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Role of yoga in prevention of neurodegenerative diseases

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Abstract
Neurodegenerative disorder is a progressive loss of structure and function of neurons. It includes Parkinson, alzheimer, cerebral stroke, anxiety and depression. Yoga therapy is effective in improving quality of life in people with neurodegenerative diseases. Yoga show beneficial effects through direct influence on the sympathetic and parasympathetic activity in autonomic nervous system. It reduces significantly neurotransmitters that involved in these diseases. Yoga improves the social interaction, quality of life and help to recover and to face life with new positivity and strength.

Keywords: neurodegenerative, yoga, parasympathetic activity

1. Introduction
Neurodegenerative diseases are progressive disorders of central nervous system, characterized by cognitive and motor dysfunction. WHO estimates that, by 2040, neurodegenerative diseases will exceeds cancer as leading cause of mortality in industrialized countries. Alzheimer's disease and Parkinson's disease are the most common neurodegenerative, movement and cognitive disorder [1]. Other important neurodegenerative disorders are depression, anxiety and cerebral stroke.
According to Swami Vivekananda yoga includes following key principles for heath: Relaxation (savsana), physical movement (asana), breathing practice (paranyama), meditation (dhyana) [2]. In the yoga sutras, Patanjali defined the word "Yoga" in the first sutras as Atha yoga anushasanam which means "Yoga" is a form of discipline [3]. The use of movement and postures are collectively called asnas, when combined with pranayama, a breathing technique, form the most popular style of yoga called hatha yoga. Practitioners usually combine hatha yoga with meditation to achieve the aims of yoga, which is complete mind body approach.

2. Parkinson's disease
Parkinson's disease is progressive neurological disorder characterized by impaired gait and balance eventually leading to disability [4]. Parkinson's disease is a most common neurodegenerative disorder, which particularly involve deficiency of dopamine in substantia nigra [5]. Neurons in brain that control muscle movements are greatly affected in Parkinson's disease. Impaired balance is major problem in people suffering from this disease. Impaired balance in turns increase risk of falls [4]. Its major symptoms are rigidity, tremors, bradykinesia. Other symptoms are loss of automatic movements, balance impairments, leg freezing, depression, personality changes and speech and communication problems [5]. Dementia is frequently occurring feature of Parkinson's disease. Parkinson's disease develops less frequently than Alzheimer's disease, ranging from 0.1% to 0.5% annually [6].

Role of Yoga in Parkinson's disease
Yoga postures for patient suffering from Parkinson's disease [7].

1) **Meditation:** it was observed that meditation increases the level of dopamine in brain [8].
2) **Tadasana and virabhadrasana:** These asanas are helpful in maintaining energy balance in body.
3) **Rechak:** Rechak is a yoga technique which is used to control tremors in patients with parkinson's disease.
4) **Sukhasana:** This asana is helpful in removing stress, depression and relax mind and body.
5) **Utkatasana and Talasana:** are some poses of yoga that stretch the muscles and help in improving coordination and balance.

Some postures to be followed by patient with PD
1) **Good sitting posture:** As posture mainly got impaired in PD patients, so good sitting posture is a better exercise for PD patients to recover from impaired posture.
2) **Breathing:** during breathing, focus on the inhalation and exhalation, helps to relax the mind and increase concentration.
3) **Joint releasing exercise:** This exercise can improve rigidity and tremors in PD patients.
4) **Wrist work:** wrist work exercise is helpful in improving the movements of wrist and elbow.
5) **Twist:** Twist can improve the flexibility of body muscles.

3. Alzheimer's disease
Alzheimer disease interferes with social cognitive and behavioral function. It is incurable and long term neurological condition [9]. According there are 20 million people affected with Alzheimer disease all around the worldwide [10]. In U.S it is estimated that 3-4 million individuals have alzheimer disease and as many as 350,000 develop each year [6].

Role of yoga in Alzheimer's disease
In recent study, it suggested that memory loss may be reversed by yoga and meditation. It also estimated that yoga and meditation may help Alzheimer and dementia patient feel better. Stress hormones could negatively affect brain structure like hippocampus, important for memory and cognition. Chronic stress is also associated with inflammation in body

and in CNS that linked to alzheimer disease. Stress factor and inflammatory factor reduce by yoga. Hatha yoga focus on physical activity through the position, in these the physical poses retained over certain period of time. So person's attention focused on muscles as in working as well as on his breathing for that reason flexibility and blood circulation increases in internal glands and in organs. It was observed that stress and symptoms of alzheimer disease reduced by hatha yoga. During the yoga program patients achieve better scores in phychological, functional and physical variables after the hatha yoga program, in comparison to the scores achieved before the program [11].

The following exercise is beneficial in alzheimer disease:

- **Seated spinal twist:** Twisting poses bring circulation into the spine release tight back muscle and centre the mind.
- **Single leg hamstring stretch**: Relieve from back pain and can create an inward focus while practiced.
- **Neck release:** Neck stretches loosen tight neck muscles, relive headache and create peace of mind [12].

4. Cerebral stroke

Cerebral stroke is the second leading cause of death worldwide [13]. WHO define cerebral stroke as "rapidly developing clinical signs of focal disturbance of cerebral function, lasting more than 24 hours and leading to death, with no apparent cause other than vascular origin". Cerebral stroke is clinical condition cause loss of brain function due to interruption in blood supply to all or parts of brain (14).

Cerebral stroke is the leading cause of several physical disabilities in the elderly, the second common cause of dementia and third most common cause of mortality after cardiovascular diseases [15]. Stroke survivors often left with cognition, sensory motor and balance impairments that in turns abnormally affect the functional mobility and other daily living activities. The most common problem after stroke is falls (16).

