

## Case Report

## Individualized Therapy to Manage Quadriplegic Spastic Cerebral Palsy with Unani Treatment Modalities

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### ABSTRACT

**Objective:** Cerebral palsy (CP) is a neurodevelopment disorder attributed to an insult or injury to the developing brain with abnormalities in muscular tone, movement and motor skill. Improvement in quality of life and ameliorating symptoms can be achieved. Therefore, this case report details a distinctive approach to treating a 5-year-old male child with quadriplegic spastic cerebral palsy utilizing Unani treatment modalities.

**Methods:** The treatment regimen commenced with *'Habb Ayarij* for constipation followed by *Sharbat Ustukhuddus* administered orally. Notably, *Sharbat Ustukhuddus* was combined with *Melia Azedarach* L. leaves vapour bath. Subsequently, *Roghan Babunna* douche was performed followed by *Dalk Layyin* and continued until symptomatic improvement was observed. *Majun Falasfa*, *Khamira Marwareed* and *Khameera Gauzaban* were administered for 30 days. The therapeutic outcome included anthropometrical measurements, developmental milestones, spasm/reflex scale, and muscle power grading.

**Results and conclusion:** Over the course of a 2-year follow-up, several clinical findings emerged. These included notable improvements in anthropometric measurements, developmental milestones such as improved head control and sitting ability, and a reduction in spasticity of the upper limbs, along with decreased muscle spasms. The therapeutic outcome of this individualized and holistic approach is potentially due to the multifaceted properties of medicinal plants (*Musakkin wa Muharrik wa Muqawwi-i-A'sab wa Dimāgh*, *Munawwim*, *Dafi-i-Tashannuj*, *Muqawwi-i-Qalb-i-Ruh*). Furthermore, the use of *Dalk* and *Naṭūl* was instrumental in providing nourishment to musculoskeletal cells and initiating intracellular signaling cascades. While these findings are encouraging, further research in the form of case series and randomized controlled trials is warranted to validate the efficacy of this unique holistic approach.

**Keywords:** *Dalk*; *Fālij-ī-Dimāgh*; *'Ilāj bi'l Tadbīr*; Regimenal therapies; Quadriplegic cerebral palsy

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## INTRODUCTION

Disabled children are of exceptional burden to the family and society.<sup>1</sup> Cerebral palsy (CP) is the most common motor disability in paediatric inhabitants affecting function and development.<sup>2</sup> It is the leading cause of chronic disability in children.<sup>1</sup> Unani System of Medicine (USM) has a separate branch of clinical specialization for the paediatrics age group known as *Ilmul Atfāl*. There is no single disease available in Unani classics texts, which can be correlated with cerebral palsy (CP) as it is a multifactorial disorder with complex clinical conditions. The terminology for CP in the classical Unani literature is *Fālij-ī-Dimāgh*. Some conditions that can be correlated with the symptoms of CP include insomnia, behaviour disorder due to weakness of the brain, convulsions, anxiety, depression, apoplexy, paralysis, muscular spasticity and stretching of muscles, facial palsy, tremors, and mental deficit. Injuries to the brain or associated structures, compression or dislocation of the spinal cord, as well as lingering effects of acute illnesses like meningitis, and any obstruction in the course of nerves are the causes of *Fālij* (paralysis).<sup>3-5</sup> Ibn Sīnā (980-1037 A.D) proposed that there are disturbances in the normal function of the body also include congenital causes, morbid cold dystemperament, trauma and injury.<sup>6</sup>

The global incidence of CP is about 2.5 or 3 cases per 1000 live births.<sup>1,7</sup> CP incidence is

estimated at around 3 cases per 1000 live births for India, nonetheless, the actual figure may be much higher being a developing country. The causes of CP may be foetal, natal, and environmental.<sup>1</sup> Children with CP are at a greater risk of these musculoskeletal anomalies deteriorating and progressing further as the disease progresses naturally. For these kids to receive successful therapy, a thorough is required.<sup>4</sup>

