Research Article

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Immediate effect of interscapular cupping on blood pressure, oxygen saturation, pulse rate and chest expansion in sedentary smoker students

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Abstract

Objectives: Increased sympathetic stimulation in smokers may be a risk factor for pulmonary and cardiovascular diseases. This study was conducted to assess the immediate effect of interscapular cupping on blood pressure (BP), oxygen (O_2) saturation, chest expansion (CE), pulse rate (PR) in sedentary male smoker students.

Methods: Forty sedentary male smoker students– aged 18–25 years -were divided randomly into two equal numbered groups; wet cupping (WC) and dry cupping (DC) groups. Systolic and diastolic BP, upper and lower CE, O_2 saturation and PR were measured immediately before and after a single cupping session in both groups.

Results: Both WC and DC types showed improvements in all measurements with a high statistically significant difference ($p<0.05$).

Conclusions: Interscapular cupping enhanced CE, O_2 saturation, BP and PR in sedentary male smoker students.

Keywords: blood pressure; chest expansion; interscapular cupping; oxygen saturation; smokers.

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Introduction

Cigarette smoking is considered a risk factor for several diseases worldwide [1, 2] such as cardiovascular disorders [3, 4] and the development of atherosclerosis [5]. In patients who were addicted to smoking, the cardiac autonomic balance shifted in favor of sympathetic activity by suppressing the parasympathetic activity [6]. Nicotine, one of the major harmful compounds of cigarettes, leads to increased levels of catecholamine by sympathetic stimulation, thereby accelerating heart rate [7]. Vasoconstriction and/or acceleration of heart rate lead to elevation of blood pressure [8]. One of the effects of smoking is the increase of hemoglobin, hematocrit, and red blood cell counts, which occur as a result of changes in blood gases [9].

Nicotine also causes pulmonary problems that result in low cardiopulmonary function [10]. The initial phase of smoking in young male smokers produces a minimization in the function of the lung, chest expansion (CE) and flexibility, work of breathing and offering a liability to dyspnea [11].

On the contrary, prophetic medicine – defined as medicine related to Prophet Muhammad peace be upon him – recommends Al-hijamah (original cupping therapy of prophetic medicine) for treating and preventing many diseases and considered it as the best remedy [12–15]. Al-Hijama is divided into two kinds, namely wet cupping (WC) (with incision and blood giving) and dry cupping (DC) (without incision) [16].

In prophetic medicine, anatomical sites for practicing Al-hijamah can be categorized into local and general anatomical sites. Local anatomical sites (located on the complaint and/or pathology site). General sites e.g., kahel region are rich in blood supply and have a large flat surface area for application of more cups. Kahel is located in the interscapular area, over T1–T3 and is the recommended site for blood pressure (BP) reduction [17].

Prophetic medicine is the reference of back points selection e.g., the Kahel region seems to be the most suitable point for cupping practitioners for preventive and

treatment purposes and is regarded as a common area for clearance of blood coming to the skin circulation in treating many disease conditions [18].

Many special features in the cupped interscapular area: brown adipose tissue, immediate proximity to sympathetic ganglia, thoracic duct passage, two important acupuncture meridians (Bladder meridian on each side and the governing vessel channel inside the spinal column, and proximity to the main vessel divisions carrying blood from the heart and the brain [19].

Supply of interscapular region by sympathetic nerves can ensure the cupping effect on organs such as heart and valves, vascular coronaries, rib cage, bronchial tubes, lung tissue, muscle of the diaphragm [20]. Sympathetic stellate ganglion lies anterior to the 1st rib nearer to the level of the 6th cervical vertebra. Cupping is usually applied at the T2–T5 vertebrates [21], which is near the stellate ganglion. The close anatomical location of the stellate ganglion to the interscapular area may convert it to a relaxed state after a shock induced by blood skin suction and blood out letting [19].

To acupuncture points, cupping is applied to certain acupuncture points of the bladder and the governing channel [19]. Because septum transversum is in this acupoint, the name of urinary bladder 17 acupoint (BL 17) is given, (Ge Shu Diaphragm Shu). BL 17 lies in the interscapular region close to the lower border of the spinous process of the 7th thoracic vertebra (T7) [22]. So the cupping on BL 17 can directly act on the septum transversum of diaphragm [23]. BL17 moves Qi in diaphragm and chest [24]. It can open chest [25] and diaphragm [24]. The link between diaphragm and BL17 may since its lateral or costal portion attaches to the ribs 7–9 [26].

