Massage with Herbal Oils as a Novel Therapeutic Approach for Cerebral Palsy: A Medical Hypothesis

Article *in* Traditional and Integrative Medicine · December 2023

DOI: 10.18502/tim.v8i4.14490

5 authors, including:

Babak Daneshfard
Shahid Beheshti University of Medical Sciences
142 PUBLICATIONS **522** CITATIONS

TRADITIONAL AND INTEGRATIVE MEDICINE

Trad Integr Med, Volume 8, Issue 4, Autumn 2023

Review

Massage with Herbal Oils as a Novel Therapeutic Approach for Cerebral Palsy: A Medical Hypothesis

Mohsen Hajihoseini[1], Hanieh Tahermohammadi[2,3]*, Babak Daneshfard[2,4], Mohammad Saleh Safari[5], Arian Karimi Rouzbahani[3,6]

[1]*Student Research Committee, Zabol University of Medical Sciences, Zabol, Iran*
[2]*Chronic Respiratory Diseases Research Center, National Research Institute of Tuberculosis and Lung Diseases (NRITLD), Shahid Beheshti University of Medical Sciences, Tehran, Iran*
[3]*USERN office, Lorestan University of Medical Sciences, Khorramabad, Iran*
[4]*Persian Medicine Network (PMN), Universal Scientific Education and Research Network (USERN), Tehran, Iran*
[5]*Veterinary Faculty of Science and Research Branch of Islamic Azad University, Tehran, Iran*
[6]*Student Research Committee, Lorestan University of Medical Sciences, Khorramabad, Iran*

Received: 14 Mar 2023 **Revised:** 9 May 2023 **Accepted:** 21 May 2023

Abstract

Cerebral palsy (CP) is a condition resulting from injury to the developing brain. Treatment modalities vary based on symptomatology and may range from physiotherapy to pharmacologic intervention and surgical intervention. Despite the current therapeutic strategies, outcomes remain suboptimal. In light of limited data regarding the therapeutic effects of oil-based massages on neonates with CP, this study aimed to investigate the potential neurological benefits of incorporating herbal oils into massage treatments for these infants. In this investigation, we conducted a thorough exploration of the medicinal herbs described in the paralysis section of medical and pharmaceutical sources in Persian medicine. Subsequently, we conducted an extensive literature review on the neurological effects of oils or essential oils derived from these herbs. Our search was conducted up to 2023 using pertinent keywords such as *Pimpinella anisum* L., anise, aniseed, *Foeniculum vulgare* Miller, fennel, *Carum carvi* L., caraway, *Piper nigrum* L., pepper, *Cinnamomum zeylanicum*, cinnamon, Nigella sativa L., black seed, *Vitis vinifera* L., grape seed, Olea europaea L., olive, *Rosa x damascena* Herrm., and rose flower. We specifically focused on studies related to neuroprotection, neurology, massage, and cerebral palsy, and obtained relevant information from data sources such as PubMed, Scopus, and Google Scholar. Our investigation revealed that massage therapy has an impact on CP and that herbal oils possess neurological properties, such as anticonvulsant and neuroprotective effects, as well as enhancements in behavior, memory, learning, and cerebral function. Based on the advantageous mechanisms of action of herbal oils, we postulate that massage therapy utilizing herbal oils may offer a promising *complementary approach* in the management of newborns with CP. We recommend further experimental and clinical studies to establish their effectiveness.

Keywords: Cerebral palsy; Massage; Herbal oil; Persian medicine; Complementary medicine; *Vitis vinifera* L.; *Rosa x damascena* Herrm.; *Pimpinella anisum* L.

http://doi.org/10.18502/tim.v8i4.14490

Citation: Hajihoseini M, Tahermohammadi H, Daneshfard B, Safari MS, Karimi Rouzbahani A. **Massage with Herbal Oils as a Novel Therapeutic Approach for Cerebral Palsy: A Medical Hypothesis.** Trad Integr Med 2023;8(4):408-418. http://doi.org/10.18502/tim.v8i4.14490

*Corresponding Author: Hanieh Tahermohammadi
Chronic Respiratory Diseases Research Center, National Research Institute of Tuberculosis and Lung Diseases (NRITLD), Shahid Beheshti University of Medical Sciences, Tehran, Iran
Email: htahermohammadi110@gmail.com

Introduction

Cerebral palsy (CP) is a chronic neurological disorder resulting from brain damage that can occur before, during, or after birth, as the brain continues to grow during the first two years of life [1, 2]. The prevalence of CP varies globally, with estimates ranging from 1.5 to over four cases per thousand live births based on population-based studies [3-8]. While most children are born with healthy musculoskeletal systems, postural issues may develop over time [9,10]. CP is characterized by motor problems such as spasticity, which manifests as increased muscle tone, hyperkinetic disorders such as dystonia and choreoathetosis, which result in unwanted excessive movements, and less commonly, ataxia, which presents as uncoordinated movement. However, many children exhibit a mixed movement disorder [11]. Dystonia can have severe consequences on function, including impaired communication and swallowing, as well as difficulties in performing self-care activities and sitting comfortably in a wheelchair. Moreover, children may develop cycles of dystonia leading to musculoskeletal pain, which further exacerbates dystonia. The most severe manifestation of this cycle is the dystonic crisis, which may require muscle paralysis or sedation [11,12].

Children with CP commonly experience cognitive deficits, hearing and vision impairments, communication difficulties, and seizures [13,14]. These challenges, together with mental health issues, limit their ability to participate in physical and skill-based activities typically performed outdoors, leading to a negative impact on their daily routines, quality of life, occupational performance, and social functioning [15-17]. Since 1862, significant scientific and medical advancements have been made in the prevention and management of CP. There are various therapeutic modalities available, including physiotherapy, drug therapy, and surgical intervention, depending on the patient's symptoms. Although physical limitations in individuals with CP are incurable, physiotherapy has demonstrated remarkable success in improving muscle function and structure, joint range of motion, relieving pain, and reducing contractures [18,19].

Complementary and alternative medicine (CAM) encompasses a broad range of therapeutic approaches that are used in conjunction with or instead of conventional medical care and treatment. CAM therapies include the use of vitamins, herbs, and minerals, as well as mind-body activities such as chiropractic, yoga, acupuncture, exercise therapies, massage therapy, and osteopathy. Other forms of complementary treatments include traditional Chinese medicine, folk medicine, naturopathy, and homeopathy [20].

Study conducted by Astin showed that 40% of individuals use CAM, often in association with chronic health conditions [21]. CAM use is typically sought to enhance overall well-being and health [22,23] or to alleviate symptoms related to chronic or life-threatening illnesses, or the adverse effects of conventional therapies [24-26]. Children, particularly those with disabilities, frequently use CAM. Children with chronic medical conditions are three times more likely to use CAM compared to their healthy peers. Furthermore, children with CP exhibit an even higher prevalence of CAM use [1].

