

Exploring the Merits of Vagus Nerve Stimulation in the Treatment of PCOS Condition in Women using Yoga

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ABSTRACT

Polycystic Ovarian Syndrome (PCOS) is a neuroendocrinal disorder that affects women of reproductive age around the world. This article explores and discusses usage of yoga for vagus nerve stimulation (yt-VNS) to manage PCOS condition in women. It covers the science and anatomy of vagus nerve, and its interaction with hypothalamus, suprachiasmatic nucleus (SCN) and various other parts of the body and its direct and indirect role in the regulation of ovulation in females. Vagus nerve, a part of the Cholinergic system, is one of the neurotransmission systems involved in the regulation of ovulation. SCN is body's internal clock, which regulates circadian rhythm, and any disruption in the circadian rhythm may play a role in the development and progress of PCOS. The vagus nerve, a major part of the parasympathetic nervous system, helps regulate heart rate, respiration, rest and digest functions and helps to regulate insulin secretion, and suppress inflammation, and plays a crucial role in maintaining the body's homeostasis. It has been established that the clinical prevention and treatment of PCOS is possible through yoga. There are several yogic techniques that have been found to stimulate the vagus nerve to regulate parasympathetic nervous system. However, it is a new idea to stimulate vagus nerve using yoga in the treatment of PCOS by regulating the reproductive and endocrinal disturbances of PCOS.

Keywords: Polycystic Ovarian Syndrome (PCOS), Yoga, Vagus Nerve, Suprachiasmatic nucleus (SCN), Acetylcholine (ACh), Cholinergic System (CNS)

I. INTRODUCTION

This article explores and discusses how yoga may be used as a means to stimulate the vagus nerve to manage PCOS condition in women. It covers the science and anatomy of vagus nerve and its interaction with various parts of the body and its direct and indirect role in the regulation of ovulation in females and how yoga therapy can stimulate vagus nerve to treat PCOS condition in women.

PCOS is a common hormonal disorder that affects women of reproductive age. While the exact cause of PCOS is unknown, it is

believed to be primarily linked to poor lifestyle, hereditary, insulin resistance, inflammation, and various other factors. The estimated prevalence of PCOS worldwide varies depending on the diagnostic criteria and is believed to affect around 5% to 20% of women of reproductive age.[1][2][3]. Comorbidities associated with PCOS include Infertility, metabolic syndrome, (high blood pressure, high blood sugar, abnormal cholesterol levels, and excess abdominal fat), Type 2 diabetes, (Insulin resistance in PCOS can lead to the development of type 2 diabetes later in life), Cardiovascular

disease (Women with PCOS have a higher risk of developing cardiovascular problems, including high blood pressure, heart disease, and stroke), Sleep apnea: (PCOS is associated with an increased risk of obstructive sleep apnea, a sleep disorder characterized by interrupted breathing during sleep), Endometrial cancer (Women with PCOS may have a higher risk of developing endometrial (uterine) cancer due to prolonged exposure to estrogen without progesterone), depression and anxiety. [1][2][3][4]. PCOS is a significant health concern in India, with a relatively high prevalence, ranging from 9% to 36%, depending on the diagnostic criteria used. In India, PCOS is often under diagnosed and under treated due to lack of awareness as well as cultural stigma around discussing menstrual health. [1][2][3]

II. YOGA

Yoga, a form of holistic mind-body medicine developed thousands of years ago, is an ancient Indian practice that involves physical, mental, and spiritual exercises aimed at achieving physical health, mental clarity, and spiritual growth. The word "yoga" comes from the Sanskrit word "yuj,"

which means to unite or integrate. Yoga includes a variety of practices, including physical postures (asanas), breath control techniques (pranayama), meditation, and ethical guidelines (yamas and niyamas). These practices are designed to bring the body, mind, and spirit into balance and harmony. Some of the benefits of regular yoga practice include improved flexibility, strength, and balance; reduced stress and anxiety; increased energy and vitality; and improved overall health and well-being.