One of the cardinal points of the governing channel is also located next to the interscapular site below the spinous process of C7 [22] and it is called governosal vessel 14 (GV14) in Chinese medicine [27]. Unblocking this point, which is associated with general energy excess, may balance the functions of all body organs [19].This site was used in studies examining the efficacy of wet-cupping on hypertension [27, 28].

More investigations are needed to clarify every facet of activating the BL17 and the GV14 cardinal points during cupping applied to these interscapular areas [19], with adding Kahel region to these points. The aim of this study was to find the immediate effect of interscapular cupping on BP, CE, oxygen (O_2) saturation, and pulse rate (PR) in sedentary male smokers.

Materials and methods

Ethical approval of the study was obtained from the institutional research ethical committee. All procedures of the study were done according to the international declaration's principles of Helsinki. Before participating in this study, every participant signed a consent form. Forty sedentary normotensive male smoker physical therapy students were voluntarily participated in this study with age 18–25 years and body mass index (BMI)<30 kg/m^2. Participants were excluded if they had history of chronic or acute pulmonary and cardiac diseases, administration of any complementary treatment in the previous 6 months, coagulopathy, congenital or acquired chest wall deformities and apparent or any history of chest trauma.

The participants were randomly assigned to WC group (n=20) or DC group (n=20) (Figure 1). All participants in both groups received only one cupping session on the same following points: Kahel region (over T1–T3 spinous processes) [17], GV14 located next to the interscapular site over the spinous process of C7 [22] and bilateral Bl17 acupoints (BL 17 is located in interscapular area 1.5 cun lateral to the lower border of the spinous process of T7) [22].

WC group: A manual suction device was used to produce the vacuum within the cup. After 3–5 min, several scarifications were made by a disposable sterile surgical razor, each 0.5–1 mm deep. The cup is put again on the same location and after using the suction device again; blood is gradually drawn out of the cuts. Repetition of this cycle was done 3 to 5 times, each one lasting for 3–5 min. In general, a wet cupping session takes 15–20 min [29]. **DC group:** cupping was done without scarifications leaving the cups up to 15–20 min [30].

Mercury sphygmomanometer was used for measuring systolic and diastolic BP (SBP), (DBP). O_2 saturation (O_2 sat.) and PR were measured by a pulse oximeter. CE was taken as end forced inspiratory minus end forced expiratory thoracic circumference without pulling the tape too tightly. For upper CE (UCE), the tape was placed at the T5 spinous process level and the 3rd intercostal space at the midclavicular line and for lower CE (LCE), the tape was placed at the of the T10 spinous process level and xiphoid process tip [31–34]. All outcome measures were assessed in both groups immediately before and after a single cupping session.

Statistical analysis

The sample size was estimated by G*Power (version 3.1.9.2) (Franz Faul, Uni Kiel, Germany). T-test, the type I error rate was set at 5%, and the effect size of the main outcome variable (UCE) was 0.83 obtained from a pilot study conducted on 10 subjects and type II error rate was at 80% power. The proper minimum sample size for this study was 38 subjects.

Collected data were analyzed using SPSS program version 18 (IBM Corp. Chicago. SPSS Inc.). After subjecting to the normality test, all data were normally distributed, all variables treated with paired and unpaired tests.

Results

There was no statistical difference before study between groups concerning age, weight, height, BMI, SBP, DBP, O_2 sat., PR, UCE and LCE (Table 1) (Table 2).

