



# Acupuncture for the treatment of sudden sensorineural hearing loss: A systematic review and meta-analysis

## Acupuncture for SSNHL

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### ARTICLE INFO

#### Keywords:

Acupuncture  
Meta-analysis  
Hearing loss  
Sudden

### ABSTRACT

**Background:** Acupuncture as an alternative treatment method is widely used in the treatment of sudden sensorineural hearing loss (SSNHL) in China. We performed a systematic review and meta-analysis to assess the clinical efficacy of acupuncture for the management of SSNHL patients.

**Materials and Methods:** The PubMed, EMBASE, Cochrane Library, China National Knowledge Infrastructure and WanFang databases were searched. Searches were performed on April 27, 2018 and without language and publication year restrictions. We collected and analyzed the randomized controlled trials (RCTs) of acupuncture for the treatment of SSNHL patients to assess its efficacy and safety. The RevMan5.3 software was used for analysis. The fixed-effects model can be applied to calculate the risk ratio (RR) or weighted mean difference (WMD) if the chi-square test shows there was no significance of heterogeneity ( $p > 0.10$ ,  $I^2 < 50\%$ ). Otherwise, the random effects mode was used.

**Results:** Twenty randomized controlled trials met our inclusion criteria. The electroacupuncture (EA), manual acupuncture (MA) plus western medicine (WM) and EA plus WM groups lead to significantly better pure tone audiometry (PTA) than WM alone in cured rate ( $P = 0.01$ ;  $P < 0.0001$ ;  $P < 0.006$ , respectively). However, no significant differences were observed between MA and WM ( $p = 0.27$ ). In terms of total effective rate, all of them showed significant improvement compared to WM alone (MA:  $P = 0.03$ ; EA:  $P = 0.01$ ; MA + WM:  $P < 0.00001$ ; EA + WM:  $P = 0.04$ ). In addition, no significant difference was found between the MA plus WM and WM alone groups in the improvement of tinnitus ( $P = 0.37$ ). No trials reported serious adverse events.

**Conclusion:** Acupuncture could be a valid treatment option for SSNHL, especially for patients who could not be cured by drugs alone. However, the outcome was limited temporarily due to the lack of high-quality research support. High-quality evidence is needed to clarify the future efficacy and safety of acupuncture for SSNHL.

### 1. Introduction

Sudden sensorineural hearing loss (SSNHL) is defined as a decline in hearing of  $\geq 30$  decibels (dB) and affects at least 3 consecutive frequencies over a 72-hour period, of a subjective sensation of hearing impairment in one or both ears.<sup>1</sup> The incidence rate of sudden hearing loss is quoted as 5–20 cases in 100,000 people per year.<sup>2</sup> Sudden deafness as a common disease is often accompanied by many complications (e.g. tinnitus and vertigo) and it seriously affects quality of life.<sup>3</sup> To date, the etiology of SSNHL is still unclear. The possible causes might include viral infection, autonomic nerve disturbance, inner ear

vascular occlusion and immunological factors. However, the majority of patients have no clear etiology before the onset of deafness. Therefore, the treatments of SSNHL are varied. Today, the most used treatment options include corticosteroids, antiviral agents, vasodilators and hyperbaric oxygen therapy. However, systemic or intratympanic steroid administration does not have a significant treatment effect, as well as the others.<sup>4–7</sup> Intratympanic steroids as a salvage treatment demonstrate a statistically significant reduction in the hearing thresholds<sup>8</sup> but such treatment may lead to localized side effects. Such as ear pain, tinnitus and tympanic membrane perforation. Due to the ineffectiveness and side effects of medication, it is worthwhile to study alternative

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<https://doi.org/10.1016/j.ctim.2018.12.009>

Received 7 May 2018; Received in revised form 21 November 2018; Accepted 17 December 2018

Available online 21 December 2018

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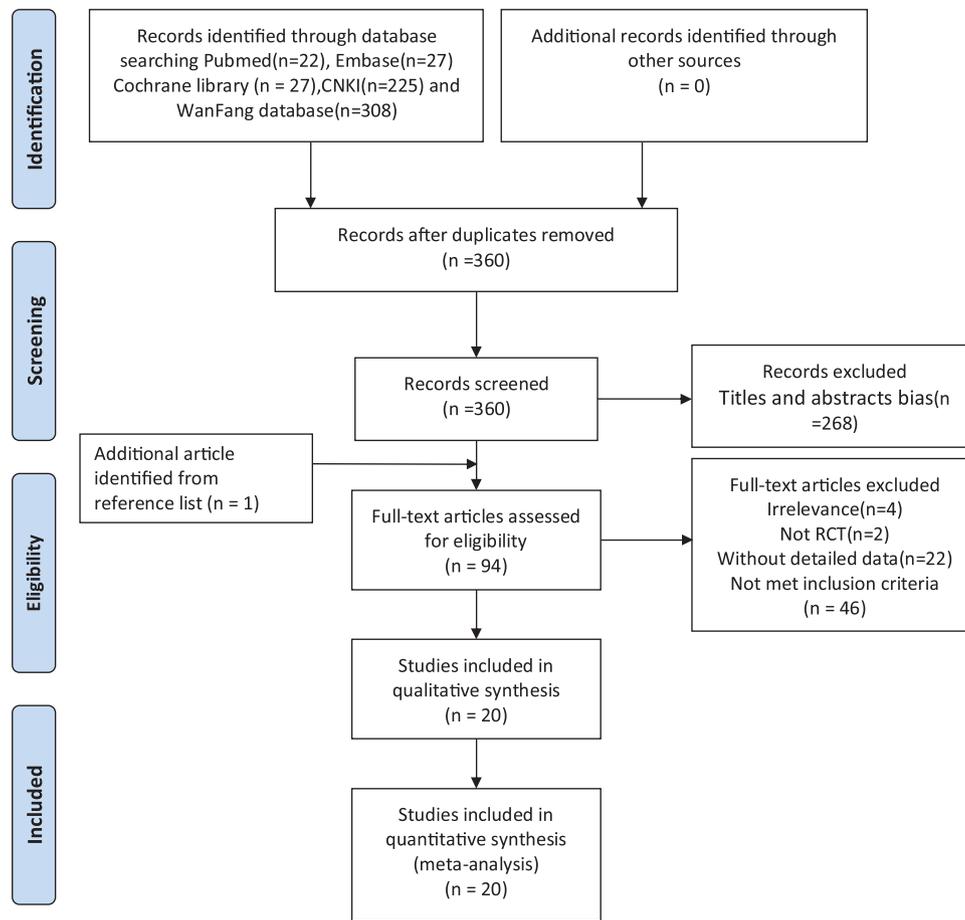