YOGA AS A THERAPY:

Yoga is fundamentally different from conventional medical practice in its approach to healthcare. Instead of trying to reduce the cause of disease to a single factor and to correct it using a specific cure, yoga aims to treat illness by improving health on all levels simultaneously and by restoring inner harmony. Yoga teaches us about the mechanism of body, mind and spirit called Pancha Kosha Viveka, which means knowledge of the five layers of our existence, based on the Taittiriya Upanishad. The outermost sheath is the annamaya kosha, or the physical body, which is sustained and nourished by food.

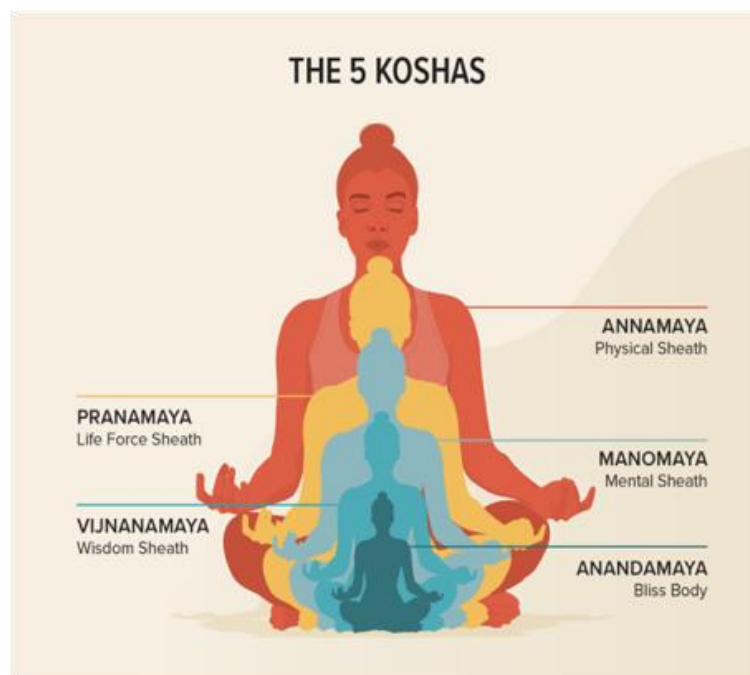


Figure - 1(30)

The second layer, (*pranamaya kosha*) is the vital body that is made up of prana, the life energy that flows through invisible channels known as nadis. The third is the *manomaya kosa*, mind (your emotions and thoughts). The fourth is the *vijnanamaya kosha*, higher intellect (perfect thought and knowledge) The final sheath is the *anandamaya kosha*, “abode of bliss”.

Stress is an outcome of modern lifestyle. At present, human existence is challenged by stress disorders or psychosomatic diseases such as hypertension, hyperacidity, insomnia, diabetes, asthma. Ill health occurs when the total balance of perfect health is disturbed. Although the original disrupting influence may only affect one level at first, the disturbance soon spreads. All the five sheaths of existence interact thus it spreads to body and pranik sheaths. For this reason yoga contains elements that address problems at every level, asanas that relax and tone your muscles massage your internal organs, pranayama that slows breathing and regulates the flow of prana, relaxation and meditation that act to calm your mind and emotion culturing to heal your spirit. As negative influences spread disruption, positive action has repercussions as well. The different types of yoga practice augment each other and are more effective when done together. When you do the asana and stretch your muscle muscular tension is released and you are able to relax. Likewise, when you relax the mind and release suppressed emotions you tend to become less tense on physical level. Every element of yoga brings benefits throughout and also acts to amplify the effect of other types of practices. This is the essence of yoga therapy both as preventive and as curative. Daily practice of complete yoga session restores natural balance and harmony bringing good health to all parts of your life physical mental and spiritual. The practice of yoga has been used to treat many different diseases such as hypertension, asthma, lower backpain, migraine, stress management and PCOS condition.

