

Efficacy of Hot and Dry Bath (*Hammām-i-Hār-Yābis*) in Activities of Daily Living for Management of Post Stroke Hemiplegia: An Exploratory Clinical Trial

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ABSTRACT

Introduction: Hemiplegia (*Fālij*) is usually caused due to obstruction (*sudda*) in ventricles of brain (*butūn-i-dimāgh*) or base of the brain (*mabda-un-nukha*). Viscid and tenacious phlegm (*Balgham*) chokes the passages present in the nerves and blocks the transmission of motor impulses (*Rūh-i-Muharrik*) into the organs to cause paralysis of a limb. Rarely, in the absence of any obstruction, the paralysis occurs due to unresponsiveness of organs due to their changed constitution (*Sue-Mizāj-i-A'zā*). Turkish bath (*Hammām*) is recommended for the resolution (*Tahllul*) and evacuation (*Tanqiya*) of viscid phlegm (*Ghaleez Balgham*) from impacted nerves by virtue of heat therapy to rejuvenate the motor functions in hemiplegia.

Aim: To evaluate the effect of hot and dry bath (*Hammām-i-Hār-Yābis*) in activities of daily living in management of post stroke hemiplegia.

Materials and Methods: This open, single arm, exploratory clinical trial was conducted during January 2018 to February 2019 at NIUM hospital, Bangalore, on 30 diagnosed patients

of post stroke hemiplegia. Patients were subjected with hot dry bath for 15 minutes at a temperature of 60°C from day 1st till 30th day. A total of 10 sittings were given on every 3rd day. Barthel Index (BI), which consists of Activities of Daily Living (ADL), was used to assess the efficacy of hot and dry bath in the patients of hemiplegia. Friedman's test with Dunn's multiple comparison test was used to assess the efficacy of the treatment.

Results: The mean age of the participants in the study was 42.54±3.3 with male dominance. Statistically significant improvement was observed in BI scores between pretreatment to 15th day ($p<0.01$); 15th to 30th day ($p<0.001$) and pretreatment to 30th day ($p<0.001$).

Conclusion: Hot and dry bath significantly improved the activities of daily living in the patients of post stroke hemiplegia. Another benefit of this therapy is infrequent and mild severity of side effects as compared to the oral medications in conventional system of medicine for post stroke neurodisabilities.

Keywords: Temperament, Thermo-therapy, Unani medicine

INTRODUCTION

Hemiplegia (*Fālij*), a well-known disease since Greek-o-Arabic period, means "to halve". It is characterised by loss of movements and sensations in longitudinal half of the body as sensory impulse (*Rūh-i-Hassās*) and motor impulse (*Muharrik*) either fail to penetrate the organs or may penetrate but the organs fail to respond due structural derangement [1-4]. It is caused due to obstruction (*Sudda*) in nerve impulse (*Rūh-i-Nafsāni*), congestion (*Imtila*), and inflammation (*Warm*). Obstruction in the passage of nerve impulse is formed due to increased viscosity, tenacity, and enormous quantity of thick fluid. Inflammation obstructs the passages of nerve impulses by exerting pressure over them while congestion inside the vessels causes their rupture due to builtup tension [1,5]. Rhazes (*Rāzi*) quoted a statement of Galen (*Jālinūs*) that, if trouble is at the origin of the spinal cord it leads to the paresis of whole body, except face. The study further stated that cervical vertebrae may lead to the paralysis of the whole body if, dislocated inwards impinging on spinal cord. [6]. Tabri R. proposed that hemiplegia occurs due to an obstruction in any part of the brain. In hemiplegia, the nerves absorb the pathogenic fluid (*Ratūbat-e-Raddiya*), descending from the brain and get paralysed leading to loss of voluntary movements of involved part [7].

Prodromal features of hemiplegia such as heaviness of head, sudden severe headache, blackouts, venous engorgement in the neck, coldness of extremities, twitching in whole body, heaviness in feet, difficulty in movement, giddiness, and vomiting have also been discussed by Sina I, Razi Z, Tabri R, Hubal I [1,6-8]. Clinically, stroke or cerebrovascular accident is defined as an abrupt onset of neurological

deficit that is attributable to a focal vascular cause which is supported by radiological brain imaging [9]. Acute focal stroke is characterised by the sudden appearance of a focal deficit of brain functions [10]. Approximately, 85% of strokes are caused by sudden onset of inadequacies of blood flow to some part or whole of the brain. The remaining strokes are due to haemorrhages into the brain tissue and into the spaces surrounding the brain, most frequently the subarachnoid space [11]. Location and extent of lesions affect the duration and severity of sign and symptoms in the patients of stroke due to cerebral infarction [12]. Cerebrovascular diseases are one of the major causes of human mortality and morbidity. It was the second leading cause of death in 2004 amounting to 5.7 million deaths worldwide representing 9.7% of total deaths. Projection to the year 2030 shows that 8 million lives are likely to be lost due to cerebrovascular diseases globally [13]. In India, age-adjusted prevalence rate of stroke was between 250-350/100,000 in the last decade [14].

