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REVIEW

Acupuncture Therapies for Individuals with Overweight or Obesity: An Overview of Systematic Reviews

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Purpose: An increasing number of people are affected by overweight or obesity, and the personal and social health burden is growing rapidly. Acupuncture is gaining popularity as an alternative treatment to manage weight. This research aims to update and synthesize the evidence of acupuncture therapies from systematic reviews for treating overweight and obesity.

Methods: Nine databases were searched from their inception to March 2022. Overweight or obesity was classified using standard diagnostic criteria. Published systematic reviews that included randomized controlled trials and quasi-randomized studies were eligible. Quality was assessed via the AMSTAR-2 scale and risk of bias using the ROBIS tool.

Results: Thirty-eight systematic reviews were identified. Acupuncture therapies and auricular acupoint stimulation showed benefits in terms of reducing body weight and body mass index. Catgut embedding therapy and abdominal acupuncture are currently not in widespread use with insufficient evidence. Acupuncture therapies appear to be safe. Most of the reviews were assessed as having high risk of bias and low confidence in the findings.

Conclusion: There is a need for larger and more methodologically sound randomized controlled trials to evaluate the effectiveness of acupuncture therapies for individuals who are affected by overweight or obesity.

Keywords: acupuncture, overweight, obesity, systematic review

Introduction

The prevalence of overweight and obesity is increasing rapidly around the world.[1] Changes in the food environment and food systems as well as reduced opportunities for physical activity often account for the high incidence of people who are affected by overweight and obesity.[2] It is estimated that more than one hundred million (5%) children and over six hundred million (12%) adults are affected by obesity worldwide.[3] In 2017, China and India had the largest population of children with obesity, and the United States and China had the highest number of adults with obesity.[3] Overweight and obesity is a risk factor for numerous chronic diseases, including cardiovascular disease, diabetes, chronic kidney disease and cancer.[4,5] A high body mass index (BMI) greater than 25 kg/m^2 (defined cut-off of overweight) accounted for four million deaths globally, and more than two-thirds of deaths were due to cardiovascular disease.[3]

Reduced energy intake, increased physical activity and behavioral change are the fundamental approaches to weight loss and weight maintenance recommended in almost all international guidelines.[6–8] In addition to lifestyle therapy, pharmacotherapy is a vital alternative or adjunct method for losing weight.[8,9] Currently, among the five long-term drug therapies approved by the US Food and Drug Administration, only orlistat is available worldwide.[10] One recent study

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found that all the approved drugs for anti-obesity were associated with higher odds of weight loss by more than 5%.[11] However, even though anti-obesity drugs can help people to lose weight, few patients are reluctant to use these drugs because of concerns about safety.[9] Actually, pharmacotherapy of obesity has a long history populated with multiple unsatisfaction, which is mainly from the concerns of side effect, such as headache, dizziness, insomnia, nausea, constipation, diarrhea, and concerns of potential risk about cardiovascular disease, stroke, hypertension, etc.[9,10] Some future candidate drugs for anti-obesity appear to be promising but there are still considerable barriers and challenges.[12,13]

In recent years, acupuncture therapy has gained popularity as a treatment for weight loss. There is also a number of clinical trials and systematic reviews that evaluate acupuncture for overweight and obesity.[14,15] However, interpreting evidence in relation to acupuncture treatment is challenging due to a limited number of high-quality trials with adequate treatment durations. The aim of this overview is to critically evaluate and synthesize published systematic reviews and provide guidance for future research.

Methods

Protocol and Registration

This systematic overview was conducted following a predetermined written protocol registered on the PROSPERO database with registration number CRD42020163840.

Data Sources and Search Strategy

PubMed, Embase, Cumulative Index of Nursing and Allied Health Literature (CINAHL), Cochrane Central Register of Controlled Trials (including the Cochrane Library and Allied and Complementary Medicine Database), China BioMedical Literature (CBM), China National Knowledge Infrastructure (CNKI), Chongqing VIP (CQVIP) and Wanfang databases were searched from their inceptions to March 2022. For all included studies, reference lists were searched for further reviews. MEDLINE search strategy is provided (Supplementary Material: Appendix 1). No restrictions were applied to the search.

Eligibility Criteria

To be eligible, systematic reviews were required to meet the following criteria:

- Type of reviews: Systematic reviews of randomized controlled trials (RCTs) or reviews that included both RCTs and quasi-randomized studies where RCTs were in the majority.
- Type of participants: Overweight or obesity was classified using standard diagnostic criteria (eg, the 2016 AACE/ACE Guidelines).[8] No restrictions regarding age, gender or condition duration were applied. Studies that included overweight or obesity as a complication of metabolic disorders such as diabetes mellitus, hyperlipidaemia were also included basing on the 2016 AACE/ACE Guidelines.[8]
- Type of intervention: Acupuncture therapies, including manual acupuncture, electroacupuncture, auricular (ear) acupuncture, acupressure, warming needle acupuncture, moxibustion, laser acupuncture, catgut embedding; used alone or in combination.
- Type of comparator: Placebo, no treatment or waitlist control, psychotherapy, pharmacotherapy, lifestyle therapies including dietary measures, physical activity, and/or behavioral changes.
- Type of outcomes: Measures of body composition including body weight (BW), BMI, waist circumference (WC), waist hip ratio (WHR) and body fat mass (BFM), or effective rate according to a recognized standard, or adverse events.

The full criteria are listed in Supplementary Material: Appendix 2.

