DISSERTATION

On

ROLE OF YOGIC PRACTICES IN MANAGING HORMONAL IMBALANCE WITH SPECIAL REFERENCE TO PCOS

Submitted for SKM YOGA TTC

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1. INTRODUCTION

Health is more than just the absence of disease. It is also being healthy physically, mentally, socially and spiritually. In today's fast-moving world, the health of the people has been greatly influenced by lifestyle changes, stress, poor eating habits, lack of exercise, irregular sleeping patterns and environmental variables. Hormonal imbalance is one of the most frequent health issues faced by people of all ages, especially women.

The endocrine glands produce hormones. Hormones are chemical messengers that help control most of the functions in the body such as metabolism, growth, reproduction, mood, sleep, and energy levels. Proper functioning of the hormones helps maintain your general health and well-being. An imbalance in any of the hormones can cause many health conditions such as irregular periods, infertility, obesity, thyroid issues, mood swings, fatigue and metabolism problems.

One of the most frequent chemical disorders women face nowadays is Polycystic Ovary Syndrome (PCOS). PCOS is a complex hormonal and metabolic illness that manifests with irregular menstrual cycles, hyperandrogenism, ovarian dysfunction, insulin resistance and various mental and reproductive morbidities. PCOS has grown a lot more common in recent years as individuals are less active, eating badly, overweight and under a lot of stress.

The common approaches to treat PCOS include using hormonal medicines, taking drugs that make the body more responsive to insulin, making changes to your diet, and regulating your lifestyle. These approaches may help with the symptoms but may not always deal with the underlying causes of stress, lifestyle issues and mind-body imbalance.

Yoga is a very old science from India and sees health and wellness in numerous ways. Asanas: physical postures. Pranayama: breathing exercises, relaxation techniques, meditation, moral concepts for living a decent life. The aim of yogic practices is to harmonize the body, mind and soul. Research has proven that yoga can assist to reduce stress, enhance digestive health, regulate menstrual cycles and generally improve life.

There is increased interest in complementary and alternative treatments and researchers and clinicians are looking at the benefits of yoga for hormonal issues. Stress and lifestyle choices have a great impact on hormonal imbalance and PCOS hence yoga can be a great technique to help improve physical, mental and reproductive health.

The purpose of this study is to explore hormonal imbalance with a focus on Polycystic Ovary Syndrome (PCOS) and to examine the impact of yoga practices in treating this disease by conducting an extensive review of the literature available.

1.1 STATEMENT OF THE PROBLEM

Hormonal imbalance is a major health problem in today's world, particularly among women of reproductive age. Polycystic Ovary Syndrome (PCOS) is a hormonal issue and one of the most frequent illnesses that affects fertility, mental health, and the health of your periods. More and more people are having PCOS and other endocrine illnesses as people live in cities faster, eat badly, stressed all the time and are not active enough. Medical treatment is still crucial, but the need for ways that treat the disease as a whole, encompassing its physical, mental and lifestyle-related aspects is expanding.

Yoga is a holistic approach to health and has been proved to be effective in regulating hormones, lowering stress, speeding up metabolism and safeguarding reproductive health. That's why it's crucial to discover how yoga practices might help with hormonal imbalances, especially with PCOS.

1.2 NEED FOR THE STUDY

In the previous decades more women have been diagnosed with hormonal diseases. Polycystic ovary syndrome impacts the health, fertility, and quality of life of millions of women worldwide. It can also impact their mental and emotional wellness.

There are several indicators like mood swings, anxiety, infertility, acne, weight gain and irregular periods that many women go through. These are not merely symptoms that damage your physical health, but signs that make you feel lousy emotionally, intellectually.

Yoga is a natural, cheap and holistic approach for your wellness. It is concerned with the physical and mental aspects of health and teaches breathing exercises, yoga postures, meditation, relaxation and control over lifestyle.

The importance of this study is:

1. Discover what hormonal imbalance is and what causes it.
2. Explore the various facets of PCOS.
3. Find out how yoga can help keep your hormones healthy.
4. Read the scientific study done on yoga and PCOS.
5. Raise awareness of the yoga practices' health benefits and healing powers.

1.3 SIGNIFICANCE OF THE STUDY

The significance of this study is that it highlights the significance of the combination of traditional yogic knowledge with modern health approaches in the treatment of hormonal diseases.

Findings of this study can help:

1. **Women**

   By raising awareness among people on how to control their lifestyle, manage stress and take care of themselves in ways that are healthy for their hormone health.

2. **Yoga practitioners**

   Let us look at the facts and see how yoga can have a function in endocrine and reproductive health.

3. **Healthcare Professionals**

   By providing you with ideas regarding alternate ways that can be used along with established treatment regimens.

4. **Researchers**

   By highlighting areas where there's more work to be done on yoga, hormone balance and women's health.

5. **Communities**

   Promoting preventive health care and encouraging individuals to live healthier lives.

1.4 OBJECTIVES OF THE STUDY

Objectives of this study are:

1. To know what is hormonal imbalance and how it affects the body.
2. To learn the structure and function of the Endocrine System.
3. What causes hormonal instability, how it shows up and what happens as a result.
4. To find out about Polycystic Ovary Syndrome (PCOS) and the complications it can cause.
5. To understand the concept and theory of yoga.
6. To study the effect of asanas, pranayama, meditation and other relaxation techniques on the balance of hormones.
7. To review the scientific material on yoga and PCOS management.
8. To explore the effect of yogic methods in managing the hormonal imbalances.