Fig. 1. Flowchart of search results for systematic review.

therapies as a substitute.

Acupuncture is a therapy method widely used in traditional Chinese medicine. It stimulates acupoints, located at lines of meridians, to arouse the flow of energy through the body.<sup>9</sup> The rationale for using acupuncture to treat SSNHL patients includes that it promotes peripheral blood circulation, alleviates blood viscosity, relieves or prevents local ischemic and anaerobic conditions and boosts local blood circulation.<sup>10,11</sup> Currently, there are many studies that have reported a positive outcome of acupuncture for sudden deafness.<sup>12–15</sup> However, evidence of acupuncture for its efficacy and safety in SSNHL patients is still limited and inconsistent. We performed a systematic review and meta-analysis of randomized controlled trials (RCTs) on the use of acupuncture for SSNHL to shed more light on this issue. The main objective of this study was to quantify the efficacy and safety of acupuncture in the treatment of SSNHL.

## 2. Materials and methods

### 2.1. Inclusion criteria

#### 2.1.1. Types of patients

Patients diagnosed with SSNHL.

#### 2.1.2. Types of interventions

Acupuncture with or without medication. Acupuncture was limited to manual acupuncture (MA) and electroacupuncture (EA), and acupoints were limited to circumference of the affected ear that included *Yi feng* (TE17); *Er meng* (TE21); *Ting gong* (SI19); and *Ting hui* (GB2).

#### 2.1.3. Types of outcome measures

Pure tone audiometry (PTA) changes and adverse events.

#### 2.1.4. Type of study

RCTs.

Microwave, laser, moxibustion, acupoint injection and Chinese herbal were excluded. Hyperbaric oxygen was included in the Western medicine(WM) group.

### 2.2. Exclusion criteria

(1) Non-RCT; (2) studies without clear criteria of diagnosis and efficacy; (3) studies comparing different types of acupuncture; (4) review, animal experiments, case reports; and (5) studies with incomplete reporting of PTA results so that the effect size cannot be calculated.

### 2.3. Search methods

The PubMed, EMBASE, Cochrane Library, China National Knowledge Infrastructure and WanFang databases were searched for eligible studies. There were no language and publication year restrictions. The search strategy is shown below:

- 1 The search terms in the full-text articles. English terms included *acupuncture* OR *electroacupuncture*. Chinese terms included *zhen ci* OR *dian zhen*.
- 2 The same process was performed with the English terms *sudden sensorineural hearing loss* OR *sudden deafness* OR *sudden hearing loss* OR *SSNHL* OR *SSHL*. Chinese terms *Tu fa xing er long* OR *tu fa xing long* OR *tu long*.

**Table 1**  
Characteristics of the included studies.

Author	Year	Sample size(N)	Age,years Mean(SD)	Intervention	Treatment regimen	Total duration	Outcome measure
Wang	2015	30	44.0(8.0)	MA	once daily	15 days	PTA
		30	42.4(13.2)	WM		15 days	
Yu	2016	25	48.15	EA	once daily	18 days	PTA
		25		WM		18 days	
Liang	2014	30	33.8(12.03)	EA	once daily	28 days	PTA
		30	31.53(11.69)	WM		28days	
Luo	2009	30	50.3(4.4)	EA	once daily	10 days	PTA
		30	51.2(5.1)	WM		10 days	
Wang	2017	32	43.6(12.5)	WM + MA	3 or 4 times weekly	4 weeks	PTA, Tinnitus
		34	43.8(12.4)	WM		4 weeks	
Zhao	2017	30	57(13)	WM + MA	once daily	20 days	PTA
		30	58(12)	WM		20 days	
Liu	2015	30	17-65	WM + MA	4 sessions	28 days	PTA
		30		WM		28 days	
Huang	2014	59	37.0(5.6)	WM + MA	once daily	20 days	PTA, Tinnitus
		53	38.0(4.9)	WM		20 days	
Mao	2009	39	50.0(0.3)	WM + MA	once daily	1 month	PTA
		37	52.2(5.6)	WM		1 month	
Yang	2011	18	49.1	WM + MA	once daily	1 month	PTA
		18	48.8	WM		1 month	
Han	2011	67	41(12)	WM + MA	once daily	20 days	PTA
		152	39(10)	WM		20 days	
Ma	2010	28	43.8	WM + MA	once daily	1 month	PTA
		28	42.56	WM		1 month	
Zhang	2013	29	7-75	WM + MA	5 times weekly	14 days	PTA
		30	19-68	WM		14 days	
Xu	2013	30	44.2(2.4)	WM + EA	once daily	15 days	PTA
		32	45.5(2.0)	WM		15 days	
Xu <sup>2</sup>	2013	30	14-67	WM + EA	once daily	1 month	PTA
		30		WM		1 month	
Qiu	2012	30	42.6(13.5)	WM + EA	once daily	20 days	PTA
		30	42.8(13.4)	WM		20 days	
Chen	2010	30	40.3(4.4)	WM + EA	once daily	10 days	PTA
		30	41.2(5.1)	WM		10 days	
Zheng	2007	42	41.42(15.01)	WM + EA	once daily	20 days	PTA
		72	43.52(14.93)	WM		20 days	
Zhao	2004	50	17-64	WM + EA	once daily	20 days	PTA
		46	20-66	WM		20 days	
Le	2003	36	16-71	WM + EA	once daily	1 month	PTA
		36	14-69	WM		1 month	

