Abtract

Objectives: To investigate the effectiveness of wet cupping as alternative treatment on reducing bone pain and built a model that predicts the level of improvement for patients who suffer from bone pain.

Methods: This retrospective study was conducted on 289 patients referred from specialty clinics to Prophetic Medicine Clinics (PMC) between September 2013 and August 2015. The effectiveness of cupping is assessed on patients with bone pain who were redirected to PMC, King Abdulaziz University Hospital, Jeddah, Saudi Arabia. An artificial neural network (ANN) method was used to propose a model that predicts levels of improvement for patients suffering from bone pain. Therefore, a random sample of 90% of the data was used to build the ANN model and tested by the remaining 10%. Inferential statistics were conducted to study relations and compare blood tests before and after treatment.

Results: Out of 289 patients suffering from bone pain, more than 11% were completely cured, and 55% improved after wet cupping treatment sessions. The proposed ANN model showed a good performance with more than 72% accuracy. In addition, the statistical analysis showed a significant improvement for most blood tests.

Conclusion: Wet cupping has positive effects on reducing bone pain. We recommend the use of an ANN model in PMC to predict whether patients will benefit from the treatment to reduce pain. This is a recommendation for further study not a conclusion.

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Wet cupping is a traditional and alternative treatment that is still used to reduce patients’ pain in several Eastern and European countries. It has been proven effective and has an essential role in reducing pain and as a treatment for many diseases in past studies. Bone pain is a common health problem and a major cause of activity restriction. This pain may not be limited to a particular age or gender. Patients with bone pain feel aching, tenderness, or other discomfort in some parts of their bones with or without moving. This pain may be due to any causes that affect the function or structure of the bone such as trauma or a deficiency in calcium and vitamin D, which could lead to osteoporosis, metastatic bone cancer, sickle cell anemia, osteomyelitis, leukemia, or pregnancy-related pelvic girdle pain. Bone pain may be reduced with pain relievers, powerful antibiotics, nutritional supplements, cancer treatments, or surgery according to the cause. In addition, acupuncture was significantly effective more than physical exercise to relieve pain according to the physical function score of the Zurich claudication questionnaire (ZCQ) and is considered as more satisfactory than medication according to the satisfaction score.

In this study we investigate the effectiveness of wet cupping as alternative treatment on reducing bone pain and built a model that predicts the level of improvement for patients who suffer from bone pain. In addition, we answered the following questions: Is there a relationship between bone pain and osteoporosis, and/or vitamin D deficiency? Does wet cupping improve patients’ health?

Methods. This study was conducted according to the ethical principles of the Helsinki Declaration. The Ethical Committees of the Faculty of Medicine at King Abdulaziz University (KAU), Jeddah, Saudi Arabia approved the initiation of the Prophetic Medicine Clinics (PMC) as an outpatient Clinics in King Abdulaziz University Hospital (KAUH). Institutional Review Board (IRB) of KAUH approved the proposal of this study. The trials are registered in the World Health Organization Clinical Trials Registator (Registration Number: IRCT2015050322060N1). The study guaranteed patients’ confidentiality to participate in the research. Signed informed consent was obtained from each participant upon enrolment in the study and they received their usual ordinary treatment.

This study used different methods to find prior related research for the effects of wet cupping on reducing bone pain. These included searching for published articles in different databases such as MEDLINE®, PubMed, Google Scholar, Google, and Cochrane using key words in addition to evaluating bibliographies of related articles from 2013 to 2018.

A retrospective study was performed to measure the effect of wet cupping in reducing bone pain for 289
patients at PMC. These patients were referred from specialty clinics at KAUH from September 2013 to August 2015.