1.5 LIMITATIONS OF THE STUDY

1. The study is based entirely on secondary sources such as books, journals, research articles, and published literature.
2. No primary data has been collected.
3. No clinical trial or experimental investigation has been conducted.
4. The findings are limited to the available literature reviewed.
5. The study focuses mainly on PCOS as a representative hormonal disorder.

2. ENDOCRINE SYSTEM AND HORMONES

2.1 The Endocrine System

If the nervous system is a fibre-optic cable – fast, direct, point-to-point – then the endocrine system is more like a radio broadcast. It's glands pour chemical signals, or hormones, directly into the blood stream. From there they float about the body until they find the correct "receiver". The body relies on a system of internal communication in order to co-ordinate its various organs, in order to maintain a stable internal environment - homeostasis - in which the temperature of the body and the level of blood electrolytes are maintained within narrow, preset limits (Hiller-Sturmhöfel & Bartke, 1998).

That is slower than nerve transmission, but it is also longer-lasting and more wide-ranging. A single hormone from a single gland can tell the liver to release sugar, the heart to speed up, the kidneys to retain water – all from one signal, sent once. Many of the hormone-producing glands of the body operate in layered chains of command. The hypothalamus releases hormones which act on the pituitary gland, and several pituitary hormones act on other glands, the thyroid, the adrenal glands, the ovaries, completing what physiologists call regulatory hormonal cascades (Hiller-Sturmhöfel & Bartke, 1998). Three such cascades are recurring themes of this dissertation: the hypothalamic-pituitary-adrenal (HPA) axis, which controls the stress response; the hypothalamic-pituitary-thyroid (HPT) axis, which controls metabolism; and the hypothalamic-pituitary-ovarian (HPO) axis, which controls the menstrual cycle. The HPO axis is at the very heart of what goes wrong in PCOS.

2.2 What exactly is a hormone?

At its simplest, a hormone is a chemical messenger – a molecule made somewhere in the body and transported in the blood to act on some other area of the body. What makes a hormone distinct from, say, a digestive enzyme is precision: a hormone doesn't just do whatever it comes across. It only works on cells that have the receptor for it, like a key only will turn the lock it was cut for. For example, if a cell lacks the receptor for insulin, it just ignores it when it floats by, no matter how much insulin is in the bloodstream.
Hormones come in a few chemical “families.” Some – insulin, growth hormone and the gonadotropins FSH and LH for example – are proteins or peptides, constructed from chains

of amino acids. Others—like estrogen, progesterone, testosterone, and cortisol—are steroids, created from cholesterol, which is part of why they can slip right through a cell's outer membrane and operate on receptors inside the cell itself. The third group, the amine hormones, consists of the thyroid hormones and epinephrine. The chemical family a hormone belongs to really matters. For example, steroid hormones usually function more slowly, but for longer. Peptide hormones, like as LH, can produce an almost immediate reaction — and that's exactly why an LH surge can cause ovulation in around 24 to 36 hours.

2.3 Functions of Hormones

Once you stop thinking of hormones one at a time and start thinking of them as a coordinated system managing four or five broad jobs at once, it's easier to get what they do:

1. **Growth and development** – from childhood growth spurts to puberty itself, is nearly completely hormone driven.
2. **Metabolism** - how quickly the body uses up energy, accumulates fat and consumes glucose. This is mostly controlled by thyroid hormone and insulin.
3. **Reproduction** – the whole menstrual cycle, ovulation, pregnancy and lactation are all coordinated by a cascade of hormones that work in sequence.
4. **Stress response and homeostasis** – cortisol and adrenaline ready the body to confront physical or psychological dangers.
5. **Hormones and mood and cognition -** Hormones don't just "stay in the body." Thyroid hormone, cortisol, and the sex hormones all have quantifiable effects on mood, sleep, and concentration.

The value of sitting with, especially for the sake of this research, is that these five functions do not exist in distinct compartments. They flow into each other all the time. Chronic stress (function four) increases cortisol and can be a contributor to blunted insulin sensitivity (function two) and a disrupted menstrual cycle (function three).

2.4 The Hypothalamus: The Brain's Endocrine Switchboard

The hypothalamus is a little structure, about the size of an almond, situated at the base of the brain, immediately above the pituitary gland. It is small yet works as the command hub that connects the neurological system to the endocrine system. This is done by making "releasing" and "inhibiting" hormones that travel a relatively short distance down to the pituitary gland and switch on or off the production of pituitary hormones. The hypothalamus produces a number of releasing and inhibitory hormones which act directly on the pituitary, promoting or reducing the production of pituitary hormones.

