Iran J Public Health, Vol. 50, No.12, Dec 2021, pp.2439-2450

Review Article

The Effect of Peer Support on Individuals with Overweight and Obesity: A Meta-Analysis

Yanya Chen, Zekai Li, Qiaohong Yang, Shuai Yang, Chunxia Dou, Tieling Zhang, *Bingsheng Guan

The First Affiliated Hospital of Jinan University, Guangzhou 510630, China

***Corresponding Author:** Email: guanbingshengxy@163.com

(Received 15 Aug 2020; accepted 14 Oct 2020)

Abstract

Background: Scarce data exists about the effect of peer support on individuals with overweight or obesity. This study aimed to conduct a meta-analysis regarding the effect of peer support on weight, BMI, waist circumference, blood pressure, quality of life, social support and depressive symptoms in individuals with overweight and obesity.

Methods: PubMed, Embase, and CENTRAL were searched for relevant studies from their inceptions to 1 Mar 2020, and 14 randomized controlled trials (RCTS) were included. Data were pooled with Review Manager 5.3.

Results: Significantly small improvement in weight (-0.78 kg) was found in individuals who received peer support than those who received usual care (MD= -0.78 kg, 95% CI-1.33 to -0.22, *P*=0.02). And peer support appeared to be associated with significant decrease in BMI levels (MD= -0.16 kg/m^2, 95% CI -0.32 to -0.01, *P*=0.04). However, there was no statistically significant improvement in the levels of waist circumference, systolic blood pressure, diastolic blood pressure, quality of life, social support and depressive symptoms after peer support.

Conclusion: Peer support appears to be associated with decreased weight and BMI levels in individuals with overweight and obesity. However, additional research is warranted due to insufficient evidence for the effects of peer support on the other health indicators.

Keywords: Peer support; Obesity; Overweight; Meta-analysis

Introduction

Prevalence of overweight and obesity is increasing these years, and has become a global public health problem along with the economic development and change of life style (1). Individuals who are overweight or obese with high body-mass index (BMI) are at high risk of a series of non-communicable disease, such as type 2 diabetes, hypertension, hyperlipemia and even cancer (2, 3). Besides numerous physical symptoms, overweight and obesity could also bring about some mental health issues, like stress, depression (4) and social isolation (5).

People are easier to gain weight if their friends or family members are also obese (6). Similarly, individuals with overweight and obesity are more willing to lose weight when people around are

doing the same things. Peer support is defined as informational, appraisal and emotional assistance provided by a member who has similar characteristics and experiential knowledge of a specific behavior or stressor, which can offer effective support for eating and exercise behaviors (7, 8). Peer support can effectively improve quality of life among HIV persons (9), self-efficacy in breast cancer patients (10), and functional status in diabetes people (11). Recently, some studies have looked at the effect of peer support on individuals with overweight and obesity, but the evidences are still mixed. For instance, peer support was conducive to BMI loss (12, 13), while other articles found that the difference was not statistically significant (14). To date, no systematic reviews and meta-analyses have been conducted. And it is still hard for us to draw a conclusion about the effect of peer support on individuals with overweight and obesity.

We attempted to conduct a meta-analysis of randomized controlled trail (RCT) to assess the effect of peer support on the health outcomes in individuals with overweight and obesity.

Methods

This meta-analysis was conducted in accordance with the guidance of the Cochrane Handbook (15), together with the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) (16).

Ethics approval was not required because no clinical intervention was conducted on individuals.

Literature search

We conducted the search process in PubMed, EMBASE, and the Cochrane Central Register of Controlled Trails (CENTRAL) from their inceptions until 1 Mar 2020 using individualized search strategies prepared for each database. Medical subject heading along with free terms were used together for literature search, including (peer support OR peer educator OR peer coach OR peer counselor OR peer adviser OR peer mentor OR peer supporter OR peer advocate OR peer listener OR peer led OR peer leader OR peer group OR trained peers) AND (obesity OR obese OR overweight OR weight loss OR body weight OR body mass index). No restrictions were imposed on language. Additionally, we also hand searched the references of identified articles and reviews for other relevant investigations.

Study selection

The inclusion criteria for this meta-analysis were as follow: 1) RCT design, 2) individuals with an initial BMI ≥25 kg/m^2, 3) intervention compared with usual care. Intervention referred to one-on-one and/or group peer support, including peer nutrition counseling, shared decision making and so on. Usual care referred to basic health care services. Exclusion criteria were studies that combined peer support with other interventions. We also excluded case reports, reviews, letters, comments, duplicate reports and studies without interesting outcomes (including weight, BMI, waist circumference, blood pressure, quality of life, social support and depressive symptoms).

Data extraction and quality assessment

We used a multi-step process for study selection in this article. Firstly, two researchers screened titles and abstracts of search results to determine whether the study should be remained or not. Secondly, two researchers assessed the full text of relevant citations, and then used a pre-specified data extraction form for data extraction. The following information was retrieved during data extraction: first author's name, publication year, location, study design, age, individuals' characteristics, BMI, type of intervention, follow-up duration and outcomes of interest. All disagreements between the two primary researchers were resolved by consultation with a third researcher. If possible, missing data would be obtained from authors by email. Quality assessment of the included trails was conducted by the Cochrane Risk of Bias Assessment Tool (15).