WM = Western medicine, MA = Manual acupuncture, EA = Electroacupuncture, PTA = Pure tone audiometry, SD = Standard deviation.

3 All studies searched (1AND2) were retained for screening.

After searches were finished, duplicate articles were discarded, then titles and abstracts of studies were reviewed by 2 authors (SW.C., M.Z.) independently. If they appeared to meet the inclusion criteria, a full-text review was then performed for further inspection. If multiple publications from the same trial meet the inclusion criteria, we chose the latest version. All potentially relevant articles were obtained.

#### 2.4. Data extraction

Two researchers extracted data from the included studies using a standardized data extraction form. The following information was collected: author, year of publication, sample size, age of patients, interventions, outcome measures, and treatment duration. Disagreements were resolved by discussion.

#### 2.5. Quality assessment and statistical analysis

The Cochrane Collaboration's tool was applied to evaluate the quality of each RCT as a methodology quality assessment. The assessment tool included the following domains: random sequence generation, allocation concealment, blinding of participants and personnel, blinding of outcome assessment, incomplete outcome data, selective reporting and other biases. The risk of bias of each domain was rated as

*low, high or unclear.*

The RevMan5.3 software (Cochrane Collaboration, London, United Kingdom) was used for statistical analysis. If the chi-square test shows that there was no significance of heterogeneity ( $p > 0.10$ ,  $I^2 < 50\%$ ), then the fixed-effects model can be applied to calculate the risk ratio (RR) or weighted mean difference (WMD) and its 95% confidence interval (CI). If heterogeneity existed, the random effects mode was used to generalize findings beyond the included studies by assuming that the selected studies are random samples from a larger population.<sup>16,17</sup>

Analysis and reporting were performed according to the Preferred Reporting Items for Systematic Reviews and Meta Analyses (PRISMA) guidelines.

### 3. Results

#### 3.1. Study selection

The search strategy initially identified 609 relevant articles. Two hundred and forty-nine articles were excluded because of duplicates. Ninety-four were selected for further assessment after their titles and abstracts were reviewed. Meanwhile, an additional article was identified through the article reference lists. Following the application of our inclusion and exclusion criteria, a total of 75 were excluded from the remaining 95 studies. Finally, 20 studies<sup>12,13,18–35</sup> met eligibility criteria for systematic review and meta-analysis. The flow chart of the

	Random sequence generation (selection bias)	Allocation concealment (selection bias)	Blinding of participants and personnel (performance bias)	Blinding of outcome assessment (detection bias)	Incomplete outcome data (attrition bias)	Selective reporting (reporting bias)	Other bias
Chen2010	?	?	?	?	+	+	?
Han2011	?	?	?	?	+	+	+
Huang2014	?	?	?	?	+	+	+
Le2003	?	?	?	?	+	+	+
Liang2014	+	?	?	?	+	+	?
Liu2015	?	?	?	?	+	+	?
Luo2009	+	?	?	?	+	+	?
Ma2010	?	?	?	?	+	?	+
Mao2009	?	?	?	?	+	?	+
Qiu2012	+	?	?	?	+	+	+
Wang2015	+	?	?	?	+	+	?
Wang2017	+	?	?	?	+	+	+
Xu2013	+	?	?	?	+	?	?
Xu2013[2]	?	?	?	?	+	?	+
Yang2011	?	?	?	?	+	+	+
Yu2016	+	?	?	?	+	+	+
Zhang2013	?	?	?	?	+	?	+
Zhao2004	●	?	?	?	+	?	+
Zhao2017	+	?	?	?	+	+	+
Zheng2007	●	?	?	?	+	+	+

Fig. 2. Risk of bias summary. Judgments about each risk of bias item for each included study.

process of article selection is shown in Fig. 1.