The three hypothalamic hormones most relevant for this dissertation are gonadotropin-releasing hormone (GnRH) which rules the reproductive axis, corticotropin-releasing hormone (CRH) which governs the stress axis, and thyrotropin-releasing hormone (TRH) which governs the thyroid axis. Since the hypothalamus also receives input from the rest of the brain—input relating to stress, emotion, and sleep—this is the point in the system where psychological condition most directly becomes hormonal state. This is why prolonged worry or poor sleep can interrupt a menstrual cycle even when the ovaries themselves are completely healthy, and why therapies that settle the nervous system, like pranayama and meditation, are theorized to impact hormonal balance "from the top down."

2.5 The Pituitary Gland: The "Master Gland"

Just below the hypothalamus, connected to it by a short stalk, sits the pituitary gland — often nicknamed the "master gland" because so many of its hormones go on to control other glands rather than acting directly on tissue themselves. The pituitary is really two glands fused together: an anterior (front) lobe and a posterior (back) lobe, each with a distinct embryological origin and distinct hormones.

The anterior pituitary is the one that matters most here. In response to GnRH from the hypothalamus, it releases follicle-stimulating hormone (FSH) and luteinizing hormone (LH) — the two gonadotropins that drive the entire ovarian cycle. It also produces thyroid-stimulating hormone (TSH), which governs the thyroid; adrenocorticotropic hormone (ACTH), which governs the adrenal cortex; growth hormone; and prolactin. The posterior

pituitary, by contrast, simply stores and releases two hormones made in the hypothalamus itself: oxytocin and antidiuretic hormone.

What makes the pituitary so consequential in conditions like PCOS is its sensitivity to feedback. As ovarian follicles grow and estradiol concentrations rise, the pituitary actually becomes progressively more sensitive to GnRH, building toward the sharp burst of LH and FSH release that triggers ovulation (College of Medicine, University of Cincinnati, n.d.). In PCOS, this fine-tuned sensitivity is disturbed — LH tends to run persistently high relative to FSH — and that single imbalance has knock-on effects throughout the rest of the reproductive system.

2.6 The Thyroid Gland

The thyroid is a tiny gland at the front of the neck that is formed like a butterfly and wraps itself around the windpipe. Together with the hypothalamus and the anterior pituitary gland it forms a self-regulating circuit called the hypothalamic-pituitary-thyroid axis and its two main hormones, thyroxine (T4) and triiodothyronine (T3) act in concert with thyrotropin-releasing hormone and thyroid-stimulating hormone to maintain an internal equilibrium (Shahid et al., 2023). T4 is produced in far greater amounts, but T3 is the more physiologically active form. Most of the body’s circulating T3 is actually created by conversion of T4 to T3 in peripheral tissues such as the liver and kidneys, rather than by the thyroid gland itself. NCBI Actually, thyroid hormone controls the rate at which practically every cell in the body burns energy. Too little (hypothyroidism) and metabolism slows. Weight gain, weariness, cold sensitivity, and, importantly, monthly irregularity follows. Too much (hyperthyroidism) and the reverse happens - weight loss, beating heart, anxiety and again, menstruation disruption. This final point is particularly relevant to this dissertation, since there is frequent overlap between thyroid dysfunction and PCOS, and the two often mimic each other's symptoms, which is one reason thyroid function tests are a normal part of any PCOS diagnostic work-up, and one reason Chapter 3 covers thyroid diseases with PCOS and not as a separate entity.

2.7 The Adrenal Glands

The two adrenal glands, the body's main stress-response organs, sit on top of the kidneys, one on each side. The hypothalamus then releases corticotropin releasing hormone which activates the pituitary gland to release adrenocorticotropic hormone into the blood. This hormone acts on the adrenal gland to cause the synthesis and release of cortisol (Tomas et al., 2013) which completes the hypothalamic-pituitary-adrenal (HPA) axis. This is the traditional "fight-or-flight" route of the body, and the primary output is cortisol.

Cortisol is not the villain it is sometimes painted as in popular wellness writing – in brief bursts, it is exactly what permits the body to mobilize energy, sharpen focus, and respond to a real threat. The difficulty is time. Cortisol mobilises energy stores, raises blood glucose and readies the body's cardiovascular system for fight or flight (PMC, 2024) – handy for minutes, but corrosive when sustained for months or years, which is precisely the pattern created by chronic modern-day stressors: work pressure, financial anxiety, sleep debt or unresolved emotional strain. Small amounts of androgens (male-type hormones found in everyone) are also made by the adrenal glands, and in PCOS, overproduction of adrenal androgens is one of multiple mechanisms leading to the hyperandrogenism that defines the condition.

2.8 The Pancreas

The pancreas sits behind the stomach and performs two quite different functions. Most of it operates as an exocrine gland, secreting digestive enzymes that pass-through ducts into the small intestine. But tucked away in the pancreas are small clusters of cells called the islets of Langerhans, and these act as an endocrine gland, secreting hormones directly into the blood. The two most familiar are insulin, secreted by beta cells, and glucagon, secreted by alpha cells. These hormones are the pancreas's main way to maintain a healthy blood sugar level, and problems such as diabetes develop when the pancreas doesn't generate enough insulin or when the body stops responding to it correctly, a condition called insulin resistance. Endocrine Society The significance of insulin in this dissertation is not incidental. We now know that insulin resistance and resulting metabolic disturbances are core aspects of PCOS rather than peripheral ones, which is why weight and metabolic management is at the heart of PCOS treatment according to international clinical guidelines. When cells lose their ability to respond well to insulin, the pancreas overcompensates by making more insulin. And this