III. OVULATION & PCOS:

Ovulation is controlled by the hypothalamus and pituitary gland. The hypothalamus, which is part of the brain that regulates the menstrual cycle, receives input from the vagus nerve. The hypothalamus then produces and releases gonadotropin-releasing hormone (GnRH), which in turn stimulates the pituitary gland to release follicle-stimulating hormone (FSH), and luteinizing hormone (LH). In addition to these neuroendocrine signals and other signals originating from the central nervous system, the pituitary glands, thyroid, adrenal glands and the ovary itself are also involved. One of the neurotransmission systems involved in the regulation of ovulation is the cholinergic system, which not only participates in the regulation of reproductive functions. The vagus nerve is one of the pathways through which acetylcholine reaches the ovary, and this pathway also participates in the regulation of ovulation [5].

PCOS is a biologically heterogeneous condition involving multiple pathophysiological processes that lead to ovarian dysfunction. It is considered to be a neuroendocrine disease resulting from hypothalamus-pituitary-ovary axis dysregulation- including rapid gonadotrophin releasing hormone pulse frequency associated with luteinizing hormone (LH) hypersecretion and increased ovarian androgen production - leads to impaired folliculogenesis and oocyte development. Adrenally derived androgens due to disruption of the hypothalamic-pituitary-adrenal (HPA) axis may also contribute to the occurrence of PCOS [6].

PCOS symptoms may include clinical, endocrinal, metabolic and psychological symptoms. Clinical symptoms may include menstrual irregularities, ovarian cysts, hirsutism, hair loss, infertility, weight gain, and acne. Endocrinal symptoms may include high levels of androgens (male hormones), LH (Luteinizing Hormone), Oestrogen, Prolactin. Metabolic symptoms may include insulin resistance, obesity,

Type-2 Diabetes. Psychological symptoms may include low self-esteem, anxiety, depression, and mood swings [7]. Autonomic dysfunction is also involved in the development of PCOS. Autonomic functions were significantly affected among females with PCOS, with sympathetic dominance and decreased vagal tone [8][9]. There is an association between circadian rhythm disruption and PCOS [10] and early lifestyle changes help to prevent PCOS condition, before any significant clinical impairment occurs [8].

IV. THE VAGUS NERVE

The vagus nerve is the 10th Cranial Nerve and is the longest nerve in the body which runs from the brain stem to the abdomen, and has afferent and efferent pathways comprising of 80% and 20%. (sensory & motor). The vagus nerve, a major part of

the parasympathetic nervous system and plays multiple key roles in the homeostatic regulations of visceral functions [11] and consists of a pair of nerves that emerge from the right and left side of the medulla oblongata portion of the brain stem and serves as the body's superhighway, carrying information between the brain and the internal organs and controlling the body's response in times of rest and relaxation. The literal translation of the vagus is "Wanderer", which aptly represents its widespread interfacing of cortex, brainstem, hypothalamus, and the body. This nerve is the sensory network that tells the brain what's going on in our organs, most specifically the digestive tract, lungs and heart, spleen, liver and kidneys and a range of other nerves. It plays a vital role in sustaining overall wellness.

