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Original Article

Evaluation of Effectiveness of Wet Cupping versus Blood Donation on Hematological Parameters in Healthy Young Adults

Zuhair Rishdi Mustafa; *Department of Nursing, College of Nursing, University of Duhok, Duhok, Iraq.*
(Correspondence: zuhair.mustafa@uod.ac)

Sabri Khalaf Sheiko; *Department of Medicine, College of Medicine, University of Duhok, Duhok, Iraq.*

ABSTRACT

Background and objectives: Therapeutic phlebotomy is the removal of blood from the body that has been practiced since ancient time for treating illnesses. Recently, interest in wet- cupping to treat various hematological disorders particularly polycythemia in public has grown. The present study aims to evaluate the effectiveness of wet-cupping versus blood donation on hematological parameters.

Methods: In this pre and post-test experimental study, a total of 60 healthy young adults were purposively assigned non-randomly either in cupping (n=30) or blood donation (n=30) groups. Blood samples were collected from all subjects to measure hematological parameters before and one week after interventions. Subjects of wet-cupping and blood donation were matched in age and baseline hematological parameters. The hematological parameters were analyzed using hematology analyzer (Symex, Japan).

Results: The findings of the study showed a significant difference in hematological parameters of wet-cupping and blood donation including hemoglobin level (Hb) (14.87 g/dl vs. 14.39 g/dl), packed cell volume (PCV) (44.78 % vs. 42.91 %), and red blood cell (RBC) (5.27 1012/uL vs. 4.94 1012/uL), respectively. While the values of other parameters were not different significantly; mean cell volume (MCV) (85.15 fl vs. 86.95 fl), mean corpuscular hemoglobin (MCH) (28.31 pg vs. 29.20 pg), mean corpuscular hemoglobin concentration (MCHC) (33.24 g/dl vs. 33.57 g/dl), red cell distribution width (RDW) (12.53 % vs. 12.40 %), platelet (245.77 109/L vs. 246.27 109/L), and white blood cell (WBC) (7.47 109/L vs. 7.47 109/L), respectively.

Conclusion: The present study concluded that both wet-cupping and blood donation are effective interventions in reducing HB, PCV, and RBC along with increase platelets in blood donation only.

Keywords: Wet-cupping; Blood donation; Hematological parameters

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INTRODUCTION

Therapeutic phlebotomy also known as venesection or bloodletting is the therapeutic removal of blood from the body that has been practiced since ancient times to treat illnesses [1]. It began in Egypt around 3000 years ago then spread around the world [2, 3]. Its use gradually declined in the late 19th century and it was almost abandoned during the 20th century [4, 5]. In the past, bloodletting was practiced using lancets, cupping, and the application of leeches for localized bleeding to virtually treat illnesses [6, 5]. At present day, however, therapeutic phlebotomy is being used in modern medicine as an essential part of the treatment for various disorders including hemochromatosis, polycythemia vera and porphyria cutanea tarda [7]. Despite significant advances in conventional medicine, there is a high prevalence and increased public interest

in complementary and alternative medicine (CAM) [8].Cupping is a method that uses local evacuation or distraction of morbid blood by glasses or cups. Generally, cupping is of two types; wet which means cupping with bloodletting and dry cupping means cupping without bloodletting [9]. Nevertheless, the mechanism of action of cupping therapy is not entirely understood [10]. Few randomized control trials have investigated the effectiveness of wet-cupping with various limitations [11]. In general, the body of CAM literature on cupping is inconclusive [12]. Positive outcomes are reported in many developing countries compared with the negative results reported by the industrialized world [11]. In Iraq, information and exact statistics on the prevalence of CAM use specifically cupping therapy is not yet available [13]. Interest in wet-cupping among the public to treat various hematological disorders, particularly polycythemia, has grown considerably in recent years. Therefore, the effectiveness of wet-cupping on hematological parameters has not been sufficiently investigated. The current clinical trial was performed to investigate the effectiveness of wet-cupping versus blood donation on hematological indicators. The author hypothesized that wet-cupping is more effective in reducing packed cell volume (PCV) compared to other categories of complete blood count while the blood donation was speculated to be more effective in hemoglobin level.