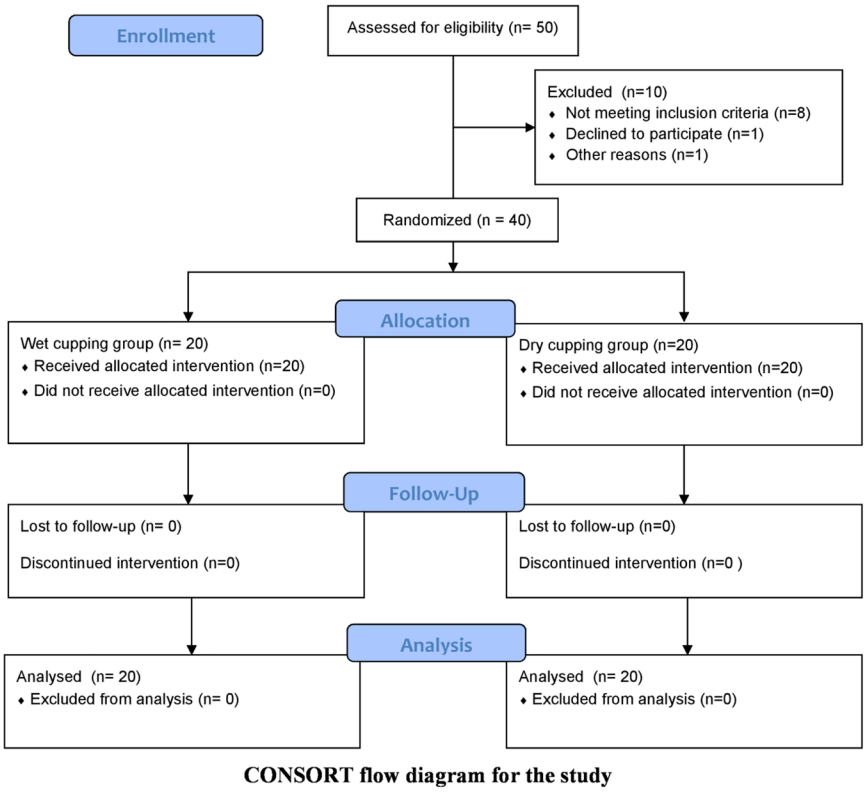

Figure 1: Trial flow diagram. A total of 50 smokers were assigned to the study. The cupped participants were only 40 (wet n=20 vs. dry cupping n=20).

Table 1: Descriptive data statistical analysis of WC and DC groups.

Measure	WC	DC	p-Value
Age, year	21.25 ± 1.33	21.55 ± 1.19	0.4568
Weight, kg	73.00 ± 8.33	74.35 ± 7.72	0.5981
Height, cm	170.60 ± 2.39	171.00 ± 2.15	0.5812
BMI, kg/m^2	25.08 ± 2.44	25.39 ± 2.31	0.6822

Data expressed as mean ± SD; BMI, body mass index; kg, kilogram; cm, centimeter; m, meter; p-Value significance <0.05.

Table 2: Mean ± SD of SBP, DBP, O_2 sat., PR, UCE and LCE of WC and DC groups before treatment.

Measure	WC	DC	p-Value
SBP, mmHg	130.45 ± 9.33	130.25 ± 9.49	0.9468
DBP, mmHg	82.60 ± 6.22	82.50 ± 6.21	0.9597
O_2 sat.	94.80 ± 1.93	94.65 ± 1.78	0.7997
PR, beat/minute	88.95 ± 3.47	89.80 ± 3.35	0.4355
UCE, cm	2.60 ± 0.64	2.57 ± 0.61	0.8802
LCE, cm	2.12 ± 0.62	2.07 ± 0.65	0.8048

SBP, systolic blood pressure; DBP, diastolic blood pressure; O_2 sat., arterial oxygen saturation; PR, pulse rate; UCE, upper chest expansion; LCE, lower chest expansion; p-Value significance<0.05.

Results showed that both WCT and DCT produced high significant difference (p=0.000) in all post-treatment measures when compared to pretreatment values within each group (Table 3).

Discussion

Smoking rate steadily increases among males in their teens and twenties producing high future risk of developing respiratory and cardiovascular diseases [35]. Interest in complementary and alternative medicine has recently grown [36]. This first study examined the immediate effect of two common cupping types on chest expansion in the interscapular area of sedentary male smoker students. Our study resulted in a significant increase in CE and O_2 saturation and a decrease in SBP, DBP, and PR.

Stimulation of autonomic nervous system by cupping tends to increase the parasympathetic activity may be due to blood loss [37], vasodilatation induced by increased nitric oxide, lowering of vascular resistance that increases blood flow [38], interstitial fluid draining, removal of excess intravascular fluid and noxious metabolic substances, and promoting vasoactive and free radical components secretion that lower BP [12]. Both cupping types of this study decreased BP because WC reduced body blood volume by removing some of this blood while DC produced a relaxing effect on the back veins, kidneys and heart leading to vasodilation of previously constricted blood vessels [39].

The mechanism by improved lung ventilation and consequently CE after WC may be related to removing part

Table 3: Pre and post mean ± SD of SBP, DBP, O_2 sat., PR, UCE and LCE of WC and DC groups.

