



Suicidal Ideation and Attempt among Homeless People: a Systematic Review and Meta-Analysis

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Published online: 28 August 2019

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Abstract

Globally, suicide is a major public health problem among homeless people. Suicidal ideation and attempt are remarkably higher among homeless people as compared to the general population and they are linked with greater risk of complete suicide. However, no systematic review and meta-analysis has been conducted to report the consolidated magnitude of suicidal ideation and attempt among homeless people. We searched PubMed, Embase, and Scopus to identify pertinent studies on suicidal ideation and attempt among homeless people. A meta-analysis of the studies was conducted using a random effect model. We also conducted a sensitivity analysis and Cochran's Q - and the I^2 test was employed to evaluate heterogeneity. Publication bias was assessed by Egger's test and visual inspection of the symmetry in funnel plots. In total, 20 eligible studies with 27,497 homeless people matched the inclusion criteria. Nineteen studies assessed suicidal attempt and thirteen studies assessed suicidal ideation among homeless people. The pooled current and lifetime prevalence of suicidal ideation was 17.83% (95% CI;10.73–28.14) and 41.60% (95% CI; 28.55–55.95), respectively whereas the pooled current and lifetime prevalence of suicidal attempt was 9.16% (95% CI;4.10–19.20) and 28.80% (95% CI; 21.66–37.18), respectively. We found a considerable heterogeneity between the studies, but we found no significant publication bias. The current review revealed a remarkably higher magnitude of suicidal ideation and attempt among homeless people as compared to the estimated prevalence in the general population. The concerned stakeholders need to give attention to address this problem emphasizing more on prevention and treatment strategies as well as utilizing holistic approaches to address the potential predictors of suicide among homeless people including physical, mental, and substance use problems.

Keywords Prevalence · Suicidal ideation · Suicidal attempt · Homeless · Systematic review · Meta-analysis

Electronic supplementary material The online version of this article (<https://doi.org/10.1007/s11126-019-09667-8>) contains supplementary material, which is available to authorized users.

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Background

Globally, suicide is a significant public health problem and is considered as a major cause of the mortality around the world with 877,000 deaths worldwide [1]. According to the World Health Organization (WHO) prediction, the death rates due to suicide shows a steady increase in the future [2].

Epidemiologic evidence indicated that worldwide, over 100 million people were homeless and over 1.6 billion people lack adequate housing [3]. Many factors attributed to homelessness such as unemployment, addictions, mental illness, family breakdown, adverse childhood experiences sexual assault, domestic violence, poverty, a critical shortage of affordable housing, social isolations, and financial difficulties [4–8].

In the past several decades, several studies determined the prevalence of suicidal ideation among homeless people and according to their report a significant proportion of homeless people found to have suicidal ideation. The reported prevalence of current suicidal ideation ranged from 12.53% to 37.50% [9–11] whereas the reported magnitude of lifetime suicidal ideation ranged from 25.99% to 61.33% [12–14] depending on the studies. Many factors contributed to these remarkable difference in the magnitude of suicidal ideation among the homeless including: (1) the variation in the magnitude of traumatic events, such as physical and sexual abuse among the homeless across the countries and population [15–20]; (2) the differences in the magnitude of mental disorders including psychosis, depression, anxiety, suicide, and other psychiatric disorder among homeless people across the studies [21–24]; and (3) the variations in the level of substance use among homeless people [25, 26].

A suicide attempt, which commonly results in death from suicide is very common among homeless people: about 2.72% to 33.48% of homeless people had current suicidal attempt [10, 27] and about 16.62% to 48.50% of homeless people do make a suicidal attempt in their lifetime [28, 29].

Nevertheless, to the best of our knowledge, there are no previous systematic review and meta-analysis studies on the magnitude of suicide among homeless people. Therefore, the objective of this study was to conduct a systematic review and meta-analysis of studies conducted across the world on suicidal ideation and attempt among homeless people and to systematically summarize: (1) the prevalence of current and lifetime suicidal ideation, (2) the prevalence of current and lifetime suicide attempt, and (3) formulate recommendation for the future research and clinical practice.

