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Methods and efficacy of social support interventions in preventing suicide: a systematic review and meta-analysis

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► Additional supplemental material is published online only. To view, please visit the journal online (http://dx.doi.org/10.1136/ebmental-2021-300318).

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Received 3 August 2021
Accepted 25 November 2021
Published Online First 15 December 2021

To cite: Hou X, Wang J, Guo J, *et al*. *Evid Based Ment Health* 2022;**25**:29–35.

ABSTRACT

Question Suicide is a global public and mental health problem. The effectiveness of social support interventions has not been widely demonstrated in the prevention of suicide. We aimed to describe the methods of social support interventions in preventing suicide and examine the efficacy of them.

Study selection and analysis We searched literature databases and conducted clinical trials. The inclusion criteria for the summary of intervention methods were as follows: (1) studies aimed at preventing suicide through method(s) that directly provide social support; (2) use of one or more method(s) to directly provide social support. The additional inclusion criteria for meta-analysis on the efficacy of these interventions included: (1) suicide, suicide attempt or social support-related outcome was measured; (2) randomised controlled trial design and (3) using social support intervention as the main/only method.

Findings In total, 22 656 records and 185 clinical trials were identified. We reviewed 77 studies in terms of intervention methods, settings, support providers and support recipients. There was a total of 18 799 person-years among the ten studies measuring suicide. The number of suicides was significantly reduced in the intervention group (risk ratio (RR)=0.48, 95% CI 0.27 to 0.85). In 14 studies with a total of 14 469 person-years, there was no significant reduction of suicide attempts in the overall pooled RR of 0.88 (95% CI 0.73 to 1.07).

Conclusions Social support interventions were recommended as a suicide prevention strategy for those with elevated suicide risk.

BACKGROUND

Suicide is a global public and mental health problem. According to the WHO, 703 000 people die by suicide every year globally.[1] More than 1 in every 100 deaths (1.3%) in 2019 were the result of suicide.[1] These unexpected deaths result in a significant economic, social and psychological burden for individuals, families, communities and countries.[2] Effective suicide prevention strategies are of vital importance. The WHO has emphasised the critical need for further strengthening and accelerating the ongoing efforts in suicide prevention.[1]

In early 1951, Durkheim[3] explained in one of his studies that social isolation increases the tendency to suicide. Subsequent studies found that being isolated from others may lead to suicide-related problems.[2 4 5] Social connectedness can prevent suicide.[6] Lower levels of social support are correlated with suicidality.[7 8]

One systematic review revealed that previous studies on the association between suicide in older adults and social factors yielded mixed results.[9] However, another systematic review and meta-analysis found that factors such as family conflict are related to suicide attempt.[10] These findings indicate that the quality of social support, rather than mere formality, is crucial.

Social isolation typically refers to objective physical separation from other people.[11] *Loneliness* is considered as a subjective social isolation.The emphasis on *social connectedness* is on the independent self in relation to others. It is defined by emotional feelings regarding the loss of specific relationships.[12] *Belongingness* refers to 'stability, affective concern and continuation into the foreseeable future'.[13] *Social Support* may include emotional support, advice and information, practical assistance and help in understanding events.[14] Thus, in this review, we used the term 'social support interventions' to describe interventions that aim to prevent suicide through methods that can directly offer social support, enhance social connectedness or decrease the feeling of loneliness.

A systematic and meta-analytic review has evaluated Brief Interventions and Contacts (BICs) for reducing suicide and concluded a non-significant positive effect of such intervention.[15] One of the most commonly reported mechanisms of BICs is the provision of social support.[16] However, neither all of the BICs involved in providing social support nor all social support interventions used BIC methods.

Several meta-analyses or systematic reviews have summarised the efficacy of suicide prevention.[17–21] However, these reviews mainly focused on pharmacotherapy and professional psychosocial interventions, in which few social support interventions were included. For example, among the 164 studies included in a 10-year systematic review on suicide prevention, only 4 assessed social support strategies.[19] Hogan *et al*[22] evaluated the efficacy of social support interventions and provided some support for overall use. However, their presenting problems were not focused on suicide. To our knowledge, no study has systematically examined the efficacy of social support methods in the prevention of suicide.