Statistical analysis

Review Manager (RevMan version 5.3) was used to analyze data from included trials. If outcomes were measured by the same scales, mean difference (MD) with 95% confidence interval (95%CI) was calculated. Otherwise, standardized mean difference (SMD) with 95%CI was calculated. When standard deviation (SD) was not provided, they would be calculated by available data. We used the Cochran Q-statistic and I^2 statistic to measure between-study heterogeneity. A *P*-value < 0.1 and I^2 > 50% were regarded as significant heterogeneity and a random effects model would be chosen to pool estimates. Otherwise, a fixed-effects model would be used. Subgroup and sensitivity analyses were carried out to investigate possible sources of between-study heterogeneity if feasible and necessary. Pre-specified subgroup analyses included type of intervention. Sensitivity analyses were performed by using the one-study-out method or changing the pooling model (random-effects model or fixed-effects model). Funnel plot was drawn to identify publication bias, if the number of studies was more than 10 (17). Moreover, the Begg and Egger tests were conducted to confirm the symmetric of funnel plot quantitatively.

Results

Of the 1450 relevant articles identified through electronic searches, 1021 titles and abstracts were screened after removal of duplicate articles. And 17 articles were reviewed for eligibility in full text. Afterwards, 14 studies were included in meta-analysis (5, 8, 12-14, 18-26). The process of study selection is displayed in Fig. 1. Table 1 presents the characteristics of included studies.

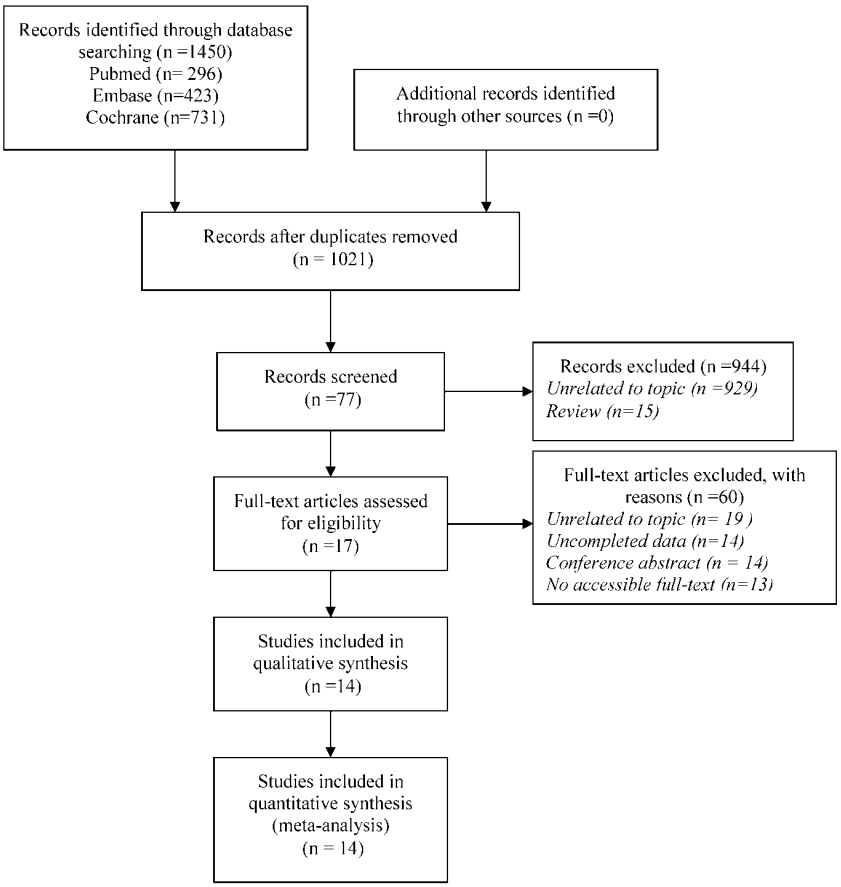

Fig. 1: PRISMA flow diagram of study selection and inclusion process

Table 1: Characteristics of included trails

Trial	*setting*	*Study design*	*No. of participants*	*Age (years, experimental/control)*	*Participants*	*BMI (kg/m²)*	*Interventions*	*Control*	*technology*	*Duration*	*Outcome and outcome measure*
Chang 2019	America	RCT	564 (382/182)	28.4+5.0/28.9 +5.0	Women with overweight and obesity	25.0~39.9 (32.2±4.4/31.7±4.2)	Video lessons featured four peers, and peer support teleconferences	Usual care	Internet	16 wk	(1) (2)
Mayer 2019	America	RCT	402 (210/192)	44.5±14.8(44.5±15.0/44.5± 14.5)	Individuals with overweight and obesity	32.6±5.9(32.6±6.1/32.55±5.7)	Peer-led workshop sessions	Usual care	Face-to-face	6 months	(3) (4)
Ing 2018	America	RCT	217 (112/105)	48.2±11.6/43.7±10.8	Individuals with overweight and obesity	31.9±6.7/33.0±7.2	Weight loss–maintenance phase delivered via peers	Usual care	Face-to-face	12 months	(3) (4) (5) (6)
Jane 2018	Australia	RCT	36 (19/17)	21~65	Individuals with overweight and obesity	25.0~40.0	Facebook group with peer support	Usual care	Internet	24 wk	(3) (7) (2)
Hageman 2017	America	RCT	201 (100/101)	40~69	Individuals with overweight and obesity	28~45	Web-based intervention with peer-led discussion	Usual care	Internet	18 months	(3) (8) (5) (6)
Arlinghaus 2017	America	RCT	140 (71/69)	13.02±0.56	Students with overweight and obesity	26.3±3.10	Intervention with peers	Usual care	Face-to-face	6 months	(3) (4)
Chang 2017	America	RCT	564 (382/182)	28.5±5.0 (28.4+5.0/28.9 +5.0)	Mothers with overweight and obesity	25.0~39.9 (32.2±4.4/31.7±4.2)	Videos featuring peers, and peer support teleconferences	Usual care	Internet	16 wk	(3) (4)
Kulik 2015	America	RCT	41(23/18)	15.3±1.5/15.1 ±1.5	Overweight adolescent females	33.8±4.5/35.6±6.0	Peer Support	Usual care	Face-to-face+Internet	16 wk	(3)
Kulik 2014	America	RCT	41(23/18)	15.3±1.5/15.1 ±1.5	Females with overweight and obesity	33.8±4.5/35.6±6.0	Peer Support	Usual care	Face-to - face+Internet	16 wk	(1)