Badr et al. [27] and Lu et al. [28] conducted updated meta-analyses that demonstrated significant daily weight gain in medically stable preterm newborns who received massage compared to controls. Badr also reported that newborns who received massage in the Neonatal Intensive Care Units (NICU) exhibited higher neurodevelopmental scores, as measured by structured developmental assessments, compared to those who received conventional care [29]. This approach is now widely utilized in NICUs [30,31] as it is considered a valid environmental enrichment model due to its beneficial effects on neonatal stress and parent-infant attachment [31,32]. Newborn massage involves the systematic tactile stimulation of a newborn by human hands [33]. Massage is a therapeutic option for several musculoskeletal pathological disorders [34-36] and is known to stimulate blood circulation in the tissues, which promotes new tissue formation and wound healing [36-38]. Massage therapy may also facilitate the elimination of lactic acid from muscles, the release of endorphins, and the inhibition of serotonin reuptake [39-41]. Furthermore, massage therapy may lengthen muscle fibers and reduce the production of fibrotic tissue, potentially preventing contractures [42-44], enhancing growth [45,46], increasing weight gain [47-50], improving gastrointestinal function [45,46], boosting the immune system [51], promoting body fat deposition [52], and mitigating neurobehavioral effects [53-56] and pain [57,58]. Massage therapy has also been demonstrated to increase heart rate variability [59], reduce stress-related factors and infant stress [58,60], alleviate jaundice [61], prevent late-onset sepsis [62], and lower maternal anxiety and depression [63]. According to studies, newborn massage therapy increases vagal activity, serum insulin, and stomach activity and has beneficial effects on the development of visual function and brain electrical activity [31,64,65]. Another study of 20 infants with CP demonstrated that massage therapy was associated with reduced stiffness, increased muscular tone, range of cognition, motion, gross and fine motor abilities, and social functioning [66,67]. However, the effects of massaging preterm newborns with or without oils on their development are currently unknown [68].

Herbal oils are derived from herbs and possess therapeutic properties [69]. The therapeutic effects of herbal oils are attributed to the combination of anti-

oxidants, nutrients, and biostimulants extracted from herbs [70]. While studies have shown that oils can serve as a source of heat and nutrients, it remains unclear what impact oil alone has on the development of premature newborns [68]. The use of oil during massage therapy makes the process frictionless, enabling prolonged rubbing with appropriate and consistent pressure. Additionally, the oil softens the skin and eliminates skin dryness. The use of oils for skin massage is gaining popularity, particularly in the Mediterranean region and India, where natural oils have been used in newborn massage therapy for over a century [71]. This may be due to their lower skin irritancy compared to synthetic oils [72].

Traditional Chinese Medicine (TCM) has been identified as an alternative therapy for individuals with CP disabilities [73]. Similarly, Persian Medicine (PM), a form of CAM, is a system of medical practices and principles documented in well-known texts [74]. The section on paralytic (falej) diseases in Persian medical literature recommends the oral ingestion of suitable medicinal herbs in individuals with CP, as well as the application of herbal oils topically for body rubbing [75].

There is currently limited data available on the efficacy of herbal oils in massage therapy and their impact on newborns with CP. Therefore, the aim of this study is to investigate the incorporation of herbal oils into massage therapy for infants with CP, particularly in relation to their neurological effects.

Materials and Methods

In this review, we aimed to investigate the potential beneficial effects of massage and herbal oils for newborns with CP. Initially, we searched for medicinal herbs mentioned in the section on paralysis in medical and pharmaceutical sources of Persian medicine. We then searched for relevant information in the literature regarding the neurological effects of oils or essential oils extracted from these herbs. The search was conducted using databases such as PubMed, Scopus, and Google Scholar, with a time frame up to 2023, using keywords such as *Pimpinella anisum* L., anise, aniseed, *Foeniculum vulgare* Mill., fennel, *Carum carvi* L., caraway, *Piper nigrum* L., pepper, *Cinnamomum zeylanicum*, cinnamon, *Nigella sativa* L., black seed, *Vitis vinifera* L., grape seed, Olea europaea L., olive, *Rosa x damascena* Herrm., and rose flower, in combination with terms such as neuroprotective, neurological, massage, and cerebral palsy.

Results

Pimpinella anisum L.

Pimpinella anisum L., commonly known as anise, belongs to the Apiaceae family and has a long history of medicinal use in PM due to its beneficial effects on epilepsy [76]. Anise contains essential oil, which makes up 1.5 to 5% of its weight. The primary constituents of anise essential oil are trans-anethole, estragole, methyl chavicol, and para-anisaldehyde [77]. Anise possesses an array of properties, including analgesic, anticonvulsant, muscle relaxant, antioxidant, antiviral, and antifungal effects [78]. A study has demonstrated the anticonvulsant effects of anise essential oil [79], while another study showed the ameliorative effect of anise essential oil on emotional reactivity disruption due to developmental exposure to lead [80]. Table 1 summarizes the neurological effects of *Pimpinella anisum* L. according to the literature.

Foeniculum vulgare Mill.

Foeniculum vulgare Mill. (fennel) is a member of the Apiaceae family. Studies have shown that fennel contains essential oil, phenolic components, fatty acids, and hydrocarbons. Fennel is a commonly used medicinal herb in traditional medicine for various disorders, including endocrine, digestive, and respiratory conditions [81]. One study has demonstrated the potential efficacy of fennel essential oil on animal models of Parkinson's disease [82]. Table 1 summarizes the neurological effects of *Foeniculum vulgare* Mill. according to the literature.

Carum carvi L.

Carum carvi L., commonly known as caraway, is a member of the Apiaceae family [83]. Caraway contains various secondary metabolites, including carvone, which is the primary component of its essential oil, as well as limonene, phenols, and flavonoids [84]. These components contribute to the antioxidant, anticancer, antimicrobial, analgesic, hypolipidemic, antidiabetic, bronchial, gastrointestinal, relaxant [83], and anticonvulsant [85] effects of caraway. One study conducted on rats illustrated that caraway oil can reduce behaviors associated with injury-related pain [86]. The neurological effects of *Carum carvi* L. are summarized in table 1.

Piper nigrum L.

Piper nigrum L. (black pepper) belongs to the Piperaceae family [87]. Black pepper contains several secondary metabolites, including phenol compounds, steroids, alkaloids, tannins, flavonoids, fatty acids, and resins [88]. The primary bioactive constituent in black pepper is piperine, which has various therapeutic effects, including antioxidant, analgesic, antihypertensive, antiplatelet, antidepressant, and anticancer effects [89-91]. One study has demonstrated that the essential oil of black pepper can improve memory impairment in rats [92]. Table 1 summarizes the studies on the neurological effects of *Piper nigrum* L.

Matricaria chamomilla L.

Matricaria chamomilla L., commonly known as chamomile, is a member of the Asteraceae family [93]. The most important group of bioactive constituents in chamomile essential oil are terpenoids, including bisabolol oxide A, bisabolol oxide B, bisabolone oxide A, chamazulene, and β-farnesene [94,95]. Chamomile essential oils and extracts exhibit antifungal, antibacterial, antioxidant, anti-inflammatory, antiparasitic, analgesic, antidepressant, antidiabetic, anticancer, anti-allergic, and antipyretic activities [93]. One study has demonstrated that hydroalcoholic extracts of chamomile can increase the time of onset, and decrease the duration and intensity of convulsions [96]. Table 1 summarizes the neurological effects of *Matricaria chamomilla* L.