Methods

Research Design and Method

This systematic review and meta-analysis was conducted following the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines [30]. The study was performed according to a predesigned protocol for searching, data abstraction, inclusion-exclusion criteria, quality evaluation, as well as data synthesis and analysis.

Search Process and Study Selection

Three electronic databases (EMBASE, PubMed, and Scopus) were comprehensively searched to identify significant studies. Searching in PubMed was performed using the following terms: (Suicide OR suicidal ideation OR suicidal attempt OR suicidal behavior) AND magnitude OR prevalence OR epidemiology) AND (homeless). EMBASE and SCOPUS were searched using database specific subject headings associated with the above terms used in PubMed. We also screened the reference lists of eligible studies to identify potential other relevant articles to this review. We evaluated the identified publications by their titles, abstract, duplication and full-text contents against the prespecified inclusion and exclusion criteria.

Eligibility Criteria

In the current systematic review and meta-analysis satisfying the following criteria we included: First, studies that assessed and reported the magnitude of suicidal ideation or studies containing data to calculate the prevalence of suicidal ideation; secondly, articles that measured and reported the magnitude of suicidal attempt or publications containing data to calculate the prevalence of suicidal attempt; thirdly, for they were conducted using observational studies (cross-sectional and case-control study design) or interventional studies if they reported magnitude of suicide; Fourthly, studies must be conducted among homeless people. We excluded those studies not published in the English language, editorials, commentaries, and reviews.

Methods for Data Extraction and Quality Assessment

Data extraction from source documents was performed by two authors (KY and MA) with disagreements fixed by discussion and consensus. We utilized a prespecified form particularly designed to extract data of methodological and scientific quality of the studies to be included in this review. We extracted the following data from each study as suggested by PRISMA [30]; the first author, year of publication, location of the study, the type of suicidal behavior, the sample size, and the reference for each study. To evaluate the quality of included in the meta-analysis studies we employed a modified version of NOS (the Newcastle-Ottawa Scale) [31]. To assess the quality of individual studies the following main domains of NOS scale were used: The tools used to estimate suicidal behavior, quality, sample procedure, sample size and comparability between participants.

Data Synthesis and Analysis

Meta-analysis was performed using a comprehensive meta-analysis software version 3 (CMA). To manage the observed heterogeneity between the included studies we used a random effect model which has handling mechanisms for the differences between the studies that estimated suicidal ideation and attempt among the homeless people. [32]. The Q and the I^2 statistics were employed to measure the presence of heterogeneity between the studies included the current meta-analysis [32]. As suggested low, medium and high level of heterogeneity represented the values of 25, 50 and 75%, respectively [33]. All the reported tests were two-tailed, and the level of significance was set at $P < 0.05$. To assess the possible source of heterogeneity and evaluate the prevalence across the groups, we conducted subgroup and

sensitivity analysis. The Egger's test and visual inspection of the symmetry in funnel plots were used to assess the presence of publication bias.

Results

Identification of Studies

A total of 419 studies were identified by our electronic search and 10 relevant studies were additionally identified through a manual search. The screening of the studies by title, duplicate, and abstracts resulted in the exclusion of 395 studies as they did not meet the inclusion criteria (Fig. 1). A full text of 34 publications was retained for further evaluation and 14 of these were excluded.

Characteristics of Included Studies

In this systematic review and meta-analysis, 20 eligible studies with 27,497 homeless people were included in the final analysis [9–14, 27–29, 34–44]. The included studies were conducted between 1989 and 2018. The studies were conducted in six countries and nearly all of the studies were conducted in developed countries (18 out of 20) and only two studies were conducted in developing countries (in Africa). Of the total studies, more most of the studies were conducted in the USA ($n = 12$) [9–11, 14, 27–29, 34, 35, 37, 43, 44] and Canada ($n = 4$) [36, 40–42]. The remaining were conducted in Australia ($n = 1$) [39], Japan ($n = 1$) [38], in Ethiopia ($n = 1$) [13] and in Ghana ($n = 1$) [12]. Among the total, nineteen of the studies evaluated the suicidal attempt, of which 13 studies determined the lifetime suicidal attempt and six studies determined the current suicidal attempt. Moreover, thirteen of the studies evaluated the suicidal ideation among the homeless people, of which eight studies assessed the lifetime attempt and five studies assessed the current attempt. (Table 1).