Measure	WCT group		DCT group	
	Pre treatment	Post treatment	Pre treatment	Post treatment
SBP, mmHg	130.45 ± 9.33	122.20 ± 6.76*	130.25 ± 9.49	125.45 ± 7.40*
DBP, mmHg	82.60 ± 6.22	78.10 ± 5.46*	82.50 ± 6.21	79.45 ± 5.11*
O_2 sat.	94.80 ± 1.93	95.75 ± 1.80*	94.65 ± 1.78	95.70 ± 1.68*
PR, beat/minute	88.95 ± 3.47	86.75 ± 3.38*	89.80 ± 3.35	87.10 ± 2.51*
UCE, cm	2.60 ± 0.64	3.47 ± 0.19*	2.57 ± 0.61	3.12 ± 0.53*
LCE, cm	2.12 ± 0.62	2.90 ± 0.42*	2.07 ± 0.65	2.56 ± 0.60*

SBP, systolic blood pressure; DBP, diastolic blood pressure; O_2 sat., arterial oxygen saturation; PR, pulse rate; UCE, upper chest expansion; LCE, lower chest expansion; *post-treatment p-Value in all measures within group was highly significant, p=0.000.

of circulating blood, unloading small circulation vessels, decrease of venous return which positively impacts pulmonary vessels spasm [40]. Tight muscle area has lower blood circulation that decreases the O_2 supply to it. Cupping therapy has hopeful pain control, range of motion restoration [41], qi regulation, blood circulation activation and promotion, stasis improvement of skin and muscles, pathogenic factors removal [42], adhesions loosening, connective tissue lifting [43], blood flow increase to organs which enhance better oxygenation[44], relieving dyspnea when applied to Kahel [45], normalization the functional state of patient and progressive muscle relaxation [37].

In agreement with our results, similar study related the significant decrease of PR after single session of WC in healthy individuals to the released adrenocortical hormone and β-endorphin into the circulation by cupping negative pressure, stimulation of pain and superficial end depth tactile receptors which in turn affect central nervous system that restores sympathovagal imbalances by stimulating the peripheral nervous system [46]. Against our results, a study on rats reported no change of baseline heart rate or mean arterial BP after cupping [43].

Our results were supported by an observational study that mentioned an immediate improvement in O_2 saturation after WC in cigarette smokers with chronic obstructive pulmonary disease [29]. Also, a recent study showed a significant increase in arterial O_2 saturation after the application of wet cupping therapy in Arabian horses [44].

Supporting our results, a recent study reported a decrease in both SBP and SBP in hypertensive patients in WC more than DC [47]. In comparison to baseline, a study reported that both SBP and DBP significantly decreased after 10 days of WC [48].

Again, Kahel area selection in our study was supported by a study applied WC and mentioned the reduction of SBP in hypertensive patients up to 4 weeks [27]. Oppositely, other studies reported decreased SBP but not DBP after three staged wet cupping treatments at 2 week intervals in hypertensive patients [49]. DBP, but not SBP, was significantly decreased following one monthly WC session for two successive months in healthy young individuals [15].

Against us, a pilot study found no significant difference of SBP and DBP between wet cupping group on Kahel and control groups used antihypertensive drugs after 4 weeks of follow up due to small-sized study sample [50].

Study limitations

This study has more than one limitation. Small size sample, no objective evaluation tool of CE and no follow up.

Conclusion

Within the limitation of this study, the results showed enhanced both CE and cardiovascular status in sedentary smoker men after a single interscapular cupping session but follow up is needed.