Imanaka 2013	Japan	RCT	175 (87/88)	50.7±7.4/49.6 ±7.2	Individuals with overweight and obesity	≥25 (27.5±3.1/27.4±2.5)	Self-disclosure peer-to-peer support	Usual care	Internet	12 wk	(3) (4) (8) (7)
Lloyd-Richardson 2012	America	RCT	100(51/49)	14.33±1.02	Obese adolescents	31.41±3.33	Peer-based therapy	Usual care	Face-to-face	16 wk	(3) (4)
Pullen 2008	America	RCT	16(8/8)	50~69(55.5±4 .9)	Women with overweight and obesity	28~34.5 (30.69±2.58)	Web site with a peer-led support group	Usual care	Internet	3 months	(3) (8) (5) (6)
Perri 1987	America	RCT	48(32/16)	21~60	Obese individuals	20~100% overweight	A peer-support program	Usual care	Face-to-face	20 wk	(3)
Foster 1985	America	RCT	89(48/41)	9.2±0.4/9.5± 0.5	Overweight children	31.8±15.2% overweight/28.6±14.0 overweight	Weight reduction program conducted by peer counselors	Usual care	Face-to-face	12 wk	(3)

(1) social support, (2) depressive symptoms, (3)Weight, (4) BMI, (5) systolic blood pressure, (6) diastolic blood pressure, (7) quality of life, (8) waist circumferenc

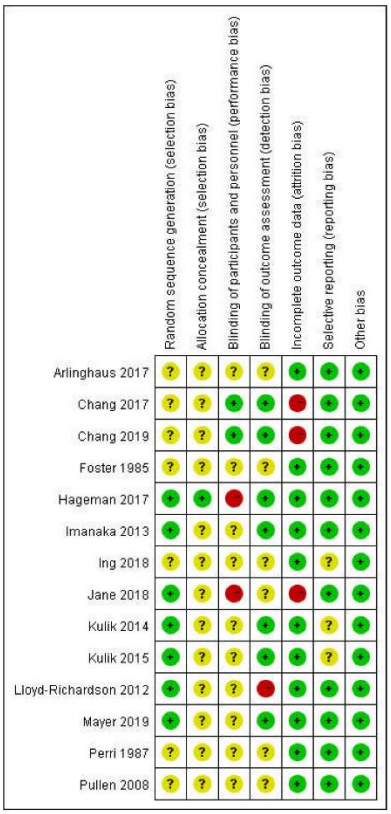

Fig. 2: Risk of bias summary

These studies were conducted in different regions (e.g., America, Australia, and Japan). The interventions were delivered via face-to-face in six studies (42.9%) (12, 14, 19, 23, 25, 26), via internet in six studies (42.9%) (5, 13, 18, 20, 21, 24), and via both face-to-face and internet in two studies (14.2%) (8, 22). The intervention duration ranged from 12 wk to 18 months. Among the included studies, 7 articles (50%) had an intervention duration less than or equal to 16 wk. A Risk of Bias Summary is shown in Fig. 2.

Twelve trials involving 1689 participants reported the outcome of weight. Between-study heterogeneity was found (P=0.02, I^2 =51%), so a random-effect model was used to calculate the pooled results. Peer support was associated with greater weight loss (MD = -0.78 kg, 95% CI -1.33 to -0.22, P=0.02) in comparison with usual care (Fig. 3).

