**ORIGINAL ARTICLE**

# Determination and comparison of laboratory parameters of venous blood before and after cupping therapy

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## ABSTRACT

A variety of methods for taking blood from the body, such as cupping and defecation, have been considered as important methods both for the prevention and treating some diseases. This study aimed to compare some laboratory parameters of venous blood before and after cupping therapy. In a follow-up study, 53 candidates for cupping phlebotomy were chosen. Before phlebotomy, 10 ml of venous blood was taken from every subject and used for specific biochemical, hematological, and immunological tests. After that, more volunteers were used for wet cupping ucolfnder standard conditions. After 7 days, intravenous blood samples were taken from each subject and were analyzed and compared with before. The mean age of the subjects was 40.86 years. The results showed that the difference in the mean number of red and white blood cells, the amount of hematocrit, platelets, ESR, and ferritin, were not statistically significant before and after cupping. Mean blood hemoglobin before and after cupping were statistically significant. Statistically, there were significant differences in the amounts of iron, uric acid, urea, and blood sugar before and after the cupping intervention, but other variables, did not show a statistically significant difference before and after this intervention. The results showed that phlebotomy by cupping therapy approach could improve some blood and other biochemical variables in treated individuals, although the differences in some laboratory results and analyzes were not significant for some variables.
**Key words**: Cupping, Phlebotomy, Venous Blood, Laboratory Parameters

## INTRODUCTION

In Iranian culture paying attention to human health and disease prevention has an ancient history and dates back to the pre-Islamic era to 3000 thousand years ago. Various methods of taking blood from the human body such as cupping and blood purification have been practiced for both the prevention and treating various diseases (1). In cupping, suction is applied by placing a balloon on the skin and creating a vacuum (2). Several theories have been proposed as the mechanisms by which cupping can affect the human body of which autohemolysis and homeostasis are the most plausible ones explaining the mechanism of action of cupping and is called Taibah theory (3). According to this theory, the release of materials from blood capillaries is caused by the difference in pressure due to suction. Usually, capillary pores are 12 nm in diameter and by applying suction (the pressure is less than 300 mm Hg in 5 minutes) pore diameter increase to 8060 nm and interstitial fluid, lymph, plasma-soluble substances as well as lysed red blood cells from capillaries and intercellular spaces are moved under the epidermis and are released by puncturing the epidermis without damaging the capillaries (4). With suction and subsequent bleeding, a series of reactions take place in the body causing the cupping positive effects. The results of studies have shown that although in many diseases, cupping has shown good therapeutic effects, cupping cannot be a substitute for common medical treatments in general, however, the simultaneous use of cupping and medication improves the therapeutic effects of drugs and can reduce the dosage and frequency of drugs consumption, reduce both their side effects and the danger of interactions of using multiple drugs in the control of chronic diseases. Specific studies have shown that chemotropic agents, such as methotrexate, have been effective. Drugs used to treat rheumatoid arthritis reduce white blood cells and have side effects, but the combination of cupping with the drug causes natural killer cells (NKC) leukocytosis. The number of NKs reduced by using the drug alone, but the combination of cupping and drug increases these cells. In rheumatoid arthritis, the amount of soluble interleukin-2 receptors is directly related to the degree of disease progression, pain intensity, number of joints involved, and degree of disease intensity. In the combined drug treatments with cupping, ESR , RF, CRP have shown significant reduction, while drug therapy alone does not cause many changes in soluble interleukin-2 receptors. Another study has shown that cupping can reduce the density and the amount of waste products in the body. For example, the presence of iron overload reduces thalassemia and hemochromatosis, or in hyperlipidemia, the amount of cholesterol and triglycerides are reduced, or in gout a decrease in blood uric acid and in autoimmune diseases autoantibodies from the interstitial fluid and blood serum are reduced. (5). Therefore, based on these premise, this study was performed to compare some laboratory parameters of venous blood before and after cupping.