Cinnamomum verum J.Presl *(Synonym: Cinnamomum zeylanicum* Blume*)*

Cinnamomum verum (cinnamon) is a member of the Lauraceae family [97]. The bioactive components of cinnamon include cinnamaldehyde, carvacrol, cinnamyl acetate, eugenol, cinnamyl alcohol, and benzyl benzoate [98]. The secondary metabolites in cinnamon have been associated with various pharmacological activities, including neuroprotective [99], antibacterial, anti-allergic, antioxidative, hypoglycemic, and anticarcinogenic effects [100]. One study has demonstrated that the essential oil of cinnamon has a neuroprotective effect against ischemic stroke [99]. Table 1 summarizes the studies on the neurological impacts of *Cinnamomum verum*.

Nigella sativa L.

Nigella sativa L., commonly known as black seed, is a member of the Ranunculaceae family [101,102]. The primary active compounds identified from black seeds include thymoquinone, thymol, alkaloids such as nigellidine, nigellimine, and nigellicine, as well as vitamins, minerals, and proteins [103]. Black seed and its oil have therapeutic effects on inflammatory disorders, digestive diseases, and diabetes [104]. Thymoquinone and black seed are known as neuroprotective substances [105]. Although there are few studies on black seeds' ability to protect the brain, in vitro studies have shown that pretreatment with black seed oil significantly increased the vitality of neuronal cells [106]. Moreover, black seed methanolic extract has significant central nervous system (CNS) and analgesic activities. It also regulates the neuronal release of amino acid neurotransmitters such as gamma-aminobutyric acid (GABA), glycine, aspartate, and glutamate in cultured cortical neurons [107,108]. Table 1 summarizes the studies on the neurological impacts of *Nigella sativa* L.

Vitis vinifera L.

Vitis vinifera L., commonly known as grape seed, is a member of the Vitaceae (grape) family. Grape seeds contain various compounds, including vitamin E, polyphenols such as catechins, gallic acid, resveratrol, tannins, proanthocyanidins, polyunsaturated fatty acids such as oleic, alpha-linolenic acids, and linoleic, carbohydrates, and protein. Grape seed oil also contains quercetin, tocopherol, carotenoids, procyanidins, and phytosterols [109]. Grape seed extracts have been shown to improve neuropathy and cognitive disorders in Alzheimer's disease mouse models [110]. In studies, grape seed powder (2.5 g/kg) had a prophylactic impact against brain ischemia/reperfusion (I/R) damage and protected against the harmful effects of I/R-induced oxidative stress [111]. Table-1 summarizes the studies on the neurological impacts of *Vitis vinifera* L.

Olea europaea L.

Olea europaea L., commonly known as the olive tree, belongs to the Oleaceae family. This plant produces phenols [112]. Natural phenols have been shown to exhibit a variety of biological functions, including the ability to alter cell redox status [113] through direct action on proteins, enzymes, receptors, and other signaling mechanisms [114,115], and the potential to disrupt biochemical homeostasis [116,117]. Olive oil has been found to have antioxidant and cytoprotective effects in rats with brain hypoxia-reoxygenation, reducing lipid peroxide levels, brain cell death, counteracting glutathione depletion, and suppressing prostaglandin E2 overproduction in brain tissues [118]. Virgin olive oil has also been found to reduce brain prostaglandin E2, lipid peroxidation, and nitric oxide production, while increasing glutathione levels and preventing cell death [119]. Table 1 summarizes the studies on the neurological impacts of *Olea europaea*.

Rosa x damascena Herrm.

Rosa x damascena Herrm., a member of the rose family, is a rich source of flavonoids such as quercetin, kaempferol, and their derivatives, which may have various therapeutic benefits for psychiatric diseases [120-122]. The flavonoids found in this plant also have several neuroprotective activities in the brain, such as protecting against neurotoxic damage, suppressing neuro-inflammation, and enhancing learning, memory, and cognitive function. Flavonoids that suppress apoptosis enhance synaptic plasticity and neuronal survival, which may be responsible for these benefits. They may also improve blood flow in the brain, neurogenesis, angiogenesis, and neuronal morphology [123]. There is substantial evidence that *Rosa x damascena* extracts strongly stimulate neurite outgrowth and prevent A-β deposition and fibrilization in the brain [124]. Additionally, *Rosa x damascena* essential oil can acquire

Table 1. Neurological effects of *Pimpinella anisum* L., *Foeniculum vulgare* Mill., *Carum carvi* L., *Piper nigrum* L., *Cinnamomum verum* J.Presl, *Matricaria chamomilla* L., *Nigella sativa* L., *Vitis vinifera* L., *Olea europaea* L., and Rosa x damascena Herrm.

First author	Country	Year	Scientific name	Types of study	Results	References
Fariba Karimzadeh	Iran	2012	*Pimpinella anisum* L.	*In vivo* and *in vitro* experimental models of rat	Neuroprotective and anticonvulsant effects of anise oil	[79]
Khaled Kahloula	Algeria	2013	*Pimpinella anisum* L.	*In vivo* study in Wistar rat pups	Amelioration of the disruption in emotional reactivity due to the developmental exposure to lead by treatment with anise essential oil	[80]
Wael M Al-Amoudi	Saudi Arabia	2017	*Foeniculum vulgare* Mill.	*In vivo* study of sodium valproate-induced hepatorenal damage in albino rats	Positive effects on the levels of ALT, AST, ALP, urea, creatinine, total proteins, and bilirubin, and the histological structure of the kidney and liver.	[135]
Mohammad Nemati	Iran	2018	*Foeniculum vulgare* Mill.	Animal study (rat)	Improvement of Parkinson's behavioral-motor disorders by essential oils of fennel	[82]
Alireza Showraki	Iran	2016	*Carum carvi* L.	Animal study (mice)	Anticonvulsant effects of the essential oil and aqueous extract of caraway	[85]
Faisal K. Alkholifi	India	2023	*Carum carvi* L.	Animal study (rat)	Reduction of behavior associated with injury-related pain by caraway oil	[86]
Nada M Mostafa	Saudi Arabia	2021	*Piper nigrum* L.	Animal study (rat)	Improvement of the rat memory by cold-pressed oil from black pepper	[92]
Walaa M S Ahmed	Egypt	2021	*Cinnamomum verum* J.Presl	Animal study (rat)	Improvement in rat behavior and brain antioxidant capacities by cinnamon oil	[136]
Yuh-Fung Chen	Taiwan	2016	*Cinnamomum verum* J.Presl	Animal study	Neuroprotective effect of essential oil in cinnamon powder against ischemic stroke	[99]
A Arzi	Iran	2014	*Matricaria chamomilla* L.	Animal study (rat)	Increase of the time of onset, decrease of the duration and intensity of convulsions by hydroalcoholic extracts of chamomile	[96]
M Kanter	Turkey	2006	*Nigella sativa* L.	Animal study (rat)	Neuroprotective effects in spinal cord injury	[137]
B.V.S. Lakshmi	India	2014	*Vitis vinifera* L.	Animal study (rat)	Improvement of the cognition, short-term memory, anxiety, muscle activity and locomotion in aluminum-induced oxidative stress in rat brain by *Vitis vinifera* extract.	[138]
Ibrahim H. Borai	Egypt	2017	*Vitis vinifera* L.	Animal study (rat)	Improvement in brain function	[139]
Deepthi Rapaka	India	2019	*Vitis vinifera* L.	Animal study (rat)	Improvement in memory and learning	[140]