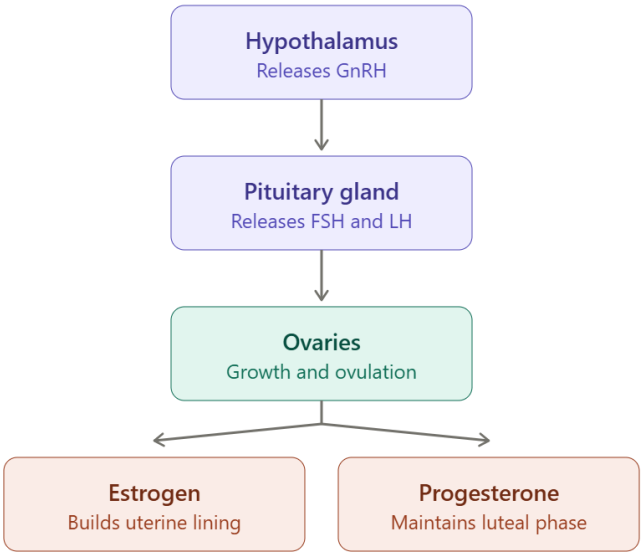
excess insulin directly stimulates the ovaries to make more androgens, fueling the hormonal imbalance that defines PCOS from yet another angle. Insulin resistance leading to androgen excess is one of the clearest physiological links between “lifestyle” (diet, activity, stress, sleep) and “hormones”, and one of the main reasons why lifestyle interventions like yoga are taken seriously as PCOS management tools rather than dismissed as unrelated wellness practices.

2.8 The Ovaries

The ovaries are two almond-shaped organs in the pelvis. They perform two things at once: they store and release eggs (the reproductive function), and they generate estrogen and progesterone, the body’s major female sex hormones (the endocrine function). The ovary, however, does not have a well-defined pattern of hormone secretion like most endocrine glands. Rather, the hormones they produce fluctuate on a programmed monthly cycle that is regulated from above by FSH and LH from the pituitary gland.

FSH stimulates the development of follicles in the ovary. In turn, the granulosa cells around the developing egg release estradiol, the dominant kind of estrogen during the reproductive years. This allows the egg and the surrounding cells to keep developing. Ovulation happens when estrogen levels go up and one of the ovaries matures and releases the egg. The remaining part of the follicle forms a short-lived tissue called the corpus luteum. This tissue produces progesterone to keep conditions favorable for a possible pregnancy. If fertilization does not occur, the corpus luteum breaks down and hormone levels fall, which results in menstruation.

The brain and the ovaries are in an ongoing back-and-forth conversation. It’s not a one-way chain of command; it’s a feedback loop. The photo illustrates the exchange from beginning to end.



↻ Estrogen and progesterone feed back to the hypothalamus and pituitary, regulating the next cycle

And that is influenced by estrogen and progesterone acting back on the hypothalamus and pituitary. Progesterone especially suppresses further FSH and LH secretion at high concentrations. The loop closes at the bottom: the release of FSH and LH is dependent on the continuous, pulsatile release of GnRH from the hypothalamus, and that release is itself shaped by estrogen and progesterone feeding back on both the hypothalamus and the pituitary. Physiologists say that a “feedback loop” means that the ovaries are not inert downstream organs simply doing what the pituitary tells them to do; they are actively reporting back, moment to moment, and that report influences what happens next. It also explains precisely why a disturbance anywhere in this loop—chronic stress signals reaching the hypothalamus, excess insulin signaling reaching the ovaries, or an LH-to-FSH ratio that's too high—can disrupt the entire cycle, even when each gland, taken in isolation, seems structurally normal. As the next two chapters will reveal, PCOS is best understood not as a disease of one malfunctioning gland but as a disruption of the dialog between numerous healthy glands.

3. HORMONAL IMBALANCE IN WOMEN

3.1 What Is Hormonal Imbalance?

Let’s pause and think about the language here, because “hormonal imbalance” is a phrase that gets used so loosely in speech that it’s virtually a catchall for everything from mood swings to weight gain. Clinically, this means something more specific: a situation in which one or more hormones are produced in either too large amounts, too low amounts, or at the wrong time relative to what the body's feedback mechanisms are built to expect. As mentioned in Chapter 2, the endocrine system is not a system of separate glands, but of interrelated cascades, and a disturbance seldom remains localized. One hormone that is too high or too low causes ripples to go out, knocking two or three other systems off their own state of homeostasis, in turn.

That is exactly why hormone imbalance in women is commonly multi system in manifestation. A woman with excess cortisol from chronic stress may not “feel stressed” in any obvious way — she may instead notice irregular periods, stubborn weight around the midsection, and disrupted sleep, with the common thread (an overactive stress axis) invisible unless someone thinks to specifically look for it. This is one of the reasons hormonal problems are so often under-recognized or misattributed to other causes, and it is a theme that goes through the rest of this chapter.

3.2 Causes of Hormonal Imbalance

In general terms, there are three overlapping explanations for women’s hormonal imbalance.