The aim in the management of moderate to severe CP children is to help the child acquire activity of daily life (ADL), improve quality of life and have a sense of belonging as a family member socially and emotionally. The latter is dependent on the child gaining improvement in cognitive functions, for which no recognized, established and accepted treatment exists.<sup>6</sup> Up to this point, conventional medicine has not developed a treatment for underlying brain injury that is successful. The ideal paradigm for the medical treatment of children with CP throughout their lifespans to manage numerous related and secondary disorders is a multidisciplinary team approach.<sup>1,9</sup> There is currently no known cure for the disease, despite the best efforts of cutting-edge technology and highly expensive, intricate therapy.<sup>1</sup> Unani Medicine adopts a holistic approach to treating the patients keeping in mind the relation to daily routine and environment (physical as well as moral). The line of treatment available to treat cerebral

palsy in USM is *Ta'dīl-i- Mizāj, Muqawwī-i- A'sāb* (nervine tonic), and *Muqawwī-i-Dimāgh* (brain tonic).<sup>6</sup> Therefore, an effort was made to treat 5 years male child with quadriplegic spastic CP using a holistic approach with Unani treatment modalities including *'Ilāj bi'l Tadbīr (Naṭūl, Dalk)* and oral treatment. Anthropometric measurements, developmental milestones, and spasm analysis were used to evaluate the treatment's effectiveness.

## CASE PRESENTATION

**Patient information and clinical history:** A 5-year-old-male child with globally delayed milestones, contracture with marked spasticity in lower extremities and mental retardation and a known case of quadriplegic spastic cerebral palsy visited outpatient of *Amrād-i- Atfāl* at A & U Tibbiya College. He was diagnosed as CP at the age of 2 years in an allopathic hospital with level 4 of the Gross Motor Function Classification System (GMFCS). He belonged to a middle-class Muslim family. The education of Father was 12<sup>th</sup> standard who was currently working as a factory employee. The mother was educated till the 10<sup>th</sup> standard and was a housewife.

The prenatal history of the child was uneventful. The mother's age was 21 years and had no specific history of disease or medication in the prenatal period. The birth history revealed that he was delivered on 21 July 2011,

full term by lower segment cesarean section (LSCS). The indication for LSCS was mother had previous LSCS with a birth weight of 3 kg. The postnatal history revealed that the baby did not cry soon after birth. He was admitted and hospitalized for one week in Neonatal intensive care (NICU) for birth asphyxia, and convulsions. He developed jaundice on day 3. Parents revealed that there was a delay in the development of milestones and the child could not achieve normal growth and development. The mother reported that the child was not able to hold the neck properly; spasticity and involuntary movement were noticed at the age of 6 months. The child started sitting at the age of 15 months and standing with support at the age of 2 years. At 10 months of age, the child started using monosyllabic, aaa, baa, etc. Since then, the parents started treating the child but found no significant benefit. The child underwent physiotherapy. They approached us for further management at the age of 4 plus years. The history also revealed that for the last 4 years, the child did not have convulsions. The family history showed second-degree consanguinity in the parents with no other family history of any congenital anomalies. The immunization history of the child showed that all primary vaccination was received. The personal habit of the child was eating only semi-solid food as there was difficulty in swallowing and chewing the solid food. His appetite was poor according to his age and his

sleep was disturbed (6–7 h/24 hours in 2-3 intervals). The stool was brownishyellow and the child had a history of constipation and passed stool once in 2 days.

**Clinical findings:** All the activities were assisted. Drooling from the mouth was present. The *Mizāj* of the child was *Bārid wa Yābis*. General examination showed lean and thin build, mild pallor, hair blackish brown skin wheatish and dry, tongue coated, and a convergent squint in both eyes. The hearing BERA screening showed 35db, indicating normal hearing. The speech was alerted and was able to say only bisyllabic babbling was present. He was conscious but not alert and the behaviour was hostile. Vitals were normal. The systematic included cardiovascular, respiratory and per abdomen examinations no abnormality was detected.

**Diagnostic assessment:** The diagnostic assessment included anthropometrical measurement, developmental milestones, spasm scale, reflex scale, and muscle power grading.