METHODS

Study design and sampling In the present quasi-experimental study, a total of 80 healthy adult male aged between 22 and 62 years were purposively screened for eligibility criteria after obtaining official permission. The participants were optionally allocated non-randomly to cupping therapy (n=40) and blood donation (n=40) groups according to inclusion and exclusion criteria. The subjects of the study were Kurdish volunteers from the community and were the staff of the Duhok Governorates over four months from November 2018 to February 2019. The subjects were matched in age and hematological parameters before final analysis, therefore, 10 cases were excluded from each group to make homogeneity. Finally, 30 subjects were included in each group of the study. Those persons who agreed to participate in the study were referred to the study clinician (second author) for complete physician and clinical examinations. The hematological parameters were analyzed using hematology analyzer (Symex, Japan). The inclusion criteria for the selection of the subject were: aged ≥18 years old, male, and regardless of socio-demographic perspectives, hemoglobin (Hb) level ≥13.5 gm/dl, and weight ≥55 kg. The participants diagnosed with the organ failures (hepatic failure, heart failure, and renal failure), anemia, cancer, hemophilia or similar hematological conditions were excluded from the study. Moreover, those utilizing pacemakers, taking chemotherapy, immunosuppressive drugs, anticoagulants, who had a previous blood donation within three months, who had a previous blood transfusion within six months, or who had wet-cupping less than three months ago were not included in the study. Also, the patients at risk of hypotension as diagnosed by the clinician were excluded from both interventions, cupping and blood donation. Clinical procedures and treatment.

Wet-cupping procedure: Wet-cupping was completed by the first author (nurse practitioner/under the supervision of a certified clinician) in a private clinic. Before cupping therapy, the 40 participants were requested to fast for 4 hours to allow blood to be distributed in the body but not in the stomach for digestion. Cupping was

at room temperature between 20 to 25 degrees Celsius to avoid vasoconstriction caused by cold weather. Before the intervention, the steps of the protocol were explained to the participants. Blood pressure was measured before the procedure began as a pre-test assessment. All participants were requested to be in the prone position in bed with raising legs 30 degrees to avoid fainting. A manual hand suction pump was used for cupping procedure with disposable cups of capacity 100 ml each. Five sites of the upper back were selected including: over seventh cervical vertebra, bilateral peri-spinal areas of the neck, and thoracic spine for the procedure (see Figure 1) [14]. An antiseptic solution (70% Ethanol) was used to clean the application areas. Each procedure lasted for around 20 minutes and was conducted aseptically in five steps as follows [15].

Scarification: The cups were removed, and ten superficial horizontal incisions 0.1-0.2 mm in depth and 1–2 cm in length parallel to each other were made on each chosen area of the skin using sterile surgical blades size 15. This technique avoids scar lesion and enhances faster healing.

Blood-letting: The cups were re-applied on the skin, and the suctioning was repeated. The cups were left on the designated areas of the skin for 10 minutes then the blood sucked out through the incisions. Negative pressure was repeated by pumping every 3 minutes to enhance suctioning as cups filled with the blood and decreased suctioning ability.

Removal: The cups were removed after 10 minutes and the used cups, blood, and surgical blades were discarded safely.

Clean and dressing: The selection areas for cupping were disinfected using povidone iodine 4 % followed by placement of sterile pads. As a measure against adverse reactions such as fainting due to bloodletting, all participants were offered a few minutes of rest and 250 ml of fruit juice. Moreover, the participants were advised to avoid bathing and swimming for 12 hours following the cupping procedure to prevent delays in wound healing.

Figure 1: A view of points on the skin in which wet-cupping therapy was applied

Blood donation: The reference population referred to Duhok Blood Donation Centre and consisted of 40 male volunteer blood donors. All participants were referred for the procedure following performing the required coordination. According to the roles of the bank, the subjects with a hemoglobin level of ≥ 13.5 g/dl, with a minimum weight of ≥ 55Kg, not fasting, not taking any medication during the last 48 hours were included in the procedure. Each subject donated a total of 450 ml of whole blood according to the blood bank policy from their antecubital vein. Each participant was offered a few minutes of rest and 250 ml of fruit juice as a measure against fainting due to blood donation.

