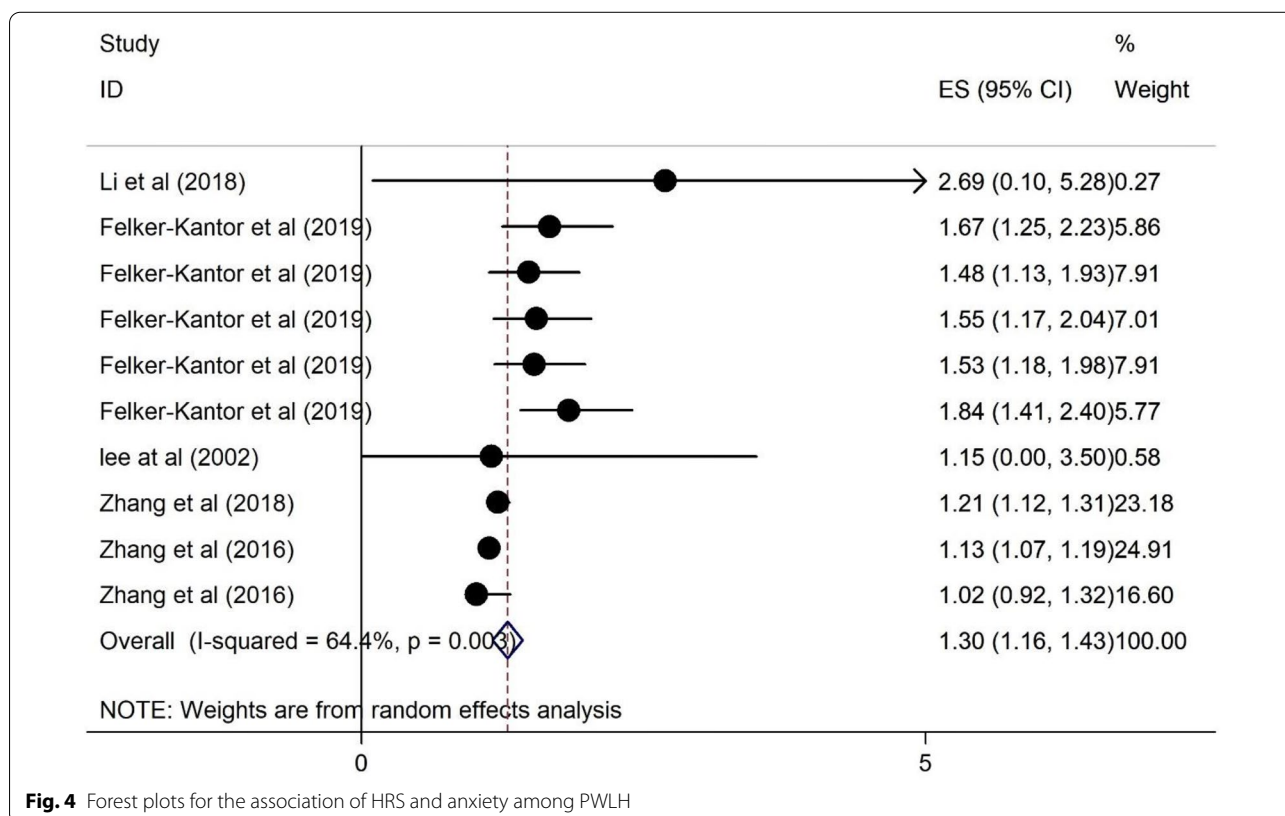


Fig. 4 Forest plots for the association of HRS and anxiety among PWLH

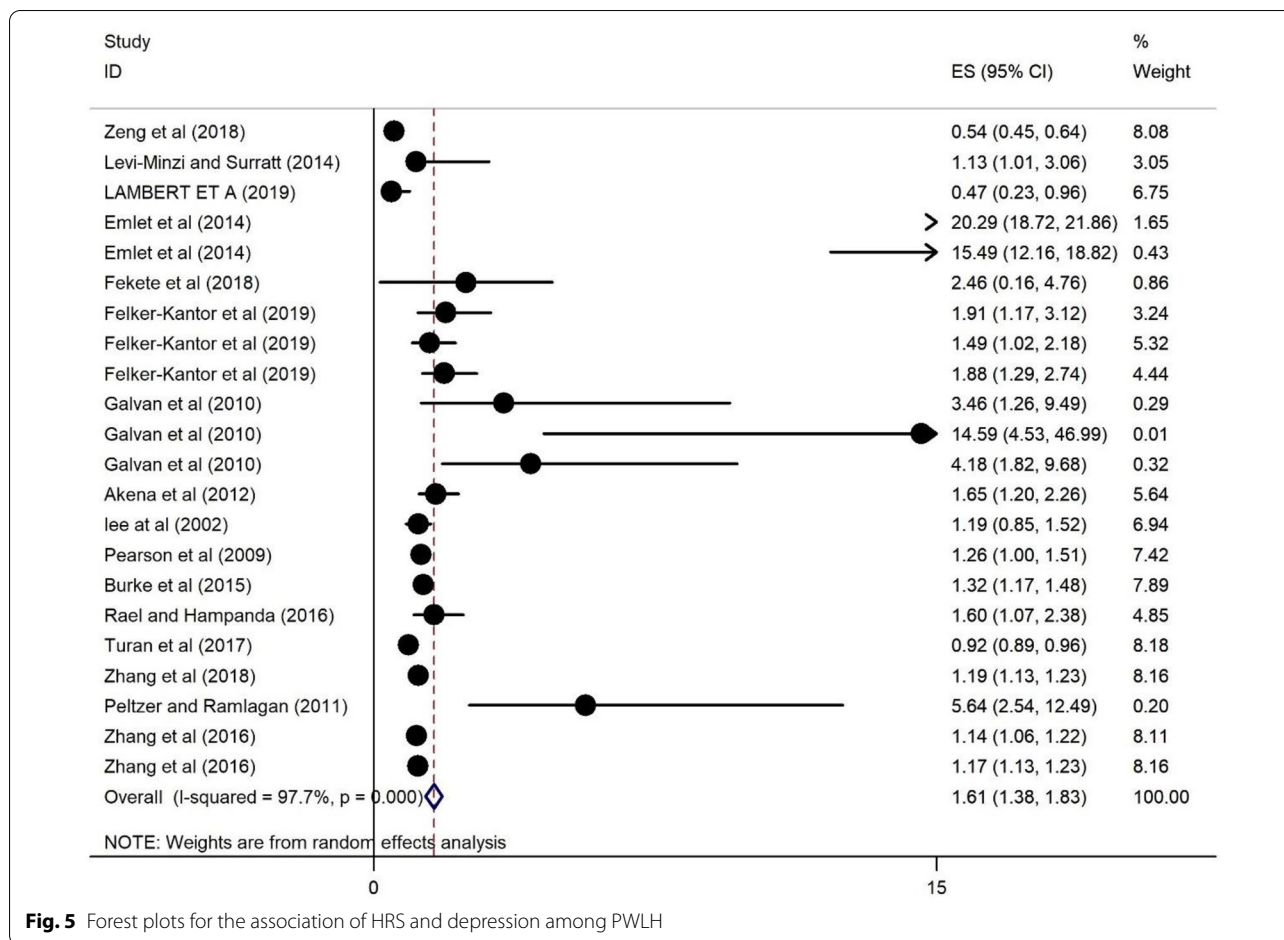


Fig. 5 Forest plots for the association of HRS and depression among PLWH

social support were at high risk for suicidal behaviors as measured by self-report [83–85]. Social support may reduce the negative feelings related to HIV stigma among PLWH, and also improves the belonging feelings [21, 86]. Social support accessibility provides relevant information and guidance of HIV treatment to PLWH [87, 88]. HIV stigma may reduce social networks and social interactions because of self-imposed social isolation and avoiding of negative judgment and guilt related to HIV [87]. Studies revealed that the sharing of positive HIV status with family, friends, or healthcare staff may lead to social stigma [54] and isolation or exclusion by community [1, 89]. Data also suggested that the lack of social support may induce depression in PLWH. Therefore, social support has a significant role in the psychological adjustment of PLWH. Improving family counseling and support services such as care for PLWH and promoting HIV screening among high-risk populations should be explored by both policy makers and health care workers.

