Scientific Based evidence of the effects of combined Makka Mud therapy (MMT) in treating nervous system injuries with special reference to MMT (Two case reports).

Manal G. Abd El Wahab[1] and Salwa Sager[2]

[1]Department of Anatomy, Faculty of Medicine for Girls, Al Azhar University, Cairo, Egypt. and (YAJ) Members of Yousef Abdul Latif Jameel Scientific Chair of Prophetic Medicine Applications, Faculty of Medicine, King Abdulaziz University (KAU) Jeddah Kingdom of Saudi Kingdom of Saudi Arabia (KSA).
[2]Certified Nurse, Ministry of Health Taif Hospital, KSA and (YAJ) Members of Yousef Abdul Latif Jameel Scientific Chair of Prophetic Medicine Applications, Faculty of Medicine, King Abdulaziz University (KAU) Jeddah Kingdom of Saudi Kingdom of Saudi Arabia (KSA)
omaman2005@hotmail.com

Abstract: Aim: Evidence based effects of combined Makka Mud therapy (MMT) in treating nervous system injuries. Material and methods: Prerartion of Makka Mud (MM) was from Makka soil from AL sail way –Al kaekea area- Jazan Road - KSA. (MM) was chemically analyzed, It was full of elements, ions and heavy metals which included CO3, HCO3, SO4, Cl-, iron Fe, cobalt, Ni, copper Cu and zinc Zn, Na+, K+, Cd, Mn, Pb. MMT was applied on two cases: one female 14 years old suffered from head injury after car accident that caused UMNL and hemiplegic. The other case was a new born infant aged 8months with hydrocephaye. **Results**: Combined (Mmt) lead to improvement of body function, decreased pain, Improvement Of Nervous System And Reflexes, Fine Movements In Two Cases Of Head Trauma And hydrocele. **Conclusion:** Combined (MMT) could be adjuvant complementary management for head and nervous system traumas. further controlled studies are needed.
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1. Introduction:

It was mentioned in the Holy book of Muslims in the Quran, many ayat and also in Ahadith of the prophet Mohamed BPUH that Allah the most merciful the most graceful had created the first human Adam from different forms and stages of mud which originally formed from soil and water: Allah created the first human Adam from soil, mud, mud which can act like glue (lazeb as mentioned in Quraan) and Allah created human from (salsal) changed black hard mud without touching fire (non kooked) witch when knocked can produce sound. In another ayat, the human and all living being were created from water. In surat al najm, aya 32: Allah had created the human from earth.

In Al sfahani mud was formed from mixing the soil with water and other tafasser of Ibn Katheer, al Galaleen and Ezz Abd Salam, Al Kortoby and Al tabary and Shankity lately: salsal which was the unit formation of human meant the hard mud which changed without touching fire and had a sound when knocked on.

Examples of some verses mentioned in Quraan about human creation:

- Your creation from dust: Surat Fater 11 and Surat Ghafer verse 67
- *Your creation from clay: Surat Al Anaam (cattle) verse 2*
- *The creation of man* began with the clay of Surat Al Sajda verse 7
- And as thy Lord said to the angels, I am the creator of man of clay Surat Sad, verse 71
- Drain (chain) of clay: Surat Al Moemenoon (The faithful people), verse 71
- I created them from the mud of Lazeb: Surah Al-Safafat, verse 11 Al-‘ explained by Ezz ibn Abd al-Salam said that mud was adhesive and sticky
- Clay as pottery: Surat al-Rahman, verse 14
- Clay from hamaen masnoon: verses 26-28-33 A variable which had changed black clay with a sound when knocked on chisel: Tafsir al-Jalalain and Al-Azaban Abd al-Salam
- Created you from the earth: Surah Al-Najm, 32
- We have made of water everything living: Surat Al Anbeya (Prophets) verse 30
- He created every daba (creature) of water: Surah An - Nur verse45
- The creation of human was from water: Al - Furqan verse5 4
- Did not we create you from a humbled water Surat Al - Mursalat. verse20