Measurement and data collection

Baseline information: The baseline and demographic characteristics of the subjects, including age, smoking (yes/ no) and its attributes were defined as light smoker: those who smoked 1-9 cigarettes/day, moderate smoker: those who smoked 10-19 cigarettes/day, and heavy smoker: those who smoked ≥20 cigarettes/day or hookah [16]. In addition, current chronic diseases (yes/ no), past medical history/ past surgical history (yes/no), occupation, education level, place of residence (urban/ rural), recent blood donation/cupping

therapy (yes/ no), and blood pressure were collected through the self-reported technique. For the eligibility criteria, the volunteers were screened through laboratory tests and physical examinations. Two mL of venous blood was collected before the commencement of procedures to test hematological parameters. Subjects with Hb level ≥ 13.5 g/dl were considered to be illegible for the study according to the blood bank policy, although this is not in line with World Health Organization 2012 Guidelines on Assessing Donor Suitability for Blood Donation [17], which stated that the recommended Hb level for donation should not be less than 13.0 g/dl for males. The blood pressure of the subjects was measured from both arms upon the subjects sitting after a few minutes of rest using blood pressure mercury (ALPK2 Japan). Hematological parameters testing

After blood sample was obtained from veins through standard procedure, two mL of blood was collected by a tube with ethylenediamine tetraacetic acid (EDTA) anticoagulant for hematologic tests directly before and after the procedures and analyzed within 1-2 hours after obtaining the blood sample, meanwhile, the samples were kept in refrigerator. Pre- and post-cupping and blood donation hematological values were measured in the blood. Parameters such as Hb, PCV, RBC, MCV, MCH, MCHC, RDW, platelet, and WBC were analyzed using hematology analyzer (Symex, Japan).

The descriptive purposes of the study were determined in frequency and distribution or mean and standard deviation. The homogeneity of the hematological parameters and age in both study groups were examined in an independent t-test. Also, the comparison of baseline information of both groups was examined in the independent t-test, Chi-square, or Fisher's; exact tests. The paired t-test was performed for examining the difference of hematological parameters between pre and post-intervention in both groups. The effect size (Cohen's d) was calculated by G*Power 3.3.9. Also, independent t-test was performed to examine the difference in hematological indicators between post-intervention study groups. The multivariate analysis model was performed to investigate the predictors of hematological parameters in both study groups. The null hypothesis was rejected in a P-value of less than 0.05. The statistical calculations were performed in the Statistical Package for Social Sciences (SPSS: 25 IBM).

The total sample size required for the present study was calculated based on the measurement of RBC from the first 5 cases of each group separately. The mean (Sta. deviation) of the first five cases of the cupping group was 5.30 (SD: 0.43). Based on our expectation to a reduction to 5.0 (SD: 0.28) following the procedure, t-test: two dependent means (matched pairs), the actual power of 0.95, α: 0.05, and the effect size: 0.79, 23 subjects were required for the study. The mean (Sta. deviation) of the first five cases of blood donation group was 5.44 (SD: 0.30). According to the expectation of the authors to a reduction to 5.12 (SD: 0.38); t-test: two dependent means (matched pairs); actual power of 0.95; t: 2.10, α: 0.05, and the effect size: 0.84, a total of 18 persons were required for the study. Ethical approval. The ethical approval of the present clinical trial was obtained from the research ethics committee of General Directorate of Health of Duhok as reference number: 17102018-8 and written informed consent from all participants before clinical assessment.

RESULTS

Two mL of blood was obtained from participants one week later after interventions.

The analysis of the results showed that subjects of wet-cupping and blood donation groups were similar in age (37.67 vs. 38.13 years, P= 0.790), chronic disease (P=0.222), smoking (P=0.121), residency (P=0.274), and past surgical history (P=0.390), see Table 1. However, subjects in cupping were more likely to have a less professional occupation as well as a lower level of education compared to their counterparts in blood donation group (P= 0.007 and P=0.004) respectively (Table 1).

The hematological parameters between the subjects of both study groups were matched before final analysis. In line with the inclusion criteria, the mean values of Hb for both wet-cupping and blood donation were 15.33 and 15.63 g/dl, P= 0.065) respectively (Table 2).

Table 1: Comparison of general information between the subjects in cupping therapy and blood donation