**Diagnosis:** The diagnosis was confirmed as Quadriplegic spastic CP as a sequel of postnatal hypoxia.

### **Intervention and Follow-up**

The child was admitted on November 2, 2015. Before initiation of treatment, parent's written consent was obtained. The child received a 65-day Unani treatment regimen, detailed in Table

1. The treatment plan included a sequence of therapies: a 5-day course of *Habb Ayarij* for constipation, followed by oral *Sharbat Ustukhuddus* comprising *Lavandula stoechas* L. Subsequently, *Sharbat Ustukhuddus* was combined with *Inkabab* of *Muḥallil-i-Auram* medicines for five days. Following this, *Naṭūl* with *Roghan Babunna* was administered, alongside *Dalk Layyin*, until symptomatic improvement. *Inkabab* was applied to the entire body, excluding the head and neck, utilizing *Joshanda* of Bakīyan leaves and *Gul Babunna*. For 30 days, *Majun Falasfa*, *Khamira Marwareed*, and *Khameera Gauzaban* were administered twice daily. This comprehensive treatment cycle was repeated every six months for a total of two years, with assessments conducted at each follow-up. Furthermore, the child's mother was instructed in the continuous application of *Dalk Layyin* as part of the treatment protocol.

**Table 1. Unani treatment received by the patient.**

<i>'Ilm al-Amrāḍ wa Asbāb</i>	<i>Uṣūl-i-'Ilāj</i> (Line of treatment)	<i>Ilāj</i> (Treatment)
<i>Sū'-i-Mizāj Bārid Raṭb Māddī</i> <i>Asbāb-i-Sū'-i-Mujāwirat</i> (causes responsible for stiffness, spasms and other symptoms)	<i>Ta'dil-i-Mizāj</i> <i>Tanqiya'-i-</i> <i>Dimāgh</i>	<i>Habb Ayarij</i> half tab crushed in honey twice daily was given for 5 days for constipation followed by <i>Sharbat Ustukhuddus</i> 7ml twice daily for 15 days for <i>Tanqiya'-i-Dimāgh</i> orally
<i>Ikhtilal-i-Aql</i> (mental deficit)	<i>Istifraḡh-i-Mawād</i>	<i>Inkabab</i> (vapour bath) of the whole body except head and shoulder in the wooden steam cabinet (Figure 1) with <i>Muhallil-i-Auram</i> (anti-inflammatory) including <i>Joshanda of Bakiyan</i> leaves and <i>Gul Babunna</i> medicine for 10 min for 5 days
<i>Ri'sha</i> (tremors) in legs	<i>Mulaöoif, Muqawwī, Muqawwī-i-</i> <i>A 'šāb, Muqawwī-i-A 'dā'</i> <i>Ra 'īsa Muqawwī-i-Dimāgh</i>	<i>Naṭūl</i> (douche/medicinal liquid preparation poured on affected part with force) on the forehead with <i>Roghan Babunna (Matricaria chamomilla</i> oil) for 15 min. for 10 days followed by <i>Dalk</i> was advised regularly till a decrease in tremors
<i>Tamaddud</i> (spasticity)	<i>Mu'arriq</i> and <i>Mulayyin</i>	<i>Dalk Layyin</i> (Soft-handed light and gentle-pressure massage) of the whole back, upper and lower extremities with <i>Hārr Mizāj</i> oil ( <i>Roghan Babunna</i> ) was advised regularly till a decrease in spasticity
<i>Falij</i> (paralysis)	There are four treatment options for <i>Istifraḡh-i-Mawād</i> : <i>Fasd</i> (venesection), <i>Mushil</i> (purgative medications), <i>Muqé</i> (emetic drugs), and <i>Huqna</i> . Children cannot utilise <i>Fasd</i> , thus <i>Mundij Motadil</i> is used instead, then <i>Taqwiyat-i-Dimāgh</i> wa <i>A 'šāb</i>	<i>Majun Falasafa</i> 1g twice daily <i>Khamira Marwareed</i> 1g <i>Khameera Gauzaban</i> for 30 days twice daily