Study Selection and Data Management

Two independent reviewers (JXC, HLW) screened titles and abstracts against the eligibility criteria and obtained full reports for all titles that appeared to meet the inclusion criteria or where there was uncertainty. The same two independent

reviewers managed data extraction in duplicate for each eligible study, using a standard data collection form in Microsoft Excel. A third reviewer (XFG) was consulted when disagreements arose. Extracted information included authors, date of publication, country, details of studies such as participant characteristics, intervention, comparator, number of participants, meta-analysis results, whether a sensitivity or subgroup analysis was conducted, risk of bias assessment and adverse events.

Risk of Bias Assessment

Three authors (JXC, JLS, HLW) independently assessed the methodological quality of each included study using the AMSTAR-2 scale and the Risk of Bias in Systematic Reviews (ROBIS) tool.[16,17] A fourth reviewer resolved any discrepancies (ALZ).

Data Synthesis

Due to the expected overlap of RCTs included in the systematic reviews and heterogeneity (particularly with regard to intervention and comparator arms), we conducted a narrative synthesis of the findings rather than pooling meta-analyses from the included reviews.

Results

The search identified 616 potentially relevant systematic reviews and 581 titles/abstracts were screened after duplicate removal (Figure 1). 77 full-text articles were assessed for eligibility and 38 systematic reviews were included in this overview. Results of the included reviews are presented in Table 1 (details of the individual studies can be found in Supplementary Material: Appendix 3). The summarized AMSTAR-2 scores and ROBIS scores are presented in Tables 2 and 3 (further justification statements are presented in Supplementary Material: Appendix 4 and Appendix 5). All excluded reviews are listed in Supplementary Material: Appendix 6. The 38 included reviews[14,15,18–53] were published between 2009 and 2020. The reviews were mostly conducted in China (33 reviews)[14,15,18,19,21–25,27–29,31–33,36–53] and one each from Australia,[26] Iran,[30] Korea,[35] Canada[34] and Brazil.[20] The reviews assessed the following acupuncture therapies, including auricular acupoint stimulation (7 reviews),[20,23,31,33,37,43,52] catgut embedding (6),[19,22,25,32,38,46] abdominal acupuncture (2),[28,32] electroacupuncture (2),[15,49] laser acupuncture (1).[30] The other 20 reviews[14,18,21,24,26,27,29,34–36,39,40,42,44,45,47,48,50,51,53] did not investigate a particular type but assessed any form of acupuncture. Anthropometry outcomes were common, such as BMI (34 reviews),[14,15,18–23,26–40,42,43,45–53] BW (30),[14,15,18–20,22,23,26,29–40,42,43,45,47–53] WC (21),[14,18,22,23,27–32,36,38,42,43,46–49,52,53] BFM (12),[14,18,23,27,29–31,37,40,42,43,52] hip circumference (13),[22,23,27,29–31,38,42,43,47,49,52,53] and adverse events were investigated in 27 reviews.[14,15,18,19,21–23,25–32,34,35,37,39–43,45,47,48,51] All of the reviews, except two,[30,37] conducted meta-analysis. The Cochrane Collaboration's tool for assessing risk of bias was used in 26 reviews[14,15,18–20,22,25–29,31–33,35–40,45,46,48–51] and the Jadad score in 12 reviews.[21,23,24,30,34,41–44,47,52,53] A total of 324 clinical trials were included in the reviews and 109 (33.6%) were included in more than one review.

Quality of the Included Reviews

AMSTAR-2

A summary of the AMSTAR-2 results can be found in Table 2. The confidence in the reviews were all rated as critically low except one[22] that was rated as low. The major insufficiencies were the lack of registration or publication of protocols prior to commencement of the reviews and justification for excluding individual studies. Thirty[14,15,18–23,25–27,29,30,32,34–37,39,40,42,43,45–52] of the 38 reviews (78.9%) employed the PICO (population, intervention, control group, and outcome) approach as an organizing framework for establishing study questions (AMSTAR-2 Item 1) but only five reviews[14,20,22,32,48] registered or published their protocol before commencement of the review (Item 2). Three reviews justified the selection of study type, eg, RCTs (Item 3).[19,23,43] Most reviews (84.2%)[14,15,18,19,21,22,24–29,31–38,40–43,45–48,50–53] included a comprehensive literature search (Item 4), performed study selection in duplicate (78.9%)[14,15,18–31,34–39,42,43,45–49,51] (Item 5) and also performed data extractions in duplicate (68.4%)[14,15,18–23,26–30,36,37,40,42,45–53] (Item 6). However, none of the reviews provided a complete list of potentially relevant studies with justification for the exclusion of each (Item 7). All but one[33] provided characteristic information of their included studies (Item 8) and 26[14,15,18,19,22,25–28,31–33,35–37,39–41,45–51,53] used a satisfactory technique for assessing the risk of bias