The results of the present study showed that there was no association between alcohol use disorders and HRS. One possible reason for this is there is limited research

examining the association between alcohol use disorders and HRS and more heterogeneous research in this area is needed. This study’s hypotheses were based on previous studies which indicated that higher levels of HRS were directly associated with alcohol use disorders [90, 91]. The reason may be due to that risky alcohol use among PLWH may increase risks for HIV transmission through reduced inhibitions which may lead to more risky sexual behavior and increased HIV transmission and progression [90]. Also, HRS may lead to important outcomes such as feelings of shame, fear of disclosure, isolation, and despair on HIV risks and reduce ART adherence in PLWH [91]. The obtained association between alcohol dependence and HIV stigma may explain that alcohol use disorders, as a HIV infection consequence [92], may increase the stigma. Also, alcohol use disorders might precede HIV infection and be increased by HIV stigma. Therefore, high HIV stigma may decrease the coping ability with the disease; or alternatively, alcohol use may increase the vulnerability of HIV-related stigma and discrimination [93]. It is recommended to increase health education about alcohol use disorder and its negative

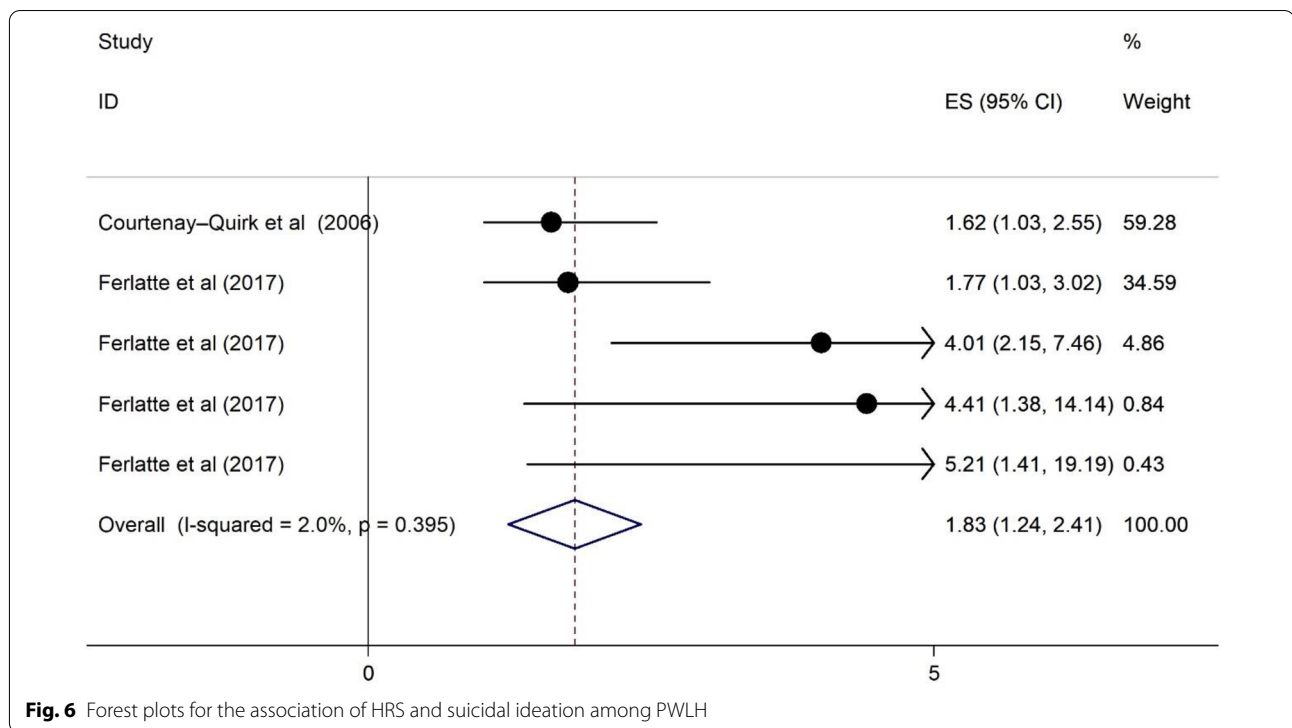


Table 5 Findings of publication bias using Eggers test

| | |
|-------------------|----------------------------|
| Suicidal ideation | C = 4.18, P value = 0.15 |
| Depression | C = 34.60, P value = 0.02 |
| Anxiety | C = 2.56, P value = 0.027 |
| Alcohol | C = -3.32, P value = 0.052 |
| Social support | C = -3.61, P value < 0.001 |

effect in the health institutions and the community to decrease the disorder. In addition, it is essential to screen for alcohol use disorders among patients with HIV/AIDS.