The Quality of the Included Studies

The quality of studies included in the current systematic review and meta-analysis was appraised by NOS with modifications. According to the scale majority of studies were high quality (NOS score 8 and above) ($n = 12$). The remaining were moderate (NOS score 6 and 7) ($n = 3$) and low (NOS score less than or equal to 5) ($n = 5$) qualities. (See supplementary file).

The Results of a Pooled Meta-Analysis

Prevalence of Suicidal Ideation among Homeless

Thirteen studies measured the prevalence of suicidal ideation among homeless people (8 studies on current and 5 studies on lifetime suicidal ideation) (Table 1). Random effect model was used to combine these studies and provide the consolidated pooled prevalence. The pooled prevalence estimate of current suicidal ideation among homeless people was found to be 17.83% (95% CI;10.73–28.14) and the heterogeneity

between the included studies was significant ($I^2 = 99.55\%$; $Q = 1538.93$, $df = 7$, $p < 0.001$) (Fig. 2).

In this study, the pooled prevalence of lifetime suicidal ideation was found to be 41.60% (95% CI; 28.55–55.95) and the heterogeneity between the included studies was significant ($I^2 = 93.87\%$; $Q = 65.26$, $df = 4$, $p < 0.001$) (Fig. 3).

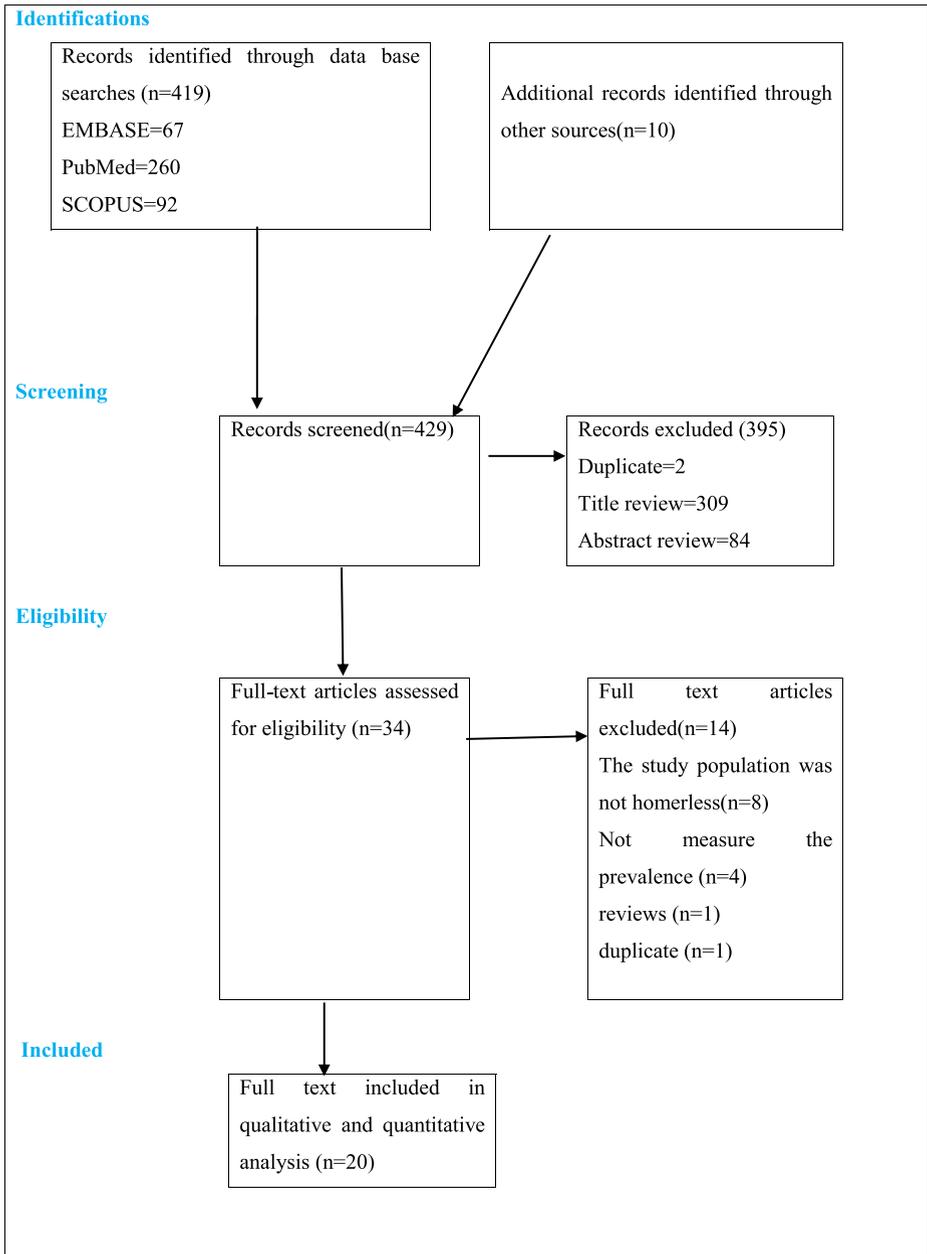
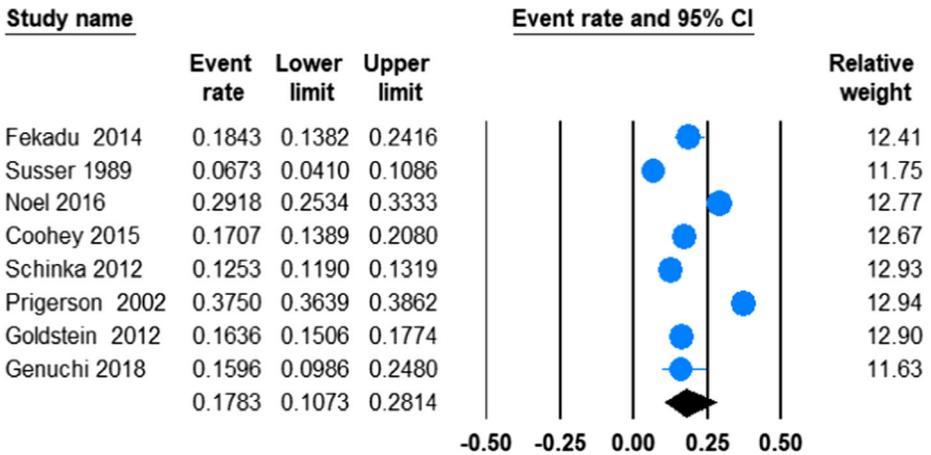


Fig. 1 PRISMA flowchart of review search

Table 1 Distribution of studies on suicidal ideation and attempt in homeless people included in qualitative and quantitative analysis based on year, sample size, country, and prevalence