### 3.2. Study characteristics

The characteristics of included studies are shown in Table 1. All included studies were RCTs. The trials included were all conducted in China; 18 were published in Chinese,<sup>12,13,18,20–25,27–35</sup> and 2 in English.<sup>19,26</sup> A total of 1498 participants were involved in the study, and

the sample sizes ranged from 36 to 219. One trial<sup>19</sup> adopted a three-arm parallel group design, and the remaining 19 trials adopted a two-arm parallel group design. Patients included in all studies met the criteria of SSNHL.<sup>36,37</sup> MA was used in 10 studies, of which 1 used MA alone,<sup>19</sup> and others used MA plus WM as a treatment method,<sup>12,13,20,22,24,27–29,32</sup> Three studies<sup>18,21,25,31</sup> used EA alone and the remaining 7 studies<sup>23,25,26,30,33–35</sup> used EA plus WM. Meanwhile, all studies used WM alone in the control group. To avoid repeated data involved in the analysis, we selected the longest follow-up results in two articles.<sup>18,21</sup>

### 3.3. Quality assessment and publication Bias

The results of the quality assessment for articles are shown in Fig. 2. All of the included studies mentioned randomization, and eight of them described detailed methods of random sequence generation.<sup>12,13,18,19,21,23,26,31</sup> Two trials<sup>33,34</sup> applied incorrect randomization methods. The blinding of participants and personnel was not mentioned in all included studies. We considered that detection bias was unavoidable. The risk of bias was generally low for incomplete outcome data, selective reporting and other forms of bias.

### 3.4. Subgroup analysis

To study the effect of different types of acupuncture on SSNHL, we performed a subgroup analysis. Of the 20 RCTs, one trial used MA alone, nine trials used MA plus WM, three trials used EA alone and seven trials used EA plus WM.

### 3.5. Sensitivity analysis

To test the stability of the results, sensitivity analysis was conducted by excluding one study at a time. The combined RR of overall risk estimates were consistent and without apparent fluctuation by using cured rate to evaluate the efficacy. However, regarding the total effective rate, the results showed that Zhang et al.<sup>24</sup> and Chen et al.<sup>30</sup> studies led to the presence of heterogeneity. After the Zhang et al. and Chen et al studies were removed, the chi-squared value dropped from 19% to 0 and 30% to 17%, respectively.

### 3.6. Effects of interventions

According to the guideline of diagnosis and treatment of sudden deafness,<sup>36</sup> we use the cured rate and total effective rate to evaluate the efficacy of acupuncture. The cured is defined as the hearing of impaired frequency restored to normal and the effective is defined as improvement of impaired frequency in PTA  $\geq$  15 dB.

### 3.7. Cured rate

MA vs WM. Only one study<sup>19</sup> reported MA alone versus WM. No significant difference was observed between two methods (RR = 1.57, 95% CI, 0.71–3.50; P = 0.27; Fig. 3).

EA vs WM. Three studies<sup>18,21,31</sup> reported EA alone versus WM. The results showed a significant difference between EA and WM (RR = 2.36, 95% CI, 1.20–4.67, P = 0.01; Fig. 3).

MA + WM vs WM. MA plus WM versus WM was reported in 9 studies,<sup>12,13,20,22,24,27–29,32</sup> The pooled data favored MA plus WM (RR = 1.45, 95% CI, 1.21–1.74, P < 0.0001; Fig. 3).

EA + WM vs WM. Seven studies<sup>23,25,26,30,33–35</sup> compared the cured rate of EA plus WM to that of WM. The pooled analysis showed that EA plus WM was superior to WM alone (RR = 1.53, 95% CI, 1.13–2.09; P < 0.006; Fig. 3).