Cerebrovascular accident is the most common cause of hemiplegia, which imperils millions of stroke survivors to lead their lives with altered activities of daily living [13]. Management of hemiplegia in conventional medicine, secondary to ischaemic stroke consists of medical support, thrombolytics, anticoagulants, antiplatelet agents and neuroprotection [9]. The figures in terms of deaths and disability caused by stroke grossly suggest the limitations in its management. Considering this unconvincing scenario, *Unāni* medicine axiomatically comes to fore, as the, hemiplegia has successfully been treated since ancient times without any significant and obnoxious side effects on the body. The *Unāni* treatment of hemiplegia consists of evacuation of morbid matter (*Tanqia Mawād-i-Raddiya*), rejuvenation of weak organs (*Ta'dil Mizāj*),

general strengthening (*Taqwiat-i-Ām*) and nerve strengthening (*Taqwiat-i-A'sāb*). Eminent *Unāni* physicians have advocated massage (*dalk*), exercise (*Riyādat*), Turkish bath (*Hammām*) etc, in the rehabilitation of hemiplegia [1-8,15-18].

Hammām is an Arabic word, derived from *Hamm* meaning to heat. Architectural structure of *Hammām* consists of three rooms having variable temperature and humidity. First, second and third rooms have cold and wet (*Bārid-Raṭab*), hot and wet (*Hār-Raṭab*) and hot and dry (*Hār-Yābis*) temperaments, respectively [7]. Evacuation (*Istifrāgh*) is the most preferable principle of treatment for the diseases caused by excessive pathogenic fluid (*MaddiAmrāq*) [19]. Turkish bath is considered effective among several regimenal modalities employed for evacuation of causative morbid material from the body in the form of sweat [5]. The mechanism, procedure and benefits of Turkish bath fairly resemble today's famous procedure like sauna bath. In recent years, Turkish bath gained increasing international attention due to its preventive as well as therapeutic beneficial effects. Reported evidence reveal its benefits in rheumatic diseases, skin ailments, hormonal disturbances, and cardiovascular system, etc. [20-22]. To the best of the knowledge available, this study is the first of its kind to scientifically explore the efficacy of *Hammām-i-Hār-Yābisin* cases of post stroke hemiplegia through rigour of a clinical trial.

MATERIALS AND METHODS

The present open, single arm exploratory clinical trial was conducted from January 2018 to February 2019 at National Institute of Unani Medicine (NIUM), Bangalore, Karnataka, India. Institutional Ethical Committee accorded the Ethical clearance with following number: NIUM/IEC/2016-17/027/IBT/05. The study was conducted according to the Declaration of Helsinki and the Good Clinical Practice (GCP) guidelines. The trial was registered in clinical trial registry of India (www.ctri.nic.in) bearing a number CTRI/2018/03/012677.

Inclusion criteria: Radiologically and clinically diagnosed patients of post stroke hemiplegia, patients between 30-65 years of age, patients of stroke suffering not less than 30 days, in both genders.

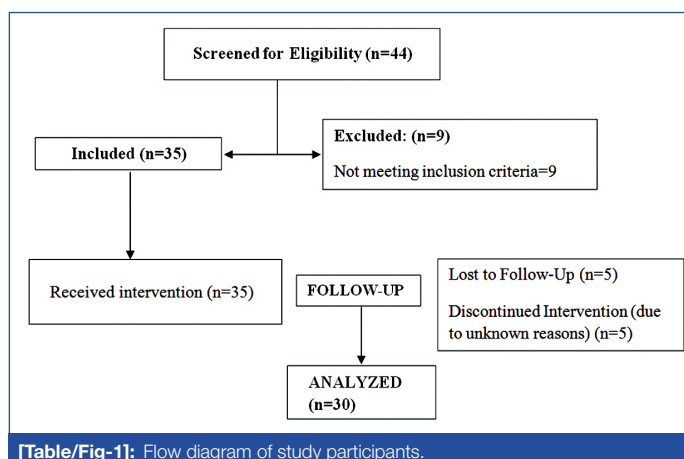
Exclusion criteria: Patients with minor stroke having non disabling deficit, patients with altered sensorium and aphasia, serious enough with impaired understanding of simple commands, pregnant and lactating women, orthopaedic or rheumatological diseases impairing mobility, evidence of fixed contracture, patients with liver, kidney, cardiac, and other co-morbidities, uncontrolled diabetes mellitus and severe hypertension were excluded.