Furthermore, the results of present study showed that HRS is significantly associated with higher levels of both anxiety and depression. The findings of this present study are consistent with previous studies [94, 95]. Studies demonstrated that increased HRS was significantly associated with greater odds of higher levels of both anxiety and depression symptoms [94, 95]. Previous studies recommended a variety of coping strategies to manage the impact of HRS on depression. In this regard, the stigma-depression association was known to be moderated using disengagement coping style (avoidant strategies, i.e., disengagement from the stressor, denial, or wishful thinking) [96, 97]. Receiving enough social resources may impede adverse psychological responses to stressful situations; therefore, high levels of social support may

decrease the negative effects of HRS, such as anxiety and depression, among PLWH [98].

Finally, HRS was significantly related with suicidal ideation and it is consistent with the results of other studies [38, 99]. The negative association of stigma may increase the psychological pressure experienced by PLWH and may increase suicidal ideation. Findings from a Nepalese study with PLWH indicated that depressive symptoms, rather than suicidal ideation were positively associated with higher levels of internalized stigma [100]. They also found that both perceived stigma and spiritual beliefs were the significant factors for suicidal ideation and this could be managed by preventive approaches to decreasing suicidal ideation. Additionally, suicide risk may be diminished through the perceived availability of social support, which could have a positive influence on health and mood among PLWH [101]. Coverage of mental health conditions in health insurance policies and reduce access to lethal means among persons at risk of suicide may lead to decreasing suicidal ideation among PLWH and also enhance their mental health and overall wellness. This gap of knowledge should be addressed by conducting longitudinal studies on the effects of other psychosocial factors. The negative effects of stigma may worsen the psychological pressure for PLWH, and in turn this may then impact suicidal ideation, because of the physical and emotional pressure felt from the discrimination.

Strengths and limitations of the study

The study limitations included first relying on HRS self-reports. Second, most of the included studies were cross-sectional meaning causal and temporal association for all results were not possible. (However, this meta-analysis may enhance the statistical inference of analyses and increase the reliability of the evidence thus possibly mitigating this limitation). Also, since we did not interfere with the setting of independent and dependent variables, we had to report only the data that were published in the articles. One of the key strengths of the present meta-analysis was that it examined many different variables such as social support, alcohol use disorders and mental health disorders and experiences (depression, anxiety, and suicidal ideation) associated with HRS among PLWH. Additionally, every observational study was evaluated, regardless of geographical location or date of publication. Moreover, this is the first meta-analysis that specifically examines social support, alcohol use disorders and mental health disorders and experiences. Finally, the findings of this study are more generalizable as an OR approach controlling for confounding and illustrate causal relationships has been used.

Implications for practice

In the present study, the findings showed that higher severity of psychosocial health problems was associated with greater HRS among PLWH. The most important advantage of the present study is the integration of different psychosocial health problems to develop a comprehensive study for the preliminary evaluation of HRS. The data from this meta-analysis could be implemented to inform health care workers about the psychosocial health problems of HRS.

Conclusion

This meta-analysis supports that HRS has a detrimental association with anxiety, depression and suicidal ideation, but social support protects against HRS in PLWH. Applying interventions which focus on the mental health disorders of PLWH may decrease HRS. Provision of social support by practitioners [102], combined with mental health treatment and assessments, and designing methods to identify stigma at different stages of illness are warranted. Interventions aimed directly at health care practitioners may improve competence, non-judgment, confidentiality and awareness of the correlates of HRS [103, 104]. Interventions to enable PLWH to challenge existing stigma through skills and leadership training, taking part in conferences and advisory boards may also go some way decreasing HIV related stigma and ultimately to improving mental health.

HRS may lead to social and economic marginalization, therefore any attempts to decrease stigma and

discrimination related to HIV/AIDS may assist countries to reach key targets for universal access. This will also be important to help protect and improve protection of human rights, as well as enhance respect for PLWH and other affected groups, and finally decrease the transmission of HIV [105].

Abbreviations

PLWH: People living with HIV; HRS: HIV-related stigma; ART: Antiretroviral therapy; CI: Confidence intervals; NOS: Newcastle–Ottawa Scale; OR: Odds ratio; WHO: World Health Organization; BSI: Brief symptom inventory; AUDIT: Alcohol use disorders test.

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Authors' contributions

BA Conceived the study. BA collected all data. LFM, LGN, AHB and YF analyzed and interpreted the data. BA, PH and MJF drafted the manuscript. All authors commented on the drafts of the manuscript. All authors read and approved the final manuscript.

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Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate

This study was an analysis of pre-existing literature and did not use human subjects.

Consent for publication

Not applicable.

Competing interests

The authors declare that there are no conflicts of interest.

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