It was reported that mud packs were beneficial for many health problems specially osteoartherosis (Bellometti et al., 1979), osteoarthritis (Costantino et al., 2006). Odabasi et al. (2009) Fioravanti et al. (2010), rheumatic disease, Fioravanti et al. (2011), fibromyalgia (Giannitti et al., 2008). Mud was recorded to be anti-inflammatory Giacomino (de Michele, 2007) and could change serum receptors of tumor necrosis factor (Bellometti et al., 2002), and could change body enzymes (Bellometti et al. 2005). It was noted that Oxidative stress, hemoglobin content, superoxide dismutase and catalase activity were influenced by sulphur baths and mud packs in patients with osteoarthritis. Jokić et al. (2010), patients with Psoriasis were treated mud bath therapy Costantino (Lampa, 2005). Datients with Musculoskelet Rehabilitation were treated with mud compressors (Gungen et al., 2015). Therapeutic efficacy of peloid plasters in the treatment of osteoarthritis of the peripheral joints and spondylosis were documented (Klimiuk et al., 2004) Mud could decrease pain and improve quality of life (Yilmaz et al., 2004).

The review of literature showed many studies were done on mud, however there was no study the effect of MM on emprove healing of the nervous system after heat trauma or on hydrocephaly. The aim of this work is to find out Evidence based effects of combined Makka Mud therapy (MMT) in treating nervous system injuries with special reference to MMT.

2. Material and Methods:

Makka soil analysis:

Makka soil was analyzed chemically especially for the present work and was made in Egypt Suez Canal university Sues Cana by Head of the Department Prof Dr. Mohamed Ahmed Nasr.

Soil analysis of Makka soil- after rain that was taken from AL sail way –Al kaekea- Jazan Road - KSA. (Table 1) and was full of elements, ions and heavy metals which included CO3, HCO3, SO4, Cl-, iron Fe, cobalt, Ni, copper Cu and zinc Zn, Na+, K+, Cd, Mn, Pb.

No	EC dSm	ph	Cations meq-1					HCO3-	CO3 -2	r 4
4	2,16	7,85	Ca+	Mg+	Na+	K+				
			4.80	3.40	12.93	0.87	9.50			2.60

Element	Fe	Ni	Cd	Pb	Cu	Mn	Zn
	38.2886	1.6809	0.0018	0.1842	1.2701	13.4979	2.4517

No	T.N ppm	T.P ppm	T.K ppm	O.M%
4	175	Trace	240	0.2905

Makka Mud (MM) preparation

Mud preparation was formed from Makka soil, mixed with tap water or Zamzam water in the room temperature to be semisolid. Then used after exposure of the formed semisolid mixtures to sun and moon light outdoors in open air for 24 hours.

Application of one centimeter mud thickness with different methods on the diseased body areas for hours daily or weekly for weeks or months were tailored according to the patient case. Assessment of body functions as Visual acuity and lens clearance were held according to case needs at base line, after two weeks and at the end of one month from stating MMT.

Medical Investigations:

Some investigations like x- ray image analysis, ultrasound, CAT scan and blood tests were done and specific tests for nervous system as well as. Pain assessments. Inquiring and questioning the patients and their relatives about the improvement of their life Quality.

3. Patients received MMT:

Case 1: Young adult female patient suffered from severe head injury and coma travelled to hospital after car accident in the year 2005.

Her medical reports in different Saudi Arabia (Ksa) Hospitals were as follows:

Physical findings: the patient was intubated and ventilated. BP: 140/90 PULSE 100/MIN.

Temp: 37.7.

Neurologically she was comatose with Glascow coma score of 5/15withleft sided hemi paresis with face edema and left raccoon eye. The pupils showed right RRR pupil and left dilated non reactive pupil (traumatic mydriasis). There was evidence of bleeding from nose and sublegal hematoma in the left side.