**Figure 1. a) Wooden steam cabinet for *Inkabab* and b) process of *Naṭūl* on the forehead**

**Outcome and assessment:** At each follow-up, the effectiveness of the treatment was evaluated using anthropometric measurements, developmental milestones, spasm scales, reflex scales, and muscle power grading. All growth parameters were evaluated before and at each follow-up, and the GMFC Scale (Gross Motor Function Classification System), Ashworth Scale (to measure spasticity), Spasm Scale (to measure the intensity of spasm), and Manual Ability Classification System (MACS) (to measure upper limb function)

were used as evaluation criteria to track the effectiveness of therapy. The anthropometrical measurement at the time of examination was weight-11 kg, height- 98cm, BMI 11.4 kg/m<sup>2</sup>, and head circumference 51cm. Developmental milestones were delayed as per age. The central nervous system examination details were recorded. The skull and spine were normal.

**Gross Motor Function Classification System - Expanded & Revised (GMFCS - E&R):** It showed level IV, i.e., self-mobility

was limited and the child was brought by his mother in arms. He had no orientation for time, place or person and was able to recognize his parents. Muscle wasting was marked in the extremities.

**Spasm scale:** The spasm scale showed hypertonia in all extremities however was more marked in the lower extremities.

Muscle power grading was 3/5 in the lower extremities and 4/5 in the upper extremities.

**Reflexes:** Knee jerk was exaggerated with clonus in both the limbs, biceps reflex and triceps reflex were also exaggerated. Plantar was extensor in the right and left leg with Babinski sign positive.

**Ashworth scale to assess spasticity:** Spasticity is measured using the Ashworth scale: He also had grade 4 spasticity (hypertonia) with ankle and knee contractures. There were no abnormalities in the sensory system. Because of the patient's extremely impaired physical and mental state, a cranial nerve examination could not be performed. The differential diagnosis included demyelinating and degenerative central nervous system (CNS) illness.

At the follow-up, the Achilles tendon tightness was lessened, and only the ankle joint improved in the goniometric examination. Following treatment, contracture improved.

Elbow and knee flexion increased by 10 degrees, whereas ankle plantar flexion reduced by 10 degrees. The Ashworth scale revealed a 30% reduction in spasticity (grade 3). The spasm scale improved by 30%, and the manual ability categorization system improved by 30% as a result of decreased spasticity and increased ROM. Figure 2 depicts the child's improvement after he was able to stand without assistance.

**Patient and parent's perspective:** Patient was comfortable with the hospital environment as the pediatric ward was child friendly with accessible washrooms and wheelchair facilities. The patient enjoyed all the therapies and was very friendly with the doctor and staff around. Parents were happy and satisfied with the treatment as they found some response in the activity of the child. However, patient's mother had difficulty in giving oral medication, as patient disliked the taste of some medicine.

## DISCUSSION

CP is classified into four types viz., spastic, ataxic, dyskinetic, and mixed. Dyskinetic CP includes athetosis and dystonia (4%-7%), whereas ataxic CP and hypotonic CP constitute 4%-6% and 2%, respectively.<sup>7</sup> Spastic CP is the most commonest type, among all the types of CP, occurring in 70–80% of all cases.<sup>1</sup> Spastic CP is further sub-classified into

hemiplegia (38% of all spastic CP cases), diplegia (37%), and quadriplegia (24%). Multiple epidemiological studies report that half of the children who develop CP were born at term without any identified risk factor.<sup>7</sup>

