



Original Article

Effect of acupressure on smoking cessation in young smokers with nicotine dependence: A mixed methods study



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ABSTRACT

Background: Acupressure has been widely used to help people quit for a long time in China. This study explores the feasibility and effects of acupressure on smoking cessation in young smokers with nicotine dependence to inform policy and decision-making.

Methods: This was a single-group study with a pre/posttest design. The participants received four weeks of auricular acupressure treatment, led by a registered acupuncturist. Smoking cravings, nicotine dependence, withdrawal symptoms, and number of cigarettes per day (CPD) were recorded before and after treatment. Changes in outcomes were analyzed at 2 weeks and 4 weeks using SPSS software version 22.0. Semi-structured interviews were conducted with the participants to explore their experiences and attitudes toward auricular acupressure. Thematic analysis was used to analyze the data.

Results: A total of 20 participants completed this study. A significant reduction was observed in smoking cravings ($F = 11.02, P < 0.05$), nicotine dependence ($F = 11.09, P < 0.05$), withdrawal symptoms ($F = 11.19, P < 0.05$), and CPD ($F = 19.03, P < 0.05$) across sessions. Additionally, withdrawal symptoms decreased significantly from 2 weeks to 4 weeks ($P < 0.05$) of acupressure treatment. Three interrelated themes emerged from the interviews: personal and external resources, the psychological and physical effects of acupressure, and satisfaction with acupressure for smoking cessation.

Conclusions: The quantitative and qualitative data suggest that acupressure may effectively decrease nicotine dependence and smoking cravings. However, this was a pilot and single-arm study, and these findings must be further verified. The study supports the feasibility and safety of introducing acupressure therapy for smoking cessation in young smokers.

1. Introduction

A report suggested that cigarette smoking is the second most important risk factor for death worldwide.¹ China is a major tobacco consuming country,² and smoking has imposed enormous social and economic burdens.³ The majority of current smokers became addicted to nicotine when they were young, which made it more difficult to quit smoking. The first round of a national tobacco survey conducted in China suggests that the current smoker rate among college students is 7.8%, and

67.5% current smokers are willing to quit smoking, but the successful abstinence rate was only 26.0%.⁴ It has been reported that post-puberty to adulthood was a key period of continuous brain development, which was also more prone to nicotine addiction.⁵ Therefore, it is urgent to improve the abstinence rate of young smokers to prevent diseases and premature deaths caused by cigarette smoking.

Currently, pharmacological therapy combined with behavioral intervention recommended in guidelines^{6,7} is considered as the most effective therapy for smoking cessation. However, pharmacological interven-

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tions, including varenicline, nicotine replacement therapy (NRT), and bupropion, have limited use in quitting smoking due to their high cost, low popularity, and side effects.^{8,9} Behavioral therapy alone is difficult to control withdrawal symptoms after quitting smoking.

Acupuncture and related therapies have been used for smoking cessation in different countries for at least 45 years,^{10,11} and acupressure is one of the earliest acupuncture therapies used for quitting smoking. Many randomized controlled trials (RCTs) on acupressure for smoking cessation have suggested that acupressure was effective for improving short-term abstinence rate.^{11,12} This may be attributed to acupressure relieving withdrawal symptoms¹³ or suppressing cravings for cigarettes after quitting.¹⁴ Additionally, interview studies^{15,16} suggest that participants in trials prefer acupressure over transdermal acupuncture.

To our knowledge, few studies have explored the feasibility, experience, and attitude towards acupressure for smoking cessation. Therefore, a mixed method design with quantitative and qualitative study is applied to provide a comprehensive overview of acupressure for smoking cessation. The primary aim is to examine the feasibility of acupressure and further provide more detailed knowledge and understanding of acupressure intervention for smoking cessation. The secondary aim is to observe the effect of acupressure on smoking cessation.