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References

1. Elfahl AA, AbdelHady AA, Abdelghany AI, Morsy MM, Mohammed AH. Effect of Aerobic versus high intensity interval training on forced vital capacity in smoker students. Biosci Res 2018;15:3735–42.
2. Mahapatra SK, Das S, Dey SK, Roy S. Smoking induced oxidative stress in serum and neutrophil of the university students. Al Ameen J Med Sci 2008;1:20–31.
3. Schwertner HA. Association of smoking and low serum bilirubin antioxidant concentrations. Atherosclerosis 1998;136:383–7.
4. Chiu YW, Chuang HY, Huang MC, Wu MT, Liu HW, Huang CT. Comparison of plasma antioxidant levels and related metabolic parameters between smokers and non-smokers. Kaohsiung J Med Sci 2009;25:423–30.
5. Brown AJ. Paradoxical effects of acute cigarette smoking on plasma antioxidant status in humans. Nutr Res 1998;18: 1499–519.
6. Yuksel R, Yuksel RN, Sengezer T, Dane S. Autonomic cardiac activity in patients with smoking and alcohol addiction by heart rate variability analysis. Clin Invest Med 2016:147–52.
7. Colberg SR, Casazza GA, Horning MA, Brooks GA. Increased dependence on blood glucose in smokers during rest and sustained exercise. J Appl Physiol 1994;76:26–32.
8. De Cesaris R, Ranieri G, Filitti V, Bonfantino MV, Andriani A. Cardiovascular effects of cigarette smoking. Cardiology 1992;81: 233–7.
9. Rannard SI. Treatment of stable chronic obstructive pulmonary disease. Lancet 2004;364:791–803.
10. Hwang SY, Park KG. Knowledge on cardiovascular prevention and nicotine dependency among smoking male college students. J Korean Acad Com Heal Nurs 2014;25:75–84.
11. Mehmood M, Shahid MA, Saleem A. Analysis of effects of smoking on lung function, and respiratory muscle strength of Pakistani youth. Indo Am J Pharm Sci 2018;5:7209–12.
12. El Sayed SM, Mahmoud HS, Nabo MMH. Medical and scientific bases of wet cupping therapy (Al-hijamah): in light of modern medicine and prophetic medicine. Altern Integ Med 2013;2:1–16.
13. Chirali IZ. Traditional Chinese medicine cupping therapy. China: Elsevier Health Sciences; 1999:73–86 p.
14. Loukas M, Saad Y, Tubbs RS, Shoja MM. The heart and cardiovascular system in the Qur'an and Hadeeth. Int J Cardiol 2010;140:19–23.
15. Refaat B, El-Shemi AG, Ebid AA, Ashshi A, BaSalamah MA. Islamic wet cupping and risk factors of cardiovascular diseases: effects on blood pressure, metabolic profile and serum electrolytes in healthy young adult men. Altern Integ Med 2014;3:151.
16. Vakilinia SR, Bayat D, Asghari M. Hijama (wet cupping or dry cupping) for diabetes treatment. Iran J Med Sci 2016;41:37.
17. Guo KR. Bloodletting and cupping radical treatment of 35 cases of hypertension. Zhon Zhen Jiu 1999;19:548.
18. Mahmoud HS, Abou-El-Naga M, Omar NAA, El-Ghazzawy HA, Fathy YM, Nabo MMH, et al. Anatomical sites for practicing wet cupping therapy (Al-hijamah): in light of modern medicine and prophetic medicine. Altern Integ Med 2013;2:138.
19. Ghods R, Sayfouri N, Ayati MH. Anatomical features of the interscapular area where wet cupping therapy is done and its possible relation to acupuncture meridians. J Acup Merid Stud 2016;9:290–6.
20. Moore KL, Anne MR, Agur FA. Clinical oriented anatomy, 6th ed. Philadelphia, USA: Wolters Klumar/Lippincott Williams & Wilikins; 2013:1168 p.
21. Vaez Mahdavi MR, Ghazanfari T, Aghajani M, Danyali F, Naseri M. Evaluation of the effects of traditional cupping on the biochemical, haematological and immunological factors of human venous blood. A Comp of Essays on Altern Ther Croatia: InTec 2012:67–88.
22. Atlas of acupuncture points. Available from: http://www.chiro.org/acupuncture/ABSTRACTS/Acupuncture_Points.pdf [Accessed 5 Feb 2020].
23. Juanping GOU. Acupuncture combined with cupping therapy for 30 cases of intractable hiccup. World J Acup-Moxib 2018;28: 66–7.
24. Maciocia G. The foundations of Chinese medicine e-book: a comprehensive text, 3rd ed. China: Elsevier Health Sciences; 2015:1320 p.
25. Rosen R. Heart shock: diagnosis and treatment of trauma with Shen-Hammer and classical chinese medicine. London: Singing Dragon; 2018:472 p.
26. Robinson NG. Interactive medical acupuncture anatomy. USA, New York: CRC Press; 2016:1215 p.
27. Aleyeidi NA, Aseri KS, Matbouli SM, Sulaiamani AA, Kobeisy SA. Effects of wet-cupping on blood pressure in hypertensive patients: a randomized controlled trial. J of Integr Med 2015;13: 391–9.
28. Lee MS, Choi TY, Shin BC, Kim JI, Nam SS. Cupping for hypertension: a systematic review. Clin Exp Hypertens 2010;32: 423–5.
29. Hekmatpou D, Moeini L, Haji-Nadali S. The effectiveness of wet cupping vs. venesection on arterial O2 saturation level of cigarette smokers: a randomized controlled clinical trial. Pak J Med Sci 2013;29:1349–53.
30. Tham LM, Lee HP, Lu C. Cupping: from a biomechanical perspective. J Biomech 2006;39:2183–93.
31. Adedoyin RA, Adeleke OE, Fehintola AO, Erhabor GE, Bisiriyu LA. Reference values for chest expansion among adult residents in Ile-Ife. J Yoga Phys Ther 2013;6:54–8.
32. Malaguti C, Rondelli RR, de Souza LM. Reliability of chest wall mobility and its correlation with pulmonary function in patients with chronic obstructive pulmonary disease. Respir Care 2009; 54:1703–11.
33. Lapier TK, Cook A, Droege K, Oliverson R. Intertester and Intratester reliablity of chest excursion measurement in subjects without impairment. Cardiopulm Phys Ther 2000;3:94–8.
34. Moll JMH, Wright V. An objective clinical study of chest expansion of chest expansion. Ann Rheum Dis 1972;31:1–8.
35. Seo K, Park SH, Park K. Effects of diaphragm respiration exercise on pulmonary function of male smokers in their twenties. J Phys Ther Sci 2015;27:2313–5.
36. Noory N, Boojar MMA, Boojar MMA. A comparative biochemical study on the antioxidant status in peripheral and cupping blood samples of smokers and non-smokers. BCAIJ 2013;7:78–88.
37. Al-Bedah AM, Elsubai IS, Qureshi NA, Aboushanab TS, Ali GI, El-Olemy AT, et al. The medical perspective of cupping therapy: effects and mechanisms of action. J Trad Compl Med 2019;9: 90–7.
38. Moncada S, Palmer RM, Higgs EA. Nitric oxide: physiology, pathophysiology, and pharmacology. Pharm Times 1991;43: 109–42.