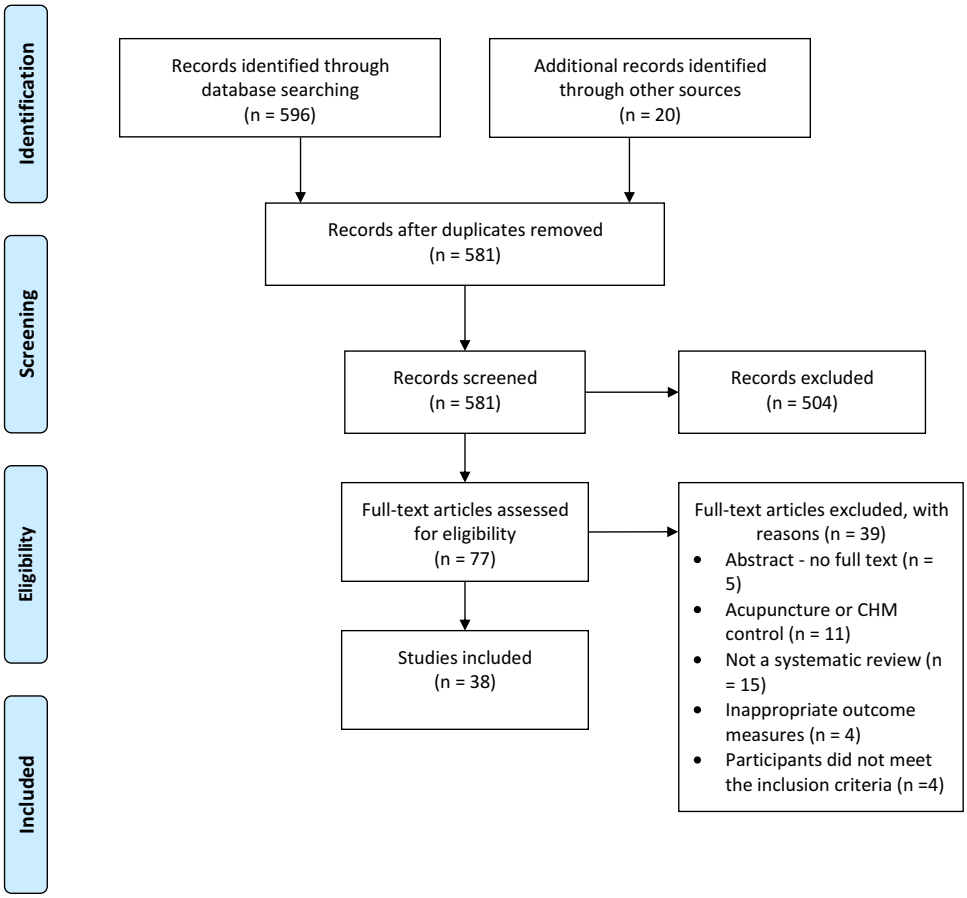

Figure 1 Flow diagram of study selection.

in individual studies, such as the Cochrane Risk of Bias Tool (Item 9). Only one review reported funding sources of the included studies (Item 10).[20] Statistical methods for meta-analysis were appropriate in most reviews (81.6%)[14,15,18–25,27–29,32,34,35,37,40–53] (Item 11) but only five reviews[24,25,43,45,52] reported the potential impact of risk of bias on the results (Item 12). Although, when reviewers interpreted their results most discussed the impact of risk of bias (71.1%) (Item 13).[18,21–31,33–37,39–42,44–47,50,52] Exploration of heterogeneity and its impact on the result and clinical recommendations was discussed in 18 reviews (Item 14).[15,18,25,28–31,34–36,39,43–49] Publication bias was discussed in 24 reviews[15,18–25,27,28,34,35,38,41–45,47–49,52,53] (Item 15) and potential sources of conflict of interest and review funding was noted in 28 reviews[14,18–23,26,30–32,34–36,38,40,42–53] (Item 16).

ROBIS

The ROBIS tool is divided into four domains. Domain 1, which assesses concerns regarding specification of study eligibility criteria, was only at low risk of bias in two review.[14,48] Domain 2 assesses any concerns regarding methods used to identify/select studies. Three[14,28,45] achieved a low risk of bias rating overall, one[34] was rated as unclear and the remaining 34[14,15,18–27,29–33,35–44,46–53] were judged to be at a high risk of bias because some eligible studies were likely missing from the review. Domain 3 assesses concerns regarding methods used to collect data and appraise studies. 14[14,22,26–28,37,40,45,47–51,53] of the 38 reviews achieved a low risk of bias, 11[15,18,19,25,31,32,35,36,39,41,46] were at unclear risk and 13[20,21,23,24,29,30,33,34,38,42–44,52] were at high risk of bias because some bias may have been introduced through the data collection or risk of bias assessment (Table 3). With regards to domain 4, which assesses concerns regarding the synthesis of results, the majority were rated at high risk of bias because potential bias were ignored or heterogeneity was not accounted.[14,15,19–24,26,27,29,31–40,42,43,45–47,49–53] Two[30,48] was rated as low risk of bias and five[18,25,28,41,44] were at unclear risk. The final section of the tool provides a rating of the overall risk of bias of reviews. All the reviews were judged to be at

Table 1 Summary of the Included Systematic Reviews

Author, Year	Country	No. of Studies (No. of Participants)	Study Designs	Intervention	Control	Outcomes	Meta-Analysis	Risk of Bias
Cho 2009[34]	Canada	31 (3013)	RCTs	Any acupuncture therapy alone or acupuncture combined with control therapies as an add-on treatment	No Tx, sham/plac acu, drugs, lifestyle interv. (such as diet or exercise)	BW, BMI, AEs	Yes	Jadad
Lin 2009[29]	China	8 (1017)	RCTs	Any acupuncture therapy	Drugs	Effective rate, BMI, BW, HC, WC, WHR, BFM, weight regain rate, serum leptin	Yes	Cochrane
Yu 2010[44]	China	8 (958)	RCTs	Any acupuncture therapy	Drugs	Effective rate	Yes	Jadad
Sui 2012[42]	Hong Kong China	44 (4167)	RCTs	Acupuncture therapies used alone^	No Tx, sham/plac acu, drugs, lifestyle interv. (such as diet or exercise)	BW, BMI, WC, HC, BFM, blood lipids, blood glucose, insulin sensitivity, appetite, relapse of weight regain, AEs	Yes	Jadad
Li 2013[24]	China	11 (1257)	RCTs	Any acupuncture therapy	Non-acupuncture therapy, including diet, exercise, drugs and surgery	Effective rate	Yes	Jadad
Shi 2013[33]	China	4 (312)	RCTs	Auricular acupressure	No Tx, diet, exercise, behavior modification	BMI, BW	Yes	Cochrane
Liao 2014[25]	China	19 (1658)	RCTs	Catgut embedding therapy	Non-catgut embedding therapy	Effective rate	Yes	Cochrane
Liu 2014[27]	China	27 (3043)	RCTs and Controlled trials	Any acupuncture therapy, with or without basic treatment such as diet and exercise	No Tx, sham/plac acu, drugs, with or without basic treatment such as diet and exercise	Effective rate, BMI, WC, HC, WHR, BFM, lipid level, blood sugar, fasting insulin, leptin, appetite VAS score, AEs	Yes	Cochrane
Guo 2015[22]	China	43 (3520)	RCTs	Acupoint catgut embedding	No Tx, sham/plac acu, drugs, lifestyle interv. (such as diet or exercise), other acu interventions	BW, BMI, WC, HC, overall improvement rate, AEs	Yes	Cochrane

(*Continued*)

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Table 1 (Continued).