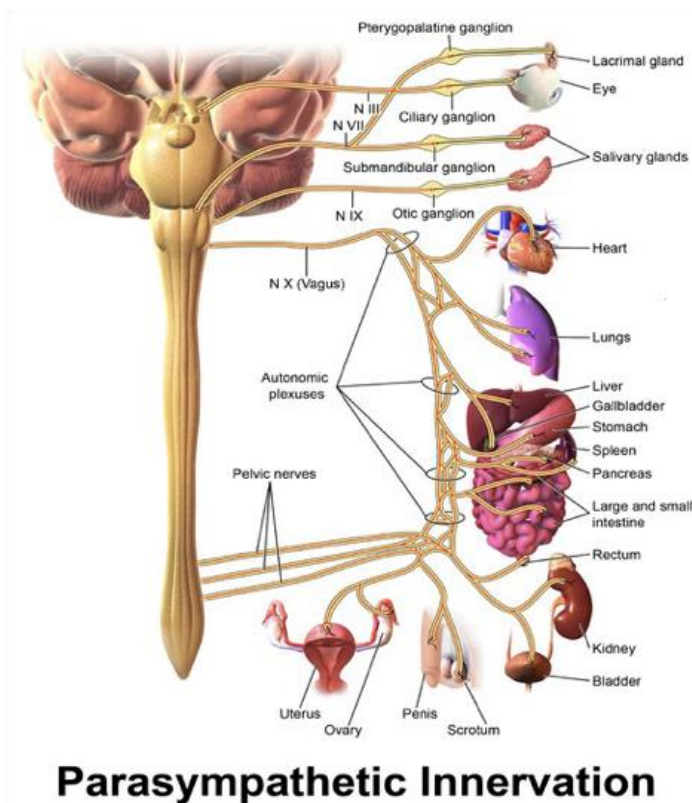


Figure – 2(31)

Vagal Tone:

Vagal tone is an internal biological process that represents the vagus nerve activity. Vagus tone can be measured using various

methods like, heart rate variability (HRV), Respiratory Sinus Arrhythmia (RSA), Galvanic Skin Response (GSR), Event-related potentials (ERPs), Blood pressure

(BP), and Cortisol levels. HRV is an effective way to index vagal tone and gauge robustness of physiological ability to counteract SNS driven fight or flight stress response. Higher HRV is associated with stronger vagus nerve function, lower chronic stress level, better overall health and improved cognition. Increasing the vagus nerve activity or vagal tone helps activate the parasympathetic nervous system and allows us to return to a relaxed state after stressful experiences [9] and aids to decrease in heart rate and blood pressure.

The causes of healthy vagal tone can include regular physical exercise, stress management techniques such as yoga, mindfulness meditation, a balanced diet, and sufficient sleep. Symptoms of healthy vagal tone may include, a lower resting heart rate, better digestion and bowel function, reduced feelings of anxiety, improved mood and emotional regulation, better immune function, improved cognitive function, including better attention, memory, and decision-making abilities, better social functioning, including better communication skills and stronger interpersonal connections. Poor vagal tone can be caused by a chronic stress, lack of physical activity, poor diet, inadequate sleep, poor breathing, excessive mobile usage and certain medical conditions such as diabetes and autoimmune disorders. Symptoms of poor vagal tone include increased heart rate and blood pressure, poor digestion and bowel function, including constipation, increased anxiety and stress levels, depression or mood swings, Chronic fatigue and low energy levels, increased inflammation in the body, reduced immune function and increased susceptibility to infections, poor cognitive function, including difficulty with memory and concentration, reduced social functioning, including difficulty with communication and interpersonal relationships.

The “tone” of our vagus nerve is fundamental when it comes to our overall health and well-being. There are several yoga techniques such as, breath focused

yoga practice, deep belly breathing, and Om Chanting, meditation and practicing mindful body awareness to increase vagal tone and activate parasympathetic nervous system [12].

VAGUS NERVE& OVULATION:

Ovary function is not only regulated by hormones, but also by neural signals. The vagus nerve has branches that innervate the ovaries and other reproductive organs, allowing for direct communication between the brain and these organs. The ovary is innervated by the sympathetic superior ovarian nerve and the ovarian plexus nerve from the upper lumbar segment via visceral nerve fibers and by the parasympathetic nerve through the VN, which is regulated by the central nervous system (CNS) [13][14]. The vagus nerve also plays a role in modulating the release of hormones, as well as other neuropeptides and neurotransmitters, through its connections to the hypothalamus and other regions of the brain. The vagus nerve can influence the activity of the immune system and inflammation, which can impact reproductive function and fertility. The vagus nerve plays an indirect role in the hormonal signalling that leads to ovulation [15].