## MATERIALS AND METHODS

This study was a follow-up study carried on 53 candidates for cupping approved by the university ethics committee (IRB) and also obtaining informed written consent from each candidate. The main criteria for inclusion in the study were: the willingness of subjects to participate in the study, the age range of 20 to 50 years old, the absence of life-

threatening diseases such as cancer, terminal stage kidney disease and dialysis, diabetes, cardiac ischemia, lack of contraindications to cupping such as extreme weakness and being skinny, menstruation and pregnancy and the presence of colagulation disorders. The subjects were adult males and females. The main exclusion criteria were: unwillingness to continue the study and the occurrence of certain diseases that need treatment. The initial questionnaire of demographic characteristics and physical information such as the height and weight of candidates and initial medical examinations, vital signs, and blood pressure were recorded. After that, 10 ml of venous blood was taken from all subjects and sent to analyze the specific biochemical, hematological, and immunological tests and their quantitative parameters. After that, wet cupping was done for candidates under standard cupping conditions. To perform cupping, that is a general cupping, is done between the two shoulders and on the second to fifth thoracic vertebrae, by a suction device. After disinfecting the suction and puncturing site, blood samples were taken three times and collected. To find out whether cupping can affect the peripheral venous blood parameters or not, venous blood samples were tested after 7 days for each individual and the same previous laboratory elemnets were checked again. The qualitative parameters in the two tests were compared to find out whether cupping can affect the qualitative blood parameters in venous blood sampling and also whether cupping has been able to improve both the clinical symptoms and the main human subjetc's complaints. Numerical indices and frequency tables were used to analyze and display the data. Therefore, the data are shown as the mean (standard deviation) for quantitative variables and as a frequency (percentage) for qualitative variables. The SPSS software version 21 was used for data analysis. To evaluate the results of the study, Tukey test of variance, and multiple comparisons and Spearman correlation coefficient were used. A significant level was considered as $P < 0.05$ in all cases.

## RESULTS

A total of 53 adult candidates were included in this study, of which 40 were male and 13 were female. The mean age of the subjects was 40.86 years. Comparison of the mean number of red and white blood cells, hemoglobin, hematocrit, platelets, ESR, and ferritin, before and after cupping are summarized in Table 1.

Results show that the mean number and the amount of red and white blood cells, hematocrit, platelets, ESR, and ferritin, before and after cupping, were not statistically significant. No significant reduction in these variables was observed after cupping. The results of Table 1 show that the difference in the mean amount of blood hemoglobin before and after cupping was statistically significant. A significant increase in the mean amount of hemoglobin was observed after cupping. The amounts of FBS, urea, creatine, uric acid, cholesterol, triglyceride, HDL, LDL, liver enzymes AST, ALT, and ALP as well as iron were determined and compared before and after cupping (Table 1). The variables such as iron, uric acid, urea, and blood sugar before and after the intervention showed a statistically significant difference, but the other variables were not statistically different before and after the intervention.

Table 1- Determination and comparison of FBS, urea, creatine, uric acid, cholesterol, and triglyceride, HDL, LDL, liver enzymes AST, ALT and ALP and iron before and after cupping intervention

| Variable | Before phlebotomy | After phlebotomy | P-value |
|---|---|---|---|
| Red blood cells | 5.15±0.44 | 5.13±0.42 | 0.332 |
| White blood cells | 6.51±1.45 | 6.57±1.39 | 0.692 |
| Hemoglobin | 15.21±1.35 | 15.07±1.28 | 0.043 |
| *Hematocrit (HCT)* | *42.96±3.12* | *42.85±6.35* | *0.873* |
| Platelets | 244.62±59.45 | 244.43±65.35 | 0.714 |
| Erythrocyte Sedimentation Rate (ESR) | 9.96±6.79 | 9.54±6.72 | 0.465 |
| Ferritin | 94.43±77.38 | 78.78±72.84 | 0.395 |
| Fasting Blood Sugar (FBS) | 87.81±15.94 | 97.03±24.50 | 0.000 |
| Urea | 29.07±6.97 | 25.66±5.48 | 0.000 |
| Creatinine | 1.07±0.14 | 1.07±0.12 | 0.714 |
| Uric acid | 5.41±1.18 | 5.03±1.06 | 0.000 |
| Cholesterol | 173.22±35.26 | 170.81±31.69 | 0.224 |
| *Triglyceride* (TG) | *146.18±56.31* | *135.07±66.59* | *0.096* |
| *High-density lipoprotein* (*HDL*) | *44.66±8.16* | *45.52±8.89* | *0.416* |
| Low Density Lipoprotein (LDL) | 99.32±26.89 | 98.26±25.44 | 0.590 |
| Aspartate transaminase (AST) | 18.37±4.63 | 18.66±0457 | 0.594 |
| Alanine aminotransferase (ALT) | 23.07±13.07 | 22.37±12.94 | 0.516 |
| Alkaline Phosphatase (ALP) | 96.96±176.15 | 177.58±36.12 | 0.391 |
| Iron | 103.24±32.92 | 89.09±73032 | 0.006 |