2. Methods

2.1. Study design

This was a pilot and single-arm study, and using a mixed method design. The study was conducted between May and August 2024 in affiliated hospital of Shaanxi University of Traditional Chinese Medicine in Xianyang, China. Auricular acupressure intervention was administered by a certificated acupuncturist. A semi-structured interview was conducted after acupressure treatment to acquire a deeper interpretation of objective data. The reporting of the study followed the consolidated criteria for reporting qualitative research (COREQ), a checklist which ensures explicit and comprehensive reporting in qualitative studies (Supplement 1).¹⁷

2.2. Ethical approval

The study protocol was approved by IEC of the affiliated hospital of Shaanxi University of Traditional Chinese Medicine (SZFYIEC-PJ-2024-87). Written informed consent was obtained from all participants prior to the interview. The principle of voluntary participation and the right to withdraw at any time from the study was informed to every participant. They were also notified that the collected data would be recorded anonymously, and their personal information would be kept confidential.

2.3. Study sample

Study participants were recruited from Shaanxi University of Traditional Chinese Medicine and its affiliated hospital. This was a pilot study and a sample size of at least 20 participants was considered adequate in an interview study.¹⁸ The eligibility criteria were as follows: 1) Current smokers who had smoked 100 cigarettes in their lifetime and currently smoked daily ("everyday" smoker) or only on some days ("some days" smoker). 2) Adult smokers who were willing to quit smoking, aged between 18 and 35 years old. 3) Smokers with moderate or severe nicotine dependence, and Fagerstrom Test of Cigarette Dependence (FTCD) ≥ 4 . 4) Smokers who were willing to participate and provide signed informed consent. The study sample was recruited mainly by advertisements and Wechat. Male or female participants from different social backgrounds, were included to maximize the variation in study sample. Three time points (baseline, 2 weeks, and 4 weeks of treatment) were employed to measure the outcomes.

2.4. Study procedure

2.4.1. Auricular acupressure

Auricular acupressure was conducted by a certified doctor (YJL), who was a trained acupuncturist. The auricular acupressure was administered three times a week and lasted for four weeks. Traditional herbal seeds (semen vaccariae) were fixed on medical adhesive tape and then applied on acupoints to provide a lasting acupressure effect (Supplement 2). Participants were informed to press these ear stickers especially when they were eager for cigarettes. Ear stickers were exchanged and alternated to the other ear every two days, and lasted for 4 weeks of treatment. The stimulated auricular acupoints included Lung (CO₁₄), Stomach (CO₄), Shenmen (TF₄), Mouth (CO₁), and Endocrine (CO₁₈), and which is also shown in Supplement 2. The selection of acupoints was based on our previous study.¹⁹

2.4.2. Interviews

After acupressure intervention, semi-structured interviews were conducted by a doctor (YYZ) who was also a university female lecturer. The interviews were composed of open-ended questions that encouraged participants to talk about their feelings, experiences and preferences regarding auricular acupressure in their own words. The semi-structured interview guideline was created followed using the Capability, Opportunity, and Motivation-Behavior (COM-B) framework.²⁰ Additionally, a pilot interview was conducted before formal interview in order to make sure the interview guideline was complete and thought-provoking. The duration of each interview was 25 min. The interview guideline is shown in Supplement 3.

2.5. Data collection

Participants were allowed to adequately express their feelings, attitudes, or experiences regarding acupressure intervention for smoking cessation in their own words. Interviews were recorded after obtained written informed consent from participants. All the interviews were conducted in a quiet and independent room. The quantitative data was collected by questionnaires. Craving for cigarettes was measured by the Brief Questionnaire of Smoking Urges (QSU-Brief).²¹ Withdrawal symptoms was measured by the Minnesota Nicotine Withdrawal Scale (MNWS).²² Nicotine dependence was measured by the Fagerstrom Test of Cigarette Dependence (FTCD).²³ Abstinence rate was self-reported or validated by exhaled carbon monoxide (CO). Cigarettes Per Day (CPD),²⁴ and adverse events were also evaluated.

2.6. Data analysis

The interviews were recorded and transcribed by (ZZY and YJL), and each transcript was completely anonymous. Thematic analysis was applied to analyze the data using NVivo 12 software, following the procedures recommended by Braun and Clarke.²⁵ The two researchers firstly read and re-read the transcripts to obtain the initial codes after discussion, and then clustered the initial codes into categories and themes. Any disagreements were resolved by discussion until a consensus was reached. In terms of quantitative data, changes in outcomes were analyzed at 2 weeks and 4 weeks were performed using SPSS software version 22.0. Descriptive statistics (M, Mean; SD, Standard Deviation) were computed for each continuous variable. Repeated measures analysis of variance²⁶ was performed to observe the change of QSU-Brief, MNWS, FTCD, and CPD before and after auricular acupressure.