One of the neurotransmission systems involved in the regulation of ovulation is the cholinergic system [5]. The cholinergic system includes the neurotransmitter molecule, acetylcholine (ACh), cholinergic receptors (AChRs), choline acetyltransferase (ChAT) enzyme, and acetylcholinesterase (AChE) enzyme. These molecules are involved in regulating immune response and playing a crucial role in maintaining homeostasis and is involved in many physiological processes, including the regulation of reproductive function [16]. It also modulates motor coordination, thermoregulation, and is linked to memory, attention, and other cognitive functions and helps regulate the vagus nerve and its stimulation. The vagus nerve releases acetylcholine as its primary neurotransmitter

to regulate these functions, which is why it is considered part of the cholinergic system. In mammals, the vagus nerve is one of the pathways through which acetylcholine reaches the ovary, and this pathway also participates in the regulation of ovulation. There is evidence of the roles of the central and peripheral cholinergic system and vagal

innervation in the regulation of GnRH secretion and ovulation as well as their roles in the development and persistence of polycystic ovary syndrome (PCOS). Abnormalities in the cholinergic system may contribute to the development of PCOS.

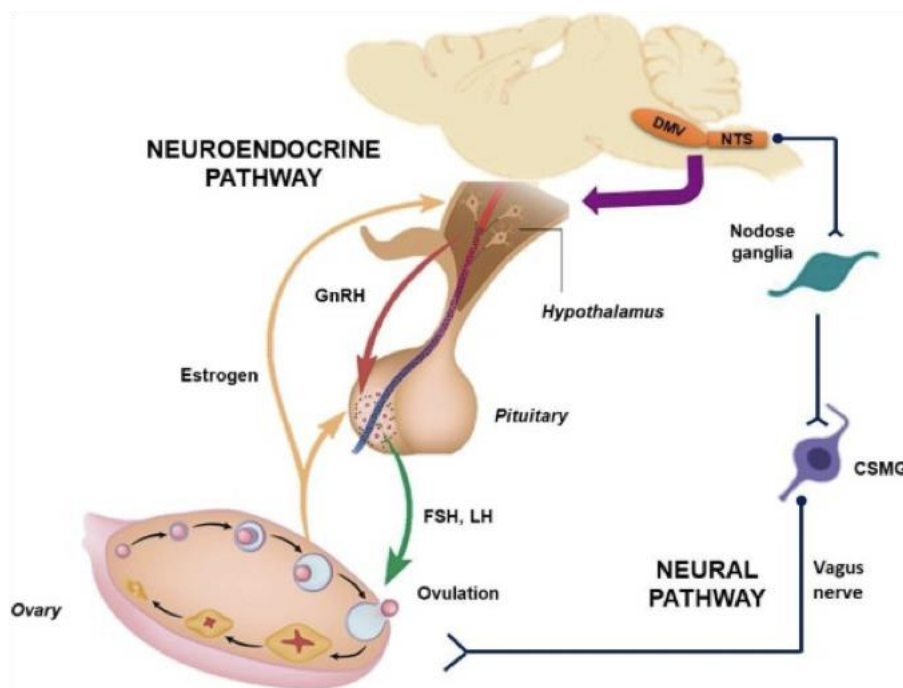


Figure – 3 (32)

Vagus Nerve and Suprachiasmatic Nucleus (SCN):

The suprachiasmatic nucleus (SCN) is a small region in the brain's hypothalamus region and acts as the body's internal clock [6]. Helps to regulate the Circadian rhythms of the body, such as sleep-wake cycle, hormonal cycles, and other physiological processes. Disruption in the circadian rhythm may play a role in the development and progress of PCOS [10]. Disruption in sleep-wake cycle may contribute to insulin resistance, which is a common feature of PCOS [6]. Endocrine secretions have far reached influence on the brain and periphery, circadian regulation of hormones is essential for normal functioning and any disruptions to circadian timing (e.g., irregular sleep patterns, limited exposure to sunlight, jet lag, nighttime light exposure) have detrimental health consequences [6].