Sample size calculation: The sample size was calculated using the following formula: $N = (Z_{\alpha})^2 \frac{S^2}{d^2}$ [23]. Where, N=sample size required, S=standard deviation obtained from previous study (38.9) [24], d=expected clinically significant difference between pre and post means=14, and Z_{α} =normal deviate for two tailed hypothesis=1.96. The final calculated sample size was 30.

Study Procedure

Patients fulfilling the inclusion criteria were provided with an information sheet having details regarding the nature of the study and the procedure of intervention. Patients were selected randomly using convenient sampling from the NIUM outpatient/inpatient Department and they reported at the Regimenal Therapy Centre. Patients were given sufficient time to go through the contents of informed consent sheet and ensured to feel free to ask any doubt regarding the study and procedure. After voluntarily agreeing to it, they were requested to sign the informed consent form for the enrolment in the study. Socio-economic classification of the patients was done on the basis of modified Kuppuswamy Scale [25]. The enrolled cases of hemiplegia underwent the hot and dry bath every third day for 15 minutes per sitting at a temperature of 60° C till the 30th day of the study (10 sittings) [26]. The timing for the treatment was from 11:00 am to 1:00 pm daily. Out of 44 screened patients, 35 fulfilled the inclusion criteria and 30 cases completed

the study as five cases were lost to follow-up, as they discontinued the intervention [Table/Fig-1].



[Table/Fig-1]: Flow diagram of study participants.

Barthel Index [27]: The assessment of the efficacy of hot and dry bath in the patients of hemiplegia was done on the basis of Barthel Index (BI) which consists Activities of Daily Living (ADL) such as feeding, bathing, grooming, dressing, bowels, bladder, toilet use, transfer (from bed to chair and back), mobility (on level surfaces), and stairs. On the day of enrolment, the baseline values of the activities of daily living were assessed and compared with post treatment values. Before starting the treatment, assessment of activities of daily living (ADL) was done using Barthel index. No patient reported any adverse effect or reaction; therefore, it is assumed that the intervention is free from any kind of unexpected or unusual side effect.

Patients were followed-up fortnightly (0, 15th, and 30th day) and enquired about any improvement or worsening of their symptoms at every visit. Enrolled cases of controlled diabetes mellitus and hypertension using concomitant medications were allowed to continue in the study provided there was no change in dosage and schedule of the used drugs before 15 days of enrollment and during the entire duration of the study.

STATISTICAL ANALYSIS

The statistical analysis was restricted to those patients who had completed the study. Statistical Package of Social Science (SPSS) version 22.0, and R Environment version 3.2.2 software for the analysis of the data. Friedman's test with Dunn's multiple comparison tests were applied and $p < 0.05$ was considered as statistically significant.

RESULTS

The demography of the participants is depicted in [Table/Fig-2]. The mean age of the participant in the study was found to be 42.54 ± 3.3 years with male dominance among the studied participants.

Demographic characteristics	Values in Mean±SD or number ratio (n=30)
Age (years)	42.54±3.3
Gender (Male:Female:Others)	26:4:0
Religion (Hindu:Muslims:Christians:Others)	20:9:1:0
Marital Status (Married:Unmarried)	29:1
Socio-economic status (I:II:III:IV:V) *	2:3:7:17:1
Body side involved (Right:Left)	21:9
Duration of disease in months	21.47±9.6
Risk Factors (H:A:A+H:A+S:H+S:H+D:NRF)	8:3:3:2:2:7:5

[Table/Fig-2]: Participants demographics.

*I=Upper, II=Upper middle, III=Lower middle, IV=Upper lower, V=Lower

**H=Hypertension, A=Alcoholic, S=Smoker, D=Diabetic, NRF=No risk factor

As depicted in [Table/Fig-3], rank sum difference from 0 to 15th day was -25.500 and was statistically significant ($p < 0.01$). The rank sum difference from 15th to 30th day was -30.000 and found statistically

significant ($p < 0.001$). The rank sum difference from 0 to 30th day was -55.500 and was statistically significant ($p < 0.001$).

Multiple comparisons at two different levels	Rank sum difference	p-value
(0 Day) vs (15 th Day)	-25.500	$p < 0.01^*$
(0 Day) vs (30 th Day)	-55.500	$p < 0.001^*$
(15 th Day) vs (30 th Day)	-30.000	$p < 0.001^*$

[Table/Fig-3]: Efficacy assessment on Barthel Index Value.
*Friedman's test with Dunn's multiple comparison tests

DISCUSSION

Present open, single arm exploratory clinical study was conducted on 30 patients of hemiplegia with disabilities in activities of daily living. The assessment of efficacy was carried out on the basis of BI comprising activities of daily living. Pre, mid and post treatment values of BI were statistically analysed using Friedman's test with Dunn's multiple comparison tests. Hot and dry bath therapy showed a significant difference in the mean scores of BI indicating its effect in reducing the post stroke neurodisabilities. The results showed significant improvement in activities of daily living after 30 days of study.