OBJECTIVE

The aims of this proposed systematic review and meta-analysis include: (1) to describe and summarise social support intervention methods that have been used for suicide prevention; and (2) to examine the efficacy of these interventions for suicidal individuals with a randomised controlled trial (RCT) design measuring suicide, suicide attempts and/or social support-related outcomes, compared with treatment as usual (TAU) or the latter serving group.

METHODS

Search strategy

We searched PubMed, Web of Science, PsycINFO, Embase, the Cochrane library and EBSCO for all relevant studies limited to English language and published up to 31 May 2021, with a combination of search terms relating to 'social support' and 'suicide prevention' (online supplemental file 1). We searched the ISRCTN registry, ClinicalTrials.gov, and EU Clinical Trials Register for registered trials. All identified records were duplicated using Endnote X9.

Study selection

Five reviewers (XH, JG, JL, XZ and LQ) independently examined the titles and abstracts of the records identified in the searches, and irrelevant records or unrelated topics were excluded. Those rated as relevant or considered relevant by the reviewers were included in the full-text analyses. Additional records were also obtained from the reference list of previous systematic reviews and meta-analyses that were searched. Full-text articles were reviewed independently by XH and LZ to evaluate the eligibility based on the inclusion and exclusion criteria. It was undertaken according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (online supplemental file 2). Disagreements were resolved through face-to-face meetings. All authors consented to the result of the review.

There were two stages of this study based on two aims. The inclusion criteria for the systematic review of intervention methods (stage one) were: (1) one of the objectives of the programme was to prevent suicide; (2) a method or method(s) of providing social support directly was used by the programme; and (3) at least one of the mechanisms of preventing suicide must be through promoting social support/connectedness or decreasing social isolation/feeling of loneliness as the author mentioned. The exclusion criteria were as follows: (1) studies were excluded if professional psychotherapy was the only/major method used in the programme; (2) studies were excluded if the intervention was designed to specifically address self-harm (without suicidal intent); (3) protocols were excluded.

The meta-analysis (stage two) was also based on the criteria above. Additional inclusion criteria for this stage were as follows: (1) at least one of the primary or secondary outcome measures was suicide, suicide attempt or outcome related to social support/social connection/thwarted belongingness; (2) the study design was an RCT; and (3) non-professional intervention providing social support directly must be the main method to prevent suicide. Those studies that only reported suicidal ideation as an outcome were not included because suicidal ideation is only remotely related to suicide behaviour and the assessment of suicidal ideation varied significantly across studies.

Data extraction

Data from the relevant studies in both stages were extracted independently using structured sheets containing information on intervention, type of study, participants, follow-up duration, settings and outcomes by two reviewers (XH and JW). Any disagreement was discussed, decisions were documented and, if necessary, authors of the study were contacted for classification. To estimate the primary outcome variables, we extracted the baseline sample size and the number of suicides and suicide attempts from baseline to follow-up. Suicide attempts included non-fatal suicide events. Outcomes related to social support/social connection/thwarted belongingness were extracted as the secondary outcome of our study.

Quality assessment

We used the Cochrane collaboration tool to assess the risk of bias in randomised trials. Reviewers judged the trials to be at 'low', 'unclear' or 'high' risk of bias for each domain. Two reviewers (XH and JW) independently and in group assessed each of the studies. A conjunct evaluation was performed to reach a consensus when they disagree with any of the reviewed items.

Statistical analysis

We used meta-analysis to assess the impact of social support interventions. RevMan software (Review Manager, V.5.3) was used to perform data analyses. For dichotomous outcomes, we reported the pooled risk ratio (RR) with a corresponding 95% CI. Results were analysed on an intention-to-treat basis. For continuous outcomes, we reported standardised mean differences with a corresponding 95% CI, using data at follow-up.

We defined significant statistical heterogeneity using χ^2 $p<0.10$ or I^2 >50%. Random effect model was used to assess the impact of suicide prevention by offering social support on attempted suicide as well as suicide.

We performed subgroup analyses by intervention method, participant, age and gender ratio to examine details about the association. Sensitivity analyses were undertaken to assess the effect of excluding studies at high risk of bias or with different lengths of follow-up period.

Egger test was conducted to detect the small-study effects using STATA V.16.0 for Windows.

We report the estimates from the main analysis. Search strategy and detailed characteristics of each trial included in the systematic review are listed in the online supplemental file 1. The systematic review protocol was registered on PROSPERO (CRD42021234859).