Yisong Qian	China	2016	*Olea europaea* L.	Animal study (rat)	Improvement of glial function by maslinic acid (a natural product from *Olea europaea*)	[141]
F. Ashrafzadeh	Iran	2007	*Rosa x damascena* Herrm.	Clinical trial	Reduction in mean seizure frequency with *Rosa damascena* essential oil	[142]
Mansour Homayoun	Iran	2020	*Rosa x damascena* Herrm.	Animal study (rat)	Reduction in apoptotic neurons by *Rosa damascena* extract	[143]
Mansour Homayoun	Iran	2015	*Rosa x damascena* Herrm.	Animal study (rat)	Prolongation the latency, reduction the frequency, and inhibition of production of dark neurons in the hippocampus by hydro-alcoholic extract of *Rosa damascena*	[144]

contract kindling and has been shown to reduce the development of behavioral seizures in amygdale electrical kindling [125]. Table 1 summarizes the studies on the neurological effects of *Rosa x damascena*.

Discussion

Massage therapy has been used since ancient times to treat muscular tightness and promote overall health in both newborns and adults, and it is often used as CAM [126, 127]. Various studies have demonstrated the benefits of massage therapy in improving spasticity and motor skills in children with CP. For instance, Rasool et al. showed that deep cross-friction massage improved spasticity in children with CP [128]. Silva et al. demonstrated that Qigong massage improved motor skills and sensory responses in young children with CP [129]. Elbasan et al. showed that reflexology improved constipation and motor functions in children with CP [130]. Malila et al. showed that Thai massage decreased muscle spasticity in young people with CP [131]. Mahmood et al. indicated that traditional massage reduced spasticity in children with CP [126]. Özkan et al. found that reflexology with physiotherapy improved gross motor functions, reduced spasticity in legs, and decreased dependency in children with CP [132]. Wang et al. showed that massage improved gross motor function in children with spastic CP [133]. In conclusion, these findings suggest that massage therapy is an effective complementary therapeutic method for reducing muscle spasticity and improving motor functions in patients with CP.

Recent studies have shown that baby massage is more effective when used in combination with oil [71]. Essential oils and their constituents are known to be quickly absorbed by the skin. For instance, linalyl acetate and linalool can be rapidly detected in plasma after topical application with massage, with peak levels occurring after approximately 19 minutes [134]. Furthermore, based on the findings of our study, medicinal herbs have neuroprotective effects.

Limitations

A limitation of this study was the insufficient number of studies on the efficacy of massage therapy in conjunction with medicinal oils in individuals with cerebral palsy. Although existing studies suggest that herbal oils may have potential as a complementary therapy for cerebral palsy, further studies are necessary to establish the safety and efficacy of this approach. Additionally, more studies are required to determine the optimal massage therapy type and the most effective herbal oils for this population. Further studies in this area could help to broaden the range of treatment options available to individuals with cerebral palsy and enhance their quality of life.

Conclusion

Based on our findings, herbal oils such as *Pimpinella anisum*, *Foeniculum vulgare*, *Carum carvi*, *Piper nigrum*, *Matricaria chamomilla*, *Cinnamomum verum*, *Nigella sativa*, *Vitis vinifera* , Olea europaea, and *Rosa x damascena* have potential effects on the nervous system due to their neuroprotective, cytoprotective, and antioxidant activity. Given the beneficial mechanisms of action of these herbal oils, we suggest that massage therapy with herbal oils may be used as a complementary therapy in newborns with cerebral palsy. However, more experimental and clinical studies are needed to confirm the effects of this approach.

Declaration of competing interest

There is no conflict of interests to be disclosed.

Acknowledgments

None.

References

[1] Bass N. Cerebral palsy and neurodegenerative disease. Curr Opin Pediatr 1999;11:504-507.

[2] Krigger KW. Cerebral palsy: an overview. Am Fam Physician 2006;73:91-100.

[3] Stavsky M, Mor O, Mastrolia SA, Greenbaum S, Than NG, et al. Cerebral palsy-trends in epidemiology and recent development in prenatal mechanisms of disease, treatment, and prevention. Front Pediatr 2017;5:21.

[4] Arneson CL, Durkin MS, Benedict RE, Kirby RS, Yeargin-Allsopp M, et al. Prevalence of cerebral palsy: autism and developmental disabilities monitoring network, three sites, united states, 2004. Disabil Health J 2009;2:45-48.

[5] Bhasin TK, Brocksen S, Avchen RN, Van Naarden Braun K. Prevalence of four developmental disabilities among children aged 8 years--metropolitan atlanta developmental disabilities surveillance program, 1996 and 2000. MMWR Surveill Summ 2006;55:1-9.

[6] Paneth N, Hong T, Korzeniewski S. The descriptive epidemiology of cerebral palsy. Clin Perinatol 2006;33:251-267.

[7] Anonymous. Prevalence and characteristics of children with cerebral palsy in Europe. Dev Med Child Neurol 2002;44:633-640.

[8] Winter S, Autry A, Boyle C, Yeargin-Allsopp M. Trends in the prevalence of cerebral palsy in a population-based study. Pediatrics 2002;110:1220-1225.

[9] Kerr Graham H, Selber P. Musculoskeletal aspects of cerebral palsy. J Bone Joint Surg Br 2003;85:157-166.

[10] Marpole R, Blackmore AM, Gibson N, Cooper MS, Langdon K, et al. Evaluation and Management of Respiratory Illness in Children With Cerebral Palsy. Front Pediatr 2020;8:333.

[11] Harvey AR, Baker LB, Reddihough DS, Scheinberg A, Williams K. Trihexyphenidyl for dystonia in cerebral palsy. Cochrane Database Syst Rev 2018;5:CD012430.

[12] Allen NM, Lin JP, Lynch T, King MD. Status dystonicus: a practice guide. Dev Med Child Neurol 2014;56:105-112.

[13] Rosenbaum P, Paneth N, Leviton A, Goldstein M, Bax M, et al. A report: the definition and classification of cerebral palsy April 2006. Dev Med Child Neurol Suppl 2007;109:8-14.

[14] Ryan JM, Cassidy EE, Noorduyn SG, O'Connell NE. Exercise interventions for cerebral palsy. Cochrane Database Syst Rev 2017;6:CD011660-CD.

[15] Beckung E, Hagberg G. Neuroimpairments, activity limitations, and participation restrictions in children with cerebral palsy. Dev Med Child Neurol 2002;44:309-316.