Author, Year	Country	No. of Studies (No. of Participants)	Study Designs	Intervention	Control	Outcomes	Meta-Analysis	Risk of Bias
Li KX 2015[26]	Australia	9 (556)	RCTs	Manual acupuncture and acupuncture combined with control therapies as an add-on treatment	No Tx, sham/plac acu, drugs, lifestyle interv. (such as diet or exercise)	BW, BMI, overall improvement rate, AEs	Yes	Cochrane
Li XH 2015[28]	China	5 (317)	RCTs and Controlled trials	Abdominal acupuncture	Non-abdominal acu	BW, BMI, WHR, WC, WHR, effective rate	Yes	Cochrane
Xia 2015[39]	China	15 (1082)	RCTs	Any acupuncture therapy	Placebo acu and other therapies including diet, exercise, drug therapy and Chinese herbal medicine	BW, BMI, improvement rate	Yes	Cochrane
Xue 2015[37]	China	17 (1246)	RCTs	Auricular point taping	No Tx, placebo, other routine treatments	BMI, BW, BFM, WC, AEs	No	Cochrane
Yang 2015[41]	China	16 (1611)	RCTs	Abdominal acupuncture	Non abdominal acupuncture	Effective rate	Yes	Jadad
Zhang 2015[50]	China	23 (1871)	RCTs	Any acupuncture therapy	Sham acu, lifestyle interv., drug therapy	BW, BMI	Yes	Cochrane
Chen 2016[18]	China	21 (1929)	RCTs	Any acupuncture therapy	No Tx, placebo, drugs	BW, BMI, WC, BFM, Effective rate	Yes	Cochrane
Ruan 2016[31]	China	9 (777)	RCTs	Auricular acupoint stimulation alone or with control therapies as an add-on treatment	No Tx, sham/plac acu, drugs, lifestyle interv. (such as diet or exercise)	BW, BMI, WC, HC, BFM, WHR, TC, TG, glucose, LDL, HDL, AEs	Yes	Cochrane
Fang 2017[21]	China	23 (1808)	RCTs	Manual acupuncture, electro-acupuncture and catgut embedding alone and combined with lifestyle therapies	No Tx, sham/plac acu, lifestyle interv. (such as diet or exercise)	BMI, AEs	Yes	Jadad
Namazi 2017[30]	Iran	7 (369)	RCTs and Controlled trials	Laser acupuncture	No Tx, sham/plac acu, drugs, lifestyle interv. (such as diet or exercise)	BW, BMI, WC, HC, BFM, appetite parameters, AEs	No	Jadad

Xie 2017[38]	China	16 (1284)	RCTs	Catgut embedding therapy	Non-catgut embedding therapy, including no Tx, placebo, drugs or other therapy	Effective rate, BMI, BW, WC, HC, TC	Yes	Cochrane
Yeh 2017[43]	Taiwan China	18 (1775)	RCTs	Auricular acupoint stimulation	Sham/placebo acupuncture	BW, BMI, WC, HC, BFM, AEs	Yes	Jadad
Zhang, Tan 2017[52]	China	11 (643)	RCTs	Auricular acupoint stimulation alone or with dietary restrictions	Sham/plac acu	BW, BMI, WC, HC, BFM	Yes	Jadad
Zhang, Han 2017[53]	China	6 (236)	RCTs	Acupuncture therapy, including acupuncture, electro-acupuncture or auricular acupuncture	Sham acu	BW, WC, BMI, HC	Yes	Jadad
Cho 2018[19]	Hong Kong China	5 (425)	RCTs	Acupoint catgut embedding	Sham/plac acu	BW, BMI, AEs	Yes	Cochrane
Kim 2018[35]	South Korea	27 (2219)	RCTs	Any acupuncture therapy	No Tx, sham/plac acu, lifestyle interv. (such as diet or exercise)	BW, BMI, AEs	Yes	Cochrane
Wang 2018[36]	China	14 (1127)	RCTs	Any acupuncture therapy	Non-acupuncture therapy	BW, BMI, WC, TG, TC, FPG, HbA1C, effective rate	Yes	Cochrane
Zhang YZ 2018[51]	China	34 (2283)	RCTs	Manual acupuncture, electro-acupuncture, auricular acupoint stimulation, acupoint catgut embedding and warming acupuncture alone or in combination. Excluded laser acupuncture	Sham/plac acu, drugs, lifestyle interv. (such as diet or exercise)	BW, BMI, AEs	Yes	Cochrane
Zhang KP 2018[45]	China	21 (1389)	RCTs	Any acupuncture therapy and acupuncture combined with control therapies as an add-on treatment	No Tx, sham/plac acu, drugs, lifestyle interv. (such as diet or exercise)	BW, BMI, incidence of cardiovascular events, AEs	Yes	Cochrane
Huang 2019[23]	Taiwan China	8 (811)	RCTs and Controlled trials	Auricular acupoint stimulation alone or combined with control therapies as an add-on treatment	No Tx, sham/plac acu, lifestyle interv. (such as diet or exercise)	BW, BMI, WC, HC, BFM, AEs	Yes	Jadad
Mendonça 2019[20]	Brazil	12 (874)	RCTs	Auricular acupoint stimulation	Sham/plac acu, lifestyle interv. (such as diet or exercise)	BW, BMI	Yes	Cochrane/ GRADE

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Table 1 (Continued).