Characteristics (N=60)	Cupping (n=30)	Blood Donation (n=30)	P-Value (Two-Sided)
Age (Year)	37.67 (6.57)	38.13 (6.91)	
Range	22-49	25-52	0.790*
Chronic Disease	9 (30)	5 (16.7)	0.222**
Smoker	18 (60)	12 (40)	0.121**
Smoking Type			
Moderate	1 (5.6)	3 (25)	0.274***
Heavy	17 (94.4)	9 (75)	
Residency			
Urban	29 (96.7)	30 (100)	1.00***
Rural	1 (3.3)	0 (0)	
Occupation			
Unemployed (Students)	1 (3.3)	1 (3.3)	
Worker	13 (43.3)	4 (13.3)	0.007***
Governmental employed	16 (53.3)	20 (66.7)	
Profession	0 (0)	5 (16.7)	
Education			
Illiterate	8 (26.7)	5 (16.7)	
Primary school graduate	3 (10)	0 (0)	
Intermediate school graduate	8 (26.7)	1 (3.3)	
High School graduate	3 (10)	6 (20)	0.004***
Institute graduate	4 (13.3)	5 (16.7)	
College graduate	4 (13.3)	6 (20)	
Postgraduate graduate	0 (0)	7 (23.3)	
Past Surgical History	10 (33.3)	7 (23.3)	0.390**

*Independent t-test, **Chi-square, and ***Fishers' exact tests were performed for statistical analyses.
The bold numbers show significant differences.

Table 2: Comparison of pre-intervention assessment of hematological parameters between cupping and blood donation groups

Hematological parameters (n=60)	Cupping (n=30)		Donation (n=30)		P-Value (Two-Sided)
	Mean	SD	Mean	SD	
HB (g/dl)	15.33	0.70	15.63	0.54	0.065
PCV (%)	46.42	2.68	46.89	1.79	0.431
RBC (10^{12}/uL)	5.44	0.39	5.40	0.29	0.655
MCV (fl)	85.55	3.91	87.11	3.48	0.108
MCH (pg)	28.28	1.51	29.02	1.56	0.068
MCHC (g/dl)	33.05	0.80	33.37	1.12	0.215
RDW (%)	12.45	0.80	12.50	0.49	0.801
Platelet (10^9/L)	238.57	44.83	231.83	53.40	0.599
WBC (10^9/L)	7.79	2.04	8.67	8.48	0.584

Independent t-test was performed for statistical analyses.

The complications found in subjects underwent wet-cupping therapy were Bullae formation (n=3), discomfort in the region that underwent cupping (n=1), and dizziness (n=1). Also, the complications in blood donation were local reactions (hematomas due to extravasation during procedure (n=1), dizziness (n=1), hypotension (n=1), and local reactions (hematoma due to extravasation after procedure) (n=3) (not shown in Tables). The present study found a significant difference between pre and one week later assessment in some hematological parameters in both cupping and blood donation groups. In the cupping group, significant changes were observed in Hb level (MD: Mean Difference: -0.46, P=<0.001), PCV (MD: -1.64, P=<0.001), and RBC (MD: -0.17, P=<0.001).However,no significant changes were observed in MCV (MD: -0.40, P=0.256), MCH (MD: +0.03, P=0.740), MCHC (MD: +0.19, P=0.123), RDW (MD: +0.07, P=0.529), Platelet (MD: +7.20, P=0.081), and WBC (MD: -0.32, P=0.083) P=<0.001). Similarly, significant differences were seen in the blood donation group in Hb level (MD: -1.25, P=<0.001), PCV (MD: -3.98, P=<0.001), RBC (MD: -0.46, P=<0.001). Correspondingly as cupping intervention, the other parameters in blood donation group did not change significantly; including MCV (MD: -0.17, P=0.652), MCH (MD: +0.18, P=0.097), MCHC (MD: +0.20, P=0.117), RDW (MD: -0.09, P=0.365), and WBC (MD= -1.20, P=0.460), but a significant increase in the platelet count (MD: +14.43, P=0.011) was observed (Table 3).
In a comparison of post-intervention of hematological parameters between cupping and blood donation groups, there was a significant difference in some indicators. The subjects in wet-cupping therapy had a higher level of Hb (14.87 g/dl vs. 14.39 g/dl, P=0.018), PCV (44.78 % vs. 42.91 %, P=0.009), and RBC (5.27 1012/uL vs. 4.94 1012/uL, P=0.001), respectively. The subjects were comparable in other hematological parameters (P>0.05), see Table 4.
The different hematological parameters between two study groups (Hb, PCV, and RBC) were considered dependent variables and other baseline and hematological factors as independent variables in the multivariate analysis model. The analysis did not find any another predictor for this difference except the intervention (Table 5).