[16] Lin YC, Huang CY, Lin IL, Shieh JY, Chung YT, et al. Evaluating functional outcomes of botulinum toxin type a injection combined with occupational therapy in the upper limbs of children with cerebral palsy: a 9-month follow-up from the perspectives of both child and caregiver. PLoS One 2015;10:e0142769.

[17] Jamali AR, Amini M. The effects of constraint-induced movement therapy on functions of cerebral palsy children. Iran J Child Neurol 2018;12:16-27.

[18] Paul S, Nahar A, Bhagawati M, Kunwar AJ. A review on recent advances of cerebral palsy. Oxid Med Cell Longev 2022;2022:2622310.

[19] Flyckt N, Wong C, Michelsen JS. Non-pharmacological and non-surgical treatment of pain in children and adolescents with cerebral palsy: A scoping review. J Pediatr Rehabil Med 2022;15:49-67.

[20] Oskoui M, Ng P, Zaman M, Buckley D, Kirton A, et al. Complementary and alternative therapy use in children with cerebral palsy. Can J Neurol Sci 2021;48:408-414.

[21] Astin JA. Why patients use alternative medicine: results of a national study. Jama 1998;279:1548-1553.

[22] Astin JA, Pelletier KR, Marie A, Haskell WL. Complementary and alternative medicine use among elderly persons: one-year analysis of a Blue Shield Medicare supplement. J Gerontol A Biol Sci Med Sci 2000;55:M4-9.

[23] Wolsko PM, Eisenberg DM, Davis RB, Ettner SL, Phillips RS. Insurance coverage, medical conditions, and visits to alternative medicine providers: results of a national survey. Arch Intern Med 2002;162:281-287.

[24] Barnes PM, Bloom B, Nahin RL. Complementary and alternative medicine use among adults and children: United States, 2007. Natl Health Stat Report 2008:1-23.

[25] Shen J, Andersen R, Albert PS, Wenger N, Glaspy J, et al. Use of complementary/alternative therapies by women with advanced-stage breast cancer. BMC Complement Altern Med 2002;2:8.

[26] Humpel N, Jones SC. Gaining insight into the what, why and where of complementary and alternative medicine use by cancer patients and survivors. Eur J Cancer Care (Engl) 2006;15:362-368.

[27] Badr LK, Abdallah B, Kahale L. A Meta-analysis of preterm infant massage: an ancient practice with contemporary applications. MCN Am J Matern Child Nurs 2015;40:344-358.

[28] Lu LC, Lan SH, Hsieh YP, Lin LY, Chen JC, et al. Massage therapy for weight gain in preterm neonates: A systematic review and meta-analysis of randomized controlled trials. Complement Ther Clin Pract 2020;39:101168.

[29] Juneau AL, Aita M, Héon M. Review and critical analysis of massage studies for term and preterm infants. Neonatal Netw 2015;34:165-177.

[30] Bennett C, Underdown A, Barlow J. Massage for promoting mental and physical health in typically developing infants under the age of six months. Cochrane Database Syst Rev 2013;2013:CD005038-CD.

[31] Menici V, Antonelli C, Beani E, Mattiola A, Giampietri M, et al. Feasibility of early intervention through home-based and parent-delivered infant massage in infants at high risk for cerebral palsy. Front Pediatr 2021;9:673956.

[32] Cioni G, D'Acunto G, Guzzetta A. Perinatal brain damage in children: neuroplasticity, early intervention, and molecular mechanisms of recovery. Prog Brain Res 2011;189:139-154.

[33] Vickers A, Ohlsson A, Lacy JB, Horsley A. Massage for promoting growth and development of preterm and/or low birth-weight infants. Cochrane Database Syst Rev 2004;2004:Cd000390.

[34] Barreto DM, Batista MVA. Swedish massage: a systematic review of its physical and psychological benefits. Adv Mind Body Med 2017;31:16-20.

[35] Polastri M, Clini EM, Nava S, Ambrosino N. Manual massage therapy for patients with copd: a scoping review. Medicina (Kaunas) 2019;55:151.