Case 1 Investigations:

Hb, WBC, HCT, SGPT, SGOT. Urea creatine, bleeding profile, repeated Na, Ca, Serum osmalirity, CBC and chest X ray. S**keletal** survey, NAD.

CT scan brain:

Multiple fissure fracture with simple parietal depressed fracture, right parietal area of brain contusion and **brain edema.** Follow up C T scan revealed enlarging right fronto- temporal subdural hygroma with mass effects.

Medical treatment adjuvant complement therapy by (MMT

The patient received medical treatment especially antibiotics, physiotherapy and an adjuvant complement therapy by (MMT) mud packs put around the circumference of the head for ONE years in the following regime:

Preparing Makka Mud Pack (MMP): (MMP) was prepared by spreading the semisolid mud mixisure witrh zamzam water on a shaved head. (MM was prepared as mentioned in material and methods above)

Three times application of Makka mud packs (MMP) was applied above a completely shaved head and around the for-head circumference for three hours, daily and the fourth applied **mud pack** was kept above the head and the patient slept all-night with the Makka mud (MM) pack with one cm thickness. Combined therapy with hijama (cupping) occurred and herbal (henna) treatment and honey.

Follow up: minimal right subdural hydromel.

Hospital report: No more depressed bone could be seen.

Right temproparietal hypodense (sequence of contusion): The initial diagnosis was:

On the year 2007 Patient state

The patient had left sided upper motor neuron (UML) findings, lefts side hemi paresis. Her vital signs were within normal limits. Systemic examination was unremarkable.

The patient was recommended to have occupational rehabilitation and physiotherapy.

On the year 2018 Patient state:

The patient continued until now is under rehabilitation and physiotherapy. The patient is now a college student graduate, the dysartheria had been less. The hemiplegic symptoms and signs decreased, though unstable gate similar to that of Parkinsons could be noted. Patient can speak slowly and with slight difficulty. However there had been improvement in fixing and adjusting the course and fine adjustment of the hand clock watch to point out the exact time by hours and seconds. The patient could not fix the hand watch before combined medical and physiotherapy and (MMT).

Case 2:

New born female infant aged 8 months, weight was 5 kilos, suffering from epileptic fits. hydrocephaly and brain atrophy. Chest problems: Asthma and wheezes. The patient suffered from difficult suckling and eye squint as well as impaired some reflexes eye.

The patient was treated with mud packs around the head circumflex combined with colustum, *Negilla sativa*, thym natural honey diets for one month every two hours, and change the packs every one and half hour, and in the night there was no mud packs.

The patient was under Oxygen therapy in (B>>>Hospital) three times a day.

Results of the Makka mud (MMT) complementary therapy combined treatment: There was improvement in the epileptic fits almost disappeared.

There was improvement in suckling mother breast for feeding. there was improvement in body reflexes and improvement of squint and eye reflexes.

4. Discussion:

In the present work Makka Mud MM was formed by mixing soil from Sail WAy -road of JAZAAN - Makka with water or mineral water of Zamzam, the soil from KAEKEA area KSA.

The MM was left in moon light and sun light for 24 hours outdoors then to be used in room temperature.

Mixing soil and water and making mud and then leaving the mud in moon and light for 24 hours that will make a similar base to what the original human being was created of by the most mercifull Allah. So when using the MM will provide the different nutrients, minerals, ions that caucused the diseases and health problems after traumas and lesions.

Makka Mud composition varied due to the place of origin., mineral constituents of mud varied with the kind of rocks found in the region and the process of soil formation. Secondly, mud property was influenced by kind of flora and fauna besides the surrounding environment of the region. That coincided with the Quran, Suret Fater, aya 27.

Analysis of Makka soil mineral contents showed the presence of many minerals and ions which were proved to be found in the body built of human cells, tissues, organs, and systems.