Biological and genetic factors include puberty, pregnancy and menopause, all of which involve major, predictable hormonal alterations, and hereditary predispositions to illnesses such as PCOS and thyroid autoimmunity, which run in families. Medical causes include disorders that directly damage or overstimulate an endocrine gland, such as autoimmune thyroid disease, pituitary tumors, certain drugs and chronic illnesses causing constant metabolic stress on the body. The third and most actionable group for the sake of this dissertation, are lifestyle-related reasons - chronic stress, poor sleep, sedentary behavior, obesity and poor food habits. Each is at least partially controllable through sustained behavioural change. Section 3.4 looks at each of these five lifestyle elements in turn, as together they comprise the physiological explanation for how a non-pharmacological intervention such as yoga may even feasibly affect hormonal outcomes.

It’s worth noting that these three categories rarely work in isolation. For example, take a lady with a genetic tendency for insulin resistance. She can be completely asymptomatic for years

until chronic stress, lack of sleep, and a sedentary desk job work together to push an already stressed system over the cliff. That's the layered, cumulative nature of hormone imbalance that makes it so difficult to trace back to a single cause, and so vital to address with equally multi-layered, lifestyle-level therapies.

3.3 Symptoms of Hormonal Imbalance

Due to the involvement of so many hormones, the symptom picture of hormonal imbalance in women can look dramatically different from one individual to the next. That said, some symptoms are common enough across different illnesses to be regarded classic warning signs:

1. Heavy, missing, irregular or unusually painful periods
2. Unexplained weight gain or difficulty reducing weight, especially around the abdomen
3. Tiredness that lasts even after you get enough sleep
4. Acne, greasy skin, or too much hair on the face and body.
5. Thinning of hair or hair loss on the scalp
6. Changes in mood – irritation, anxiety, low mood, frequently exacerbated premenstrually
7. Sleep problems, such as trouble falling asleep or staying asleep
8. Reduced fertility or trouble conceiving

None of these symptoms is diagnostic – weariness, for example, has dozens of potential explanations that have nothing to do with hormones. It is the clustering of several of these symptoms together that tends to be clinically meaningful, particularly when menstrual irregularity is associated with metabolic signs like weight gain and skin changes, which is exactly the pattern that leads many women to a diagnosis of PCOS or thyroid dysfunction in the first place.

3.4 Lifestyle Factors That Drive Hormonal Imbalance

This section is the axis on which the remainder of this dissertation revolves. Each of the five below is well established in the scientific literature as an individual driver of hormonal disruption - and each is, not coincidentally, a factor that yogic practice is believed to

influence directly, via stress reduction, better sleep, increased physical activity, weight management, or more indirectly via healthier eating patterns that often come along with a broader lifestyle shift.

3.4.1 Stress

The chronic stress response keeps the hypothalamic-pituitary-adrenal (HPA) axis engaged far longer than it was ever meant to be. Since the menstrual cycle is controlled by the pulsatile secretion of GnRH (gonadotropin-releasing hormone) from the hypothalamus, and stress can inhibit the very same GnRH secretion via the HPA (hypothalamic-pituitary-adrenal) axis, there is a direct, mechanistic pathway from sustained psychological stress into menstrual disruption. It's not just a correlation that researchers have observed; there is a definite physiological pathway from "stressed brain" to "disrupted cycle." This is evident in the clinical literature on menstrual disorders related to stress: reviews of premenstrual syndrome and premenstrual dysphoric disorder highlight a bi-directional relationship between the HPO axis, which controls the menstrual cycle, and the HPA axis, which controls the stress response – the two systems are anatomically overlapping and constantly modulate each other's activity (Cheng et al., 2025). Chronic stress doesn't just make a difficult cycle feel worse; it can be a real contributing cause of the irregularity itself, especially for young women dealing with academic or early-career pressures, which is exactly the demographic most commonly diagnosed with PCOS and menstrual irregularity today.

3.4.2 Poor Sleep

In fact, much of the body's hormonal "housekeeping" happens when you're asleep, and the implications of sleep loss extend far beyond just feeling sleepy the next day. A comprehensive review of sleep and female neuroendocrinology found that sleep deprivation, disruption, dysrhythmia, and sleep disorders are consistently associated with impaired reproductive function and poorer reproductive outcomes among women, with pathologic sleep patterns being closely associated with menstrual irregularity, polycystic ovarian syndrome, premature ovarian insufficiency, and infertility (Beroukhim et al., 2022). It works mainly along the same stress route described above: bad sleep is a stressor in and of itself, activating the HPA axis, elevating cortisol, which interferes with the chemicals that control ovulation. The practical message is one that is easy to underestimate—sleep hygiene isn't a minor footnote in a discussion of hormonal health. For many women, it's one of the more direct levers available.

3.4.3 Sedentary Lifestyle

Prolonged sitting has become the rule rather than the exception in modern work and study patterns, and the body responds to this faster and more severely than most people predict. Sedentary behavior has been demonstrated to raise the risk of insulin resistance, and the significant changes in modern lifestyle toward reduced physical activity have contributed to increasing prevalence of insulin-related metabolic illnesses even in young individuals (Yaribeygi et al., 2021). This is a really big deal for women's hormonal health in particular, since as we learned in Chapter 2, insulin resistance doesn't just sit about in the blood sugar department. Too much insulin directly stimulates the ovaries to create too many androgens, one of the key processes in PCOS. In other words, the reproductive system isn't usually the first thing to suffer from a sedentary lifestyle, insulin sensitivity is, but the reproductive repercussions tend to follow close on its heels.