The circadian timing has three major endocrine axes, the hypothalamo-pituitary-gonadal (HPG), hypothalamo-pituitary-adrenal (HPA) and hypothalamo-pituitary-thyroid (HPT) axes, and then consider the negative health consequences of circadian disruptions in each of these systems. Disruptions to HPG axis circadian timing led to a host of negative reproductive outcomes such as irregular menstrual cycles, low sperm density and increased rates of miscarriages and infertility. Dysregulation of HPA axis timing is associated with obesity and metabolic disease, whereas disruptions to the HPT axis are associated with dysregulated metabolic gene rhythms in the heart. The above overview underscores the significance of circadian endocrine rhythms in normal health, ovulation and PCOS disease prevention [6].

The vagus nerve plays an important role in the communication between the SCN and the ovaries in females through a complex network of neural and endocrine pathways. SCN communicates with the ovaries through a path-way that involves the hypothalamus, pituitary glands and the release of various hormones, including gonadotropin-releasing hormone (GnRH), luteinizing hormone (LH), and follicle-stimulating hormone (FSH). Research suggests that the right vagus nerve plays a role in the multi-synaptic pathways of communication between the SCN and the ovaries and indicate that such neural information participates in the regulation of the oestradiol and progesterone surge, which triggers the preovulatory peak of LH and determines ovulation [17].

Vagus Nerve Stimulation (VNS):

The “great wandering protector” plays a crucial role in the organism's homeostasis, and is currently being explored as therapeutic target in a variety of disorders [18]. By stimulating the vagus nerve, it is shown to modulate these functions and produce therapeutic effects. VNS has been shown to be effective to treat seizures in people with epilepsy, depression and anxiety, and has been found to improve mood and reduce symptoms in some patients [19]. It was discovered that vagal nerve stimulation caused prominent attenuation of systematic inflammatory response, given the important role that inflammation plays in numerous disease processes [20].

Vagus nerve stimulation (VNS) can be achieved through two different approaches, using a device that delivers electrical impulses to the nerve, and through the practice of yoga therapy. Yoga has capacity to stimulate the vagus nerve and decrease inflammatory markers, cortisol [21].[22].[23]. Yoga's potential mental and physical health benefits have highlighted reduction in sympathetic tone and increase in vagal activity[21]. Some of the most common device-based VNS methods are

Implantable VNS Devices, Transcutaneous VNS(tVNS), GammaCore, Auricular VNS (aVNS).

V. LITERATURE REVIEW

In an article published in the Journal of Inflammation Research, April 2023 edition, by Rhaya L Johnson & Christopher G Wilson's review article, “A review of Vagus nerve stimulation as a therapeutic intervention”, VNS has been shown to be effective in treating chronic inflammatory disorders such as diabetes, rheumatoid arthritis, migraines and fibromyalgia, possibly by modulating pain pathways in the brain. There is accumulating evidence to suggest that VNS can be used to help quell inflammation in a number of autonomic or inflammatory disorders. VNS has been proven to be a useful treatment across a number of domains and has been used effectively to treat epilepsy and depression in adults. There is an overwhelming evidence to suggest that Vagus nerve is an important component of the immune response and manipulating vagal tone is a way to modulate the immune system. Using VNS to manipulate vagal tone provides an exciting new opportunity for minimally invasive therapeutic intervention in adult and pediatric patients [18].

In an article published in the journal, Frontiers in Psychiatry, *Vagus Nerve as Modulator of the Brain-Gut Axis in Psychiatric and inflammatory Disorders*, by authors Sigrid Breit, et al, it is discussed that the Vagus nerve represents the main component of the parasympathetic nervous system, which oversees a vast array of crucial bodily functions, including control of mood, immune response digestion and heart rate. In this article, the authors discuss various functions of the vagus nerve which make it an attractive target in treating psychiatric and gastrointestinal disorders. There is preliminary evidence that vagus nerve stimulation is a promising add-on treatment for treatment of refractory depression, posttraumatic stress disorder, and inflammatory bowel disease.