Findings

Our literature search identified 22 656 records. An additional 97 records were obtained from the manual search of reference lists of previous systematic reviews and meta-analyses and other sources. We searched the ISRCTN registry, ClinicalTrials.gov and EU Clinical Trials Register for relevant clinical trials and identified 185 records. A total of 13 967 records remained after duplicates were removed. A total of 1141 full-text articles and detailed information of 30 clinical trials were reviewed and 77 studies were included in the systematic review. For the clinical trials identified without outcome reported, we tried to contact the authors through email for at least three times to ask for the suicidal outcomes. For the included studies that only reported either suicide attempts or death by suicide, we contacted the authors to ask for data on the other outcome. Thus, we got an additional result of one trial.[23] In total, 16 studies among them were included in the meta-analysis (figure 1).

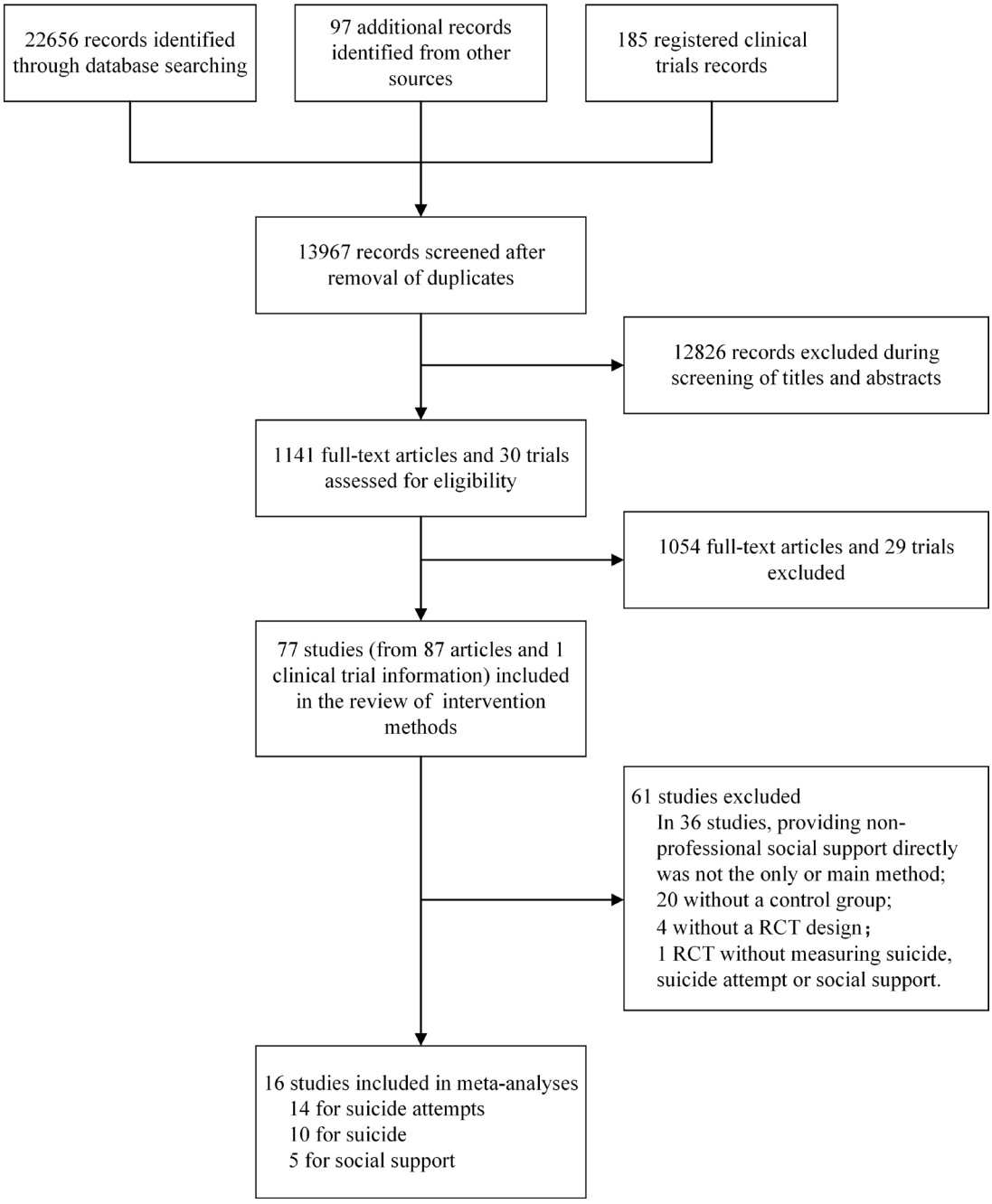

Figure 1 PRISMA flow chart. PRISMA, Preferred Reporting Items for Systematic Reviews and Meta-AnalysesRCT, randomised controlled trial.