3. Results

3.1. Quantitative results

3.1.1. Characteristics of participants

A total of 20 participants (M \pm SD = 23 \pm 4 years) with different levels of education and smoking history were included. All these young

Table 1
Baseline characteristics and smoking history of participants.

Characteristics	Current smokers (n = 20)
Age, y, mean (SD)	23 (4)
18–20	7
21–25	6
26–30	3
30–35	4
Gender	
Male	16
Female	4
Education	
Primary school and below	3
Middle school	5
College and above	12
Duration of smoking, y, mean (SD)	5 (2)
≤5	15
6–10	4
>10	1
Motivation to quit smoking	
0–3	3
4–6	6
7–9	11
Number of attempts to quit smoking	
0	5
1–3	13
>3	2
Types of tobacco products smoked	
Cigarettes only	17
Cigarettes and home-made tobacco	0
Cigarettes, home-made tobacco, e-cigarettes or Cigar	3
Cigarettes per day	
≤5	4
6–10	8
11–15	4
>15	4

SD, standard deviation; y, years.

smokers were motivated to quit smoking, and at least 15 smokers had tried more than once to attempt to quit. The most commonly used tobacco type was traditional cigarettes. The baseline characteristics and smoking history of participants are shown in Table 1.

3.1.2. Effects of interventions

3.1.2.1. Cravings for cigarettes. In terms of smoking cravings measured by QSU-Brief, the higher the score, the stronger the smoking cravings. A significant reduction was observed in smoking cravings over sessions ($F = 11.02$, $P < 0.05$). Compared with baseline, paired comparison test suggested that smoking cravings decreased significantly after 2 weeks ($P < 0.01$) and 4 weeks ($P < 0.01$) of acupressure treatment. However, no significant difference was found between 2 weeks and 4 weeks, see Fig. 1, and (Supplement 4).

3.1.2.2. Nicotine dependence. Nicotine dependence measured by FTCD showed a statistical reduction over sessions ($F = 11.09$, $P < 0.05$). Compared with baseline, FTCD decreased significantly after 2 weeks ($P < 0.05$) and 4 weeks ($P < 0.01$) of acupressure treatment. This effect was not observed between 2 weeks and 4 weeks (Fig. 1, Supplement 4).

3.1.2.3. Withdrawal symptoms. MNWS also showed a significant reduction over sessions ($F = 11.19$, $P < 0.05$). After 4 weeks of treatment, MNWS decreased significantly ($P < 0.01$) than baseline and that of 2 weeks ($P < 0.05$). However, there was no significant difference between 2 weeks of treatment and baseline ($P > 0.05$) (Supplement 4, 5).

3.1.2.4. Cigarettes per day. In terms of average cigarettes per day measured by CPD, a significant reduction was also observed over sessions ($F = 19.03$, $P < 0.05$). We found that CPD decreased significantly after 2 weeks ($P < 0.01$) and 4 weeks ($P < 0.01$) of treatment. However,

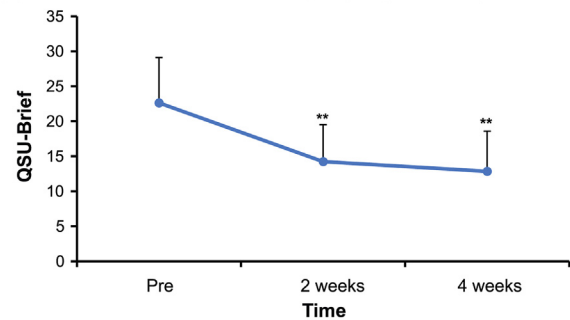
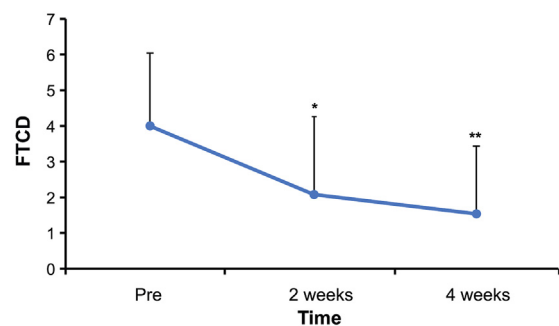
(A) Brief Questionnaire of Smoking Urges (QSU-Brief)**(B) Fagerstrom Test of Cigarette Dependence (FTCD)**