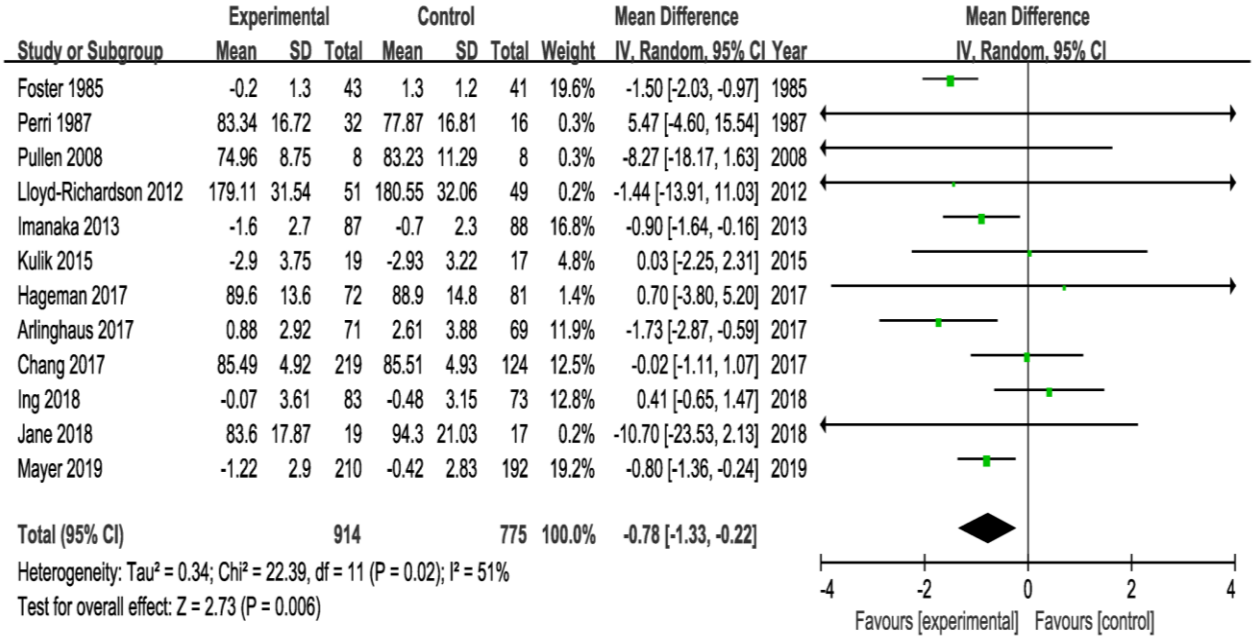

Fig. 3: Pooled results of peer support experimental group versus control group for included studies on weight

Among the studies reported the outcome of weight, subgroup analysis by type of intervention was performed to explore potential source of heterogeneity. It led to homogeneous result (P=0.15, I^2 =40%) for the five studies using internet-based intervention (MD=-0.62 kg, 95% CI -1.79 to 0.55), but not for the six that used face-to-face intervention (MD = -0.91 kg, 95% CI -1.65 to -0.16). The difference between these two subgroups was not obvious (P=0.69). In sensitivity analysis, the effect of peer support was confirmed through changing the random-effects model to a fixed-effect model (MD = -0.93 Kg, 95% CI -1.23 to -0.63, P<0.00001). The publication bias was not significant for this outcome (Begg, P=0.230; Egger, P=0.068). The funnel plot was shown in Fig. 4.

Six studies reported the outcome of BMI, with 1316 individuals overall. Between-study homogeneity was found (P=0.21, I^2 =30%), so a fixed-effect model was used to pool results. Peer support was associated with lower BMI level (MD= -0.16 kg/m^2, 95% CI -0.32 to -0.01, P=0.04) in comparison with control group (Fig. 5).

Three studies with 343 participants were enrolled in the meta-analysis of waist circumference (Fig. 5). We identified significant heterogeneity across these studies (P=0.007, I^2 = 80%), and the

pooled result of the random-effects model indicated that peer support did not lead to significant reduction in waist circumference (MD = -2.68 cm, 95% CI -7.08 to 1.72, *P* = 0.23).

Three studies examined the effect of peer support on systolic blood pressure, with 324 participants. Between-study heterogeneity was found (*P*= 0.06, I^2 = 65%), thus a random-effects model was selected. There was no significant difference between the intervention and control groups (MD = -2.51 mmHg, 95% CI -7.69 to 2.68, *P*=0.34) (Fig. 6).

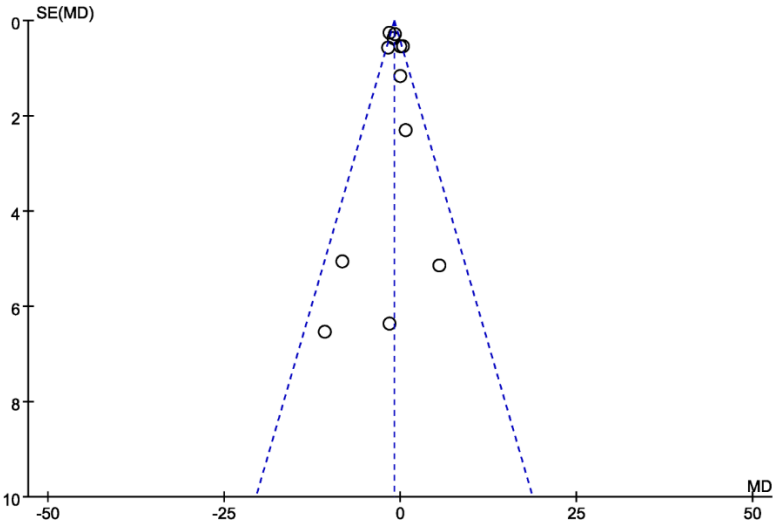

Fig. 4: Funnel plot of publication bias of intervention studies using peer support in weight loss interventions