Cerebral palsy (CP) as it is a multifactorial disorder with complex clinical conditions therefore, there is no single disease available in Unani classic texts, which can be correlated. However, some causative factors are linked to its aetiology and pathology is described in many chapters of Unani classical texts and can be correlated with the symptoms of CP that include *Sahar* (insomnia), *Ru'unat* (behaviour disorder due to weakness of the brain), *Jumūd* (obstruction produced in the brain resulting in stoppage of sensory function and body movements), *Şar' Dimāghī* (convulsions), *Junūn wa Sabat* (anxiety, depression, violent behaviour), *Ḍu'f-i- Dimāgh* (weakness of brain), *Abūblaqsiyā* (apoplexy), *Fālij* (Paralysis), *Tashannuj Īdhā'ī* (muscular spasm), *Tamaddud* (spasticity and stretching of muscles), *Laqwa* (facial palsy), *Ri'sha* (tremors) *Khadar* (numbness), *Hawal* (squint), *Tashnak* (weakness/sub-acute inflammation in brain especially in children), *Ḥumq* (imbalance in routine work and social behaviour), and *Ikhtilāf al-'Aql* (mental deficit) or *Fālij-i- Dimāgh*. According to USM, injuries to these

structures, compression or dislocation of the spinal cord, as well as lingering effects of acute illnesses like meningitis and *Insidād-i-Aw'iyā /Sudda* (any obstruction) in the course of nerves caused by *Balgham Ghalīz* (phlegmatic humour in the brain or neurons), are the causes of *Fālij* (paralysis).<sup>3,4</sup> *Imtilā'ī Balgham* first manifest in the region of the *Baṭn-i-Dimāgh* (brain's ventricles), where it abruptly dissolves. From there, *Balgham* falls to either the left or right side of the body, depending on which side is weaker.<sup>5</sup> Ibn Sīnā (980-1037 A.D) proposed that there are disturbances in the normal function of the body in *Humuq* whereas impairment of thought is found in *Ikhtilāl-i-Aql*. *Ikhtilāl-i-Aql* is a condition of the mid-brain, the probable causes include *Asbāb-i-Khilqī* (congenital causes), *Sū'-i-Mizāj Bārid* (morbid cold distemperament) and trauma and injury.<sup>6</sup>

The spasm scale improved by 30%, and the manual ability categorization system improved by 30% as a result of decreased spasticity and increased ROM. Figure 2 depicts the child's improvement after he was able to stand without assistance. With the holistic and individualized approach with Unani medicine adapted to treat CP in children, the effect might have been achieved due to the localized application of *Muḥallil-i-Auram*



*Harr* oils through *Dalk Layyin*. The line of treatment available to treat cerebral palsy in USM is *Ta'dil-i-Mizāj*, *Tanqiya'-i-Dimāgh* (cleansing of morbid matter/humour from the brain), *Istifrāgh-i-Mawād* (removal of morbid matter), *Muqawwī-i-A'sāb*, and *Muqawwī-i-Dimāgh*.<sup>6</sup> CP is incurable. However, improvement in quality of life and prevention of spasms and contractures is required. CP treatment needs long follow-ups. Sixty-day treatment included *Habb Ayarij* followed by *Sharbat Ustukhuddus* orally. *Sharbat Ustukhuddus* with *Inkabab* of *Muḥallil-i-Auram* medicine was given 10 min for 5 days. After 5 days of *Inkabab*, *Naṭūl* with *Roghan Babunna* followed by *Dalk Layyin* was advised regularly till improvement in symptoms.<sup>10</sup> *Dalk Layyin* with *Hārr Mizāj* (hot temperament) oils have *Muḥallil* (anti-inflammatory) and *Muqawwī-i-A'sāb*, actions are recommended to dissolve the causative matter and potentiate the nerves.<sup>11</sup>

The delayed development of gross and fine motor functions could be related to an issue with the brain's normal function. As a result of *Muqawwī-i-A'sab wa Dimāgh* properties of Unani medicine, increase brain function and are recommended to obtain results in developmental diseases. Here, improvement in growth has been achieved by *Ta'dil-i-Mizāj*

and *Tanqiya'-i-Dimāgh* with *Habb Ayarij* and *Sharbat Ustukhuddus*. The ethnomedicinal properties of *L. steochas* include *Muḥallil* (anti-inflammatory), *Mundij* (concoctive), *Muqawwī* (tonic), *Mulattif*, *Munaqqi-i-Dimāgh* (cleansing of the brain), *Muqawwī-i-A'sab*, *Munawwim* (sedative), *Mushil-i-Balgham* (phlegm purgative), *Mushil-i-Sawdā'* (Black bile purgative), *Muharrik-i-A'sab* (nervine stimulant), *Mufarrih Qalb* (exhilarant), *Muqawwī-i-Badn* (general tonic), *Kasir-i-Riyah* (carminative), *Dafi-i-Tashannuj* (antispasmodic), *Muqawwī-i-Qalb* (cardiotonic), *Musakkin- i-A'sab* (nervine analgesic), and *Muqawwī-i-Mi'da* (Stomachic).