39. Ahmadi A, Schwebel DC, Rezaei M. The efficacy of wet-cupping in the treatment of tension and migraine headache. Am J Chin Med 2008;36:37–44.
40. Klepikov I. Cupping therapy as a means of first aid in acute pneumonia. J Clin Case Stud 2018;3:1–3.
41. Ahmad MW, Goswami A, us Salam M. Management of acute torticollis by oil cupping massage: a case study. Intern J AYUSH 2019;8:10–7.
42. Wang QF, Wang GY, Han CP. Therapeutic effect observation on treatment of acne with acupuncture plus moving cupping and blood-letting. J Acupunct Tuina Sci 2008;6:212–4.
43. Shekarforoush S, Foadoddini M, Noroozzadeh A, Akbarinia H, Khoshbaten A. Cardiac effects of cupping: myocardial infarction, arrhythmias, heart rate and mean arterial blood pressure in the rat heart. Chin J Physiol 2012;55:253–8.
44. Shawaf T, El-Deeb W, Hussen J, Hendi M, Al-Bulushi S. Evaluation of wet cupping therapy on the arterial and venous blood parameters in healthy Arabian horses. Vet World 2018;11:620.
45. Saeed AM, Mohammed RM, Ibrahim MEA. Evaluation of cupping therapy as an adjuvant therapy in a smoking cessation program. Egy J Bronch 2015;9:276–82.
46. Arslan M, Yeşilçam N, Aydin D, Yüksel R, Dane Ş. Wet cupping therapy restores sympathovagal imbalances in cardiac rhythm. J Alternative Compl Med 2014;20:318–21.
47. Imaningtias W, Angkasa MP, Yuniarsih SM. The effectiveness of wet cupping and dry cupping in reducing blood pressure in hypertension patients. Intern nurs conf on chronic dise manag. Pekalongan, Indonesia: Proceeding INC2DM press; 2019:163–7 p.
48. Alshowafi FK. Effect of blood cupping on some biochemical parameter. Med J Cairo Univ 2010;78:311–5.
49. Zarei M, Hejazi S, Javadi S, Farahani H. The efficacy of wet cupping in the treatment of hypertension. ARYA Atheroscl 2012:145–8.
50. Aleyeidi N, Aseri K, Kawthar A. The efficacy of wet cupping on blood pressure among hypertension patients in Jeddah, Saudi Arabia: a randomized controlled trial pilot study. Altern Integr Med 2015;4:183.