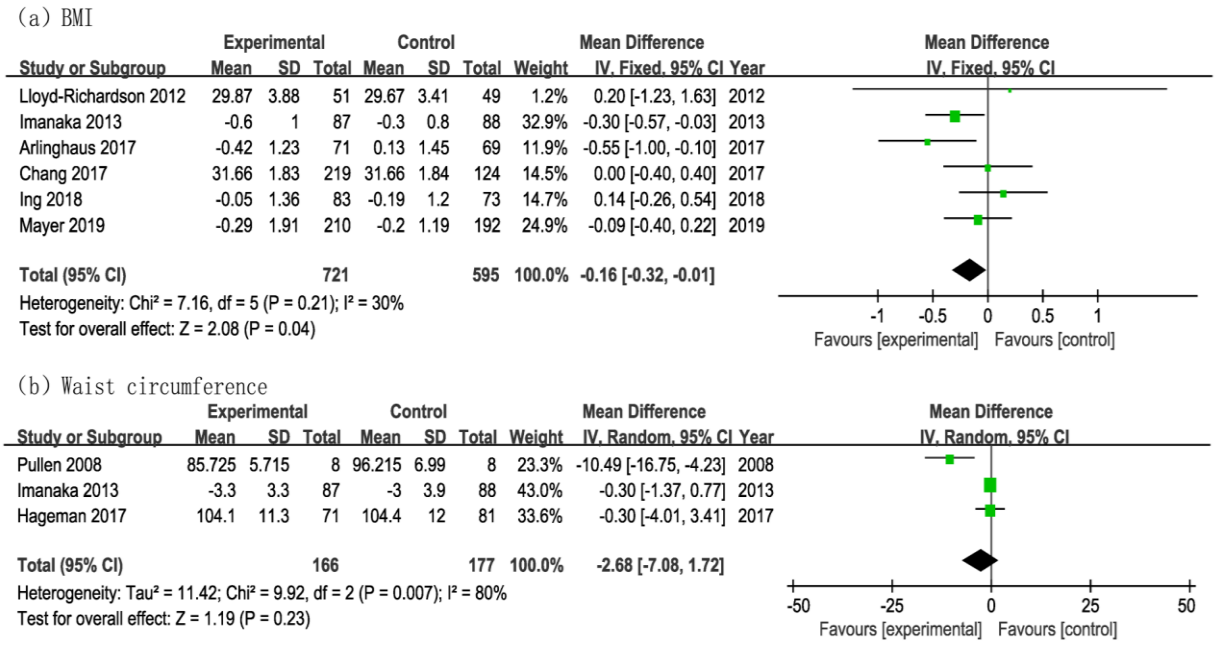

Fig. 5: Pooled results of peer support experimental group versus control group for included studies on BMI and waist circumference

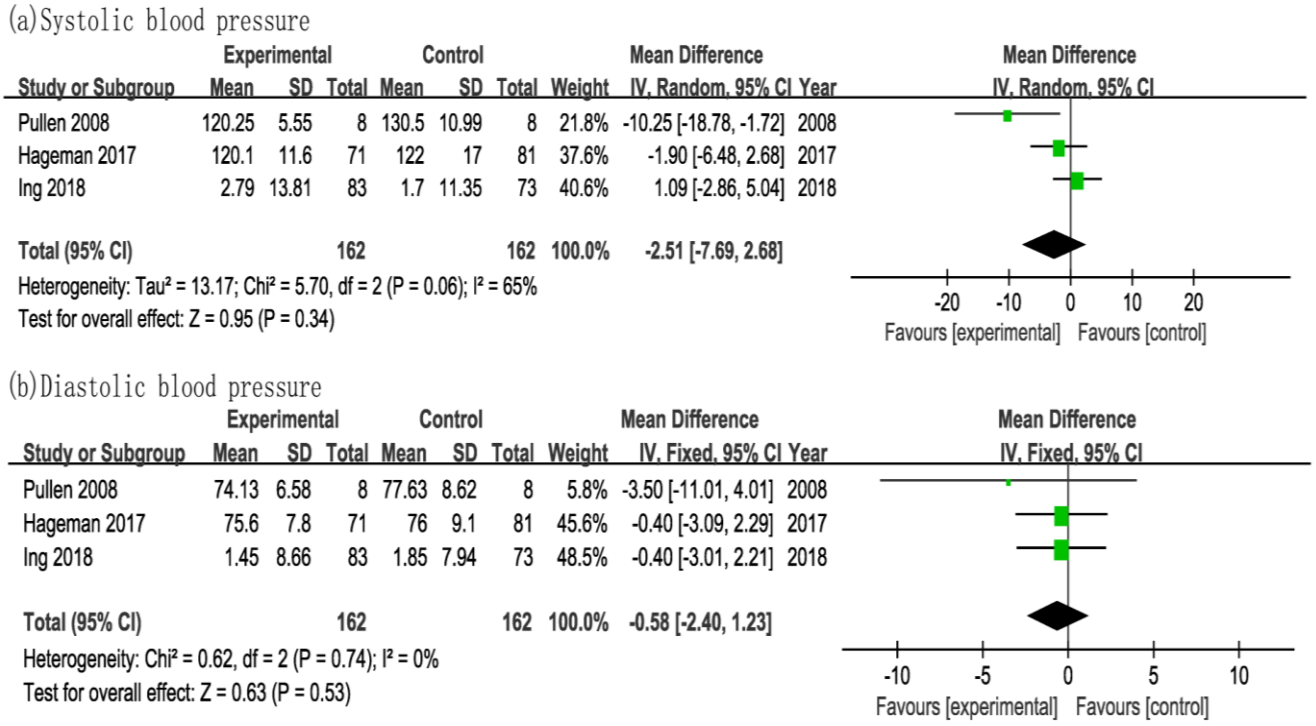

Fig. 6: Pooled results of peer support experimental group versus control group for included studies on systolic blood pressure and diastolic blood pressure

The same three studies also reported the outcome of diastolic blood pressure. There was homogeneity across these studies (P = 0.74, I^2 = 0%), and the pooled estimate from fixed-effect model suggested that the effect of peer support on diastolic blood pressure was not statistically significant among individuals with overweight and obesity (MD = -0.58 mmHg, 95% CI -2.40 to 1.23, P = 0.53) (Fig. 6).