## DISCUSSION

There are no interfering factors in cupping and a complete treatment will result in recovery. The most common application of cupping is in the prevention of disease. The basic mechanism involved in the effects of cupping has not yet been properly elucidated, but the regulation of the immune system and changes in biochemical and hormonal compounds in the blood, as well as the regulation of the body's sympathetic and parasympathetic nervous systems by cupping, have been suggested (6). Cupping may play disease preventive role by clearing the interstitial spaces and the interstitial fluids of any metabolic waste products, free radicals, or foreign matters (7). The medical basis of cupping is similar to kidney glomerular filtration, in which the difference in capillary hydrostatic pressure and

Bowman's capsule-like in cupping, is the pressure difference between the balloon and the capillaries of the skin which helps filtering the blood capillaries (8). In the case of disease afflictions, inflammatory substances, toxins, bacteria, and harmful biologics or chemical substances accumulate and tend to be located in specific locations that vary according to the type and stage of the disease. By applying the cupping therapy in these locations, drainage and the cleaning of pathogens can be facilitated (9). Studies have shown that when cupping is applied on the area between the two shoulders, after two weeks, a significant reduction in the levels of red blood cells, hematocrit, and hemoglobin were observed (10). In our study, a decrease in these variables was observed after cupping, but unlike the results reported in a similar study, the decrease was not significant. Another difference between our study and the one reported (10), was the duration of determining the blood parameters after cupping. In our study, blood parameters were determined seven days after cupping, while in the study reported, these parameters were determined two weeks after cupping. It has been reported that the number of white blood cells in blood samples taken in cupping is one-tenth of venous blood samples (11-13). In our study, an increase in white blood cell count was observed one week after cupping, although this increase was not statistically significant. This result was consistent with the results reported in similar studies (12,14). Similar studies have also shown an increase in the number of white blood cells after cupping and have confirmed that repeated cupping can lead to an increase in the number of white blood cells (13). In our study, a decrease in red blood cell count, hematocrit and hemoglobin concentration was observed, although the differences were not significant. Sheikho et al. showed that the morphology of red blood cells in blood taken by cupping was different from that of venous RBCs, and argued that cupping may play an important role in the excretion of old RBCs (12, 14). As the number of red blood cells increases, so does the blood hematocrit and viscosity because too many red blood cells will cause an increase in blood viscosity and therefore slows down the blood flow. In short, blood cells, hematocrit, and blood viscosity are perfectly related to each other (15).

Therefore, cupping can be effective in diluting the blood by reducing red blood cells, hemoglobin, and hematocrit. A decrease in platelet count after cupping as compared to before was observed in our study, although was not statistically significant. Ahmadi et al. reported a similar result, except that the decrease observed in their study was significant. Sucking pressure applied by cupping seems to cause more platelets to be depleted at a lower density. This platelet excretion increases blood clotting time, thus facilitating blood flow and oxygen delivery to the final organ. Erythrocyte sedimentation rate (ESR) is a simple and inexpensive laboratory test that is widely used in clinical practices to assess inflammatory or acute responses (16). ESR can be used in the diagnosis of inflammatory cases as well as in the prognosis of non-inflammatory conditions (17, 18). Our results showed that one week after cupping, a decrease in ESR occurred compared to before. Ahmad et al. (19) by examining the effects of cupping on immune system regulation in patients with rheumatoid arthritis, showed that after cupping a decrease in the rate of laboratory markers such as CRP and ESR was evident as compared to before cupping. These results are consistent with the results of our study. The decrease in ESR can be attributed to the high density of cupping blood samples, in which the number of red blood cells is much higher than the venous blood samples, or maybe due to the decrease in total protein in the cupping blood compared to the venous blood. The amounts of blood cholesterol, triglycerides, HDL, and LDL did not show significant changes in the subjects before and after cupping. In a study performed on mice, these variables showed a significant difference after cupping, which is not consistent with our study. Cupping can reduce the concentration of serum lipoproteins and reduce the risk factors causing atherosclerosis (10). This can be due to the removal of harmful substances and the induction of molecules that are effective in modulating fat metabolism and body water (7). Large molecules such as low-density lipoprotein due to their high molecular weight cannot be cleared by renal glomerular filtration (8). The repulsive role of cupping in controlling such molecules, which is done through nonspecific purification depending on pressure and size, can be more important than the role of kidneys (9). Roxan et al. (15) evaluated and reported the effect of cupping on the concentration of lipids and by-products (copper, zinc, and manganese) in serum. Due to cupping, the serum concentration increased significantly and showed a positive correlation with HDL cholesterol levels. Zinc is essential for the function of more than 200 enzymes, and zinc-containing enzymes have been found in metabolic pathways involved in lipid metabolism (15). In our study, a decrease in cholesterol, triglyceride, and LDL levels and an increase in HDL levels after cupping as compared to before the cupping, was observed, but the differences were not statistically significant. This slight change in our study could also be related to the above argument. In our study, the amount of iron in the blood showed a significant decrease. Proper absorption of minerals such as iron is one of the requirements of a healthy life. However, high absorption of this mineral can cause problems such as cancer, cardiovascular disease, and insulin resistance (3, 16). It has been suggested that cupping is very effective in eliminating excessive elements from the blood. It seems that by reducing serum iron, insulin secretion, and sensitivity to will be improved (16). Therefore, cupping is expected to be associated with a decrease in iron. In our study, a significant increase in blood sugar was observed, which was consistent with the study of Rafat et. al . This increase in fasting blood sugar 48 hours after cupping attributed to the increased production of glucocorticoids due to stress, which also confirms the results of our study. In our study, cupping reduced the level of ferritin, but the decrease was not statistically significant. These results are consistent with the reports of previous researchers (1, 4, 5, 7) that cupping cleanses the blood of accumulated cellular metabolites such as ferritin (14). In our study, the levels of uric acid, urea, and creatinine decreased after cupping but the decrease was only significant for the uric acid. These results are consistent with those reported by others (10, 12, 20). The decrease in urea levels can occur not only through