Author (year)	Sample size	Country	Suicidal ideation	Suicidal attempt
J. Topolovec-Vranic et al. (2016)	2088	Canada	–	51.77% (N = 1081) Suicidal attempt (lifetime)
Fekadu et al. (2014)	217	Ethiopia	21.7% (n = 40) Suicidal ideation (Current)	14.8% (N = 31) SUICIDAL ATTEMPT (Current)
Susser et al. (1989)	223	USA	7% (n = 15) Suicidal ideation (Current)	19% (n = 43) Suicidal attempt (Lifetime)
Lee et al. 2017	156	USA	40.9% (n = 64) Suicidal ideation (lifetime)	21.6% (n = 34) Suicide attempt (lifetime)
Noel et al., 2016	497	Canada	30% (n = 145) Suicidal ideation (Current)	–
Coohy et al., 2015	457	USA	17.07% (n = 78) Suicidal ideation (Current)	33.34% (n = 153) Suicidal attempt (Current)
Patterson et al., 2012	97	Canada	–	24% (n = 23) Suicidal attempt (lifetime)
Rohde et al., 2001	342	USA	–	38% Suicidal attempt (Lifetime)
Okamura et al., 2014	418	Japan	–	17.7% (74) Suicidal attempt (Lifetime)
Schimka et al., 2012	10,111	USA	12.53% (1267) Suicidal ideation	275 (2.7) suicidal attempt (Current)
I				
Eynan et al. 2002	300	USA	61.3% (184) Suicidal ideation (Lifetime)	34.1% (n = 102) suicidal attempt (Lifetime)
Asante et al., 2017	227	Ghana	26% (59) Suicidal ideation (lifetime)	26.4% (n = 60) suicidal attempt (lifetime)
Sinyor et al., 2017	60	USA	–	16.7% (n = 10) Suicidal attempt (lifetime)
Rhoades et al., 2018	167	USA	–	54.4% (n = 81) Suicidal attempt (lifetime)
Armatovska et al., 2104	92	Australia	38% (35) Suicidal ideation (lifetime)	29.3% (n = 27) suicidal attempt (lifetime)
Tsat et al., 2019	1680	USA	–	24.52% (n = 412) suicidal attempt (lifetime)
Prigerson et al., 2002	7224	USA	37.5% (n = 2709) Suicidal ideation (current)	7.9% (n = 570) suicidal attempt (current)
Goldstein et al., 2012	2947	USA	14.20% (n = 482) Suicidal ideation (current)	5.06% (n = 149) suicidal attempt (current)
Genuchi, 2018	94	USA	16% (n = 15) Suicidal ideation (current)	31.9% (n = 30) suicidal attempt (Lifetime)
VOTTA et al., 2004	100	Canada	43% (n = 43) Suicidal ideation (lifetime)	21% (n = 21) suicidal attempt (lifetime)



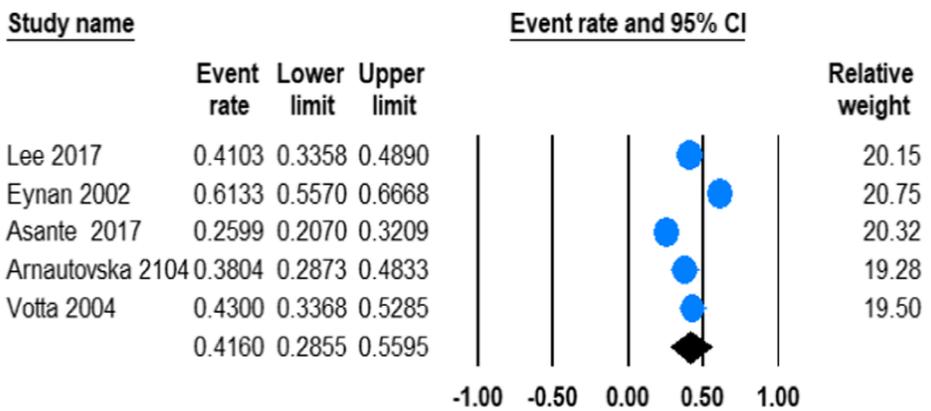
Keys: $I^2=99.55\%$, $P<0.001$; $Q=1538.93$; $df=8$; Based on random effect analysis

Fig. 2 Forest plot of the prevalence of current suicidal ideation among homeless people