According to the research inclusion criteria, only patients with bone pain were tested. One part of the data was taken from a questionnaire and the other part from the KAUH patients’ database that includes blood tests results conducted at the initial visit to PMC and after 3 sessions. The tests used in this study are the intracellular protein test (ferritin), autoantibodies that bind to contents of the cell nucleus (ANA), white blood count (WBC), red blood count (RBC), hemoglobin level (Hb), thyroid stimulating hormone (TSH), vitamin D level (Vitamin D), C-reactive protein (CRP), and fasting blood sugar (FBS).

The wet cupping procedure used in the PMC involved cleaning the pain area with an alcohol swab, then placing disposable cups over the pain area and starting moderate suction. The cup is left for about 3 to 5 minutes. Then the cup is removed, and parallel incisions are conducted on the area of pain with a disposable lancet, as reported previously.2,3 Most patients repeated the wet cupping procedure each month until the pain was reduced.

Statistical analysis. The Statistical Package for the Social Sciences (SPSS) version 21 (Armonk, NY: IBM Corp.) and the R program were used to analyze the cupping data.8 Inferential methods such as Wilcoxon signed rank test for paired sample test was used on all blood analyses as the data are non-normally distributed. P-value less than 0.05 was considered significant.

In addition, an artificial neural network (ANN) was used to propose a model that can predict the level of improvement and pain reduction after wet cupping for patients suffering from bone pain. Artificial neural network consists of 3 main layers: input units in the input layer that represent variables measured for each training instance. Those inputs are weighted and fed to a hidden layer at the same time. Output units or neuroses are the units in the hidden layers and output layer. Then, outputs of the hidden layer are fed to different hidden layer. Finally, weighted outputs of the last hidden layer are fed to the output layer, which gives the estimate and prediction for the instances. Each output unit uses a nonlinear (activation function) to the weighted input.9,10

Results. A total of 289 patients were referred to PMC suffering from bone pain, and most of the patients were ages 36-53 (n=138, 47%) (Table 1). The percentage of recovery from bone pain and improvement of pain was more than 66% (192 out of 289) for both males and females. In addition, patients aged less than 36 years had a higher rate 74% (55 out of 74) of recovery and improvement from bone pain in their age group than older patients. The study shows that 11.4% of the patients were completely cured after wet cupping, and 55% of patients had bone pain improvement. Each patient had blood tests before and after 3 wet cupping sessions. Therefore, the Wilcoxon signed rank test was used to see if there were significant differences in all blood tests before and after wet cupping. The results in Table 2 show significant differences between all blood tests before and after wet cupping except FBS, HB, RBC and WBC tests. According to the normal range used in KAUH devices, these differences showed improvement after wet cupping sessions. Focusing on CRP, TSH, and Vitamin D, we observed that there was significant improvement in blood test after wet cupping sessions, especially Vitamin D level that showed a

Table 1 - Cupping impact on bone pain according to gender and age group.

| Variables | Cupping impact on bone pain | Total |
|-----------|-----------------------------|-------|
|           | No improvement | Improvement | Complete recovery |
| Gender    |               |              |                   |
| Female    | 70 (33.7) | 112 (53.8) | 26 (12.5) | 208 |
| Male      | 27 (33.3) | 47 (58.0) | 7 (8.6) | 81  |
| Age       |               |              |                   |
| 18-35     | 19 (25.7) | 42 (56.8) | 13 (17.6) | 74  |
| 36-53     | 50 (36.2) | 71 (51.4) | 17 (12.3) | 138 |
| 54-71     | 28 (36.4) | 46 (59.7) | 3 (3.9) | 77  |
| Total     | 97 (33.6) | 159 (55.0) | 33 (11.4) | 289 |

Values are presented as number and percentage (%)
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Table 2 - Blood test comparison before and after wet cupping.