[36] Weerapong P, Hume PA, Kolt GS. The mechanisms of mas-

sage and effects on performance, muscle recovery and injury prevention. Sports Med 2005;35:235-256.
[37] Miyaji A, Sugimori K, Hayashi N. Short- and long-term effects of using a facial massage roller on facial skin blood flow and vascular reactivity. Complement Ther Med 2018;41:271-276.
[38] Cipani S, Bartolozzi C, Ballo P, Sarti A. Blood flow maintenance by cardiac massage during cardiopulmonary resuscitation: Classical theories, newer hypotheses, and clinical utility of mechanical devices. J Intensive Care Soc 2019;20:2-10.
[39] Kaada B, Torsteinbø O. Increase of plasma beta-endorphins in connective tissue massage. Gen Pharmacol 1989;20:487-489.
[40] Wiltshire EV, Poitras V, Pak M, Hong T, Rayner J, et al. Massage impairs postexercise muscle blood flow and "lactic acid" removal. Med Sci Sports Exerc 2010;42:1062-1071.
[41] Field T, Hernandez-Reif M, Diego M, Schanberg S, Kuhn C. Cortisol decreases and serotonin and dopamine increase following massage therapy. Int J Neurosci 2005;115:1397-1413.
[42] Laumonier T, Menetrey J. Muscle injuries and strategies for improving their repair. J Exp Orthop 2016;3:15.
[43] Best TM, Gharaibeh B, Huard J. Stem cells, angiogenesis and muscle healing: a potential role in massage therapies? Br J Sports Med 2013;47:556-560.
[44] Crane JD, Ogborn DI, Cupido C, Melov S, Hubbard A, et al. Massage therapy attenuates inflammatory signaling after exercise-induced muscle damage. Sci Transl Med 2012;4:119ra13-119ra13.
[45] Tekgündüz K, Gürol A, Apay SE, Caner I. Effect of abdomen massage for prevention of feeding intolerance in preterm infants. Ital J Pediatr 2014;40:89.
[46] Choi H, Kim SJ, Oh J, Lee MN, Kim S, et al. The effects of massage therapy on physical growth and gastrointestinal function in premature infants: a pilot study. J Child Health Care 2016;20:394-404.
[47] Massaro AN, Hammad TA, Jazzo B, Aly H. Massage with kinesthetic stimulation improves weight gain in preterm infants. J Perinatol 2009;29:352-357.
[48] Diego MA, Field T, Hernandez-Reif M. Preterm infant weight gain is increased by massage therapy and exercise via different underlying mechanisms. Early Hum Dev 2014;90:137-140.
[49] Lai MM, D'Acunto G, Guzzetta A, Boyd RN, Rose SE, et al. PREMM: preterm early massage by the mother: protocol of a randomised controlled trial of massage therapy in very preterm infants. BMC Pediatr 2016;16:146.
[50] Field T, Diego M, Hernandez-Reif M, Dieter JN, Kumar AM, et al. Insulin and insulin-like growth factor-1 increased in preterm neonates following massage therapy. J Dev Behav Pediatr 2008;29:463-466.
[51] Moyer-Mileur LJ, Haley S, Slater H, Beachy J, Smith SL. Massage improves growth quality by decreasing body fat deposition in male preterm infants. J Pediatr 2013;162:490-495.
[52] Ang JY, Lua JL, Mathur A, Thomas R, Asmar BI, et al. A randomized placebo-controlled trial of massage therapy on the immune system of preterm infants. Pediatrics 2012;130:e1549-e1558.
[53] Smith JR. Comforting touch in the very preterm hospitalized infant: an integrative review. Adv Neonatal Care 2012;12:349-365.
[54] Ho YB, Lee RS, Chow CB, Pang MY. Impact of massage therapy on motor outcomes in very low-birthweight infants: randomized controlled pilot study. Pediatr Int 2010;52:378-385.
[55] Procianoy RS, Mendes EW, Silveira RC. Massage therapy improves neurodevelopment outcome at two years corrected age for very low birth weight infants. Early Hum Dev 2010;86:7-11.
[56] Guzzetta A, D'Acunto MG, Carotenuto M, Berardi N, Bancale A, et al. The effects of preterm infant massage on brain electrical activity. Dev Med Child Neurol 2011;53:46-51.
[57] Jain S, Kumar P, McMillan DD. Prior leg massage decreases pain responses to heel stick in preterm babies. J Paediatr Child Health 2006;42:505-508.
[58] Hernandez-Reif M, Diego M, Field T. Preterm infants show reduced stress behaviors and activity after 5 days of massage therapy. Infant Behav Dev 2007;30:557-561.
[59] Smith S, Lux R, Haley S, Slater H, Beechy J, et al. The effect of massage on heart rate variability in preterm infants. J Perinatol 2013;33:59-64.
[60] Acolet D, Modi N, Giannakoulopoulos X, Bond C, Weg W, et al. Changes in plasma cortisol and catecholamine concentrations in response to massage in preterm infants. Arch Dis Child 1993;68:29-31.
[61] Basiri-Moghadam M, Basiri-Moghadam K, Kianmehr M, Jani S. The effect of massage on neonatal jaundice in stable preterm newborn infants: a randomized controlled trial. J Pak Med Assoc 2015;65:602-606.
[62] Mendes EW, Procianoy RS. Massage therapy reduces hospital stay and occurrence of late-onset sepsis in very preterm neonates. J Perinatol 2008;28:815-820.
[63] Feijó L, Hernandez-Reif M, Field T, Burns W, Valley-Gray S, et al. Mothers' depressed mood and anxiety levels are reduced after massaging their preterm infants. Infant Behav Dev 2006;29:476-80.
[64] Guzzetta A, D'acunto MG, Carotenuto M, Berardi N, Bancale A, et al. The effects of preterm infant massage on brain electrical activity. Dev Med Child Neurol 2011;53:46-51.
[65] Guzzetta A, Baldini S, Bancale A, Baroncelli L, Ciucci F, et al. Massage accelerates brain development and the maturation of visual function. J Neurosci 2009;29:6042-6051.
[66] Hernandez-Reif M, Field T, Largie S, Diego M, Manigat N, et al. Cerebral palsy symptoms in children decreased following massage therapy. Early Child Dev Care 2005;175:445-456.
[67] Glew GM, Fan M-Y, Hagland S, Bjornson K, Beider S, et al. Survey of the use of massage for children with cerebral palsy. Int J Ther Massage Bodywork 2010;3:10-15.
[68] Arora J, Kumar A, Ramji S. Effect of oil massage on growth and neurobehavior in very low birth weight preterm neonates. Indian Pediatr 2005;42:1092-1100.
[69] Shafi A, Akram K. Chapter 10 - Herbal oil in healthcare. In: Mandal SC, Nayak AK, Dhara AK, editors. Herbal Biomolecules in Healthcare Applications: Academic Press. 2022; pp 205-213.
[70] Mikaili P, Shayegh J, Sarahroodi S, Sharifi M. Pharmacological properties of herbal oil extracts used in iranian traditional med-