Prevalence of Suicidal Attempt among the Homeless

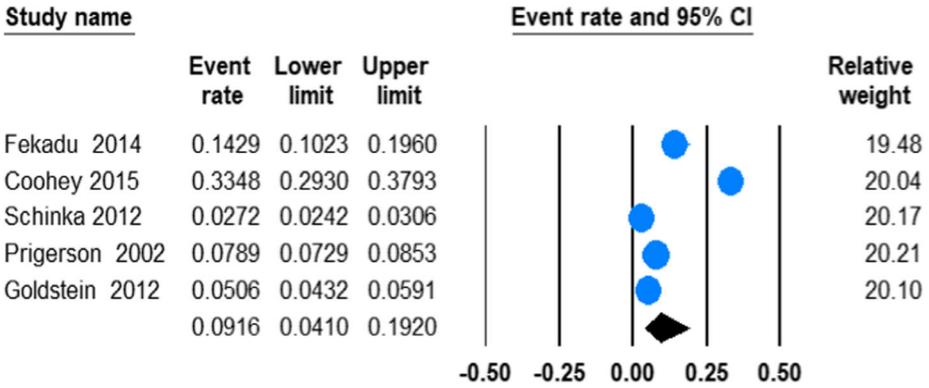
From the total, 19 studies estimated the prevalence of suicidal ideation among homeless people (14 studies on current and 5 studies on lifetime suicidal attempt) (Table 1). The pooled prevalence of current suicidal attempt was found to be 9.16% (95% CI;4.10–19.20) and the observed heterogeneity between the included the studies was significant ($I^2 = 99.40\%$; $Q = 671.41$, $df = 4$, $p < 0.001$) (Fig. 4).

Furthermore, in the current review, the pooled prevalence of lifetime suicidal attempt was found to be 28.80% (95% CI; 21.66–37.18). A significant between-study heterogeneity was detected ($I^2 = 97.30\%$; $Q = 443.94$, $df = 13$, $p < 0.001$) (Fig. 5).



Keys: $I^2=93.87\%$, $P<0.001$; $Q=98.63$; $df=4$; Based on random effect analysis

Fig. 3 Forest plot of the prevalence lifetime suicidal ideation among homeless people

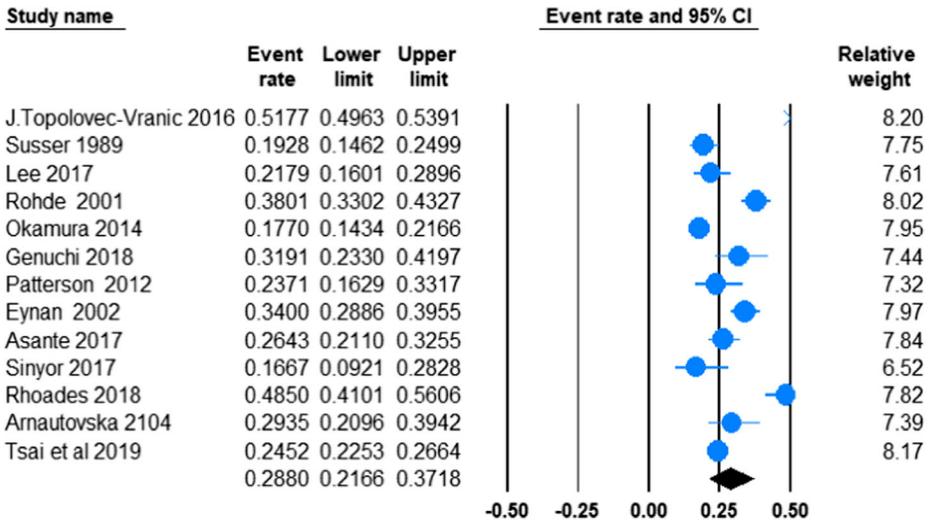


Keys: $I^2=99.49\%$, $P<0.001$; $Q=671.41$; $df=4$; Based on random effect analysis

Fig. 4 Forest plot of the prevalence of current suicidal attempt among homeless people

Publication Bias

Our analysis revealed no evidence of substantial publication bias as evidenced by the funnel plot and Egger’s regression tests for the prevalence of lifetime suicidal attempt ($B = -5.14$, $SE = 2.72$, $P = 0.086$) (Fig. 6). Publication bias was not evaluated for the current suicidal ideation and attempt as well as lifetime suicidal ideation due to the number of studies included in each analysis were less than ten.