Fig. 1. Effect of acupressure on (A) Brief Questionnaire of Smoking Urges (QSU-Brief), and (B) Fagerstrom Test of Cigarette Dependence (FTCD). Data are expressed as means and standard deviation. *, $P < 0.05$; **, $P < 0.01$, compared with pre-treatment.

this effect was not observed between 2 weeks of treatment and that of 4 weeks ($P > 0.05$) (Supplement 4, 6).

3.1.2.5. Abstinence rate and adverse events. Exhaled CO validated abstinence rate suggested that there was no statistical difference between baseline and after treatment ($F = 1.75$, $P > 0.05$). In terms of self-reported abstinence rate, 3 of 20 smokers had given up smoking after 4 weeks of treatment. Five of 20 participants reported minor and transient adverse events, manifested as feeling hot (2 cases), itching (1 case), or mild tenderness (2 cases) in the ear. These reported minor adverse events were all relieved after the removal of acupressure treatment. No serious adverse events were reported in this study.

3.2. Qualitative results

Twenty interviewees were audio recorded, and we also took detailed field notes as far as possible. Every participant agreed and signed the written informed consent form. Finally, three-inter-related themes and 6 categories emerged: personal and external resources, psychological and physical effects of acupressure, and satisfaction with acupressure for smoking cessation. The emerged themes and categories are shown in Fig. 2.

3.2.1. Theme 1: Personal and external resources

3.2.1.1. Motivation and determination to quit smoking. Interviewees believed that personal motivation to quit smoking was a prerequisite for successful quitting, since the quitting process was usually initiated by themselves. Not only that, personal determination to resist temptation of cigarettes was also a decisive factor for achieving smoking cessation.

I was aware of the harms of smoking, so I had been trying many times to give up smoking. Once I threw away all my cigarettes and stopped smoking for nearly 2 months, but I relapsed after my friends shared cigarettes with me. Meanwhile, I found I was more likely to relapse when I was down, smoking could really cheer me up! I thought I had no enough willpower to resist temptation (Interviewee 3).