icine. Adv Environ Biol 2012;6:153-158.
[71] Darmstadt GL, Saha SK. Traditional practice of oil massage of neonates in Bangladesh. J Health Popul Nutr 2002;20:184-188.
[72] Jabraeile M, Rasooly A, Farshi M, Malakouti J. Effect of olive oil massage on weight gain in preterm infants: A randomized controlled clinical trial. Niger J Med 2016;57:160-163.
[73] Chen Z, Huang Z, Li X, Deng W, Gao M, et al. Effects of traditional Chinese medicine combined with modern rehabilitation therapies on motor function in children with cerebral palsy: A systematic review and meta-analysis. Front Neurosci 2023;17:1097477.
[74] Yousefi M, Hosseini SMA, Taghipour A, Zibaee S, Noras MR. Exploring hepatitis from the perspective of iranian traditional medicine: using a qualitative approach. J Evid Based Complementary Altern Med 2017;22:317-323.
[75] IbnSina AAHiA. Al Qanoun fe Al teb Al elmy al matbouat Institute. Lebanon 2005.
[76] Asadollahpoor A, Abdollahi M, Rahimi R. Pimpinella anisum L. fruit: Chemical composition and effect on rat model of non-alcoholic fatty liver disease. J Res Med Sci 2017;22:37.
[77] Shojaii A, Abdollahi Fard M. Review of pharmacological properties and chemical constituents of pimpinella anisum. ISRN pharm 2012;2012:510795.
[78] Mosavat SH, Jaberi AR, Sobhani Z, Mosaffa-Jahromi M, Iraji A, et al. Efficacy of Anise (Pimpinella anisum L.) oil for migraine headache: A pilot randomized placebo-controlled clinical trial. J Ethnopharmacol 2019;236:155-60.
[79] Karimzadeh F, Hosseini M, Mangeng D, Alavi H, Hassanzadeh GR, et al. Anticonvulsant and neuroprotective effects of Pimpinella anisum in rat brain. BMC Complement Altern Med 2012;12:76.
[80] Kahloula K, Slimani M, Adli D, Rachdi S, Boumediene D. Neuro beneficial effects of Pimpinella anisum against lead exposure. Int J Green Pharm 2013;7:18.
[81] Badgujar SB, Patel VV, Bandivdekar AH. Foeniculum vulgare Mill: a review of its botany, phytochemistry, pharmacology, contemporary application, and toxicology. BioMed Res Int 2014;2014:842674.
[82] Nemati M, Hemmati AA, Najafzadeh H, Mansouri MT, Khodayar MJ. Evaluation of the Effects of Foeniculum vulgare essence on behavioral-motor disorders of Parkinson's disease induced by Reserpine in Ovariectomized and Non Ovariectomized Rats. Jundishapur J Nat Pharm Prod 2018;13:e67391.
[83] Al-Snafi A. The chemical constituents and pharmacological effects of carum carvi-a review. Indian J Pharm Sci Res 2015;5:72-82.
[84] Aly A, Maraei R, Rezk A, Diab A. Phytochemical constitutes and biological activities of essential oil extracted from irradiated caraway seeds (Carum carvi L.). Int J Radiat Biol 2023;99:318-328.
[85] Showraki A, Emamghoreishi M, Oftadegan S. Anticonvulsant effect of the aqueous extract and essential oil of carum carvi l. seeds in a pentylenetetrazol model of seizure in mice. Iran J Med Sci 2016;41:200-208.
[86] Alkholifi FK, Devi S, Alam A, Kamal M, Yusufoglu HS. Caraway oil as a multimodal therapy for neuropathic pain: investigating the mechanisms of action in rats with chronic constriction injury. Appl Sci 2023;13:2989.
[87] Ashokkumar K, Murugan M, Dhanya MK, Pandian A, Warkentin TD. Phytochemistry and therapeutic potential of black pepper [Piper nigrum (L.)] essential oil and piperine: a review. Clin Phytoscience 2021;7:52.
[88] Ganesh P, Suresh Kumar R, Saranraj P. Phytochemical analysis and antibacterial activity of Pepper (Piper nigrum L.) against some human pathogens. Central Eur J Biol 2014;3:36-41.
[89] Taqvi SI, Shah AJ, Gilani AH. Blood pressure lowering and vasomodulator effects of piperine. J Cardiovasc Pharmacol 2008;52:452-458.
[90] Manoharan S, Balakrishnan S, Menon VP, Alias LM, Reena AR. Chemopreventive efficacy of curcumin and piperine during 7,12-dimethylbenz[a]anthracene-induced hamster buccal pouch carcinogenesis. Singap Med J 2009;50:139-146.
[91] Li S, Wang C, Wang M, Li W, Matsumoto K, et al. Antidepressant like effects of piperine in chronic mild stress treated mice and its possible mechanisms. Life Sci 2007;80:1373-1381.
[92] Mostafa NM, Mostafa AM, Ashour ML, Elhady SS. Neuroprotective effects of black pepper cold-pressed oil on scopolamine-induced oxidative stress and memory impairment in rats. Antioxidants 2021;10:1993.
[93] El Mihyaoui A, Esteves da Silva JCG, Charfi S, Candela Castillo ME, Lamarti A, Arnao MB. Chamomile (Matricaria chamomilla L.): A Review of Ethnomedicinal Use, Phytochemistry and Pharmacological Uses. Life (Basel, Switzerland) 2022;12.
[94] Orav A, Raal A, Arak E. Content and composition of the essential oil of Chamomilla recutita (L.) Rauschert from some European countries. Nat Prod Res 2010;24:48-55.
[95] Piri E, Mahmoodi Sourestani M, Khaleghi E, Mottaghipisheh J, Zomborszki ZP, et al. Chemo-diversity and antiradical potential of twelve matricaria chamomilla L. Populations from Iran: proof of ecological effects. Molecules 2019;24:1315.
[96] Arzi A, Kesmati M, Alikhani M. Preventive effect of hydroalcoholic extract of Matricaria Chamomilla on Nicotine induced convulsions in mice. J Babol Univ Medi Sci 2004;6:12-17.
[97] Rao PV, Gan SH. Cinnamon: A multifaceted medicinal plant. Evid Based Complement Altern Med 2014;2014:642942.
[98] Saeed M, Kamboh AA, Syed SF, Babazadeh D, Suheryani I, et al. Phytochemistry and beneficial impacts of cinnamon (Cinnamomum zeylanicum) as a dietary supplement in poultry diets. World's Poult Sci J 2018;74:331-346.
[99] Chen YF, Wang YW, Huang WS, Lee MM, Wood WG, et al. Trans-Cinnamaldehyde, an essential oil in cinnamon powder, ameliorates cerebral ischemia-induced brain injury via inhibition of neuroinflammation through attenuation of iNOS, COX-2 expression and NFκ-B Signaling Pathway. Neuromolecular Med 2016;18:322-333.
[100] Sivapriya T, John S. Qualitative, quantitative, and antioxidant analysis of phytochemicals present in Cinnamomum zeylanicum species. Indian J Health Sci Biomed Res 2020;13:105-111.
[101] Hughes DA, Haslam PL, Townsend PJ, Turner-Warwick M. Numerical and functional alterations in circulatory lymphocytes in cigarette smokers. Clin Exp Immunol 1985;61:459-