In the present study the improvement in nevous system of both cases was due to the direct effects of

the MM eliement found as shown in table (1) of MM analysis as most body built element were found especially Magnesium Mg+ and Sulphur carbonate CO_3 and HCO_3, sulphate SO_4, Calcium Ca+, chloride Cl-, and trace minerals, iron Fe, cobalt, nickel, copper Cu and zinc Zn., Soduim Na+, potassium K+, cadmium Cd. Manganese Mn, nikal Ni, lead Pb**.** The results of the present work agreed with Bartram [2] who said about Calcium, Magnesium and Sulphur " Calcium combines with protein to give structural solidarity to bones and flesh. Given with benefit to all bone problems, delayed union after injury, brittleness in the elderly, delayed dentition and weakness in rapidly growing children. Cataracts. Rickets in children. Muscle cramps, spasms, tremors, nervousness, insomnia and joint pains. Bodily effects include healthy teeth and bones, blood clotting, nerve and muscle resilience.

Magnesium is an important mineral. Essential for use of vitamins B1 and B6, a deficiency of which affects the nervous system. Vasodilator. Platelet inhibitor. Deficiency may lead to disorders of arteries and kidneys: brittle bones, pre-menstrual tension, heart disease, muscle cramps, hypoglycaemia, insomnia, palpitation, tremor of hands or lower limbs; anorexia, anxiety, depression, tiredness, dizziness, confusion. Studies reveal that two thirds of patients with peripheral vascular disease are magnesium deficient. Absorption is blocked by the contraceptive pill, a high milk or fat intake. Chronic fatigue syndrome. Heart attack. It enables the co-ordination of nerves and muscles. Healthy teeth and bones. This metal activates more enzymes in the body than any other mineral., carbonate, sulphate, chloride, bromide, fluoride and carbon. To name but a few of the trace minerals – iodine, aluminium, iron, cobalt, nickel, copper and zinc.

In the present study a comatose teenager after car accident admitted to hospital in KSA had received combined treating medical especially antibiotics physiotherapy, and MMT, hijama occurred and herbal in addition to honey.

The patient was diagnosed temporal subdural hygroma with mass treatment right, then after two years from the accident the diagnosis became.

Right fronto- temproparietal hypodense (sequence of contusion and later The patient had left sided upper motor neuron (UML) findings, lefts side hemi paresis. Her vital signs were within normal limits. Systemic examination was unremarkable At year 2018 the hemiplegic symptoms and signs decreased although unstable gate similar to that of Parkinson's could be noted. However there had been improvement in fixing and adjusting the course and fine adjustment of the hand clock watch to point out the exact time by hours and seconds. The patient could not fix the hand watch before combined medical and physiotherapy and (MMT) with herbal and hijama.

The improvement of the patient body function after the combined medical, physical and MMT and plant medical plants and hijama could be due to the effects of the combined therapy Mud had been proved to have a physical, mechanical, antiinfamatory anti toxic and stimulatory effect of the immune system., The promoting growth effect because of the presence of many factors that help body and nerve regeneration? changing in the body enzymes, and their inhibitors and the presence of growth insulin factor, and rebalance of the Hypothalamic –pituitary –adrenal –axis. Changing endorphins, cytokines, growth hormone, prolactin, prostaglandins, interleukins. The body blood circulation also was improved.

The improvement in the well- being of the patients might be due to the induction of growth factors and the action of MMT That agreed with Fioravanti et al. (2011) who pointed that Mud-bath therapy increases plasma β-endorphin levels and secretion of corticotrophin, cortisol, growth hormone and prolactin. It has recently been demonstrated that thermal mud-pack therapy induces a reduction in the circulating levels of prostaglandin E2 (PGE2), leukotriene B4 (LTB4), interleukin-1β (IL-1β) and tumour necrosis factor-α (TNF-α), important mediators of inflammation and pain. Spa therapy has been found to cause an increase in insulin-like growth factor-1 (IGF1), which stimulates cartilage metabolism, and transforming growth factor-β (TGF-β). There is also evidence of the positive action of mud-packs and thermal baths on the oxidant/antioxidant system, with a reduction in the release of reactive oxygen (ROS) and nitrogen (RNS) species. Overall, thermal stress has an immunosuppressive effect. Many other non-specific factors may also contribute to the beneficial effects observed after spa therapy in some rheumatic diseases, including effects on cardiovascular risk factors, and changes in the environment, pleasant surroundings and the absence of work duties.