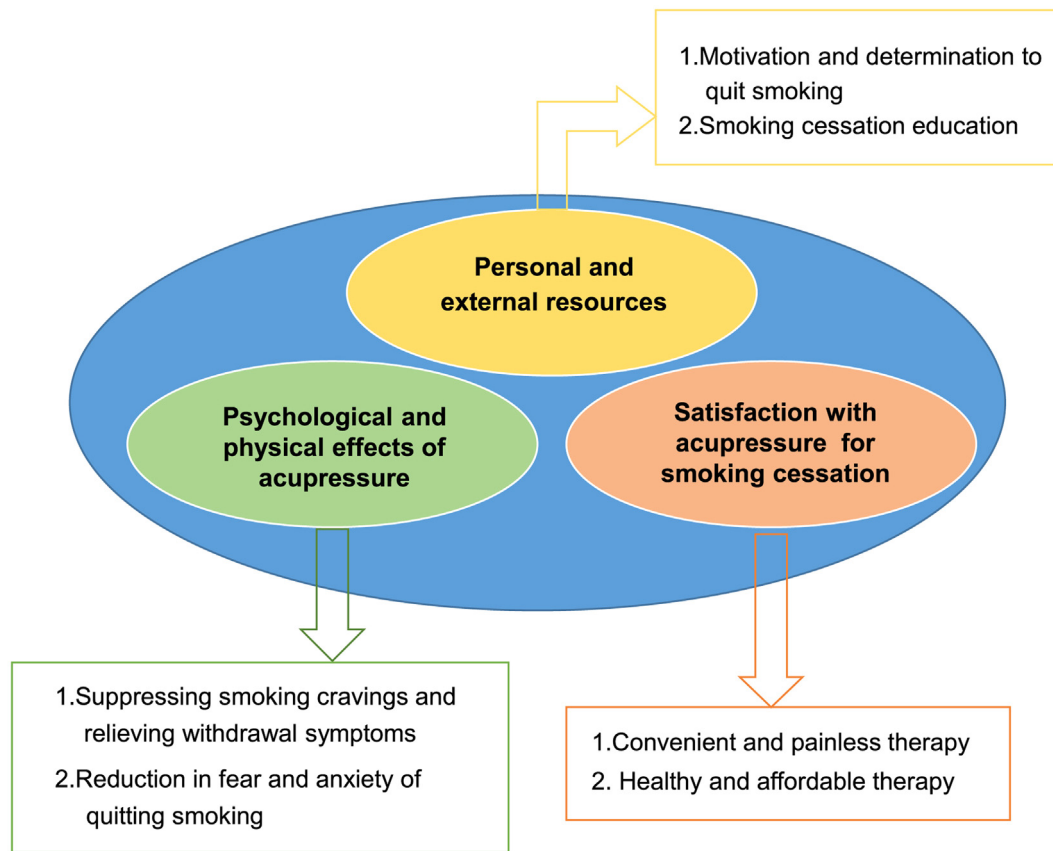


Fig. 2. The thematic map emerged from interviews.

3.2.1.2. Smoking cessation education. Most of the participants had never heard about the smoking cessation clinics in China, let alone seeking detailed professional help provided by health-workers. None of the interviewees had received pharmacotherapy or behavioral therapy for smoking cessation. Advertisements on TV or cellphone usually focus on the harms of tobacco rather than medical resources for smoking cessation.

This was my first time to know smoking cessation medication. As you know, I was healthy and less addicted, so there was no need to take any medicine. Apart from that, I was worried about its price and side-effects, and I considered other non-drug therapy may be more appropriate for me (Interviewee 10).

3.2.2. Theme 2: Psychological and physical effects of acupressure

3.2.2.1. Suppressing smoking cravings and relieving withdrawal symptoms. Severe addiction to nicotine was another important factor for relapse. We found that many young smokers who were motivated to quit smoking usually relapsed due to strong cravings for cigarettes or severe withdrawal symptoms. As a traditional Chinese therapy, acupressure has been widely used for quitting smoking for a long time in China. In this study, most of the interviewees believed that acupressure was effective in suppressing smoking cravings, and relieving withdrawal symptoms after quitting.

I had to smoke immediately once I waked up in the morning, since I had strong cravings for cigarettes. To my surprise, after 2 weeks of acupressure treatment, I found that I was not always craving for cigarettes as before, even the smell of cigarettes was not as good as it used to be, and I was reluctant to smoke any more (Interviewee 15).

I used to smoke half a pack per day and now <3. After being given acupressure treatment, I was told to press the acupoints when I was thirsty

for cigarettes, yawning or bored. Now I felt much less addicted to tobacco (Interviewee 2).

3.2.2.2. Reduction in fear and anxiety of quitting smoking. Interviewees who had tried acupressure treatment maintained that they felt more relaxed psychologically, and slept better than before. Reduction in anxiety and fear also made them more confident of successful quitting.

I have struggled 4 times to quit smoking but failed due to great mental stress. I was stressed, upset, fearful and even insomnia after I stopped smoking. Gradually, I was reluctant to attempt to quit any more by myself. But with the help of acupressure treatment, I felt much more relieved psychologically and had more confidence to achieve smoking cessation (Interviewee 18).

3.2.3. Theme 3: Satisfaction with acupressure for smoking cessation

3.2.3.1. Convenient and painless therapy. Interviewees maintained that acupressure was a painless and convenient method for smoking cessation. They did not need to spend too much time for treatment in the hospital every day. The greatest advantage of acupressure was less pain and which was much more suitable for long-term adherence to treatment.