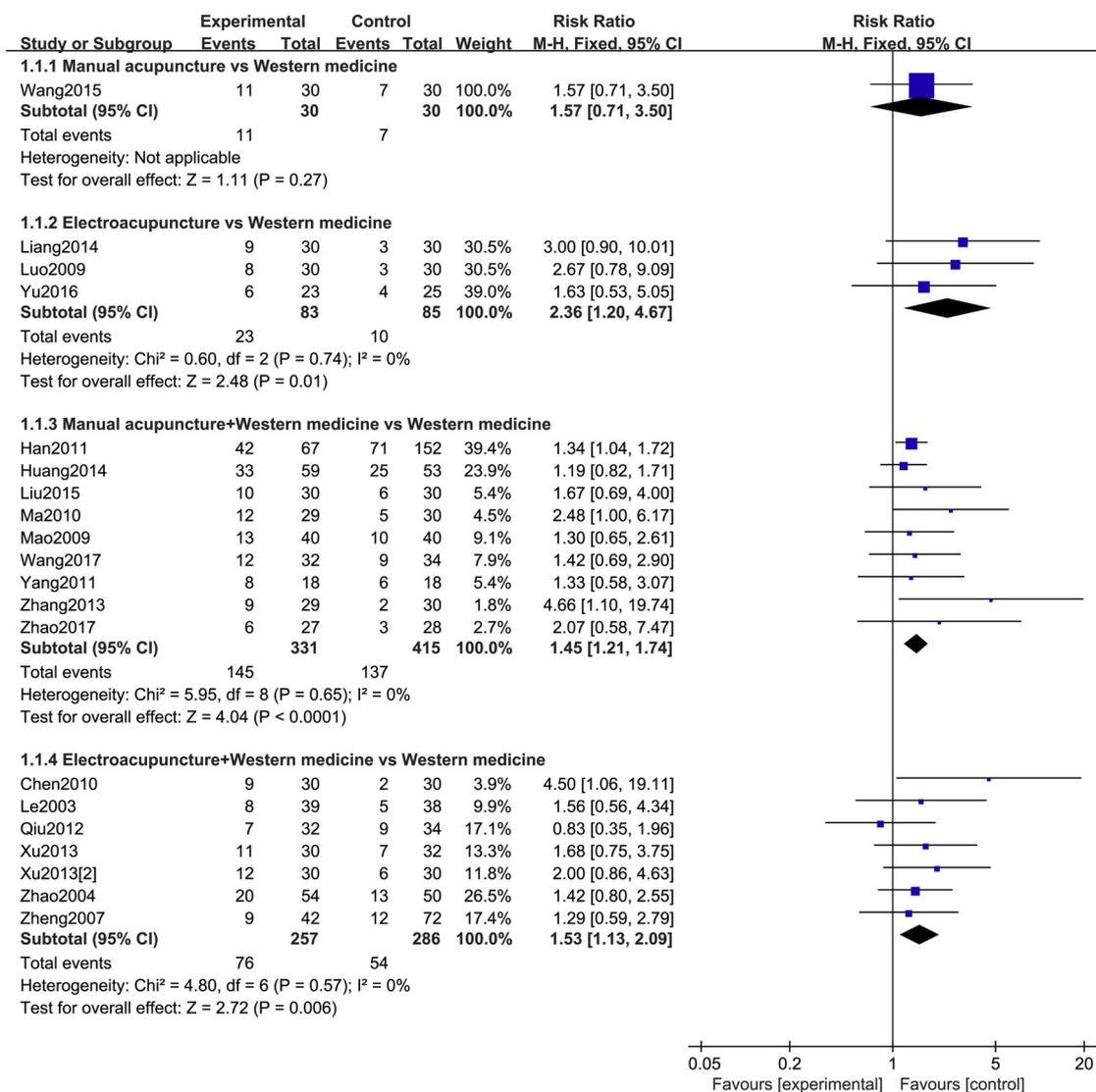


Fig. 3. Meta-analysis of the RCTs comparing cured rate between acupuncture group and control group.

3.8. Total effective rate

Regarding the total effective rate, the results are consistent with the above analysis. The pooled data favored EA, MA plus WM, and EA plus WM (P = 0.01; P < 0.00001; P = 0.006, respectively; Fig. 4). After the Zhang et al and Chen et al studies were removed, the P value still favored the MA plus WM group (P < 0.00001) and EA plus WM group (P = 0.04). In the analysis of the MA versus WM group, the results showed a better effect for MA than that for WM (P = 0.03; Fig. 4).

3.9. Tinnitus

Two studies<sup>12,22</sup> evaluated the effect of acupuncture on the improvement of tinnitus. Both studies compared MA plus WM to WM alone, and no significant difference was found between these two groups (P = 0.37; Fig. 5).

3.10. Adverse events

Only one study<sup>26</sup> used blood samples to assess the effect of acupuncture on liver and kidney function, but there was no significant change perioperatively.

4. Discussion

SSNHL is a common disease, and it should be a focus of attention due to a significantly lower quality of life of its patients.<sup>38–40</sup> Because of its unknown pathogenesis, the treatment of SSNHL is varied and the cured rate is not ideal.<sup>41</sup> As a traditional Chinese medicine therapy, acupuncture is widely used in clinical practice, especially as a supplement to WM. Current research<sup>42</sup> has shown that acupuncture can improve local blood circulation and reduce blood clotting. This may provide a theoretical feasibility for the treatment of SSNHL using acupuncture. Nevertheless, although it is widely practiced worldwide, acupuncture treatment for SSNHL still lacks sufficient evidence to make related recommendations. In the present study, we have developed detailed search strategies and strict inclusion criteria to obtain data for the meta-analysis and conclusion.

This systematic review included 20 RCTs that satisfied our inclusion criteria. PTA representing hearing loss from all studies was suitable for meta-analyses. Our meta-analysis showed that the acupuncture group had a superior effect on the improvement in hearing compared to the WM group, especially in terms of acupuncture plus WM. The subgroup analysis was carried out for the potential heterogeneity of the use of different treatment methods. Only one subgroup comparing MA with WM did not demonstrate pros and cons. However, due to a limited