<sup>12</sup> Lavender has a long history of medicinal use and possesses anti-depressive, neuroprotective, antioxidant, anticonvulsant, sedative, anxiolytic, and calming properties. Some medieval physicians including Ibn Sīnā and Rāzī recommended lavender for the treatment of epilepsy and migraine. Lavender is also thought to be helpful in the treatment of pain and tremors.



**Figure 2. Child standing without support**

*Majun Falasfa, Khamira Marwareed and Khameera Gauzaban* twice daily were advised for 30 days. The same line of treatment was repeated every six months for two years. *Habb Ayarij* was advised for *Ta'dil-i-Mizāj* and constipation. *Sharbat Ustukhuddus* and *Inkabab* were advised for *Tanqiya'-i-Dimāgh*. After *Tanqiya'-i-Dimāgh*, *Dalk Layyin* with *Roghan Babunna* was advised as *Babunna* has *Mulayyin, Muqawwī-i-A'ṣāb* and *Muhallil* properties. After *Tanqiya'-i-badan, Muqawwī-i-A'ṣāb wa Dimāgh wa Aamwas* advised such as *Majun Falasfa, Khamira Marwareed and Khameera Gauzaban* to strengthen brain, nerve and nourishment of the body.

Linalool, which is found in lavender, inhibits acetylcholine release and modifies ion channel activity at the neuromuscular junction. The effects of lavender on motor activity and their link to dopaminergic neurotransmission were investigated, and it was shown that intraperitoneal administration of lavender greatly boosted rotarod activity and improved dopamine receptors subtype D3 in mouse olfactory bulbs. The cholinergic system is thought to have a role in lavender's analgesic, antianxiety, anti-depressive, and anticonvulsant properties. It has been claimed that certain medicinal herbs have good impacts on cognition.<sup>13</sup>

*Habb Ayarij* is useful in chronic headaches, melancholy, paralysis, facial palsy, epilepsy and other diseases of the brain. Cleans the brain from toxic substances as it possesses *Mukrij'-Akhlal Salasa wa Ghaliz* property of the brain and stomach.<sup>14</sup>

*Muqawwī-i-Dimāgh wa A'ṣāb* drugs such as *Majun Falasfa*, *Khamira Marwareed* and *Khameera Gauzaban* are used for toning up the brain, nerves and heart and to improve its faculties as they possess *Muqawwī-i-Qalb wa Dimāgh* properties.<sup>14</sup> *Muqawwī* drug such as *Majun Falasfa* strengthens organs of the body for their optimal functions.<sup>15</sup>

*Matricaria chamomilla* (Chamomile) is beneficial in reducing spasms as it possesses antioxidant, anti-inflammatory, relaxant,

antispasmodic, and analgesic activities. Chamomile's apigenin ingredient decreases the impact of hormones on the body and mind as well as excitation neurotransmitters, therefore relaxing the overactive sympathetic nervous system. It influences the activity of dopamine and serotonin. Furthermore, suppressing the COX enzyme lowers pain feeling and the immune system's inflammatory response. Its essential oil also contains antispasmodic and calming properties, making it useful for symptom relief. Because CNS stimulating molecule is a nerve relaxant, it is also beneficial for stress and anxiety reduction as Apigenin, Luteolin, Glycine, and flavonoid. Enhancers have been reported to be usually safe.<sup>16,17</sup>

Chamomile's potent bioactive plant metabolite, a flavonoid, stimulates the CNS. Apigenin and Luteolin, two bioactive compounds, operate as antianxiety and pain relievers by binding to benzodiazepine receptors.<sup>18</sup> Chamazulene, which is contained in chamomile extract, has been linked to anti-inflammatory properties. Both matricine and (-)-alpha-bisabolol have anti-inflammatory and analgesic properties. (-)-alpha-bisabolol, spiroethers, and apigenin have spasmolytic properties.<sup>19</sup>