In the present study the improvement of the nervous system and decrease in UMNL might be due to the effects of combined medical and physiotherapy and the direct effect of mud on the nervous system. That agreed with Tarkhan-Muuravi and Dzhakobiia (2006) who reported that 82 patients with traumas of peripheral nervous trunks (middle, ulnar, radial, tibular and tibial nerves) were investigated, including 44 persons with neuroapraxia of those trunks and 38 with axonotmesis. It was established that the patients with traumas of peripheral nervous trunks showed the presence of inflammatory process and sensitization of the body which was exposed in the reaction of precipitation at C-reactive protein with the increase of

the content of serum glycoides and total nonspecific immunuglobulin E in blood serum. The investigated patients showed also decrease in nonspecific resistance of organism and change in immune status. All the above-referred shifts were more expressed at axonotmesis of peripheral nervous trunks. Rehabilitation with the use of Kumisi therapeutic mud and electro magneto field of millimeter range resulted decrease of inflammation process and body sensitization in patients with traumas of peripheral nervous trunks almost to disappearance of inflammation process and body sensitization. Such rehabilitation increased nonspecific resistance, normalized the indices of immune reactivity. The above-referred positive shifts were comparatively well expressed at neuroapraxia of peripheral nervous trunks.

In the present study the improvement of the nervous system and decrease in UMNL and improvement of gate and decrease in pain sensation might be due to the effects of combined medical and physiotherapy and the direct effect of MMT on the hypothalamic –pitutary –adrenal axis HPA axis and production of endogenous endorphin and stress hormones that reduced pain and inflammation. The results of the present work coincided with by Giacomino et al. (2007) who mentioned that fangotherapy in arthritis patients seemed to cause variations in amino acid involved in cartilage homeostasis, and also produced reduction in pain ratings in gonarthrosis. Mud modified nitric oxide, myeloperoxidase and glutathione peroxidase serum levels in arthritic patients and beta-endorphin and stress hormones in patients affected by osteoarthritis by reducing inflammation pain and therefore diminished the cause of stress. They pronounced that the thermal stress associated with Fang therapy, activated the pituitary gland and the biochemical effects of peat components had aside from their physical-thermal effects. Furthermore, steroids and antimicrobial activity of certain therapeutic mud has been suggested.

In the present study the in the case of head trauma after car accident who had upper motor neuron lesion UMNL and hemiplegia, the Pain had decreased and muscle tone and body functions and nerve refleses had improved. The improvement in pain and Muscle tone and pain intensity can be positively progressed due to combined MMT. That was similar to Giannittet al.,2008 stated that Spa therapy was one of the most commonly used non-pharmacological approaches for many rheumatic diseases. In Fibromyalgia Syndrome (FS) it might be useful for the chronic widespread musculoskeletal pain. Because of the unknown etiology and the not clear understood pathogenesis, there was no standard therapy regimen for FS. Also the mechanisms of action of spa therapy were not completely known, but most probably the benefits could be derived from mechanical, physical and chemical factors. Muscle tone and pain intensity could be positively influenced by mud packs and thermal baths.

In the present study the brain edema, hydrocele with brain atrophy decreased after combined (MMT) In CASE 1 in the head injury and CASE 2 of the newborn, The decrease in patients head edema could be due to the direct effect of combination of medical, physiotherapy and MMT as well as herbal, hijame in addition to the colostrums feeding in the new born. that might produce anti-inflammatory, analgetic, antiedematic, actions and promoted immunity and hemodynamics. That was similar to Reshetova et al. (2004) who mentioned that experimental and clinical evidence (76 patients with osteoarthrosis) justified combined use of thermovibration massage and lipid extract from therapeutic mud eplir. That combination produced analgetic, antiedematic, antiinflammatory actions and promoted normalization of systemic immunity and peripheral hemodynamics.