Two studies, encompassing 209 individuals, reported the result of quality of life. Because of between-study homogeneity (P=0.70, I^2 =0%), we used a fixed-effect model to calculate the mean effect size. The effect of peer support on quality of life was not so obvious (MD = 0.12, 95% CI -0.15 to 0.39, P=0.38) (Fig. 7).

Two studies (8, 18) reported the outcome of social support, and two (5, 18) for depressive symptoms (Fig. 7). There was homogeneity across the studies reporting the outcome of social support (P=0.30, I^2 =8%), but not for depressive symptom (P=0.12, I^2 =58%). Therefore, we selected fixed-effect model for the meta-analysis of social support, and random-effect model for the meta-analysis of depressive symptom. The pooled estimate suggested that peer support could not significantly improve social support (MD=0.15, 95% CI -0.06 to 0.36, P=0.16) and depressive symptoms (MD= -0.08, 95% CI -0.60 to 0.44, P=0.76) among participants with overweight and obesity

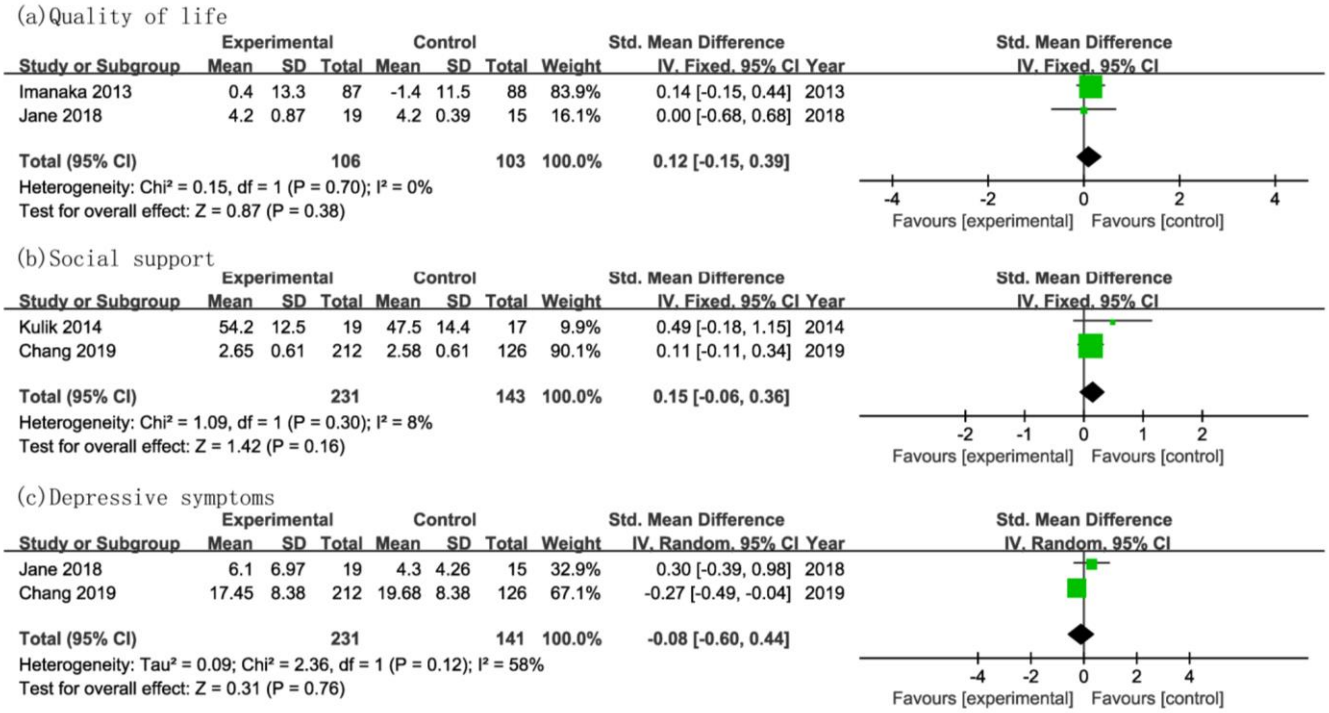

Fig. 7: Pooled results of peer support experimental group versus control group for included studies on quality of Life, social support and depressive symptoms

Discussion

The important role of social relationships in maintenance of health, well-being and treatment of disease has drawn researchers' attention across disciplines of health and behavioral science (7). Peer relationship was one important part of social relationship according to social relationship construct (7). Individuals may turn to peers for support when they need to response to barriers or deficiencies encountered in health-care system. To the best of our knowledge, this study represents the first meta-analysis to examine the effect of peer support on individuals with overweight and obesity. The meta-analysis conducted in this review suggested that peer support intervention appeared to have greater post-intervention weight loss and lower BMI level compared to usual care. However, there were no statistically significant improvement in the levels of waist circumference, diastolic blood pressure, systolic blood pressure, quality of life, social support and depressive symptoms after intervention.