I was a sophomore and busy with my study, and I had limited time. My friend and I preferred acupressure treatment because we only needed to go for a treatment every 2 days and it took less than ten minutes for each treatment, and this was much more convenient. Additionally, I was fear of pain, and acupressure treatment was nearly painless and this made me relaxed and willing to adhere to treatment (Interviewee 6).

3.2.3.2. Healthy and affordable therapy. Nearly all the participants were reluctant to take oral medication for smoking cessation. They considered it was unnecessary to spend too much money to buy medicine for

smoking cessation, moreover, medicine may produce side effects. As an external therapy, acupressure was considered healthy and affordable.

I had to take medicines daily due to hypertension, and my doctor advised me to stop smoking. I thought acupressure was safe since it was an external therapy and had no influence on other drugs I took. More than anything, acupressure treatment was affordable and could be self-administered when I was familiar with it. This was the most attractive for me, and I had recommended acupressure therapy to my friends.

4. Discussion

4.1. Research question

Acupressure has been used for smoking cessation for a long time in China and abroad.²⁷⁻²⁹ These studies on acupressure for smoking cessation mainly focused on its effectiveness, however, feasibility, experiences, and attitudes toward acupressure for smoking cessation were seldom studied. Therefore, a mixed method with quantitative and qualitative design was used to observe its effects and explore its feasibility for smoking cessation to inform policy and decision-making.

4.2. Main findings

A total of 20 participants finished this study, and three time points (baseline, 2 weeks, and 4 weeks of acupressure treatment) were employed to observe the effects of acupressure for smoking cessation. We found that cravings for cigarettes, nicotine dependence, withdrawal symptoms, and CPD showed a significant reduction over sessions. Nicotine dependence, cravings for cigarettes, and cigarettes per-day decreased significantly from baseline to 2 weeks, and 4 weeks of acupressure treatment. Withdrawal symptoms were also relieved significantly after 4 weeks of acupressure treatment, but this effect was not observed after 2 weeks of treatment, suggesting that at least 4 weeks of acupressure intervention maybe effective in relieving withdrawal symptoms. Three of 20 participants reported that they had stopped smoking after 4 weeks of treatment, but exhaled CO validated abstinence rate suggested that there was no statistical difference over sessions. Minor and transient adverse events were reported, such as itching, feeling hot, and mild tenderness in the ear, but all these symptoms were relieved after the removal of acupressure treatment.

In terms of interviews, three-inter-related themes and 6 categories emerged: personal and external resources, psychological and physical effects of acupressure, and satisfaction with acupressure for smoking cessation. Personal motivation and determination were viewed as decisive factors for successful quitting. Interviewees believed that they could stay away from cigarettes when they had a strong determination to quit. However, smokers usually attempted to quit smoking by themselves rather than seeking professional help, and most of interviewees had little knowledge about smoking cessation clinics. A national survey⁸ consistently reported that professional interventions for smoking cessation were not popular among Chinese smokers. Therefore, participants complained that they always struggled desperately with strong cravings for cigarettes and then relapsed. Additionally, relapse always occurred due to stress, anxiety, and boredom in quitting attempts among young smokers. Naturally, their attitude towards smoking cessation interventions depended on their efficacy and availability. Interviewees maintained that acupressure therapy could effectively suppress smoking cravings and relieve adverse emotions induced by quitting. Acupressure treatment made them more relaxed psychologically and become more confident about achieving smoking cessation. With the acupressure treatment, daily cigarettes consumption gradually decreased until withdrawal. These findings were consistent with our quantitative results that acupressure was beneficial for decreasing smoking cravings, nicotine dependence, daily cigarettes consumption, and relieving withdrawal symptoms. In terms of the feasibility of acupressure, nearly all

participants were satisfied with acupressure therapy for smoking cessation due to its convenience, painlessness, safety, and low price. Acupressure was considered as a more suitable smoking cessation therapy for long-term adherence.