3.4.4 Obesity

Adipose (fat) tissue is not just inert storage, it is, functionally, a functioning endocrine organ in its own right. Adipose tissue directly contacts insulin, leptin, and sex hormones. This interaction can result in functional problems in the female hypothalamic-pituitary-ovarian axis through central and peripheral processes (Chen et al., 2025). Hence obesity and hormonal disruption are often co-travelers rather than one being a mere side consequence of the other. Excess fat tissue itself is actively producing more hormonal signals (including its own androgens and inflammatory chemicals) that are fed back into the reproductive axis. That's also why even small, persistent weight loss—the number mentioned in Chapter 1 was as little as 5 to 10% of body weight—can significantly enhance menstrual regularity: the connection is mechanical, not merely statistical.

3.4.5 Poor Dietary Habits

Diet's impact on hormonal health is mostly, but not only, through its impact on blood sugar and insulin. Refined carbs, high glycaemic index and glycaemic load, and low fibre diet have been consistently related with PCOS, while diets higher in fibre and whole grains have been proven to increase insulin sensitivity and reduce insulin resistance in afflicted women (Zhang et al., 2025). A diet high in refined sugar and processed carbohydrates causes rapid, dramatic insulin spikes; over months and years, this repeated demand can lead to the same insulin resistance discussed in the previous two sections — so diet, inactivity and obesity often act as

three reinforcing arms of a single metabolic problem rather than three separate issues. This is exactly why food modification is so rarely prescribed alone in serious PCOS care, and why it makes a brief appearance in Chapter 8 of this dissertation, alongside yogic lifestyle practices, even though diet is not within the major topic of this study.

3.5 Common Hormonal Disorders in Women

The five lifestyle factors above don't operate in a vacuum — they converge, in practice, into a handful of recognisable clinical conditions. Three are introduced briefly here; the most significant of them, PCOS, is given its own dedicated chapter immediately following this one.

3.5.1 Polycystic Ovary Syndrome (PCOS)

Polycystic Ovary Syndrome (PCOS) is one of the most prevalent endocrine disorders in women of reproductive age. It is a complex endocrine and metabolic disorder which affects normal functioning of ovaries. Women with PCOS may have irregular periods, increased production of male hormones (androgens), problems with ovulation, weight gain, acne, excessive hair growth, and fertility problems.

The sedentary lifestyle, unfavorable food habits, obesity, chronic stress, poor sleep and lack of physical activity have led to an increase in the prevalence of PCOS in the current world. The specific etiology of PCOS is not totally understood however genetic, hormonal, metabolic and environmental factors are likely to play a major influence in the development of PCOS.

The condition impacts reproductive health, mental well-being, self-confidence, metabolic health and overall quality of life. Thus, early diagnosis and adequate care are of utmost importance.

3.5.2 Thyroid Dysfunction

Indian women have a high prevalence of thyroid diseases which are often under-diagnosed. It is estimated that over 42 million people in India suffer from some type of thyroid dysfunction. Population-based studies report the prevalence of hypothyroidism to be significantly greater in women than males (Unnikrishnan & Menon, 2011). More recent multi-city data directly supports this gender divide. In a statewide study performed in India,

hypothyroidism was detected in 15.86% of the female participants and only 5.02% of the male participants, with the prevalence increasing with age. Subclinical hypothyroidism is a milder, often asymptomatic type of the condition where TSH levels are high but other thyroid markers are normal; thus it is technically not hypothyroidism. This form is even more common, and often undetected, because thyroid testing is not often part of standard check-ups unless there are symptoms that warrant it. The relationship between thyroid disease and PCOS is not accidental. Both illnesses can independently induce menstruation irregularity, weight fluctuations, exhaustion and mood instability. This means the two are occasionally misunderstood for each other – or, in a considerable minority of women, occur concurrently. This is why a basic thyroid panel is standard when PCOS is suspected, and why this dissertation treats thyroid dysfunction as a close companion issue instead of an isolated separate condition.

3.5.3 Menstrual Irregularities

In some ways, menstrual irregularity is the most obvious symptom of this entire chapter—it's often the first thing a woman will notice, much before a blood test can discover what's behind it underneath. A multi-country comparison found that menstrual irregularity was reported by as many as 35.7% of women surveyed in India and 64.2% in Nepal, figures far higher than the 26.5-32.6% reported in studies across Ethiopia. This is a reminder that this is not a marginal problem affecting a small minority, but a genuinely widespread issue, especially across South Asia. The same study found that younger age, early menarche, short sleep duration, perceived stress and being overweight were significantly associated with the likelihood of menstrual irregularity – which is, in essence, a near-perfect overlap with the five lifestyle factors discussed earlier in this chapter, discovered independently through a completely different study population. That overlap is what this chapter really tells us Stress, sleep, inactivity, obesity and diet are not five different risk factors that happen to appear on the same list. They are five points of entry to the same underlying hormonal system, each of which can disrupt that system, and as later chapters will argue, each of which can be at least partially addressed through sustained yogic practice.