Description of intervention methods

Classification of social support interventions

A variety of methods ranging from sending postcards to online support groups have been used to provide social support in the included studies. Based on our observation and induction, these different methods can be divided into 'One-to-one' and 'Group' interventions. Detailed characteristics of each trial are listed in online supplemental eTable 1.

One-To-one interventions

The one-to-one support intervention included 53 studies with five main intervention methods offering support by mail, text message, face -to-face, telephone or email (online supplemental eTable 1).

Most mail (n=7) and text message (n=3) support providers were research staff, while most of the recipients were patients who survived suicide attempts or self-harm. The study by Ehret *et al*[24] encouraged veterans with living mental health experience to make cards for their peers. Face-to-face (n=13) and telephone (n=13) methods accounted for the largest proportion of one-to-one interventions, in which support recipients were able to respond during the intervention process. For example, the trained peers made regular check-ins to have supportive contact with those with needs; the research team member might routinely call a targeted participant. Email (n=2) methods were provided by special service centres offering peer support to the needy. The majority of studies were conducted using multiple interventions (n=15). They used a combination of face to face and mails, phone calls, or text messages.

Nearly half of the support providers were laypersons, including school staff and parents, participant-nominated persons, trained volunteers, etc. The professionals offering caring contacts in these studies were psychiatrists, psychologists, nurses, graduate students and postdocs in psychology. Most of the recipients were patients who attempted suicide or self-harm or individuals identified as at risk for suicide using different screening tools.

Group interventions

Nineteen studies used group interventions. Most of the time, there was a leader in group intervention to ensure the smooth progress of activities. Group leaders and other members of the group are listed in online supplemental eTable 1. Face-to-face (n=11) was the main pattern, including regular meetings, hiking, horticultural work and integrated activities, which contained volunteer services, social gatherings, indoor activities, physical exercise, etc. Target participants included students, middle-aged and older adults, veterans, prisoners, patients at risk of suicide and trans women. Online groups (n=8) provided opportunities for asynchronous communication in a discussion forum to facilitate engagement in virtual reality social interactions, which sprung up in the past few years.

Interventions by both one-to-one and group methods

Five interventions provided both methods, all of which were conducted in community settings, described in detail in online supplemental eTable 1. Two of them provided opportunities for residents to get together for group activities.[25 26] At the same time, public health nurses regularly visited the participants to comfort them for being lonely. The participants of one of the studies received mentorship and weekly emails and group activities.[27] In Baker's study, social supports were provided by peer mentors by both group and one-to-one intervention.[28]

Meta-Analyses

Reasons for excluding studies from meta-analyses

All 77 studies included in our systematic review were evaluated for further meta-analyses. In 36 studies, non-professional intervention providing social support directly was not the main method to prevent suicide, so they were excluded from the meta-analysis. A total of 20 studies were excluded because they were case reports, feasibility analysis or single group design, with no control group. Four studies were not RCTs. One RCT was excluded for not evaluating suicide, suicide attempt or social support-related outcomes. Therefore, 16 studies were included in the meta-analysis.

Description of the studies included in the meta-analyses

In this systematic review, 16 RCTs were included based on the inclusion and exclusion criteria. Three articles[29–31] were part of the WHO SUPRE-MISS programme sharing the same data source. Fleischmann *et al*[29] and Bertolote *et al*[30] were extracted from five low and middle-income countries sites with different outcomes (death by suicide suicide attempts), while Vijayakumar *et al*[31] were from Chennai. This means that data from Vijayakumar *et al* were part of the data in the other two articles, so we did not use its outcomes. Data of two articles[32 33] were from the same clinical trial, but they assessed different outcomes as well. King *et al*[32] was a post hoc secondary analysis of a randomised clinical trial using National Death Index data. Data in two articles[34 35] were from the same population; the former was from the intervention period, and the latter from the 12-month to 24-month follow-up; hence, we extracted the data from both articles and pooled the outcomes. Two articles[36 37] were from the same study measuring death by suicide, so we used data from Motto and Bostrom[37] in our meta-analysis. Geraci[27] used a three-arm RCT design: Arm 1 received mentorship from their matched mentors who integrated professional components (eg, Interpersonal Therapy) to help veterans; arm 2 were able to access a large online community and engage in social activities without professional intervention; arm 3 was a waitlist arm. Therefore, we extracted the data of arms 2 and 3.