Treatments that target the vagus nerve increase the vagal tone and inhibit cytokine production.

Both are important mechanism of resiliency. The stimulation of vagal afferent fibers in the gut influences monoaminergic brain systems in the brain stem that play crucial roles in major psychiatric conditions, such as mood and anxiety disorders. Since the vagal tone is correlated with capacity to regulate stress responses and can be influenced by breathing, its increase through meditation and yoga likely contribute to resilience and mitigation of mood and anxiety symptoms [19]. VNS studies are not just clinically, but also scientifically informative regarding the role of the vagus nerve in health and disease. The Vagus nerve is an essential part of the brain-gut axis and plays an important role in the modulation of inflammation, the maintenance of intestinal homeostasis and the regulation of food intake, satiety and energy homeostasis. An interaction between nutrition and the vagus nerve is well known, and vagal tone can influence food intake and weight gain. The Vagus nerve plays an important role in the pathogenesis of psychiatric disorders, obesity as well as other stress-induced and inflammatory diseases. Vagus nerve stimulation and several meditation techniques demonstrate that modulating the vagus nerve has a therapeutic effect, mainly due to its relaxing and anti-inflammatory properties.

In an article published in *Gastroenterology*, March 2017, *The Vagus Nerve in Appetite Regulation, Mood and Intestinal Inflammation*, by authors Kirsteen N Browning et al, the article discusses the physiological roles of the afferent (sensory) and motor (efferent) vagus in regulation of appetite, mood and the immune system, as well as pathophysiological outcomes of vagus nerve dysfunction resulting in obesity, mood disorders and inflammation. The therapeutic potential of vagus nerve modulation to attenuate or reverse these pathophysiological outcomes and restore

autonomic homeostasis is also discussed [24].

In an article published in *Frontiers in Human Neuroscience*, in October 2018, *Breath of Life: The Respiratory Vagal Stimulation Model of Contemplative Activity*, by authors Roderik J.S. Gerritsen et al, the review presents Contemplative practices such as meditation and yoga are increasingly popular among the general public and the beneficial effects associated with these practices. The review presents a wide range of studies that illustrates how slower respiration rates and longer exhalation physically and tonically stimulate the vagus nerve using diaphragmatic breathing techniques to kick start the calming rest and digest influences of the parasympathetic nervous system, referred to as respiratory vagus nerve stimulation (r-vns) [25]. Clearly, these functions move the system towards rest digest mode of operation and away from fight and flight. Vagus nerve not only controls the heart rate and slow deep breathing, slow respiration rates with extended exhalations could activate parasympathetic system by vagus nerve afferent function in the airways. This is a form of bio-feedback. Slow breathing techniques with long exhalation will signal a state of relaxation by the vagus nerve resulting in more vagus nerve activating and further relaxation.

In an article published in the journal, *Medical Hypotheses*, in May 2012, *Effects of Yoga on the autonomic nervous system, gamma-aminobutyric-acid (GABA), and allostasis in epilepsy, depression, and post-traumatic stress disorder*, by authors C.C. Streeter, et al, proposed to explain the benefits of yoga practices and hypothesized that yoga-based practices correct underactivity of the PNS and GABA systems in part through stimulation of the Vagus nerves, the main peripheral pathway of the PNS [26].

In an article published in the *Journal, International Journal of Yoga*, Jan-June 2011, *“Neurohemodynamic correlates of ‘OM’ chanting: A pilot functional magnetic*

resonance imaging study” by authors G. Kalyani et al, the authors hypothesize and conclude that like the transcutaneous VNS, neurohemodynamic correlates of OM chanting indicate limbic deactivation [27].

In an article published in IOSR Journal of Dental and Medical Sciences (IOSR-JDMS) March 2019, titled “Effect of yogic techniques on Heart Rate Variability in Polycystic Ovarian Syndrome patients” by authors Anushka Verma, Asha Gandhi et al, the authors studied Autonomic dysfunction in Polycystic Ovarian Syndrome (PCOS) patients and concluded that Yogic techniques effectively improve HRV in PCOS patients with autonomic dysfunction [5].