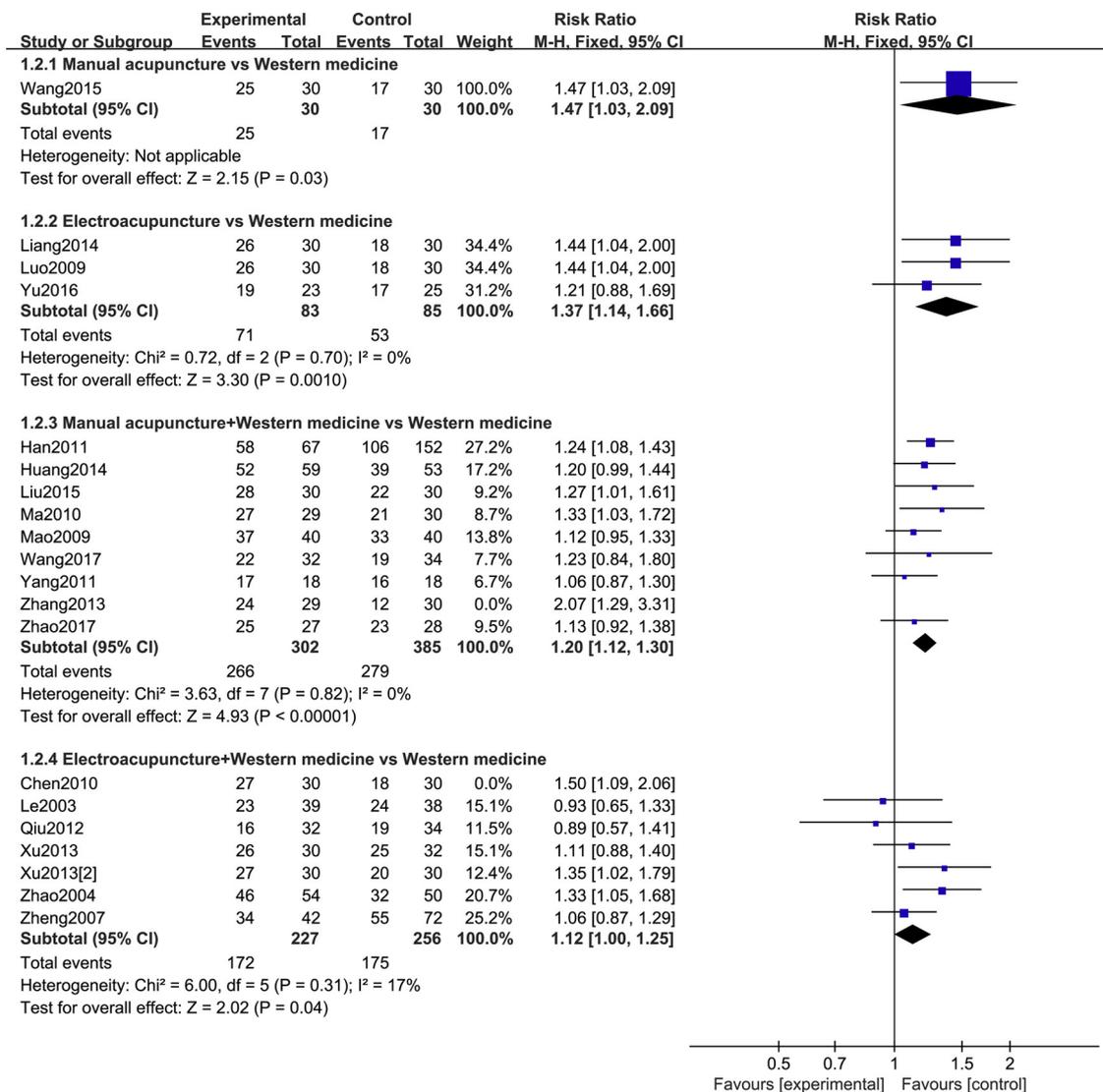


Fig. 4. Meta-analysis of the RCTs comparing total effective rate between acupuncture group and control group.

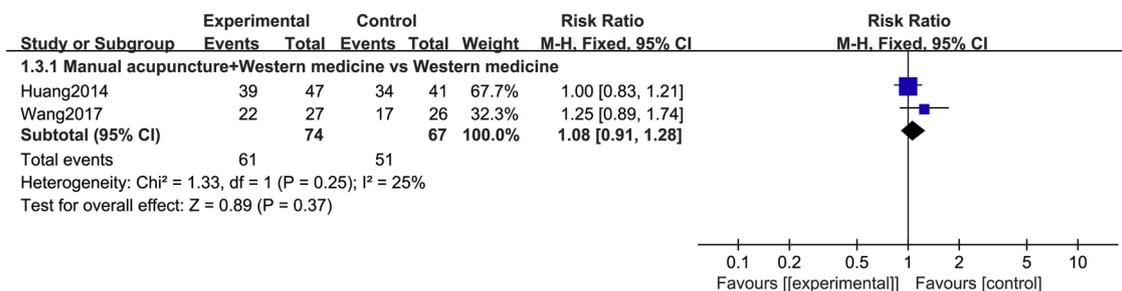


Fig. 5. Meta-analysis of the RCTs comparing tinnitus between acupuncture group and control group.

number of included studies, additional studies are needed to definitively prove the results. Furthermore, regarding the analysis of tinnitus related to hearing loss, the results did not show that acupuncture can relieve the symptoms of tinnitus. As for the safety of acupuncture, this was mentioned by only one of the included studies, and no adverse event occurred. However, according to other published literature,<sup>42–45</sup> acupuncture may be accompanied by adverse events such as pain and bleeding. More studies are needed to confirm the safety of using acupuncture to treat SSNHL.

In this study, we retrieved one study<sup>46</sup> using an ocular needling to treat sudden deafness. A total of 114 subjects were included in this

study and divided into an acupuncture group and a Western medicine group. Total effective rate of the treatment group was 81%, while the rate of western medicine group was 62.5%. It was concluded that the acupuncture group had better efficacy in treating sudden deafness. Acupoints around the eyeball and the edge of the eye socket are recorded in Chinese medicine for the treatment of systemic diseases, but the detailed mechanism is still not clear. At the same time, this study was relatively old, and the literature quality was low (wrong random method, unknown inter-group comparability, unknown analysis method etc.). These shortcomings all reduced the credibility of the literature. Therefore, more studies are needed to confirm the efficacy of

distal points in the treatment of sudden deafness.

In our study, we searched the major databases and tried to include all eligible randomized controlled trials to evaluate the effect of acupuncture on SSNHL. Meanwhile, we also applied strict criteria for inclusion and exclusion, and categorized acupuncture methods to obtain more reliable results. However, the final result showed that the quality of the included studies was low, which greatly weakened the validity of the analysis. In addition, due to the lack of blinding of the process and assessment of the original studies, there were unavoidable performance and detection biases. The follow-up of the included studies was ten days to one month, so confirming the long-term efficacy still requires additional research. Finally, the quality of life (QOL) assessment was not mentioned in all studies. As we think that QOL is necessary, further trials must focus more attention on the QOL of patients.