Weight management was a big challenge for these people who attempt to lose weight and it needs ongoing dietary and psychological support (27). A recent American Heart Association scientific statement suggested that greater level of peer interaction was beneficial to address obesity, improve weight loss efforts and maintain the loss (28). One potential explanation for why it appeared to be an association between peer support and weight loss and BMI decrease in this article was that peers can individually tailor weight management intervention for individuals with overweight and obesity in a way that medical professionals were often unable to (18). Because peers had similar socioeconomic and ethnic backgrounds, they may have a deeper understanding of need and social environments among individuals with overweight and obesity. Ongoing and professional help was not always affordable, while the individuals who receive peer support may feel more attention, which could help to improve their outcomes of weight and BMI decrease (18). Statistical significance was found in

weight and BMI loss in this meta-analysis, although only a small improvement in weight (0.78 kg) was found with peer support intervention. One explanation for this small improvement may be that the intervention duration was short (≤ 16 wk) in half of the included studies. With the development of electronic communication, the number of internet-based lifestyle behavior interventions has rapidly increased in recent years (20). Here, we did not find any significant difference between internet-based peer support and face-to-face peer support, indicating that internet-based peer support has proved to be similarly effective as face-to-face methods. Internet technologies were cost-effective avenues for individuals to interact with peers and were identified as a source of social support (5). It could reach more people and offer support that is more continuous while it was hard to continue face-to-face peer support for some people, busy middle-aged worker especially (13). Notably, the positive effect of peer support on individuals' dietary intake behaviors did not appear to last at follow-up assessment, partly because they had relapsed to previous habits without awareness after intervention (29). Peer support intervention might be a feasible alternative for individuals with overweight and obesity in places with limited professional resources, and innovative approaches with continuous peer support are needed.

Peer support was related to some small improvement in systolic blood pressure and diastolic blood pressure, although it did not reach statistical significance. BMI reduction could bring about blood pressure reduction in individuals with overweight and obesity (30). As the pooled results for BMI was relatively small (MD= -0.16 mmHg, 95% CI -0.32 to -0.01, *P*=0.04), it might not be able to bring about sufficient blood pressure reduction. Other potential reasons for why the difference was not statistically significant might be small sample size and short length of intervention time. However, at the population level, this small improvement might be clinically relevant. Take systolic blood pressure for example, a 2 mm decrease was related to 3% reductions of total mortality, 6% caused by stroke and 4% caused by coronary heart disease (31). Further studies with larger sample size and longer period of intervention are needed for confirming the effect of peer support on individuals with overweight and obesity.

Social support was regarded as an important influencing factor for overweight and obese individuals to persist with losing weight (32). It could also decrease stress level and buffer the relationship of stressful life events and depression (33). In this meta-analysis, peer support seems to improve social support and depressive symptoms, although it did not reach statistical significance. Similar results of a peer based therapy program were reported, both intervention group and control group lost weight but no significant difference was found in social support status (34). Some individuals with overweight and obesity had strong social support systems (18), but many of them felt uncomfortable when asking for help; because of worrying about being rejected, or just do not want to share personal information with others. Furthermore, individuals with overweight and obesity were more likely to have joint disorder, low back pain, sleep disorders and depression, resulting in low quality of life (13). The small intergroup difference in weight loss and short intervention period might blur the effect of peer support on quality in this study.

This study has some limitations. One is that type of intervention and duration of follow-up vary differently between studies, which may cause reporting biases. For this issue, we used random-effect model to pool results when needed, in order to get the most conservative estimates. Secondly, the number of included studies for some outcomes is limited, making us unable to run subgroup analysis of them. Thirdly, intervention duration of half of the included studies was short (≤ 16 wk), which may result in small improvement in weight. However, to our knowledge, this is one of the first meta-analysis to examine the effect of peer support on overweight and obesity individuals, which can give us more reliable conclusion regarding this topic.

Conclusion

Peer support appears to result in decrease of weight and BMI in individuals with overweight and obesity. However, additional studies are needed to identify further the effect of peer support on waist circumference, blood pressure, quality of life, social support and depressive symptoms.

Ethical consideration

Ethical issues (Including informed consent, plagiarism, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc.) have been completely observed by the authors.

Acknowledgements

This research is supported by grants from Medical Scientific Research Foundation of Guangdong Province of China (B2018044).

Conflict of interest

The author(s) declared no potential conflicts of interest.

References

1. Di Cesare M, Bentham J, Stevens GA, et al (2016). Trends in adult body-mass index in 200 countries from 1975 to 2014: a pooled analysis of 1698 population-based measurement studies with 19.2 million participants. *Lancet*, 387(10026): 1377-1396.
2. Zheng Y, Manson JE, Yuan C, et al (2017). Associations of weight gain from early to middle adulthood with major health outcomes later in life. *JAMA,* 318(3): 255-269.
3. Keum N, Greenwood DC, Lee DH, et al (2015). Adult weight gain and adiposity-related cancers: a dose-response meta-analysis of prospective observational studies. *J Natl Cancer Inst,* 107(2):djv088.
4. Luppino FS, de Wit LM, Bouvy PF, et al (2010). Overweight, obesity, and depression: a systematic review and meta-analysis of longitudinal studies. *Arch Gen Psychiatry,* 67(3): 220-9.
5. Jane M, Foster J, Hagger M, et al (2018). Psychological effects of belonging to a Facebook weight management group in overweight and obese adults: Results of a randomised controlled trial. *Health Soc Care Community,* doi: 10.1111/hsc.12584.
6. Christakis NA, Fowler JH (2007). The spread of obesity in a large social network over 32 years. *N Engl J Med,* 357(4): 370-9.
7. Dennis C (2003). Peer support within a health care context: a concept analysis. *Int J Nurs Stud,* 40(3): 321-32.
8. Kulik NL, Fisher EB., Ward, D. S., et al (2014). Peer support enhanced social support in adolescent females during weight loss. *Am J Health Behav,* 38(5): 789-800.
9. Van Tam V, Larsson M, Pharris A, et al (2012). Peer support and improved quality of life among persons living with HIV on antiretroviral treatment: a randomised controlled trial from north-eastern Vietnam. *Health Qual Life Outcomes,* 10: 53.
10. Lee R, Lee KS, Oh EG, Kim SH (2013). A randomized trial of dyadic peer support intervention for newly diagnosed breast cancer patients in Korea. *Cancer Nurs,* 36(3): E15-22.
11. Andreae SJ, Andreae LJ, Richman JS, et al (2020). Peer-Delivered Cognitive Behavioral Training to Improve Functioning in Patients With Diabetes: A Cluster-Randomized Trial. *Ann Fam Med,* 18(1): 15-23.
12. Arlinghaus K, Moreno J, Reesor L, et al (2017). Compañeros: high School Students Mentor Middle School Students to Address Obesity Among Hispanic Adolescents. *Preventing chronic disease,*14: E92.
13. Imanaka M, Ando M, Kitamura T, Kawamura T (2013). Effectiveness of web-based self-disclosure peer-to-peer support for weight loss: randomized controlled trial. *J Med Internet Res,* 15(7): e136.
14. Ing C, Miyamoto R, Fang R, et al (2018).Comparing Weight Loss-Maintenance Outcomes of a Worksite-Based Lifestyle Program Delivered via DVD and Face-to-Face: a Randomized Trial. *Health Educ Behav,* 45(4) :569-580.