The follow-up time ranged from 6 months to 12.8 years. King *et al* had the longest follow-up period, ranging from 11.2 to 14.1 years (mean, 12.8). Intervention time ranged from 3 months to 5 years. Motto and Bostrom had the longest intervention period, with at least four contacts a year for 5 years. Detailed information on each trial included in the meta-analyses is listed in online supplemental eTable 2.

Quality assessments of the studies included in the meta-analyses are shown in online supplemental file 1.

Effects of interventions

Deaths by suicide in the intervention group compared with the control group

Outcomes of 10 RCTs (online supplemental eTable 2) contained suicide outcomes. Figure 2 showed the results of individual study estimates and the pooled RR of the proportion of participants who died by suicide. There were a total of 18 799 person years. The overall pooled RR was 0.48 (95% CI 0.27 to 0.85, p=0.01). The I^2 statistic indicated that heterogeneity across studies was moderate but non-significant (I^2=17%, p=0.30).

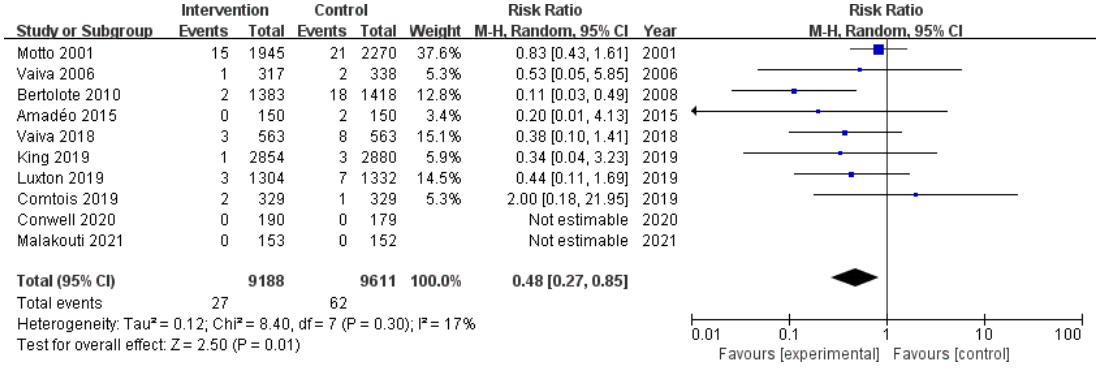

Figure 2 Pooled random-effects meta-analysis assessing the efficacy of suicide preventions providing social support on the proportion of suicide in the intervention and control groups (person-years).

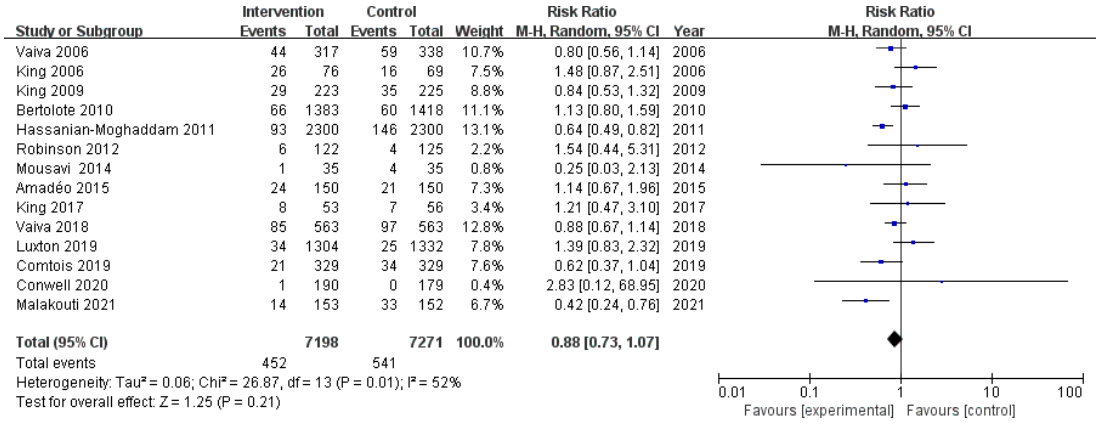

Figure 3 Pooled random-effects meta-analysis assessing the efficacy of suicide prevention providing social support on the proportion of people who attempted suicide in the intervention and control groups (person-years).