Although the results of this meta-analysis showed that there was a positive outcome for acupuncture as a treatment method for SSNHL, a few caveats should be taken into consideration. The adoption of various Western pharmaceuticals along with the choice of acupoint and intervention protocol (e.g. treatment sessions and treatment duration) adopted may have potentially affected our results. These factors may have caused the potential risks of bias and heterogeneity. Future research is needed to reduce these as much as possible.

Further trials with a large sample size should be conducted while emphasizing high quality. In addition, the random sequence generation, allocation concealment, blinding and outcome assessments should be designed more rigorously and the results should be reported adequately according to the CONSORT (Consolidated Standards for Reporting of Trials) guidelines.

## 5. Conclusion

In conclusion, this meta-analysis preliminarily suggests that acupuncture is a valid treatment option for SSNHL. However, due to the lack of high quality studies and a standardized treatment strategy, the finality of this systemic review and meta-analysis was limited. Large-scale and well-designed RCTs about this topic are needed to further verify our preliminary findings regarding acupuncture as an optional treatment method for SSNHL.

## Authors' contributions

SW Chen and JX Qiu conceived and designed the review. SW Chen and M Zhao performed the searching, screening, selecting of studies and data extraction. SW Chen performed data analyses and drafted the manuscript. SW Chen, M Zhao and JX Qiu were involved in revising the manuscript. All authors approved the final manuscript.

## Funding

This study has no funding to declare.

## Conflict of interest

All authors declare that they have no conflict of interest.

## Ethical approval

This article does not contain any studies with human participants performed by any of the authors.

## References

- Stachler RJ, Chandrasekhar SS, Archer SM, et al. Clinical practice guideline: sudden hearing loss. *Otolaryngol Head Neck Surg.* 2012;146:S1.
- Klemm E, Deutscher AR. A present investigation of the epidemiology in idiopathic sudden sensorineural hearing loss. *Laryngol Rhino Otol.* 2009;88:524–527.
- Carlsson PI, Hall M, Lind KJ, Danermark B. Quality of life, psychosocial consequences, and audiological rehabilitation after sudden sensorineural hearing loss. *Int J Audiol.* 2011;50:139–144.
- Crane RA, Camillon M, Nguyen S, Meyer TA. Steroids for treatment of sudden sensorineural hearing loss: a meta-analysis of randomized controlled trials. *Laryngoscope.* 2015;125:209–217.
- Agarwal L, Pothier DD. Vasodilators and vasoactive substances for idiopathic sudden sensorineural hearing loss. *Cochrane Db Syst Rev.* 2009;4:D3422.
- Bennett M, Kertesz T, Yeung P. Hyperbaric oxygen therapy for idiopathic sudden sensorineural hearing loss and tinnitus: a systematic review of randomized controlled trials. *J Laryngol Otol.* 2005;119:791–798.
- Cinamon U, Bendet E, Kronenberg J. Steroids, carbogen or placebo for sudden hearing loss: a prospective double-blind study. *Eur Arch Otorhinolaryngol.* 2001;258:477–480.
- Ng JH, Ho RC, Cheong CS, et al. Intratympanic steroids as a salvage treatment for sudden sensorineural hearing loss? A meta-analysis. *Eur Arch Otorhinolaryngol.* 2015;272:2777–2782.
- Ma W. Acupuncture: its place in the history of Chinese medicine. *Acupunct Med.* 2000;18:88.
- Wang CH, Wang W, Li JC, et al. Effects of acupuncture on nailfold microcirculation in patients with sudden deafness. *Di 4 Jun Yi Da Xue Xue Bao.* 2003;24:477–478.
- Wang CH, Yang LW, Wang HC, et al. Effect of acupuncture treatment on hemorheology in the patient of sudden deafness. *Chin Acupunct Mox.* 2003;23:87–88.
- Wang Y, Zhang W, Jia L, et al. Acupuncture combined with Vinpocetine for treatment of 28 cases of sudden deafness with blood stasis. *Global Tradit Chin Med.* 2017;10:1526–1528.
- Zhao Y, Wang S, Zhao ZM. Therapeutic observation of acupuncture plus medication for sudden hearing loss. *Shanghai J Acupunct Mox.* 2017;36:323–326.
- Huang N, Li C. RecuWMDent sudden sensorineural hearing loss in a 58-year-old woman with severe dizziness: a case report. *Acupunct Med.* 2012;30:56–59.
- Huang N, Li C. Acupuncture in treating sudden sensorineural hearing loss: a report of 2 cases. *Forsch Komplementmed.* 2014;21:246–249.
- Cheung MW, Ho RC, Lim Y, Mak A. Conducting a meta-analysis: basics and good practices. *Int J Rheum Dis.* 2012;15:129–135.
- Higgins JP, Thompson SG. Quantifying heterogeneity in a meta-analysis. *Stat Med.* 2002;21:1539–1558.
- Yu YJ, Huang W, Hao YN, Jin WQ, Gao YY. Acupuncture treatment of sudden deafness. *Guide Chin Med.* 2016;14:165–166.
- Wang HR, Meng FR, Chi XW, Ding J, Huang GQ. Observation on therapeutic effects of acupuncture plus Chinese herbs for sudden deafness. *J Acupunct Tuina Sci.* 2015;4:260–264.
- Liu Z, Qin LH. Nape acupuncture combined with the points around ear in the treatment of sudden deafness. *Clin J Tradit Chin Med.* 2015;27:531–533.
- Liang JG, Zhang WR, Cai WW. Therapeutic effect of medicine combined with acupuncture on sudden deafness. *Chin J Otorhinolaryngol Integ Med.* 2014;22:95–97.
- Huang W, Yue HY, Hu H, et al. Combination of acupuncture and western medicine for the treatment of sudden deafness: report of 59 cases. *Shanghai J Tradit Chin Med.* 2014;48:50–52.
- Xu WY, Li TL. Clinical research of electro-acupuncture assisted treatment for sudden deafness. *Chin J Chin Med.* 2013;28:1915–1917.
- Zhang B, Wang SX, Zhu HH. Observation on the efficacy of acupuncture and medicine in treating sudden deafness. *J N Chin Med.* 2013;45:97–98.
- Xu YG, Wei JZ, Zhang J, Yang JF. Clinical observation on treatment of sudden deafness with shen guan point combined with ear acupuncture. *J N Chin Med.* 2013;45:127–128.
- Qiu L, Zheng X, Xie F, et al. Clinical observation on the different frequency hearing damages in sudden deafness treated by electroacupuncture combined with western medicine comprehensive therapy. *World J Acupunct Mox.* 2012;22:22–27.
- Yang YH, Duan JX, Zhang YH. Acupuncture treatment with Ginatong for sudden deafness. *Chin J Pract Nerv Dis.* 2011;14:81–82.
- Han Y. Observations on the efficacy of balancing acupuncture plus hyperbaric oxygen in treating sudden deafness. *Shanghai J Acupunct Mox.* 2011;30:598–599.
- Ma XM, Ren LY. Clinical observation on 28 cases of sudden deafness treated by acupuncture. *Chin Med Technol.* 2010;17:31.
- Chen XL, Luo RH, Xu K, Luo RH. Clinical Observation of Electroacupuncture Combined with Medicine for Treatment of Sudden Deafness. *J N Chin Med.* 2010;42:76–77.
- Luo RH, Zhou J, Huang YS, Xu K. Observation on therapeutic effect of electroacupuncture for treatment of sudden hearing loss. *Chin Acupunct Mox.* 2009;29:185–187.
- Mao M, Chen YF, Chen X, Bai Y, Mou X. Clinical observation on acupuncture combined with hyperbaric oxygen for sudden deafness. *J N Chin Med.* 2009;41:79–80.
- Zheng CZ. Observation on the therapeutic electro acupuncture for 42 cases of sudden deafness. *J Clinl Acupunct Mox.* 2007;23:24–25.
- Zhao CH, Sheng YX, Peng JX, He L. Clinical observation on 50 cases of sudden deafness treated with acupuncture and western medicine routine therapy. *J Sichuan Tradit Chin Med.* 2004;22:88–89.
- Le XH, Fu LP, Wang RH. Clinical observations on the treatment of paroxysmal deafness with electroacupuncture plus hyperbaric oxygen. *Shanghai J Acupunct Mox.* 2003;22:22–23.
- Editorial Board of Chinese Journal of Otorhinolaryngology head and neck surgery. Guideline of diagnosis and treatment of sudden deafness (2005). *Chin J Otorhinolaryngol Head Neck.* 2006;50:443.
- Editorial Board of Chinese Journal of Otorhinolaryngology Head And Neck Surgery. The diagnosis and efficacy grade of sudden hearing loss (1997). *Chin J Otorhinolaryngol Head Neck.* 1997;32:72.