Keys: $I^2=97.30\%$, $P<0.001$; $Q=443.94$; $df=13$; Based on random effect analysis

Fig. 5 Forest plot of the prevalence lifetime suicidal attempt among homeless people

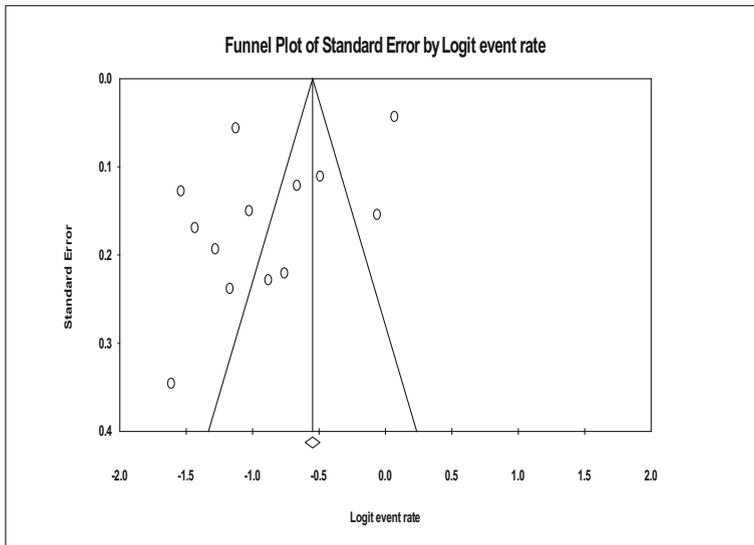


Fig. 6 Funnel plot of publication bias for lifetime suicidal attempt

Subgroup and Sensitivity Analysis

We also conducted a subgroup and sensitivity analysis for the lifetime suicidal attempt based on the quality of the included studies. Our analysis revealed no significant difference in the prevalence of lifetime suicidal attempt based on the quality of the included studies ($P = 0.748$). The estimated prevalence was 29.81% (93%CI 19.03–43.34), 31.39% (93%CI 18.06–48.71), 26.10% (93%CI 20.40–32.74) for high, moderate and low-quality studies, respectively.

Discussion

Main Findings

The study has summarized 20 studies which assessed the prevalence of suicidal ideation and attempt among homeless people. To the best of our knowledge, this is the first systematic review and meta-analysis of the prevalence of suicidal ideation and attempt among homeless people. The results of our final analysis demonstrated a remarkably higher magnitude of suicidal ideation and attempt among the homeless people as compared to the reported prevalence in the general population. In this review, the current and lifetime prevalence of suicidal ideation among the homeless people was 17.83% and 41.60%, respectively whereas the current and lifetime prevalence of suicidal attempt was 9.16% and 28.88%, respectively.

Characteristics of the Studies

In this review, we identified that the epidemiologic evidence on the magnitude of suicidal ideation and attempt was highly diverse by the gender of the participants, the type of suicidal behavior, the years of publications, and the locations of the studies. The studies reported the

magnitude of suicidal ideation and attempt in participants from a different country (six countries). Regarding the suicidal behavior, some of the studies include current suicidal ideation and attempt, some of them included lifetime suicidal ideation and attempt, some studies reported only suicidal ideation and some of them included suicidal ideation and attempt together.

Comparing with the Previous Studies

The pooled prevalence of current (17.83%) and lifetime (41.60%) suicidal ideation among homeless people in this study was remarkably higher than the prevalence estimates of the general population in America (lifetime suicidal ideation 8.8%) [45], China (lifetime suicidal ideation 3.9%) [46] as well as the UK (lifetime suicidal ideation 20.5%) [47]. The possible reason for the observed variation in the magnitude of suicidal ideation may be due to homeless people are more likely to experience traumatic events, such as physical and sexual abuse, which leave them at risk of developing suicidal as compared to the general population [15–20]. Another explanation for a higher prevalence of suicidal ideation among homeless people in the present study could have been due to the considerably greater magnitude of mental disorders including psychosis, depression, anxiety, suicide, and other psychiatric disorder among homeless people as compared with other populations [21–24]. Supporting the above explanations epidemiologic evidence showed that psychiatric disorders among the factors that increase the risk of suicide among the risk groups [48–50]. Furthermore, the other possible causes for the increased magnitude of suicidal ideation among the homeless people could be due to a higher level of substance use among homeless people [25, 26] and epidemiologic evidence shows that substance use is associated with a greater risk of suicide for those population groups [51, 52].