466.
[102] Tamminga M, Hiltermann TJN, Schuuring E, Timens W, Fehrmann RS, et al. Immune microenvironment composition in non-small cell lung cancer and its association with survival. Clin Transl Immunol 2020;9:e1142.
[103] Salem ML. Immunomodulatory and therapeutic properties of the Nigella sativa L. seed. Int Immunopharmacol 2005;5:1749-1770.
[104] Kooti W, Hasanzadeh-Noohi Z, Sharafi-Ahvazi N, Asadi-Samani M, Ashtary-Larky D. Phytochemistry, pharmacology, and therapeutic uses of black seed (Nigella sativa). Chin J Nat Med 2016;14:732-745.
[105] Hosseinzadeh H, Parvardeh S, Asl MN, Sadeghnia HR, Ziaee T. Effect of thymoquinone and Nigella sativa seeds oil on lipid peroxidation level during global cerebral ischemia-reperfusion injury in rat hippocampus. Phytomedicine 2007;14:621-627.
[106] Ismail N, Ismail M, Latiff LA, Mazlan M, Mariod AA. Black cumin seed (nigella sativa linn.) oil and its fractions protect against beta amyloid peptide-induced toxicity in primary cerebellar granule neurons. J Food Lipids 2008;15:519-533.
[107] Al-Naggar TB, Gómez-Serranillos MP, Carretero ME, Villar AM. Neuropharmacological activity of Nigella sativa L. extracts. J Ethnopharmacol 2003;88:63-68.
[108] El-Naggar T, Gómez-Serranillos MP, Palomino OM, Arce C, Carretero ME. Nigella sativa L. seed extract modulates the neurotransmitter amino acids release in cultured neurons in vitro. J Biomed Biotechnol 2010;2010:398312.
[109] Garavaglia J, Markoski MM, Oliveira A, Marcadenti A. Grape seed oil compounds: biological and chemical actions for health. Nutr Metab Insights 2016;9:59-64.
[110] Ho L, Pasinetti GM. Polyphenolic compounds for treating neurodegenerative disorders involving protein misfolding. Expert Rev Proteomics 2010;7:579-589.
[111] Safwen K, Selima S, Mohamed E, Ferid L, Pascal C, et al. Protective effect of grape seed and skin extract on cerebral ischemia in rat: implication of transition metals. Int J Stroke 2015;10:415-424.
[112] Casamenti F, Stefani M. Olive polyphenols: new promising agents to combat aging-associated neurodegeneration. Expert Rev Neurother 2017;17:345-358.
[113] Singh M, Arseneault M, Sanderson T, Murthy V, Ramassamy C. Challenges for research on polyphenols from foods in Alzheimer's disease: bioavailability, metabolism, and cellular and molecular mechanisms. J Agric Food Chem 2008;56:4855-4873.
[114] Kim HS, Quon MJ, Kim JA. New insights into the mechanisms of polyphenols beyond antioxidant properties; lessons from the green tea polyphenol, epigallocatechin 3-gallate. Redox Biol 2014;2:187-195.
[115] Goszcz K, Duthie GG, Stewart D, Leslie SJ, Megson IL. Bioactive polyphenols and cardiovascular disease: chemical antagonists, pharmacological agents or xenobiotics that drive an adaptive response? Br J Pharmacol 2017;174:1209-1225.
[116] Abuznait AH, Qosa H, Busnena BA, El Sayed KA, Kaddoumi A. Olive-oil-derived oleocanthal enhances β-amyloid clearance as a potential neuroprotective mechanism against Alzheimer's disease: in vitro and in vivo studies. ACS Chem Neurosci 2013;4:973-982.
[117] Grossi C, Rigacci S, Ambrosini S, Ed Dami T, Luccarini I, et al. The polyphenol oleuropein aglycone protects TgCRND8 mice against Aß plaque pathology. PLoS One 2013;8:e71702.
[118] González-Correa JA, Muñoz-Marín J, Arrebola MM, Guerrero A, Narbona F, et al. Dietary virgin olive oil reduces oxidative stress and cellular damage in rat brain slices subjected to hypoxia-reoxygenation. Lipids 2007;42:921-929.
[119] González-Correa JA, Navas MD, Lopez-Villodres JA, Trujillo M, Espartero JL, et al. Neuroprotective effect of hydroxytyrosol and hydroxytyrosol acetate in rat brain slices subjected to hypoxia-reoxygenation. Neurosci Lett 2008;446:143-146.
[120] Kalim MD, Bhattacharyya D, Banerjee A, Chattopadhyay S. Oxidative DNA damage preventive activity and antioxidant potential of plants used in Unani system of medicine. BMC Complement Altern Med 2010;10:77.
[121] Schiber A, Mihalev K, Berardini N, Mollov P, Carle R. Flavonol glycosides from distilled petals of Rosa damascena Mill. Z Naturforsch C J Biosci 2005;60:379-384.
[122] Esfandiary E, Abdolali Z, Omranifard V, Ghanadian M, Bagherian-Sararoud R, et al. Novel effects of rosa damascena extract on patients with neurocognitive disorder and depression: a clinical trial study. Int J Prev Med 2018;9:57.
[123] Spencer JP. The impact of fruit flavonoids on memory and cognition. Br J Nutr 2010;104:S40-S47.
[124] Awale S, Tohda C, Tezuka Y, Miyazaki M, Kadota S. Protective effects of rosa damascena and its active constituent on aβ(25-35)-induced neuritic atrophy. Evid Based Complement Alternat Med 2011;2011:131042.
[125] Ramezani R, Moghimi A, Rakhshandeh H, Ejtehadi H, Kheirabadi M. The effect of Rosa damascena essential oil on the amygdala electrical kindling seizures in rat. Pak J Biol Sci 2008;11:746-751.
[126] Mahmood Q, Habibullah S, Babur MN. The effects of traditional massage on spasticity of children with cerebral palsy: a randomized controlled trial. J Pak Med Assoc 2020;70:809-814.
[127] Apolo-Arenas MD, Jerônimo AFA, Caña-Pino A, Fernandes O, Alegrete J, et al. Standardized outcomes measures in physical therapy practice for treatment and rehabilitation of cerebral palsy: a systematic review. J Pers Med 2021;11:604.
[128] Rasool F, Memon AR, Kiyani MM, Sajjad AG. The effect of deep cross friction massage on spasticity of children with cerebral palsy: A double-blind randomised controlled trial. J Pak Med Assoc 2017;67:87-91.
[129] Silva LM, Schalock M, Garberg J, Smith CL. Qigong massage for motor skills in young children with cerebral palsy and Down syndrome. Am J Occup Ther 2012;66:348-355.
[130] Elbasan B, Bezgin S. The effects of reflexology on constipation and motor functions in children with cerebral palsy. Pediatr Neonatol 2018;59:42-47.
[131] Malila P, Seeda K, Machom S, Eungpinithpong W. Effects of Thai massage on spasticity in young people with cerebral palsy. J Med Assoc Thai 2015;98:S92-S96.
[132] Özkan F, Zincir H. The effect of reflexology upon spasticity

and function among children with cerebral palsy who received physiotherapy: Three group randomised trial. Applied Nurs Res 2017;36:128-134.

[133] Wang Y, Zhu WL, Dong YF. Massage manipulation of supplementing marrow and kneading tendon in treating 30 children with spastic cerebral palsy. Chin J Integr Trad West Med 2008;28:363-365.

[134] Jäger W, Buchbauer G, Jirovetz L, Fritzer M. Percutaneous absorption of lavender oil from a massage oil. J Soc Cosmet Chem 1992;43:49-54.

[135] Al-Amoudi WM. Protective effects of fennel oil extract against sodium valproate-induced hepatorenal damage in albino rats. Saudi J Biol Sci 2017;24:915-924.

[136] Ahmed WMS, Abdel-Azeem NM, Ibrahim MA, Helmy NA, Radi AM. Neuromodulatory effect of cinnamon oil on behavioural disturbance, $CYP_{1A}1$, iNOStranscripts and neurochemical alterations induced by deltamethrin in rat brain. Ecotoxicol Environ Saf 2021;209:111820.

[137] Kanter M, Coskun O, Kalayci M, Buyukbas S, Cagavi F. Neuroprotective effects of Nigella sativa on experimental spinal cord injury in rats. Hum Exp Toxicol 2006;25:127-133.

[138] Lakshmi BVS, Sudhakar M, Anisha M. Neuroprotective role of hydroalcoholic extract of Vitis vinifera against aluminium-induced oxidative stress in rat brain. Neurotoxicology 2014;41:73-79.

[139] Borai IH, Ezz MK, Rizk MZ, Aly HF, El-Sherbiny M, et al. Therapeutic impact of grape leaves polyphenols on certain biochemical and neurological markers in AlCl3-induced Alzheimer's disease. Biomed Pharmacother 2017;93:837-851.

[140] Rapaka D, Bitra VR, Vishala TC, Akula A. Vitis vinifera acts as anti-Alzheimer's agent by modulating biochemical parameters implicated in cognition and memory. J Ayurveda Integr Med 2019;10:241-247.

[141] Qian Y, Tang X, Guan T, Li Y, Sun H. Neuroprotection by combined administration with maslinic acid, a natural product from olea europaea, and MK-801 in the cerebral ischemia model. Molecules 2016;21:1093.

[142] Ashrafzadeh Md F, Rakhshandeh Md H, Mahmodi Md E. Rosa damascena oil: an adjunctive therapy for pediatric refractory seizures. Iran J Child Neurol 2009;1:13-17.

[143] Homayoun M, Shafieian R, Seghatoleslam M, Hosseini M, Ebrahimzadeh-Bideskan A. Protective impact of Rosa damascena against neural damage in a rat model of pentylenetetrazole (PTZ)-induced seizure. Avicenna J Phytomed 2020;10:574-583.

[144] Homayoun M, Seghatoleslam M, Pourzaki M, Shafieian R, Hosseini M, et al. Anticonvulsant and neuroprotective effects of Rosa damascena hydro-alcoholic extract on rat hippocampus. Avicenna J Phytomed 2015;5:260-270.