38. Sano H, Okamoto M, Ohhashi K, Iwasaki S, Ogawa K. Quality of life reported by patients with idiopathic sudden sensorineural hearing loss. *Otol Neurotol*. 2013;34:36–40.
39. Lind KJ. Quality of life, psychosocial consequences, and audiological rehabilitation after sudden sensorineural hearing loss. *Int J Audiol*. 2011;50:139–144.
40. Sato M, Ogawa K, Saito H, et al. Evaluation of the quality of life in sudden deafness patients by HHIA (hearing Hatidicap Inventory) and questionnaire. *Nippon Jibiinkoka Gakkai Kaiho*. 2005;108:1158–1164.
41. Conlin AE, Parnes LS. Treatment of sudden sensorineural hearing loss: II. A Meta-analysis. *Arch Otolaryngol*. 2007;133:582.
42. Sandberg M, Lundeborg T, Lindberg LG, Gerdle B. Effects of acupuncture on skin and muscle blood flow in healthy subjects. *Eur J Appl Physiol*. 2003;90:114–119.
43. Odsberg A, Schill U, Haker E. Acupuncture treatment: side effects and complications reported by Swedish physiotherapists. *Complement Ther Med*. 2001;9:17.
44. White A, Hayhoe S, Hart A, Ernst E. Adverse events following acupuncture: prospective survey of 32 000 consultations with doctors and physiotherapists. *BMJ*. 2001;323:485–486.
45. Peuker ET, White A, Ernst E, Pera F, Filler TJ. Traumatic complications of acupuncture. Therapists need to know human anatomy. *Arch Fam Med*. 1999;8:553.
46. Zheng Z, Shi J. Clinical observation on 42 cases of sudden deafness treated with ocular acupuncture. *Chin Acupunct Mox*. 2002;22:8–523.