In an article published in Scientific reports, May 2023 by authors Shike Zhang, et al, Transcutaneous auricular vagus nerve stimulation as a potential novel treatment for polycystic ovary syndrome, by authors Shike Zhang et al discusses that Research has shown that PCOS is a neuroendocrine disease, and the ovary, its target organs are all associated with the vagus nerve. It has also been shown that PCOS can be treated by transcutaneous auricular vagus nerve stimulation (ta-VNS) in regulating the reproductive and endocrinal disturbance of PCOS, the ta-VNS treats PCOS by improving insulin resistance; the ta-VNS relieves PCOS-induced psychological disorders through the treatment of depression; the ta-VNS is applicable in treatment of PCOS complications, such as hypertension and diabetes [28][29].

VI. DISCUSSION

PCOS is a biologically heterogeneous condition involving multiple pathophysiological processes that lead to ovarian dysfunction. It is also considered to be a neuroendocrine disease resulting from Hypothalamus-pituitary-ovary axis dysregulation. Autonomic functions were significantly affected among females with PCOS, with sympathetic dominance and decreased vagal tone. There is an association between circadian rhythm

disruption and PCOS. Early lifestyle changes help to prevent PCOS condition, before any significant clinical impairment occurs.

The autonomic nervous system consists of sympathetic and parasympathetic nervous systems. Sympathetic nervous system is associated with the fight or flight response that is the result of the release of cortisol (stress chemicals). The parasympathetic nervous system is associated with relaxation, digestion and regeneration. These two parts of the autonomic nervous system are meant to work in rhythmic alternation, a process that supports healthy rhythms of alertness and restfulness, that facilitate physical and mental health. As we live in a world that is over-stimulating which is activating the sympathetic nervous system, many of us need access to tools like yoga, that help us engage the parasympathetic nervous system on a daily basis. Vagus nerve, a part of the parasympathetic nervous system, can be stimulated through yoga.

The vagus nerve extends from the brain stem down to the stomach and intestines, innervating the heart and lungs and connecting the throat and facial muscles. Therefore, any yoga practice that stimulate these areas of the body can have a profound influence on the vagal tone. In the physically active mind-body exercises, respiration can be synchronized with body movements, moving with the breath. For example, in some yoga postures moving towards body is performed on inhale and moving outward on exhale. In yoga, moving is performed slowly, and so is the breathing cycle, during yogic breathing exercises (pranayamas). As parasympathetic activity goes up, sympathetic activity goes down. This shift is known as vagal dominance. In vagal dominance chronic stress and stress-related conditions like PCOS are attenuated. Thereby, incorporating a yoga therapy regimen to stimulate vagus nerve has the potential to improve overall well-being and alleviate symptoms associated with PCOS related conditions.

VII. CONCLUSION

The above literature review shows that vagus nerve stimulation (VNS) bears the promise of being applied to a wider range of therapeutic applications. Overall, vagus nerve stimulation may be an alternate treatment option for patients with certain medical conditions who have not responded to other treatments or who experience severe symptoms. VNS may help to improve hormonal imbalances and menstrual irregularities associated with PCOS. It may be safely concluded that yogic techniques such as asanas, pranayama, chanting and meditation can be an effective way to stimulate the vagus nerve to help regulate hormonal cycles, reduce inflammation, and promote overall health and wellbeing to treat PCOS. VNS using yogic techniques effectively improve HRV in PCOS patients indicating increased parasympathetic nervous system activity with a healthy vagal tone.

Hence, we can conclude that the “great wandering protector” plays a crucial role to maintain homeostasis, and VNS using yoga therapy may be a safe and effective option to relieve PCOS condition in females. Yoga therapy vagus nerve stimulation is a promising new approach in treatment of PCOS.

Declaration by Authors

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