Role of yoga in post cerebral stroke disabilities

1. Yoga can help the stroke survivors to revive with society and live back in normal life. According to new study, the yoga postures like downward-facing dog, tree pose and child pose as well as other yoga movements can restore balance and significantly reduce the risk of falling in stroke survivors with stroke related disabilities [17].
2. Mindfulness training in yoga may improve attention related behavioral responses by increasing activity of specific subcomponent of attention. This mindfulness may improve cognitive skills in patients with post cerebral stroke disabilities [3].
3. Yoga asanas enhances the level of gamma-aminobutyric acid, neurotransmitter in brain, as low levels of gamma-aminobutyric acid have been associated with depression and anxiety, so yoga asanas show potential benefits in improving mental health conditions [8].
4. Yoga is beneficial in managing epilepsy it reduces frequency of seizures [18]. Pranayama, asanas, dhyana are some poses of yoga helpful for peoples with epileptic seizures [19].

Chair yoga

Yoga posture for balance recovery in stroke survivors [20].

a) **Forward bend:** This pose gives stretch to back and neck.
b) **Spiral twist:** This pose enhances the flexibility and circulation in the spinal cord.
c) **Side stretch:** The side stretch pose improves respiration and also enhances the flexibility of spinal cord.
d) **Knee squeeze:** This pose promotes digestion and respiration and also helpful in relaxation of lower back.
e) **Leg lift:** Increases circulation in lower limbs and lower back.
f) **Sun pose:** Increase circulation to head and provide elasticity to spine and hip region.

5. Anxiety and depression

Anxiety and depression are the most common mental health concern in our society. Both disorders may occur together. It can be difficult to differentiate between them but it's important to treat both illnesses because they are associated with serious mental disturbances like memory loss, sleep disorders and thoughts of death or suicide (21). Anxiety is a state of excessive fear. The acute stress response characterized by a state of abnormal or exaggerated fear [22]. Feeling worried or nervous is a normal part of everyday life but overwhelming anxiety interfering with daily life is not normal (23). It includes panic disorder, obsessive compulsive disorder post-traumatic stress disorder, phobias [24].

Depression is typically characterized by low energy and mood, low self-esteem and loss of interest. The major depressive disorder (MDD) as a persistent depressed mood or loss of pleasure for at least two weeks accompanied by constellation of other symptoms that may include feeling of guilt or worthlessness, cognitive slowing, changes in sleep, changes in appetite and potential suicidal ideations [2].

According to WHO, depression was third leading global burden all over the world in 2004 [25]. It is estimated 1-2% India's population are affected with serious mental disorder and 5% population are affected with minor depressive disorder. A number of studies indicate that 20-25% patient attending primary care from depression and anxiety disorder [26].

Role of yoga in anxiety and depression

The GABA and Serotenergic neurotransmitter system have been implicated in anxiety and depression [27]. GABA and serotonin reduction leads to anxiety and depressive symptoms [28].

According to randomized controlled MRS (magnetic resonance study) conducted in 2010 year it was observed that GABA level in brain significantly increases immediately after yoga. This is the first study to report positive correlation between thalamic GABA levels and improved mood or decreased anxiety and depression [29]. The strongest evidence in benefits of yoga through direct influence on the sympethatic and parasympethatic activity in autonomic nervous system is common evidence. It suggests the respiratory effect of pranayama, visualization and calming effect in dhyana as well as motor movement in asanas reduce sympethatic activation, increases level of GABA, regulate the hypothelmic-pituituary-adrenal (HPA) axis to improve outcome in mood disorders, stress, well-being provide an anxiolytic effect [30]. It has been established that the level of serotonin increases which mediate beneficial effects on mental and neurological disorders after yoga exercise interventions (31).

Yoga helps over the quality of life

Yoga improves behavioural social interaction. Enhancing sleep quality to improve psychologic well-being, reducing social isolation, reinforce physical activity and self-care and healthier physical and psychological responses to stress; impairments in anxiety and depression [32].

On daily practice yoga can help you stay calm and relaxed and give strength to face as they come without restless. On daily practice it includes the complete package of asanas (body postures), breathing techniques (prayanama), and meditation yoga has helped several patient recover and face life with new positivity and strength [33].

Asanas help release tension and negativity from the system. Dhanurasna (bow pose), corpse pose, marjaryasana (cat pose), at the end of the yoga posture session, lie down in yoga nidra to give your mind and body of through relaxation. The technique is helpful in flushing out body toxins, a primary cause of stress from the system. Prayanams help to release anxiety. Kapal bharti prayanama and bhastrika prayanama, nadi shodhan prayanama (alternate nostril breathing) effective in releasing stress from the system (where the exhalation is longer than inhalation). Meditation can be an excellent technique to relax a distracted mind, give you a sense of calm and peace. Scientific research has shown that regular meditation practice can help significantly reduce the level of stress harmone [33].

Yoga asanas can be powerful practice for anxiety or depression. The breathing used in yoga, such as ujjayi, calm our stress response system and contributes to a state of calm. Five poses that can specifically help with depression are:

- **Uttanasana (forward fold):** in light on yoga, B.K.S Iyengar say about this pose, "any depression felt in mind is removed if one holds the pose for 2 minute or more.
- **Janu sirasana (head to knee forward bend):** the head to knee forward bend posture is usually for calm the mind.
- **Bhujangasna (cobra):** This posture expands the chest and gives elasticity to the lungs.
- **Setu bandha sarvangasana:** this pose is backbend that strengthen the legs, open the chest and stimulate the abdominal organs, lungs and thyroid.
- **Salamba sirasana (supported head stand):** This asana is called the king of all asanas. Inversion literally turns your world upside down and gives your brain cells a fresh supply of blood. Attention and presence are essential in and it is a great to pause your thoughts and hoped-for new plans [34].

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