We also found that the pooled prevalence of current (9.16%) and lifetime (28.88%) of suicidal attempt among homeless people was remarkably higher than the prevalence estimates of the general population in America (lifetime suicidal attempt 2.5%) [45], China (lifetime suicidal ideation 0.8%) [46] as well as the UK (lifetime suicidal attempt 8.1%) [47]. The higher rate of psychological trauma and violence, mental disorders and substance uses, as well as medical conditions, are among the so many factors responsible for the observed variation in the magnitude of suicidal attempt among homeless people as compared to the general population estimates.

The Difference between the Studies Included in the Present Systematic Review and Meta-Analysis

In this study, significant between-study heterogeneity was observed in current and lifetime suicidal ideation as well as a suicidal attempt. The variation in the characteristics of the study participants across the studies including the existing psychiatric disorders, substance use problems, psychosocial stressors as well as medical conditions may lead to this considerable difference between the studies. To manage the observed heterogeneity and to make our findings meaningful, utilized different methods Firstly, we used the suitable analysis model which control the effects of the observed considerable heterogeneity during analysis. That means in the current meta-analysis we employed a random effect model where the summary effect estimates are conservative than fixed effect models. Secondly, we conducted subgroup and sensitivity analysis based on the quality of studies and the results of our analysis revealed that the findings are robust and not dependent on the quality of the studies.

Strengths and Limitations

This systematic review and meta-analysis have found a number of strengths: First, we used a predesigned search strategy, data extraction, quality assessment, and analysis protocol and reviewers to minimize the possible reviewer bias, performed data extraction and quality evaluation by two independent reviewers. Second, performing sensitivity based on the quality of the studies. Thirdly, determining the current and the exiting (lifetime) suicidal behaviors of suicidal ideation as well as a suicidal attempt.

The present study was subject to some limitation related the global representativeness of the findings and the possible inclusion of further stratified analysis; (1) in this systematic review and meta-analysis, nearly all studies are conducted in Canada and the USA so that the estimated magnitude may not represent the other population of the world. (2) unable to conduct extensive subgroup analysis due to the small number of studies in each subgroup across the various factors such as country, sex, and other clinical factors.

Implications for Future Research and Clinical Practice

The current study identified some implication for the future research; our meta-analysis identified the considerably higher magnitude of suicidal ideation and attempt among the homeless as compared to the estimated magnitude in the general population which necessities further investigation to assess the possible reasons for the remarkably higher magnitude as well as better ways of addressing the issues. We also identified limited studies across the globe that determined the magnitude of suicidal ideation and attempt among the homeless which requires robust future studies to fill the observed gaps. Finally, the concerned bodies need to give attention to address the problem including prevention and possible treatment strategies as well as utilizing holistic approaches of treating the homeless people including suicide, physical, mental, and substance use problems.

Conclusion

The results of our final meta-analysis demonstrated that the current and lifetime prevalence of suicidal ideation among the homeless people was 17.83% and 41.60%, respectively whereas the current and lifetime prevalence of suicidal attempt was 9.16% and 28.88%, respectively.

Robust studies focusing on the possible reasons for the considerably higher prevalence suicidal ideation and attempt as well as better ways of addressing this factor are recommended. We also identified limited studies across the globe that determined the magnitude of suicidal ideation and attempt among the homeless which requires robust future studies to fill the observed gaps. Finally, the concerned bodies need to give attention to address the problem including prevention and possible treatment strategies as well as utilizing holistic approaches of treating the homeless people including suicide, physical, mental, and substance use problems.

Authors' Contributions The author (GA) conceptualized the study, developed the protocol, conducted the analyses and draft and approval of the final manuscript. MA performed a search, data extraction, and approved the final manuscript. KY and LT participated in discussion and consensus and approved the final manuscript.

Funding Information The author declares that there is no funding.

Data Availability All data generated or analyzed during this study are included in this article.

Compliance with Ethical Standards

Conflict of Interest The authors declare that there are no competing interests.

Consent for Publication N/A

Ethics Approval and Consent to Participate N/A

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Publisher's Note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

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