Suicide attempts in the intervention compared with the control group

Since more articles provided the number of participants who had attempted suicide, but not the number of suicide attempts, over a certain period, we extracted the former data. The individual study estimates and the pooled RR of the proportion of participants who had any attempted suicide are shown in figure 3. There were 14 RCTs (online supplemental eTable 2) that were eligible for inclusion into the analysis, giving a total of 14 469 person-years. The overall pooled RR was 0.88 (95% CI 0.73 to 1.07, p=0.21). Inspection of the I^2 statistic indicated a higher and significant amount of heterogeneity between the studies (I^2=52%, p=0.01).

Social support-related outcomes in the intervention group compared with the control group

Five studies[23 27 38–40] reported social support-related outcomes. Three studies[23 39 40] reported thwarted belongingness by Thwarted Belongingness subscale (which included loneliness) of the Interpersonal Needs Questionnaire (18-item) or the Interpersonal Needs Questionnaire Revised (15-item). Thwarted belongings did not differ significantly between groups in the three studies after intervention.

One study[38] reported perceived social support measured by Multidimensional Scale of Perceived Social Support. No significant difference was found between the two groups after intervention. One[27] showed that perceived availability of social support, as measured by Social Support Survey, was improved significantly in the intervention group.

One[39] of the above studies measured loneliness by the UCLA Loneliness Scale-Revised and community connectedness by the Community Connectedness Scale at the same time. Loneliness was reduced significantly in the intervention group. The intervention effects for community connectedness were not significant.

Subgroup and sensitivity analyses

Subgroup analysis by intervention method suggested that face to face interventions significantly reduced the risk of suicide with a pooled RR of 0.16 (95% CI 0.05. to 0.53), while suicides in other subgroups using different methods were not reduced significantly. Interventions targeting suicide attempters significantly reduce their risk of suicide (RR=0.24, 95% CI 0.10 to 0.58). However, interventions targeting other participants did not reduce suicide significantly. The subgroup analysis by gender ratio suggested social support interventions reduce suicide in population with gender ratio (females/males) ≥1 (RR=0.41, 95% CI: 0.20 to 0.86), but not in population with gender ratio (females/males) <1 (RR=0.67, 95% CI: 0.18 to 2.54). After removing two studies with a long follow-up period (5 years and 11.2–14.1 years, respectively), the pooled RR was 0.34 (95% CI: 0.17 to 0.69, p<0.01), I^2=0%, p=0.44.

Subgroup analyses for suicide attempt by method, participant, age and gender ratio showed low to moderate heterogeneity among subgroups (I^2=45%, 53%, 29%, 0%, respectively).

Detailed subgroup, sensitivity, and publication bias analyses are shown in online supplemental file 1.

CONCLUSIONS AND CLINICAL IMPLICATIONS

To our knowledge, this is the first study that has systematically described the methods that have been used for preventing suicide by offering social support directly and examined the efficacy of these interventions. Inconsistent results are found in our meta-analyses: social support interventions can prevent suicide but cannot reduce suicide attempts.

The relative risk of suicide attempts was lower in the intervention group compared with the control group, but the result was not significant. However, when using suicide as the outcome, the meta-analysis showed a 52% reduction in the intervention group than in the TAU group. The inconsistency between suicide attempts and suicide should be considered from several aspects. First, out of the 16 studies included in the meta-analyses, only 9 studies have reported both suicide attempt and suicide. These different studies with significant heterogeneity may have yielded inconsistent results on suicide attempt and suicide. Second, suicide attempters and suicide decedents are two different populations with overlap.[41–43] Previous study showed that difficulties in communication predicted the lethality and seriousness of suicide attempts.[44] Living alone was associated with high lethal suicide means.[45] Social support interventions may reduce risk to use high lethal methods, therefore reduce deaths by suicide, but not suicide attempts. Third, suicide attempt data were self-reported or combined information of self-report and medical records, which led to recall bias or reporting bias. Most data on suicides, however, were derived from objective records with low potential for bias. Thus, suicide may be a more accurate reflection of reality.