Author, Year	Country	No. of Studies (No. of Participants)	Study Designs	Intervention	Control	Outcomes	Meta-Analysis	Risk of Bias
Shan 2019[15]	China	5 (380)	RCTs	Electro-acupuncture therapy, with diet and exercise as basic treatment	No Tx with diet and exercise as basic treatment	BW, BMI, Effective rate	Yes	Cochrane
Sheng 2019[32]	China	15 (1584)	RCTs	Acupoint catgut embedding	Sham/plac acu, lifestyle interv. (such as diet or exercise)	BW, BMI, WC, AEs	Yes	Cochrane
Yao 2019[40]	China	12 (1151)	RCTs	Any acupuncture therapy	No Tx, sham/plac acu, lifestyle interv. (such as diet or exercise)	BW, BMI, WC, BFM, serum lipids, AEs	Yes	Cochrane
Chen 2020[48]	China	33 (2503)	RCTs	Any acupuncture therapy alone or acupuncture combined with control therapies as an add-on treatment	Sham/plac acu, lifestyle interv. (diet or exercise)	BW, BMI, WC, AEs	Yes	Cochrane
Gao 2020[49]	China	13 (937)	RCTs or controlled studies	Electro-acupuncture	Non-eletro-acupuncture	BW, BMI, WC, HC, WHR, Body Fat Rate Reduction	Yes	Cochrane
Nie 2020[46]	China	5 (344)	RCTs or quasi-RCTs	Catgut embedding therapy	Non-catgut embedding therapy	Effective rate, Kupperman score, BMI, WC	Yes	Cochrane
Pan 2020[47]	China	16 (1109)	RCTs	Any acupuncture therapy	Sham acu	BW, BMI, WC, HC WHR, leptin, insulin, adiponectin, ghrelin, HOMA-IR, FPG, TC, TG, HDL, LDL, AEs	Yes	Jadad
Zhong 2020[14]	China	8 (403)	RCTs	Any acupuncture therapy	No Tx, sham/plac acu	BW, BMI, WC, WHR, BFM, AEs	Yes	Cochrane

Notes: Types of acupuncture include: manual acupuncture, electro-acupuncture, laser acupuncture, acupressure, auricular acupoint stimulation, warming needle. ^Review included Chinese Herbal Medicine also, only included acupuncture part of the review.

Abbreviations: AEs, adverse events; BFM, body fat mass; BMI, body mass index; BW, body weight; HC, hip circumference; WC, waist circumference; WHR, waist hip ratio; TC, total cholesterol; TG, triglyceride; LDL, low density lipoprotein cholesterol; HDL, high density lipoprotein cholesterol; FPG, fasting plasma glucose; Tx, treatments; plac, placebo; acu, acupuncture; interv, intervention.

Table 2 Result of AMSTAR-2

Author, Year	Item 1	Item 2	Item 3	Item 4	Item 5	Item 6	Item 7	Item 8	Item 9	Item 10	Item 11	Item 12	Item 13	Item 14	Item 15	Item 16	Overall Statement
Cho 2009[34]	Y	N	N	Y	Y	N	N	Y	N	N	Y	N	Y	Y	Y	Y	Critically low
Lin 2009[29]	Y	N	N	Y	Y	Y	N	Y	N	N	Y	N	Y	Y	N	N	Critically low
Yu 2010[44]	N	N	N	N	N	N	N	Y	N	N	Y	N	Y	Y	Y	Y	Critically low
Sui 2012[42]	Y	N	N	Y	Y	Y	N	Y	N	N	Y	N	Y	N	Y	Y	Critically low
Li 2013[24]	N	N	N	Y	Y	N	N	Y	N	N	Y	N	Y	N	Y	N	Critically low
Shi 2013[33]	N	N	N	Y	N	N	N	N	Y	N	N	N	Y	N	N	N	Critically low
Liao 2014[25]	Y	N	N	Y	Y	N	N	Y	Y	N	Y	Y	Y	Y	Y	N	Critically low
Liu 2014[27]	Y	N	N	Y	Y	Y	N	Y	Y	N	Y	N	Y	N	Y	N	Critically low
Guo 2015[22]	Y	Y	N	Y	Y	Y	N	Y	Y	N	Y	N	Y	N	Y	Y	Low
Li 2015[26]	Y	N	N	Y	Y	Y	N	Y	Y	N	N	N	Y	N	N	Y	Critically low
Li 2015[28]	N	N	N	Y	Y	Y	N	Y	Y	N	Y	N	Y	Y	Y	N	Critically low
Xia 2015[39]	Y	N	N	N	Y	N	N	Y	Y	N	N	N	Y	Y	N	N	Critically low
Xue 2015[37]	Y	N	N	Y	Y	Y	N	Y	Y	N	Y	N	Y	N	N	N	Critically low
Yang 2015[41]	N	N	N	Y	N	N	N	Y	Y	N	Y	N	Y	N	Y	N	Critically low
Zhang 2015[50]	Y	N	N	Y	N	Y	N	Y	Y	N	Y	N	Y	N	N	Y	Critically low
Chen 2016[18]	Y	N	N	Y	Y	Y	N	Y	Y	N	Y	N	Y	Y	Y	Y	Critically low
Ruan 2016[31]	N	N	N	Y	Y	N	N	Y	Y	N	N	N	Y	Y	N	Y	Critically low
Fang 2017[21]	Y	N	N	Y	Y	Y	N	Y	N	N	Y	N	Y	N	Y	Y	Critically low
Namazi 2017[30]	Y	N	N	N	Y	Y	N	Y	N	N	NR	NR	Y	Y	NR	Y	Critically low
Xie 2017[38]	N	N	N	Y	Y	N	N	Y	N	N	N	N	N	N	Y	Y	Critically low
Yeh 2017[43]	Y	N	Y	Y	Y	N	N	Y	N	N	Y	v	N	Y	Y	Y	Critically low
Zhang 2017[52]	Y	N	N	Y	N	Y	N	Y	N	N	Y	Y	Y	N	Y	Y	Critically low
Zhang 2017[53]	N	N	N	Y	N	Y	N	Y	Y	N	Y	N	N	N	Y	Y	Critically low
Cho 2018[19]	Y	N	Y	Y	Y	Y	N	Y	Y	N	Y	N	N	N	Y	Y	Critically low
Kim 2018[35]	Y	N	N	Y	Y	N	N	Y	Y	N	Y	N	Y	Y	Y	Y	Critically low
Wang 2018[36]	Y	N	N	Y	Y	Y	N	Y	Y	N	N	N	Y	Y	N	Y	Critically low
Zhang KZ 2018[51]	Y	N	N	Y	Y	Y	N	Y	Y	N	Y	Y	Y	Y	Y	Y	Critically low
Zhang YL 2018[45]	Y	N	N	Y	Y	Y	N	Y	Y	N	Y	N	N	N	N	Y	Critically low
Huang 2019[23]	Y	N	Y	N	Y	Y	N	Y	N	N	Y	N	Y	N	Y	Y	Critically low
Mendonça 2019[20]	Y	Y	N	N	Y	Y	N	Y	N	Y	Y	N	N	N	Y	Y	Critically low
Shan 2019[15]	Y	N	N	Y	Y	Y	N	Y	Y	N	Y	N	N	Y	Y	N	Critically low