direct excretion but also due to reduced production. Because iron activates the enzyme xanthine oxidase (an enzyme involved in uric acid synthesis), cupping can prevent the production of excess urate by excreting the excess iron (10). In the study of Vaez Mahdavi et al. , the level of uric acid in the blood samples harvested from cupping was higher than venous blood, which was parallel with the changes in serum iron levels. The curative effects of cupping can be useful in reducing urate levels in people suffering from gout as well as reducing urea and creatinine in patients with kidney problems (10). Alkaline phosphatase is a protein found in all body tissues and is found in large quantities in the liver, bile ducts, and bones. Testing for alkaline phosphatase can help in diagnosing liver disease or bone disorders. When a liver cell is damaged, alkaline phosphatase is released into the bloodstream and its level will increase. In one study, this serum enzyme levels were reduced in cupping samples compared to venous samples (21). In another study, a significant increase in alkaline phosphatase enzyme levels was observed two weeks after cupping, (22). In our study, an increase in the level of alkaline phosphatase was observed after cupping. Of course, this increase was not statistically significant. The first step in diagnosing liver damage is a simple blood test to determine the presence of certain liver enzymes (proteins) in the blood. Among the most sensitive and widely used liver enzymes to diagnose liver damage, are aminotransferases. They include aspartate aminotransferase (AST or SGOT) and alanine aminotransferase (ALT or SGPT) (23). These enzymes are normally found in liver cells. If the liver is damaged, the liver cells release these enzymes into the bloodstream, raising their levels in the blood which is an indication of liver disease. AST is commonly found in a variety of tissues, including the liver, heart, muscles, kidneys, and brain. If any of these tissues are damaged, it will be released into the serum. For example, its level in serum rises in the event of heart attacks and muscle disorders (24). Therefore, it is not a very specific indicator of liver damage. In contrast, ALT is commonly found in the liver but not exclusively in this organ. However, its concertation is high in the liver. It is released into the bloodstream due to liver damage. It acts as a relatively specific indicator of liver condition. In our study, a slight increase in the blood level of this enzyme was observed. It should be noted that the increase was mild and probably not the result of liver damage; however, this increase seems to be due to this belief that hemolysis inevitably occurs after cupping. Therefore, one can expect a false positive increase in liver enzymes. The effect of cupping on improving blood and lymph circulation and strengthening liver function has been confirmed in a study done by Jun (25,26). The results of this study are inconsistent with the fact that liver damage increases SGPT. Therefore, it seems that the increase in liver enzymes after cupping is not the result of liver failure and other factors such as slight skin inflamation could be the reason after cupping.

## CONCLUSION

The results showed that cupping could improve some blood biochemical variables in individuals, although the results and laboratory analyzes were not significant for some variables.

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