A variety of methods have been used to prevent suicide. Almost half of these social support interventions were combined with professional interventions or were part of a comprehensive

programme, which brought difficulties in estimating the pooled effect of social support. The training of laypersons to provide social support to those at high risk of suicide played a critical role in suicide prevention. Traditional methods (eg, face to face, telephone, mail and text message) account for the majority. However, over the past decade, increasingly researchers adopted online information and interaction to reach a wider range of people, not limited by geography, and at a lower cost. However, we were not able to provide a pooled estimation of the efficacy of online social support interventions due to the limited sample size.

Among all studies included in meta-analysis, three were of high quality in measuring suicide attempts, while five were of high quality in measuring death. Main risks were detection bias and attrition bias. It can be difficult to perform blinding in studies providing social support. However, using suicide as the primary outcome or determining suicide attempts by combining self-report data and the suicide attempt surveillance system may minimise the impact of such bias. Generally, in our meta-analyses, the control group showed a higher loss to follow-up rate (eg, Vaiva *et al*[46]). When poor mental health was more likely to be lost to follow-up,[46] it is likely that the incidence rates of suicide and suicide attempt are underestimated more in the control group than in the intervention group. Therefore, the effect of interventions is probably underestimated, particularly for studies measuring self-reported suicide attempts. There is a clear need for high-quality studies examining the efficacy of social support interventions in preventing suicide.

Only five studies measured the outcomes related to social support with inconsistent results. We were unable to produce a credible pooled estimate due to the limited number of studies included. Previous meta-analyses evaluating the effects of psychotherapy and Internet support showed positive results with regard to social support, which had some implications.[47 48] Future studies should focus on measuring social support-related outcomes and providing high-quality social interactions.

Subgroup analysis on different methods showed that only face-to-face interventions could significantly reduce suicide. It seems that this direct and interactive form of communication is more effective. Suicide attempter-targeted interventions reduce their risk of suicide more than interventions that targeted other participants. This result is in line with previous studies that showed those with more severe baseline depression had been improved more.[49] Suicides were reduced significantly in studies with more female participants. This may be explained by the differences in the perception of social support between sexes.[50] However, these subgroup analyses results should be interpreted with caution because of the limited sample size in each subgroup. Sensitivity analyses revealed that studies with follow-up periods longer than 5 years are not statistically significant than TAU in preventing suicide, while the opposite results were found in studies with shorter follow-up periods. These results indicate that the effectiveness of social support may vanish after the intervention.

Our results should be interpreted with caution. We have only included studies published in English. The efficacy of group interventions cannot be examined because these studies did not adopt a comparative study design or have used social support intervention as a component of a comprehensive suicide prevention programme. There was moderate but significant heterogeneity among studies measuring suicide attempts. We have attempted to address this issue using random effects models throughout, as well as undertake subgroup and sensitivity analyses. The relationship between the dose of intervention (ie, the number of contacts made between support providers and recipients, the length of each contact, the duration of intervention) and efficacy cannot be examined due to the limited number of included studies. The sample size is relatively small, especially for a rare outcome, death by suicide.

In summary, we find that social support can prevent suicide. Our results indicate that suicide prevention is not only the responsibility of professionals. Support from lay persons can also play an important role if they are appropriately informed. Everyone has a part to play in suicide prevention, and every part can be impactful.

Contributors XH and LZ designed the study, conducted the literature search and evaluated the full-text articles. XH, JG, JL, XZ and LQ selected the records. XH and JW extracted data and assessed bias in the studies. XH, JW and LZ contributed to the figures, statistical analyses and interpretation of the results. The manuscript was revised and commented by all authors. As the guarantor, LZ is responsible for the overall content.

Funding The authors have not declared a specific grant for this research from any funding agency in the public, commercial or not-for-profit sectors.

Competing interests None declared.

Patient consent for publication Not applicable.

Ethics approval This study does not involve human participants.

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement Data are available in a public, open access repository. Not applicable.

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