| Variables     | Mean±SD   | 95% Confidence interval | P-value  | KAUH Normal range |
|---------------|-----------|-------------------------|----------|-------------------|
| Vitamin D before cupping | 23.5 ± 36.4 | 30.4 - 39.7              | 0.00*    |                   |
| Vitamin D after cupping   | 26.7 ± 53.5 | 50.1 - 59.3             |          |                   |
| CRP before cupping       | 22.1 ± 11.2 | 7.1 - 15.4              |          |                   |
| CRP after cupping        | 13.1 ± 8.4  | 5.8 - 12.0              | 0.012*   |                   |
| FBS before cupping       | 2.6 ± 6.1   | 5.6 - 6.6               |          |                   |
| FBS after cupping        | 1.9 ± 5.9   | 5.5 - 6.2               | 0.143    |                   |
| Ferritin before cupping  | 74.9 ± 49.7 | 35.6 - 63.8             |          |                   |
| Ferritin after cupping   | 65.2 ± 59.1 | 46.8 - 71.3             | 0.013*   |                   |
| WBC before cupping       | 3.4 ± 6.8   | 6.1 - 7.4               | 0.663    |                   |
| WBC after cupping        | 42.3 ± 10.9 | 3.0 - 19.0              |          |                   |
| RBC before cupping       | 0.6 ± 4.7   | 4.5 - 4.8               | 0.257    |                   |
| RBC after cupping        | 0.6 ± 4.7   | 4.5 - 4.8               |          |                   |
| Hb before cupping        | 1.7 ± 12.5  | 12.2 - 12.8             | 0.246    |                   |
| Hb after cupping         | 1.8 ± 12.6  | 12.2 - 12.9             |          |                   |
| TSH before cupping       | 19.1 ± 4.8  | 0.8 - 8.0               | 0.015*   |                   |
| TSH after cupping        | 9.6 ± 3.2   | 1.4 - 5.0               |          |                   |

*Statistically significant at P-value <0.05. CRP - C-reactive protein, FBS - fasting blood sugar, WBC - white blood count, RBC - red blood cells, Hb - hemoglobin level, TSH - thyroid stimulating hormone, KAUH - King Abdulaziz University Hospital

clear improvement for most patients. The average of Vitamin D level before wet cupping was 36.4 and after wet cupping it reached the normal range of 53.5. In addition, the TSH improved and reached the normal range. The CRP also improved but remained above the normal range.

Descriptive analysis shows that 73 patients who had bone pain suffered from osteoporosis, and more than 50% of these patients belonged to age group 36-53 years, while 45.2% of the patients who suffered from osteoporosis belonged to age group 54 and 71 years. Therefore, we conducted a Chi-square test to explore the factors that have relationships with osteoporosis. The relationships between osteoporosis and patients’ age, deficiency of Vitamin D, and gender were significant at \( p < 0.05 \). However, there was no significant relationship between family history of the patient and osteoporosis.

In addition, we built an ANN model that represented a classification for the level of improvement. The input layer consisted of gender, age, osteoporosis, vitamin D level test, CRP, and family history as input units. The levels of improvement (complete recovery, improvement, no improvement) were considered as output units. The proposed ANN model has one hidden layer as shown in Figure 1. The performance of the neural networks model was evaluated by the misclassification rate, which was 0.276. Hence, model accuracy was 0.724. Moreover, we obtained from the ANN model the important input variables that have strong relationships with the level of improvement. These were the CRP test, Vitamin D level, and nonexistence of family history, which have strong positive relationships, while osteoporosis has a moderate negative relationship with the level of improvement.\(^{13}\)

Discussion. This study was performed to measure the effect of wet cupping in reducing bone pain for 289 patients at PMC. That is, the study was limited to the patients who were referred from specialty clinics at KAUH, Jeddah, Saudi Arabia from September 2013 to August 2015. The results show the beneficial effects of wet cupping on reducing pain for most patients, where 11.4% of the patients were completely cured after wet cupping, and 55% of the patients’ health was improved. We have observed that the absence of significant differences in the changes in some blood tests, WBC, FBS, RBC and HB, is positive because these blood tests remained in the normal range after wet cupping, which shows the effectiveness of wet cupping on a patient’s overall health as reported in previous studies.\(^5,14\) That is, all related research identified a limited part of the bones and proved that cupping has a positive effect on pain treatment, but this research did not specify a specific
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Figure 1 - Neural networks model of the patient data from Prophetic Medicine Clinics at King Abdulaziz University Hospital, Jeddah, Saudi Arabia. VitD - vitamin D, CRP - C-reactive protein

part of the bone. It proved the positive effect of cupping on all the body’s bone by reducing or curing pain. Furthermore, the technique used in this study differs from the techniques used in the clinical trial as carried out by the Ministry of Health in Saudi Arabia, but the results were similar.¹