4. UNDERSTANDING PCOS

4.1 Definition of PCOS

Polycystic Ovary Syndrome is a heterogeneous endocrine and metabolic disorder affecting women of reproductive age, defined by some combination of three core features: irregular or absent ovulation, clinical or biochemical signs of excess androgens ("male" hormones present in all women, but elevated here), and a characteristic polycystic appearance of the ovaries on ultrasound. The word "syndrome" is doing real work in that name — PCOS is not one single, uniform disease with one cause and one fixed presentation. It is a *cluster* of features that can combine in different ways from one woman to the next, which is precisely why two women can both carry the same diagnosis while looking, symptomatically, quite different from each other.

4.2 History of PCOS

Some kind of PCOS has been identified for almost a century, but its definition has changed a lot as medical understanding has grown. This condition was first described clinically in 1935 when Stein and Leventhal reported seven women with hirsutism, amenorrhea, and a characteristic ovarian morphology seen at ovarian wedge resection. This work gave the condition its previous name of Stein-Leventhal syndrome. For decades to come, PCOS was viewed mainly as a reproductive issue, defined mostly by what could be seen on the ovaries themselves. This changed considerably in the 1980s and 1990s when researchers such as Rosenfield and at the University of Chicago began to show that the ovarian alterations in PCOS were not the primary problem but rather a downstream consequence of a functional hormonal issue. The work contributed to the redefinition of PCOS, formalized in a 1990 National Institutes of Health conference, as fundamentally unexplained hyperandrogenic anovulation, with a shift in focus to hormonal abnormalities rather than ovarian morphology alone. This NIH definition remained in place for over a decade until the 2003 Rotterdam consensus expanded the concept to its current form: PCOS as a diverse condition characterized by the presence of at least 2 of 3 criteria – ovulatory dysfunction, hyperandrogenism and polycystic ovarian morphology on ultrasound (Rotterdam ESHRE/ASRM-Sponsored PCOS Consensus Workshop Group, 2004). The single shift, from "all three required" to "any two of three", explains why PCOS is today understood to have

numerous discrete phenotypes rather than one set presentation, something that becomes crucial.

4.3 Epidemiology

PCOS is currently recognized as the most common endocrine condition in women of reproductive age globally (Chapter 1). Prevalence estimates are commonly approximated as 8% to 13% (Yasmin et al., 2025) with prevalence estimates varying greatly depending on whatever diagnostic criteria a given study adopts, with broader criteria naturally capturing more women than stricter ones. In India in particular, a number of regional studies indicate that the burden is higher than the global average, varying from less than 10% to more than 30% depending on the population selected (see Chapter 1). Similarly, a large Indian cohort study found that 43.2% of women with PCOS were obese, 91.9% were dyslipidemic and 32.9% had evidence of non-alcoholic fatty liver disease (Ganie et al., 2024) – data that makes it clear that PCOS is rarely an isolated reproductive problem in practice; it usually comes in a package with broader metabolic disturbance.

4.4 Pathophysiology

To understand why PCOS causes the symptoms it does we need to look at two closely related mechanisms: hyperandrogenism and insulin resistance. Both are interlinked, each exacerbating the other in what is now regularly described in the scientific literature as a "vicious cycle.

4.4.1Hyperandrogenism

The root cause of PCOS is an overproduction of androgens, mostly from the ovarian theca cells (the hormone-producing cells that surround each maturing egg). Insulin and luteinizing hormone synergistically regulate theca cells to promote ovarian androgen synthesis. Excess insulin simultaneously enhances the adrenal glands steroid response to ACTH and suppresses the liver's production of sex hormone-binding globulin (SHBG)—the protein that normally "mops up" circulating androgens. The net effect of these actions is to increase both total and free androgen levels in the blood (Mancini et al., 2022). Lower SHBG implies more free, unbound testosterone floating about in the body, and that's what truly causes things like acne and hair growth.

There is also a hypothalamic-pituitary component to this picture. PCOS pathophysiology involves dysregulation of the hypothalamic-pituitary-ovarian axis itself, with increased GnRH pulsatility, elevated LH, and suppressed FSH, which together promote thecal androgen excess and impair the normal process of follicle development (Damoulaki et al., 2025). In effect, the entire reproductive feedback loop described in Chapter 2 — hypothalamus to pituitary to ovary and back — is running with its dial turned toward androgen production and away from the orderly follicle maturation needed for regular ovulation.

4.4.2 Insulin Resistance

A large percentage of women with PCOS have insulin resistance, which has been reported in 35% to 80% of patients. Women with PCOS who are obese are more likely to be insulin resistant than women with PCOS who are not fat (Bruni et al., 2025). What makes insulin resistance so central to PCOS specifically is a kind of selective resistance: the muscle and fat tissue become unresponsive to insulin, but the ovary remains perfectly responsive — which means the flood of excess insulin the pancreas produces to compensate for that resistance elsewhere in the body still hits the ovaries at full strength, where it does real damage by overstimulating androgen production.