Table 3: Comparison of hematological parameters before and after intervention in cupping and blood donation groups

Cupping (n=30)	Pre Mean	Pre SD	Post Mean	Post SD	Mean Difference	P-Value (Two-Sided)
HB (g/dl)	15.33	0.70	14.87	0.81	-0.46	**<0.001**
PCV (%)	46.42	2.68	44.78	2.59	-1.64	**<0.001**
RBC (10^{12}/uL)	5.44	0.39	5.27	0.37	-0.17	**<0.001**
MCV (fl)	85.55	3.91	85.15	3.72	-0.40	0.256
MCH (pg)	28.28	1.51	28.31	1.60	+0.03	0.740
MCHC (g/dl)	33.05	0.80	33.24	0.86	+0.19	0.123
RDW (%)	12.45	0.80	12.53	0.68	+0.07	0.529
Platelet (10^9/L)	238.57	44.83	245.77	48.27	+7.20	0.081
WBC (10^9/L)	7.79	2.04	7.47	1.950	-0.32	0.083
Blood Donation (n=30)	**Pre Mean**	**Pre SD**	**Post Mean**	**Post SD**	**Mean Difference**	**P-Value (Two-Sided)**
HB (g/dl)	15.63	0.54	14.39	0.73	-1.25	**<0.001**
PCV (%)	46.89	1.79	42.91	2.82	-3.98	**<0.001**
RBC (10^{12}/uL)	5.40	0.29	4.94	0.36	-0.46	**<0.001**
MCV (fl)	87.11	3.48	86.95	3.63	-0.17	0.652
MCH (pg)	29.02	1.56	29.20	1.44	+0.18	0.097
MCHC (g/dl)	33.37	1.12	33.57	0.94	+0.20	0.117
RDW (%)	12.50	0.49	12.40	0.57	-0.09	0.365
Platelet (10^9/L)	231.83	53.40	246.27	55.13	+14.43	**0.011**
WBC (10^9/L)	8.67	8.48	7.47	1.40	-1.20	0.460

Paired t-test was performed for statistical analysis. The bold numbers show significant differences.

Table 4: Comparison of post-intervention assessment of hematological parameters between cupping and blood donation groups

Hematological parameters (n=60)	Cupping (n=30)		Donation (n=30)		P-Value (Two-Sided)
	Mean	SD	Mean	SD	
HB (g/dl)	14.87	0.81	14.39	0.738	**0.018**
PCV (%)	44.78	2.59	42.91	2.82	**0.009**
RBC (10^{12}/UL)	5.27	0.37	4.94	0.36	**0.001**
MCV (fl)	85.15	3.72	86.95	3.63	0.064
MCH (pg)	28.31	1.60	29.20	1.44	0.028
MCHC (g/dl)	33.24	0.86	33.57	0.94	0.165
RDW (%)	12.53	0.68	12.40	0.57	0.446
Platelet (10^9/L)	245.77	48.27	246.27	55.13	0.970
WBC (10^9/L)	7.47	1.95	7.47	1.40	> 0.99

Independent t-test was performed for statistical analyses. The bold numbers show significant differences.

Table 5: Predictors of Hb, RBC, and PCV in cupping and blood donation groups

Predictors	Dependent Variable	F Score	P-value	Partial Eta Squared (Effect Size)
Study Intervention	HB	6.646	**0.020**	0.281
	PCV	6.644	**0.020**	0.281
	RBC	6.534	**0.020**	0.278
Smoking Type	HB	0.302	0.590	0.017
	PCV	0.280	0.604	0.016
	RBC	0.198	0.662	0.012
Chronic Disease	HB	0.011	0.989	0.001
	PCV	0.008	0.992	0.001
	RBC	0.013	0.987	0.002
PSH	HB	0.193	0.666	0.011
	PCV	0.148	0.705	0.009
	RBC	0.061	0.808	0.004
Age	HB	0.097	0.759	0.006
	PCV	0.100	0.755	0.006
	RBC	0.146	0.707	0.009
MCV (fl)	HB	0.006	0.938	< 0.001
	PCV	0.011	0.919	0.001
	RBC	0.140	0.713	0.008
MCH MCH (pg)	HB	0.003	0.960	< 0.001
	PCV	0.006	0.939	< 0.001
	RBC	0.036	0.852	0.002
MCHC (g/dl)	HB	0.058	0.813	0.003
	PCV	0.184	0.673	0.011
	RBC	0.301	0.591	0.017
RDW (%)	HB	2.176	0.158	0.113
	PCV	2.261	0.151	0.117
	RBC	2.460	0.135	0.126
Platelet (10^9/L)	HB	1.063	0.317	0.059
	PCV	1.025	0.326	0.057
	RBC	0.919	0.351	0.051
WBC (10^9/L)	HB	< 0.001	0.986	< 0.001
	PCV	< 0.001	0.992	< 0.001
	RBC	0.001	0.970	< 0.001

Multivariate analysis model was performed for statistical analysis.