The proposed ANN model showed a good performance with accuracy of more than 72% and will support doctors in cupping clinics to predict patients’ level of improvement prior to starting the wet cupping treatment. This will be useful to decide whether the admitted patients will benefit from the wet cupping treatment to reduce pain.

In conclusion, this study shows promising effects of wet cupping therapy that can be considered as a complementary therapy because it clearly reduced bone pain for most patients. In addition, cupping shows a positive impact on the regulation of several blood test levels. Therefore, further studies are recommended with a larger sample of patients to confirm the findings of this study. Also, there is a need to construct models based on age or gender and explore the most effective factors on patient health and use alternative statistical model techniques to compare with the ANN model.

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References

1. AlBedah A, Khalil M, Elolemy A, Hussein A a, AlQaed M, Al Mudaimeem A, et al. The use of wet cupping for persistent nonspecific low back pain: Randomized controlled clinical trial. J Altern Complement Med 2015; 21: 504-508.
2. Arslan M, Gökgöz N, Dane Senol. The effect of traditional wet cupping on shoulder pain and neck pain: A pilot study. *Complement Ther Clin Pract* 2016; 23: 30-33.

3. Abduljabbar H, Gazzaz A, Mourad S, Oraif A. Hijama (wet cupping) for female infertility treatment: A pilot study. *Int J Reprod Contraception, Obstet Gynecol* 2016; 5: 3799-3801.

4. Mourad SA, Al-Jaouni SK. The effect of wet cupping on blood haemoglobin level. *Altern Integr Med* 2016; 5: 1-6.

5. Al Jaouni S, El-Fiky E, Mourad S, Khamis Ibrahim N, Kaki A, Rohaiem S, et al. The effect of wet cupping on quality of life of adult patients with chronic medical conditions in King Abdulaziz University Hospital. *Saudi Med J* 2017; 38: 53-62.

6. Pritchard J, Gotter A. Bone pain. [cited 2016]. Available from: https://www.healthline.com/health/bone-pain

7. Oka H, Matsudaira K, Takano Y, Kasuya D, Niiya M, Tonosu J, et al. A comparative study of three conservative treatments in patients with lumbar spinal stenosis: lumbar spinal stenosis with acupuncture and physical therapy study (LAP study). *BMC Complement Altern Med* 2018; 18: 19.

8. Team RC. A language and environment for statistical computing [cited 2013]. Available from: https://www.R-project.org/

9. Amato F, López A, Pe-a-Méndez EM, Vavnhara P, Hampl A, Havel J. Artificial neural networks in medical diagnosis. [cited 2013]. Available from: doi:10.1007/978-3-7908-1788-1_8

10. Hertz JA. Introduction to the theory of neural computation. 1st ed. Boca Raton: CRC Press; 2018.

11. Team RC. A language and environment for statistical computing. Vienna (AU): R Foundation for Statistical Computing; 2016.

12. Zhang Y, Yang Y. Cross-validation for selecting a model selection procedure. *J Econom* 2015; 187: 95-112.

13. Goh ATC. Back-propagation neural networks for modeling complex systems. *Artif Intell Eng* 1995; 9: 143-151.

14. Kim S, Lee SH, Kim MR, Kim EJ, Hwang DS, Lee J, et al. Is cupping therapy effective in patients with neck pain? A systematic review and meta-analysis. *BMJ Open* 2018; 8: e021070.

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