5. Summary:

What the combined MaKka Mud Therapy Mmt can do?

It was reported that the moistness of the peloid mud relaxed the skin, opening the pores. That allowed impurities to be drawn out affecting a deep cleanse. At the same time nutrients were absorbed from the mud. As the mud dried the skin is tightened, and circulation of blood and lymph increased, accelerating the exchange process. The skin benefited from the mud; and the increase in circulation delivered nutrients already in the body, like oxygen. Impurities in the tissues, if not drawn out of the skin, were pushed away to the other organs of excretion; nutrients that had been absorbed through the skin were transported around the body to where they were needed. That removal of impurities and the double delivery of nutrients were rejuvenating for the skin, and the rest of the body as well. The skin will function more efficiently.

Makka Mud Therapy could be useful for body cells as it could enhance Na/K pump and ion exchange in cells, especially in nervous system and could promote cure.

In the present study the improvement of the nervous system and decrease in UMNL and improvement of some nervous system reflexes, muscular-skeletal functions and decreased in pain sensation might be due to the effects of combined medical and physiotherapy and the direct effect of MMT. The results of the present study agreed with Tuzlata 2008 who mentioned that many hospital for

Rehabilitation treated combined electrical and mud therapy. They treated diseases of the central and peripheral nervous system, muscular-skeletal conditions including rehabilitation, gynaecological complaints and skin conditions. Arthritis, sciatica, trauma, MS, conception, eczema, stress, and insomnia are a few more treatment possibilities.

Tap water or mineral Zamzam water which added to Makka soil to form Makka Mud (M M):

In the present study tap water or mineral Zamzam water were mixed with MM for complimentary management besides medical treating for head trauma and hydrocephaly combined with herbal and physiotherapy and colostrums feeding for the new born infant case, that regime either using tap or Zamzam mineral water mixed with MM used caused enhancement of disease improvement and decreased pain as well as improved body function and quality of life, The results of the present study were similar to Morer C etal., 2017who studied the role of mineral elements and other chemical compounds used in balneology: data from double-blind randomized clinical trials

Morer et al. (2017) conducted a systematic literature review on balneotherapy about the specific therapeutic role of mineral elements and other chemical compounds of mineral waters and derivate peloids/muds and discussed the study methods used to evaluate it (in musculoskeletal conditions). They searched Medline by PubMed using the following key words: "spa therapy" "balneotherapy" "mud" "peloid" "mud pack Therapy" in combination with "randomized controlled trial" "double blind trial." They also reviewed the reference list of articles retrieved by the Medline search. They selected the double-blind randomized clinical trials that assessed the effects of mineral water or mud treatments compared to tap water, attenuated peloid/mud therapy or similar treatments without the specific minerals or chemical compounds of the treatment group ("non-mineral"). They evaluated the internal validity and the quality of the statistical analysis of these trials. The final selection comprised 27 double-blind randomized clinical trials, 20 related to rheumatology. A total of 1118 patients with rheumatological and other musculoskeletal diseases were evaluated in these studies: 552 of knee osteoarthritis, 47 of hand osteoarthritis, 147 chronic low back pain, 308 of reumathoid arthritis, and 64 of osteoporosis; 293 of these participants were assigned to the experimental groups of knee osteoarthritis, 24 in hand osteoarthritis, 82 of low back pain, 152 with reumathoid arthritis, and 32 with osteoporosis. They were treated with mineral water baths and/or mud/peloid (with or without other forms of treatment, like physical therapy, exercise…). The rest were allocated to the control groups; they received mainly tap water and/or "non-mineral" mud/peloid treatments. They found that Mineral water or mud treatments had better and longer improvements in pain, function, quality of life, clinical parameters, and others in some rheumatologic diseases (knee and hand osteoarthritis, chronic low back pain, rheumatoid arthritis, and osteoporosis) compared to baseline and non-mineral similar treatments. Morer et al. (2017) added that internal validity and other limitations of the study's methodology impeded causal relation of spa therapy on these improvements. They pronounced that randomized clinical trials were very heterogeneous. Double-blind randomized clinical trials seemed to be the key for studying the role of mineral elements and other chemical compounds, observing enough consistency to demonstrate better and longer improvements for mineral waters or derivate compared to tap water; but due to heterogeneity and gaps on study protocol and methodology, existing research was not sufficiently strong to draw firm conclusions. Morer et al. (2017) claimed that well-designed studies in larger patients' population were needed to establish the role of minerals and other chemical compounds in spa therapy.