DISCUSSION

The present investigation showed both wet-cupping and blood donation interventions are effective to reduce Hb, PCV, and RBC, but blood donation is more powerful than cupping in the reduction of the hematological parameters. Furthermore, some indicators including platelet count elevated in subjects who underwent blood donation. During the last few decades, there has been considerable interest in wet-cupping among the public. The effectiveness of wet-cupping on hematological parameters has not been fully explored. Studies on the effect of blood donation on hematological parameters are well documented in the literature. Whereas, no research investigated the outcomes of wet-cupping on same parameters except the few studies that examined the blood withdrawn from the wet- cupping and compared to venous blood. For example, a study by Mahdavi and colleagues was carried out in 56 healthy volunteer men 20-40 years old. Blood samples from cupping showed a significant increase in Hb, Hct, RBC, MCH, viscosity and platelet count as compared to venous blood samples. In contrast, no significant difference was observed in WBC, MCH, and MCV [18]. The authors hypothesized that Hb concentration and RBCs count are so dense in cupping samples which were relatively high compared to those in venous blood samples. The results of our study are in line with this study except for platelet count in which no significant change occurred post wet-cupping. However, there are contradictory findings as well. Abdullah et al. [19] compared cupping blood and venous blood samples of ten healthy male and female individuals through a pilot study and concluded that all parameters have similar values to those observed in the initial assessment. It is believed that blood donation reduces hematological parameters. Our findings reveal significant changes in most hematological parameters after the intervention. As mentioned earlier, studies on the effectiveness of blood donation on hematological changes are well documented in the literature although they did not measure RBC count. For example, A study by Cliville et al. [20] addressed variations in hematological and other parameters in 30 patients of both genders. There was a significant decrease in Hb and Hct levels after the donation of the blood. This resulted in an increase in reticulocytes, MCV and RDW. However, the platelet count and WBC count remained unchanged. Similar findings were reported by Beyan and colleagues [21]. Moreover, Das et al. [22] examined hematological values pre- and post-donation procedure and concluded that the values of Hb, Hct, platelet, and WBC counts were dropped significantly among the donors. The findings of our study are in agreement with these studies except platelet count that increased significantly in our study after therapeutic phlebotomy. This could be due to a possible change in erythropoietin levels following blood donation caused iron depletion and platelet count enrichment [23]. In view of the fact that erythropoietin may increase platelet count by stimulating bone marrow thrombopoiesis [24]. Although some drawbacks of repeated blood donation have been documented in the literature such as a poor iron condition in repeated blood donors [25], nevertheless several benefits were also reported in the literature including polycythemia, hemochromatosis, porphyria cutanea tarda, and sickle cell disease [7, 26]. Furthermore, phlebotomy can lower the risk of cardiovascular disease by decreasing whole blood viscosity,

plasma viscosity, Hct, and fibrinogen, and iron stores [5, 27]. In this region, a recent study by Getta and Ahmad et al [28] investigated the purpose of blood donation and identified the main reasons for blood donations among regular donors were relieving headaches (45%), polycythemia, neck and shoulder pains, dizziness, insomnia, and sleepiness. While the reasons for donations by the first time donors were to help relatives (31%), it is evident that the benefits of blood donation outweighed its drawbacks. Concerning the safety of wet-cupping, this intervention is generally safe based on outcomes of a meta-analysis done by Cao et al. [29]. Therefore, the cupping procedure in the current study was also safe with minimal side effects occurring during the procedure such as bullae formation in one cup area, discomfort in the region that underwent cupping, and dizziness. Blood donation on the other hand was also relatively safe except for a few complaints that occurred during donation including dizziness, hypotension, and local hematomas as a result of extravasation which arose a week later.

Strength and limitation

The strong point of the study must be traced in the design and the strict inclusion and exclusion criteria. While, the authors faced an issue to include females in the study due to the cultural aspects of the region.

CONCLUSION

The present study concluded that both wet-cupping and blood donation are effective interventions in reducing HB, PCV, and RBC along with increase platelets in blood donation only. The present study found cupping therapy as a safe procedure

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