(*Continued*)

Table 2 (Continued).

Author, Year	Item 1	Item 2	Item 3	Item 4	Item 5	Item 6	Item 7	Item 8	Item 9	Item 10	Item 11	Item 12	Item 13	Item 14	Item 15	Item 16	Overall Statement
Sheng 2019[32]	Y	Y	N	Y	N	N	N	Y	Y	N	Y	N	N	N	N	Y	Critically low
Yao 2019[40]	Y	N	N	Y	N	Y	N	Y	Y	N	Y	N	Y	N	N	Y	Critically low
Chen 2020[48]	Y	Y	N	Y	Y	Y	N	Y	Y	N	Y	N	N	Y	Y	Y	Critically low
Gao 2020[49]	Y	N	N	N	Y	Y	N	Y	Y	N	Y	N	N	Y	Y	Y	Critically low
Nie 2020[46]	Y	N	N	Y	Y	Y	N	Y	Y	N	Y	N	Y	Y	N	Y	Critically low
Pan 2020[47]	Y	N	N	Y	Y	Y	N	Y	Y	N	Y	N	Y	Y	Y	Y	Critically low
Zhong 2020[14]	Y	Y	N	Y	Y	Y	N	Y	Y	N	Y	N	N	N	N	Y	Critically low

Notes: Item 1. Did the research questions and inclusion criteria for the review include the components of PICO? Item 2. Did the report of the review contain an explicit statement that the review methods were established prior to the conduct of the review and did the report justify any significant deviations from the protocol? Item 3. Did the review authors explain their selection of the study designs for inclusion in the review? Item 4. Did the review authors use a comprehensive literature search strategy? Item 5. Did the review authors perform study selection in duplicate? Item 6. Did the review authors perform data extraction in duplicate? Item 7. Did the review authors provide a list of excluded studies and justify the exclusions Item 8. Did the review authors describe the included studies in adequate detail? Item 9. Did the review authors use a satisfactory technique for assessing the risk of bias (RoB) in individual studies that were included in the review? Item 10. Did the review authors report on the sources of funding for the studies included in the review? Item 11. If meta-analysis was performed did the review authors use appropriate methods for statistical combination of results? Item 12. If meta-analysis was performed, did the review authors assess the potential impact of RoB in individual studies on the results of the meta-analysis or other evidence synthesis? Item 13. Did the review authors account for RoB in individual studies when interpreting/discussing the results of the review? Item 14. Did the review authors provide a satisfactory explanation for, and discussion of, any heterogeneity observed in the results of the review? Item 15. If they performed quantitative synthesis did the review authors carry out an adequate investigation of publication bias (small study bias) and discuss its likely impact on the results of the review? Item 16. Did the review authors report any potential sources of conflict of interest, including any funding they received for conducting the review? Critically low - More than one critical flaw as well as non-critical flaws. Therefore, this review cannot be relied upon to provide an accurate and comprehensive summary of the available studies. Low - One critical flaw as well as non-critical flaws. Therefore, this review may not provide an accurate and comprehensive summary of the available studies that address the question of interest.

Abbreviations: Y, yes; N, no; NR, not reported.