15. Higgins J, Green S (2011). Cochrane Handbook for Systematic Reviews of Interventions Version 5.1.0. https://training.cochrane.org/handbook
16. Moher D, Liberati A, Tetzlaff J, et al (2010). Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. *Int J Surg,* 8: 336-341.
17. Palma PS, Delgado RM (2006). Practical considerations on detection of publication bias. *Gac Sanit,* 20 Suppl 3: 10-16.
18. Chang MW, Nitzke S, Brown R (2019). Mothers In Motion intervention effect on psychosocial health in young, low-income women with overweight or obesity.*BMC Public Health,* 19(1):56.
19. Mayer VL, Vangeepuram N, Fei K, et al (2019). Outcomes of a Weight Loss Intervention to Prevent Diabetes Among Low-Income Residents of East Harlem, New York. *Health Educ Behav,* 46(6): 1073-1082.
20. Hageman P, Pullen C, Hertzog M, et al (2017). Web-Based Interventions Alone or Supplemented with Peer-Led Support or Professional Email Counseling for Weight Loss and Weight Maintenance in Women from Rural Communities: results of a Clinical Trial. *J Obes,* 2017:1602627.
21. Chang M, Brown R, Nitzke S (2017). Results and lessons learned from a prevention of weight gain program for low-income overweight and obese young mothers: mothers In Motion. *BMC public health,* 17: 182.
22. Kulik N, Ennett S, Ward D, et al (2015). Brief report: a randomized controlled trial examining peer support and behavioral weight loss treatment. *J Adolesc*,2015: 117-23.
23. Lloyd-Richardson E, Jelalian E, Sato A, et al (2012). Two-year follow-up of an adolescent behavioral weight control intervention. *Pediatrics,* 130(2): e281-8.
24. Pullen C, Hageman P, Boeckner L, et al (2008). Feasibility of Internet-delivered weight loss interventions among rural women ages 50-69. *J Geriatr Phy Ther,* 31(3): 105-12.
25. Perri M, McAdoo W, McAllister D, et al (1987). Effects of peer support and therapist contact on long-term weight loss. *J Consult Clin Psychol,* 55(4): 615-617.
26. Foster G, Wadden T, Brownell K (1985). Peer-led program for the treatment and prevention of obesity in the schools. *J Consult Clin Psychol,* 53(4): 538-40.
27. Thomas SL, Hyde J, Karunaratne A, et al (2008). Being 'fat' in today's world: a qualitative study of the lived experiences of people with obesity in Australia. *Health Expect,* 11(4): 321-30.
28. Li JS, Barnett T A, Goodman E, et al (2013). Approaches to the prevention and management of childhood obesity: the role of social networks and the use of social media and related electronic technologies: a scientific statement from the American Heart Association. *Circulation,* 127(2): 260-267.
29. Chang MW, Brown R, Nitzke S (2017). A Community-Based Intervention Program's Effects on Dietary Intake Behaviors. *Obesity (Silver Spring),* 25(12): 2055-2061.
30. Halperin DT, Laux J, LeFranc-Garcia C, et al (2019). Findings from a randomized trial of weight gain prevention among overweight puerto rican young adults. *J Nutr Educ Behav,* 51(2): 205-216.
31. Whelton PK, He J, Appel LJ, et al (2002). Primary prevention of hypertension: clinical and public health advisory from The National High Blood Pressure Education Program. *JAMA,* 288(15): 1882-8.
32. Mackey ER, Olson A, Merwin S, et al (2018). Perceived social support for exercise and weight loss in adolescents undergoing sleeve gastrectomy. *Obes Surg,* 28(2): 421-426.
33. Tambag H, Turan Z, Tolun S, et al (2018). Perceived social support and depression levels of women in the postpartum period in Hatay, Turkey. *Niger J Clin Pract,* 21(11): 1525-1530.
34. Jelalian E, Mehlenbeck R, Lloyd-Richardson E, et al (2006). 'Adventure therapy' combined with cognitive-behavioral treatment for overweight adolescents. *Int J Obes (Lond),*30(1): 31-9.