*Melia Azedarach* L. leaves were beneficial to reduce spasms as they possess ethnomedicinal properties including *Muhallil-i-auram*, *Muqawwi-i-alm*, *Mulayin*,

and *Duf-i-Huma* properties.<sup>20</sup> It contains bioactive molecules flavonoids, acids, steroids, terpenoids, alkaloids, anthraquinones, saponins, and tannins. Terpenoids and limonoids found in the leaves include 1-Cinnamoyl-3-acetyl-11-hydroxy meliacarpin, 1-Deacetyl salannin, -Pinene, -Pinene, Terpinene, Terpeneol, Kaempferol-3-O--rutinoside, Kaempferol-3-L-rhamno-D-glucoside, and Rutin.<sup>21</sup> Further it is also proven pharmacologically as an antioxidant, anti-inflammatory, analgesic, muscular relaxant, antispasmodic, and analgesic activities.<sup>21,22</sup>

*Dalk* and *Naṭūl* provide nourishment as musculoskeletal cells can sense incoming mechanical signals using a diverse group of transmembrane mechanosensitive proteins (mechanosensory). Mechanical stimulation of the mechanosensory translates the mechanical signal into a biochemical signal (biochemical coupling), which activates intracellular signalling cascades and results in mechanical stimulus activation. As a result of the mechanical stimulus, the atrophied muscles regain strength.<sup>23</sup>

To the best of our knowledge, this is the first case report on CP and holistic approach including '*Ilāj bi'l Tadbīr*' and internal Unani medications to improve all the facets of spastic CP. It is important to recognize that while cerebral palsy (CP) remains an incurable condition, Unani Medicine has

shown promise in alleviating some of its symptoms and improving the quality of life (QOL) for affected individuals. It's crucial to understand that treating a condition like CP, particularly in children, holds significant value. Even modest advancements in their condition at an early age can translate into substantial benefits as they grow, aiding in skill development and overall well-being. Thus, the implementation of Unani treatment modalities, including oral medications and '*Ilāj bi'l Tadbīr*,' is a step toward enhancing the daily lives of children whose activities are hindered by CP-related impairments.

This observed improvement aligns with the concept of neuroplasticity, demonstrating the capacity of the nervous system to adapt and reorganize. Based on the findings of this case study, it is reasonable to infer that Unani Medicine, in combination with '*Ilāj bi'l Tadbīr*,' offers a potential avenue for enhancing the lives of children with CP. While CP remains a challenging condition, this holistic approach offers hope and an opportunity for enhanced QOL and functional outcomes in affected children. The limitations are it was a single case study, so it is difficult to apply such a study to most patients, and it seems that there are limitations in interpreting the results of this study. Furthermore, Phase II and Phase III randomized controlled trials are recommended in large sample sizes. Further,

the pharmacodynamics and pharmacokinetics of medicinal plants and the mechanism of action of *Dalk* and *Naṭūl* are suggested.

## CONCLUSION

It is important to recognize that while cerebral palsy (CP) remains incurable, Unani Medicine has shown promise in improving the quality of life (QOL) and alleviating some CP symptoms. This case, with a 30% overall improvement, highlights the value of early intervention, especially in children, as even modest progress can significantly impact their development and well-being. Unani treatments, including oral medications and '*Ilāj bi'l Tadbīr*,' offer hope for enhancing the lives of CP-affected children. This observed improvement aligns with neuroplasticity principles, showcasing the nervous system's adaptability. Further research is needed to fully harness Unani Medicine's potential in CP management.

**CONFLICT OF INTEREST:** None to declare

**CONTRIBUTION OF AUTHORS:** FK and AS: Conceptualization, Data Curation, Methodology, Validation, Software, and Writing; SS, TB and ARB: Writing and redrafting; All authors have read and agreed to the published version of the manuscript.

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