Table 3 Results of ROBIS Tool

Author, Year	1. Study Eligibility Criteria	2. Identification and Selection of Studies	3. Data Collection and Study Appraisal	4. Synthesis and Findings	Risk of Bias in the Review
Cho 2009[34]	High	Unclear	High	High	High
Lin 2009[29]	High	High	High	High	High
Yu 2010[44]	High	High	High	Unclear	High
Sui 2012[42]	High	High	High	High	High
Li 2013[24]	High	High	High	High	High
Shi 2013[33]	High	High	High	High	High
Liao 2014[25]	High	High	Unclear	Unclear	High
Liu 2014[27]	High	High	Low	High	High
Guo 2015[22]	High	High	Low	High	High
Li KX 2015[26]	High	Low	Low	High	High
Li XH 2015[28]	High	High	Low	Unclear	High
Xia 2015[39]	High	High	Unclear	High	High
Xue 2015[37]	High	High	Low	High	High
Yang 2015[41]	High	High	Unclear	Unclear	High
Zhang 2015[50]	High	High	Low	High	High
Chen 2016[18]	High	High	Unclear	High	High
Ruan 2016[31]	High	High	Unclear	Unclear	High
Fang 2017[21]	High	High	High	High	High
Namazi 2017[30]	High	High	High	High	High
Xie 2017[38]	High	High	High	Low	High
Yeh 2017[43]	High	High	High	High	High
Zhang, Tan 2017[52]	High	High	High	High	High
Zhang, Han 2017[53]	High	High	Low	High	High
Cho 2018[19]	High	High	Low	High	High
Kim 2018[35]	High	Low	Low	High	High
Wang 2018[36]	High	High	Unclear	High	High
Zhang YZ 2018[51]	High	High	Unclear	High	High
Zhang KP 2018[45]	High	High	Unclear	High	High
Huang 2019[23]	High	High	High	High	High
Mendonça 2019[20]	High	High	Low	High	High
Shan 2019[15]	High	High	Unclear	High	High
Sheng 2019[32]	High	High	High	High	High
Yao 2019[40]	High	High	Unclear	High	High
Chen 2020[48]	Low	High	Low	Low	High
Gao 2020[49]	High	High	Low	High	High
Nie 2020[46]	High	High	Unclear	High	High
Pan 2020[47]	High	High	Low	High	High
Zhong 2020[14]	Low	Low	Low	High	High

a high risk of bias because one or more of the concerns raised in the other domains was not addressed in the review conclusions and/or reviews did not consider the relevance of the included studies in light of the review question.

Effects of Interventions

Seventeen reviews assessed various acupuncture therapies compared to sham acupuncture or no treatment.[14,18,21,26,27,34,35,39,40,42,45,47,48,50–53]

Five reviews reported significant reduction both in BW and BMI in acupuncture groups.[18,34,42,45,47] In terms of BMI, four of the reviews had a high heterogeneity, which may have been due to various acupuncture treatments.[18,42,45,47] In one recent review, Pan 2020,[47] meta-analysis showed that acupuncture was superior to sham acupuncture in terms of

BMI reduction (mean difference [MD] −0.61 kg/m^2, 95% confidence interval [CI] −0.86, −0.36, I^2 = 64.9%, *n* = 15) and BW reduction (MD −1.44 kg, 95% CI −2.26, −0.63, I^2 = 66.8%, *n* = 14). Subgroup analysis based on different types of acupuncture therapies including auricular acupuncture and catgut embedding showed similar results to the overall pool of studies. The results were basically consistent with a previous study of Kepei et al in 2018.[45]

Six reviews showed inconsistent results with reductions in either BW or BMI but not both.[39,40,50–53] The remaining three reviews failed to show a statistically significant reduction in BW or BMI when acupuncture was compared to sham.[26,27,35] However, the number of included RCTs was very small with two reviews[26,35] only including one eligible RCT each and the other review[27] only including three RCTs.

One study compared acupuncture alone or in combination with lifestyle modification to sham acupuncture or no treatment.[21] There was a significant reduction in BMI in the intervention group compared to control. The other three studies showed similar results, with reported reductions in BW and BMI.[14,18,48]

Auricular Acupoint Stimulation

Five reviews investigated auricular acupoint stimulation compared to sham auricular acupoint stimulation.[20,23,33,37,43] Stimulation referred to auricular acupuncture, acupressure, or acupoint taping with seeds. All reviews reported statistically significant meta-analysis results in favour of the auricular acupoint therapies in terms of BW and BMI.

Dongqun et al examined the comparison of auricular points taping and no treatment.[37] Only one RCT was included and it showed a favorable effect of auricular acupoint taping in reducing BW and BMI. In another study, results showed no difference in BMI when auricular acupoint stimulation was compared to sham or no treatment.[31]

Catgut Embedding

Three systematic reviews compared catgut embedding therapy to placebo embedding with variable results.[19,22,32] Taipin et al pooled two studies in meta-analysis and reported a favourable effect of intervention on BW reduction (MD −3.10 kg, 95% CI −0.02, −6.0, I^2=0).[22] In 2018, William et al reported that catgut embedding reduced BW and BMI, however, results had errors as the data was incorrectly pooled.[19] Jili et al failed to show a significant effect of catgut embedding on BW or BMI in participants with abdominal obesity.[32]

Abdominal Acupuncture

One review including one RCT, reported a significant reduction of BMI when abdominal acupuncture was compared to sham abdominal acupuncture in women with obesity (MD −2.01 kg, 95% CI −0.75, −3.27).[28]

Adverse Events

A total of 27 systematic reviews reported adverse events.[14,15,18,19,21–23,25–32,34,35,37,39–43,45,47,48,51] Three reviews stated that no events occurred or were reported in the included studies.[15,30,41] Adverse events relating to acupuncture treatments were reported in 24 systematic reviews and events appeared to be mild, tolerable and self-resolving.[14,18,19,21–23,25–29,31,32,34,35,37,39,40,42,43,45,47,48,51] Local reaction to the acupuncture treatments were most common such as redness, pain or discomfort, soreness or swelling, bleeding or bruising.