4.3. Novelties about this work

To our knowledge, this was the first study using mixed method design to observe the effects and explore the feasibility of the acupressure method for smoking cessation among young smokers with nicotine dependence. A previous interview study³⁰ explored the experience of auricular acupuncture in patients with protracted withdrawal, and the positive and negative experiences were all presented in this study. Positive experiences after auricular acupuncture treatment included relaxation, anxiety reduction, and reduced cravings for alcohol and drugs; negative experience included short-term effect of auricular acupuncture. These findings were consistent with our study. However, in addition to the interviews, we also conducted a clinical trial and assessed the outcomes before and after treatment quantitatively to further verify qualitative results. Qualitative and quantitative data consistently found that acupressure was effective in suppressing smoking cravings and relieving withdrawal symptoms. Reduction in fear and anxiety about quitting attempts after acupressure treatment made smokers have more confidence in successful quitting. We also found that young smokers in China prefer acupressure therapy over oral medicine or traditional transdermal acupuncture due to painlessness and safety. Additionally, offering and gifting cigarettes to each other among participants was still a vital factor for relapse. Interviewees complained that it was hard to resist cigarettes from friends even though they had stopped smoking. It is a unique custom to share cigarettes with friends in China, and previous qualitative studies^{16, 31-33} conducted in China have also found this custom usually led to relapse. Therefore, it is urgent to establish more comprehensive and stricter tobacco control policies in China to avoid sharing cigarettes especially in public places. On the other hand, although China has set up many smoking cessation clinics in hospitals,³⁴ few smokers have heard about that and have no sufficient time to seek help. Therefore, smoking cessation services need to be diverse and suitable for smokers. China needs to strengthen online publicity of smoking cessation clinics to make more smokers know about medical resources for smoking cessation. Apart from smoking cessation clinics, WeChat-based online smoking cessation interventions were found effective for smoking cessation³⁵ and should also be considered for treatment-seeking young smokers in China. Additionally, it is urgent to improve the professional skills³⁶ of health-care workers in China to provide comprehensive and professional help for young smokers.

4.4. Limitations

Firstly, limitations involving single-arm study design, small sample size, and short-term (4 weeks) intervention should be taken into consideration. This was not a randomized controlled trial, and we aimed to observe the effects quantitatively and explore the feasibility qualitatively of acupressure method for smoking cessation in young smokers. Secondly, another limitation that should be considered was the potential selection bias in the study population. Participants in this clinical study likely had some degree of motivation to quit smoking and may have had a favorable attitude towards auricular acupressure. This self-selection bias could influence the results, which might not be generalized to other population. Thirdly, we did not follow the participants beyond 4 weeks and can not make statements about the long-term effectiveness of the intervention in this study.

4.5. Conclusions

The quantitative and qualitative data from this study suggest that acupressure maybe effective in suppressing smoking cravings, relieving

withdrawal symptoms and nicotine dependence, and decreasing daily cigarettes consumption after 4 weeks of treatment. However, this is a pilot study and lacks a control group, these effects need to be further verified by rigorously designed randomized controlled study. The study also suggests that acupressure is felt to be a convenient, safe, and painless therapy for smoking cessation, and maybe also more suitable for long-term adherence.

Author's contributions

Conceptualization: YYZ, HFQ, and JPL. Data curation: YJL. Formal analysis: YYZ. Writing the original draft: YYZ. Investigation: YW. Resources: YW. Visualization: CS. Software: SBL. Methodology: NR. Supervision: JPL and HFQ.

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Declaration of competing interest

NR and JPL are the editorial board members of the journal but their member status had no bearing on the editorial decision. The authors declare no conflict of interests.

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Ethical statement

Ethical approval was obtained from IEC of the affiliated hospital of Shaanxi University of Traditional Chinese Medicine (SZFYIEC-PJ-2024-87; Date: 4 June 2024). Written informed consent was obtained from participants.

Data availability

The data will be made available upon request.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at [doi:10.1016/j.imr.2024.101120](https://doi.org/10.1016/j.imr.2024.101120).

Supplement 1. COREQ Checklist

Supplement 2. Auricular acupressure by Semen vaccariae

Supplement 3. Interview guideline for semi-structured interviews

Supplement 4. Effects of acupressure on smoking cessation

Supplement 5. Effect of acupressure on Minnesota Nicotine Withdrawal Scale (MNWS)

Supplement 6. Effect of acupressure on Cigarettes Per Day (CPD)

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