The results of the present study were also similar to Maeda et al., 2018.

Who published a paper titled: Clinical and anti-aging effect of mud-bathing therapy for patients with fibromyalgia. Maeda et al., 2018 mentioned that .

Spa bathing is known as a medical treatment for certain diseases causing chronic pains. Spa water contains mineral components which lower the specific heat of the water, resulting in a higher efficiency to warm body-core temperature. This phenomenon yields pain-relieving effect for rheumatoid arthritis, low back pain, sciatic neuralgia, fibromyalgia, etc. They introduced medical and biological effects of mud-spa-bathing therapy for fibromyalgia other than pain relief, the changes of blood examination data, and the telomere length of circulating leukocytes. The enrolled 7 patients with fibromyalgia syndrome were hospitalized and were subject to daily mud bathing at 40 °C for 10 min for about a month. Then, their subjective pain was reduced to about a quarter in average. They also showed lowered serum triglyceride and C-reactive protein level, maintaining the levels of aspartate transaminase and creatine phosphokinase, and increased of the red blood cell count, the serum albumin level, and the serum LDL-cholesterol level in comparison with cases without mud-bathing therapy, suggesting that mud bathing prevents inflammation and muscle atrophy and improves nutritional condition in fibromyalgia. They added that, the analysis of telomere length of peripheral leukocytes revealed a trend of negative correlation between telomere shortening and laboratory data change of hemoglobin

and serum albumin. Those telomeric changes could be explained hypothetically by an effect of mud bathing extending life-span of circulating leukocytes.

The results of the present study were similar to Antonelli and, Donelli 2018 who made a: systematic review on the effects of balneotherapy and spa therapy on levels of cortisol as a stress biomarker, They reported that balneotherapy and spa therapy were well-known practices, even though limited evidence had been produced about their biological effects. Thy assessed if balneotherapy, mud/peloid therapy, and spa therapy might influence cortisol levels. They secondarily, aimed at understanding if those interventions might improve stress resilience. They searched PubMed/Medline, Embase, and Cochrane Library for relevant articles in English or Italian about studies involving healthy and sub-healthy subjects or patients with a diagnosed disease about effects of balneotherapy, mud/peloid therapy, and spa therapy on serum and salivary cortisol levels. Fifteen studies involving 684 subjects were included. Five studies investigated biological effects of balneotherapy alone. Two of them reported significant changes of cortisol levels in healthy participants. The other three studies reported no significant variations in patients with rheumatic conditions. No studies investigated biological effects of mud/peloid therapy alone. Ten studies investigated biological effects of spa therapy with or without included mud/peloid therapy, and in all but two studies, significant variations of cortisol levels were reported. Our main findings suggested that balneotherapy might have the potential to influence cortisol levels in healthy subjects, in such a way as to improve stress resilience. Spa therapy with or without included mud/peloid therapy demonstrated the same potential to influence cortisol levels also in sub-healthy subjects and in patients with a diagnosed disease. They concluded that balneotherapy and spa therapy might be considered as useful interventions for the management of stress conditions. They added that further investigation is needed because of limited available data.

Conclusion:

Combined MaKka Mud Therapy (Mmt) lead to improvement of body function, decreased pain, improvement of nervous system and fine reflexes in two cases of head trauma and hydrocele. Mmt could be adjuvant complementary management for nervous system traumas. Further controlled studies are needed.

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