Phlegmatic matter (*Balghami Madda*) is thought to be the pathogenic matter for hemiplegia, which accumulates first in brain (*Dimagh*) followed by a descent in spinal cord (*Nukha*) and nerves (*Aaṣab*), blocking the routes of sensory impulse (*Rūh-i-Hassās*) and motor impulse (*Muharrik*) [27]. According to the principles of treatment, phlegmatic diseases (*Balghami Amraz*) require evacuation of the causative material followed by normalisation and rejuvenation of physiological functions of the diseased organ. Once the matter is evacuated, the organs start regaining vigour and vitality due to tonic and stimulant properties of the drugs (*Muqawwi-e-Aasabwa Muharrik-e-Aasab*). Phlegmatic matter is eliminated from the brain through concoctive and purgative (*Munzijwa Mushil*) therapies, while the matter diffused in the peripheral nerves is eliminated by hot and dry bath (*Hammām-i-Hār-Yābis*). Hemiplegia is a cold and moist disease (*Baridwa Ratab*), hence, the employed treatment should have hot and dry (*Hārwa Yābis*) properties. *Hammām-i-Hār-Yābisin* has hot and dry properties and therefore, beneficial in the treatment of hemiplegia as evidenced by the account of available classic *Unani* literature [1-5].

Hot and dry bath has potential effect to dissolve and liquefy the morbid material. It generates a dry heat which is endowed with hot and dry properties. These properties confer it as the properties of resolution (*Tahallul*), attenuation (*Talṭeef*), evacuation (*Tanqiya*) and rejuvenation (*Tadeef*) [22]. Razi Z mentioned in *Al-Hawi* that, he treated many patients of hemiplegia by employing hot and dry bath only [6]. It may be put forth, that, heat of hot and dry bath may dissolve the matter diffused in nerves and eliminate it by sudation thereby, completing the process of evacuation and rejuvenation [28]. As soon as the causative cold and moist matter is dissolved and eliminated by the action of heat, the passage of the nerves begin to reopen to enable pulse to travel normally to the paralysed parts, imparting them vigour and vitality, as exhibited by improved motor functions and activities of daily living, thereby, improved quality of life.

Hot and dry bath induces vasodilatation and increases the blood circulation to eventually cause detoxification. The tissues of diseased organ bathe with more than normal amount of blood and nutrients which invigorate the paralysed part and strengthen them and thus potentiate the function of the nerves enabling them to provide activity and strength in the paralysed extremities [29].

There is a general belief among rehabilitation professionals that the motor recovery occurs earlier in leg and is more complete than in the arm. After a stroke, maximum recovery was achieved in 95% of patients within nine weeks. The extent of recovery is highly dependent on the severity of initial deficit. About 79% of patients with initial mild paresis regained full recovery, compared to only 18% of patients with initial severe paresis [29,30].

In present study, almost all patients reported improvement in motor power of paralysed limbs as well as improvement in ADL, especially in personal hygiene and dressing which are considered important milestones in management of post stroke patients. This improvement is expected to reduce dependence of care providers as well as burden for patient's family.

Limitation(s)

Some of the potential limitations of the present study were, of a control and short duration of the study. Thus, it is recommended that future clinical trial should necessarily be done as a randomised control trial with a larger sample size and longer duration involving other comprehensive assessment scales.

CONCLUSION(S)

It may be concluded that hot and dry bath is effective in the treatment of post stroke neurodisabilities. This treatment regimen may be used to reduce the dependence and improve the quality of life in patients of hemiplegia. Another benefit of this therapy is infrequent and mild severity of side effects as compared to the oral medications in conventional system of medicine for post stroke neurodisabilities.

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Authors' contribution: Study concept, interpretation of result: ANA; writing the protocol, conducting the study, and drafting the manuscript: MA and UA; critical revision and editing: MN, and AAA. All authors have accepted responsibility for the entire content of this manuscript and approved its submission.

Editorial note: The Unani Medicine offers treatments for chronic ailments and diseases and lifestyle disorders which have been found to be highly effective and acceptable. However, the way Unani Medicine explains the organs and diseases is different than how modern medicine explains the modern organs and diseases. It is good to bring in tradition medicine into the main stream medicine, which this article has attempted. We must encourage such work, especially when presented as clinical trials.

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