Discussion

This overview represents a comprehensive review of systematic reviews and meta-analyses on the quality, efficacy and safety of acupuncture clinical trials for people with overweight and obesity. Thirty-eight systematic reviews including over three hundreds clinical trials are identified in this review. Evaluation of the reviews indicated that acupuncture therapies may be effective and safe for weight reduction. However, assessment using AMSTAR-2 and ROBIS indicated that the systematic reviews had methodological shortfalls, and it was difficult to draw a firm conclusion.

The number of people who are affected by overweight and obesity is increasing worldwide, often referred to as a global epidemic.[54] The pathogenesis of overweight and obesity is multifaceted and includes a spectrum of environmental, genetic, and epigenetic factors, which all contribute to the disease. Among the environmental factors, an excessive energy intake, a sedentary lifestyle, and circadian rhythm sleep alterations are probably the most

important determinants.[55] Therefore, reducing daily calorie intake, regulating lifestyle and adapting activity and exercise habits appear to be the basic methods to lose weight. However, the long-term effectiveness of obesity treatments is poor and there are substantial barriers that undermine treatment results. Reasons like lack of recognition of obesity as a chronic condition, time restriction, low socioeconomic status, and a wide range of comorbidities including mental health, sleep, cardiovascular, respiratory, endocrine and digestive disorders should be taken into consideration. The absence of specific obesity training of health professionals, patient attitudes and self-determination as well as availability of obesity treatments are all important barriers.[56] Unhealthy weight loss attitudes and short-term weight loss such as vomiting, fasting, using laxatives or diet drugs, has become a concern.[57–59] Research suggests that non-medical use of prescription drugs for weight loss is relatively common and that this behavior is related to other harmful behaviors with no evidence of effective long-term weight loss.[60] Stimulants are the most widely investigated drug with regard to unhealthy weight management practices, because of their potential (and reputation) for expedited weight loss and suppression of appetite.[59–61]

As acupuncture therapies have gained wider recognition throughout the world, acupuncture treatment for weight loss has increased in popularity. In addition to filiform needle acupuncture and electroacupuncture, various types of acupuncture therapies are also applied for losing weight clinically, such as auricular acupuncture, moxibustion, cupping, catgut embedding. According to individual symptom and TCM syndrome, as well as the characteristic of each method, different types of acupuncture therapies would be applied for different patients with obesity. The popularity of acupuncture for weight loss is not without reason. On one hand, acupuncture therapies can not only help to lose weight but also to improve obesity-related problems, such as feeling of heavy body, constipation, menstrual disorder, etc. On the other hand, it is a relatively safe therapy. Adverse events are mainly related to local reaction of the treatment, such as soreness and bruising, which are usually mild and could be self-relief. What's more, when patients undergo acupuncture treatment, they would be inculcated with healthy knowledge about diet, exercise, lifestyle from their doctor or health manager, which makes them more easier to correct bad life habits and stick to their weight loss program.

The first research about acupuncture therapies for obesity treatment was published in the 1970s.[62] It reported that 21 people with obesity achieved weight loss after employing auricular acupuncture treatment lasting from two to six weeks. Following this initial research, many more research studies begun to investigate this emerging area of acupuncture treatment. The potential mechanism of body weight reduction influenced by acupuncture is complex, and it may have several actions on biochemical markers of obesity such as obesity-related peptides (eg, leptin, ghrelin), glucose and lipid metabolism, insulin resistance, and inflammatory markers.[63] Therefore, the benefits of acupuncture may be greater than weight loss alone and may include improved metabolism in terms of glucose and lipid levels.[64] This prospect is of great significance since obesity is one of the main causes of metabolic disorders such as diabetes, hyperlipidemia, and hypertension.[8]

There are still some barriers and challenges when it comes to the development and promotion of acupuncture treatment for overweight and obesity. First of all, the lack of standard and precise therapeutic schemes, including acupoint selection, type of acupuncture therapy such as electroacupuncture, manual acupuncture, auricular acupuncture and so on, treatment frequency and duration, all make it difficult to recommend its application more widely. Secondly, effects of acupuncture for losing weight may be affected by factors like age, race, obesity complication, TCM constitution and so on. Therefore, it may be of great significance to discover the advantages group of acupuncture for weight loss. Weight regain is another concern. People with obesity and overweight always go through the cycle of "lose weight – weight regain". Eventually, they have to compromise and give up their weight loss plan due to various reasons. Although this question was not specifically investigated in this overview or any of the included systematic reviews, it is worth exploring the long-term benefits of acupuncture in future studies. Furthermore, acupuncture is not available in all regions and comes at a cost. Unlike lifestyle interventions such as dieting or exercise, which can be undertaken anytime and anywhere, patients have to attend to a hospital or clinic to receive acupuncture treatments twice to three times a week for some time, which may be a significant barrier to its use.

Strengths and Limitations

The database search of this overview was thorough and up to date. The overview was not limited to the participants age and gender and type of acupuncture therapies. It excluded studies, which referred to obesity drugs such as sibutramine as it is no longer in use; therefore, this review provides relevant evidence for the current clinical environment.

However, there are also some methodological shortfalls that might limit the confidence of this overview. Firstly, the evidence might not be comprehensive since we only included systematic reviews that assessed RCTs and quasi-RCTs. The review only focused on the two main anthropometry outcomes namely BW and BMI and acupuncture effects on metabolic outcomes such as serum glucose and blood lipid levels were not assessed.

Conclusions

There are many systematic reviews that assess the efficacy and safety of acupuncture therapies for people with overweight or obesity. Results from the included systematic reviews showed promising benefits in terms of weight loss and BMI reduction. However, included systematic reviews had methodological shortfalls that significantly limited confidence in their results. Subsequently, more rigorous research is needed in the future.

Data Sharing Statement

All data generated or analyzed during this study are included in this article and its supplementary material files. Further enquiries can be directed to the corresponding author.

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Disclosure

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