Insulin resistance results in hyperinsulinemia, which stimulates androgen production through various mechanisms. The combined effect of elevated insulin and LH can prematurely activate LH receptors on theca cells, while insulin also directly stimulates androgen synthesis by increasing the activity of the enzyme P450c17, a key driver of androgen biosynthesis Wdowiak et al., 2025). Also, increased insulin inhibits aromatase, the enzyme that would convert testosterone to estradiol, while also increasing testosterone production from theca cells (Wdowiak et al., 2025) – a double mechanism that both increases testosterone and prevents its conversion to a less androgenic form. This is the above-mentioned “vicious cycle”: Insulin resistance increases the hyperandrogenism, and the excess androgen that follows can, in turn, deteriorate the insulin sensitivity, with each component strengthening the other over time without intervention.

4.5 Symptoms

4.5.1 Menstrual Irregularities

The hormonal disturbance in PCOS very often presents initially as a disruption of the cycle—oligomenorrhea (infrequent periods), amenorrhea (absent periods), or, more rarely,

unpredictable heavy bleeding, since ovulation occurs in a predictable pattern of sequential increase and drop of FSH, LH, estrogen, and progesterone as outlined in Chapter 2. This is due to the continued high androgens and the disrupted gonadotropin signalling, so no one follicle can mature reliably enough to ovulate, but instead several partially developed follicles tend to pool around the surface of the ovary, the "polycystic" looking ovary that gives the condition its name, although these are not cysts in the surgical sense, just arrested follicles.

4.5.2 Obesity

Obesity is a prevalent comorbid condition in women with PCOS (Allen et al., 2022) and the association is bidirectional, not a clear line of cause and effect. A comprehensive study and meta-analysis indicated that women with PCOS had a considerably greater prevalence of overweight, obesity and central (abdominal) obesity compared to women without the disorder (Lim et al., 2012). Excess weight, especially the visceral, abdominal type common in PCOS, worsens insulin resistance, which worsens hyperandrogenism, which can then itself make weight management more difficult due to its impact on metabolism and hunger. This is why, as mentioned in Chapter 1, even small weight loss (5–10% of body weight) tends to elicit disproportionately large changes in monthly regularity and androgen levels—the association between weight and PCOS is mechanistic, not just statistical.

4.5.3 Acne

This is at least double the number of women with acne as the overall female population. 40% to 70% of women with PCOS have acne. The highest rates are observed in teenagers (Damoulaki et al., 202 five). A comprehensive review and meta-analysis was performed focusing on this symptom and assessed the prevalence of acne vulgaris in women with PCOS worldwide. It confirmed that hyperandrogenism and insulin resistance are the major causes of it (Ramezani Tehrani et al., 2021). Testosterone, and its more potent form, dihydrotestosterone (DHT), in particular, directly stimulates the skin’s sebaceous glands, causing them to produce more sebum and creating an environment in which acne can grow clogged and inflamed (Damoulaki et al., 2025)—the same excess androgen that causes period problems directly impacts the skin.

4.6 Infertility

Infertility is the symptom that often leads to clinical attention for many women with PCOS—and it is a direct consequence of the ovulatory dysfunction discussed above. PCOS is

believed to affect 20% to 33% of women of reproductive age and is known as the major cause of anovulatory infertility. Without regular ovulation, there is no egg reliably ready to be fertilised in any cycle, no matter how fertile a woman might otherwise be.

Traditionally this has been met with first-line medical management of ovulation induction. Clomiphene citrate has been used for ovulation induction since the 1960s and remains a long-standing first-line treatment for anovulatory PCOS, although clomiphene resistance occurs in about 15% to 20% of cases. A 2016 Cochrane systematic review, one of the strongest types of evidence in medicine, investigated how well clomiphene and other antioestrogen drugs work for women with subfertility caused by anovulation typically linked with PCOS (Brown & Farquhar, 2016). More recently, letrozole, an aromatase inhibitor that works by a different mechanism, has progressively replaced clomiphene as the preferred first-line choice in various clinical guidelines, because of generally favorable pregnancy and live birth rates. What is important to note here, however, is that ovulation induction directly treats the symptom of anovulation – it does not treat the underlying insulin resistance or hyperandrogenism driving it, which is part of the rationale, expanded upon in Section 4.8, for combining medical fertility treatment with sustained lifestyle intervention rather than relying on medication alone.

4.7 Psychological Issues

The psychological burden of PCOS is now well documented – and traditionally under-acknowledged relative to its scale. A systematic review and meta-analysis of 18 studies reported a median prevalence of clinically significant depressive symptoms of 36.6% in women with PCOS compared with 14.2% in healthy peers, and a median prevalence of anxiety of 41.9% against 8.5% (Cooney et al., 2017). These are not trivial differences — they are a two-and-a-half to five-fold increase in psychiatric morbidity associated with a single endocrine disease. Oxford Academic Much of this load seems to be transmitted through body image rather than existing independently of it. Women with PCOS had higher scores on measures of body image distress than women without PCOS, and body image distress has been found to mediate the association between PCOS and both anxiety and depressive symptoms and to be associated with lower quality of life. This makes intuitive sense given the symptom picture already discussed: acne, weight gain, and excess hair growth are all visible, socially-read symptoms, in a way that an internal hormone reading is not — and the psychological toll of living with visible, hormonally driven changes to one’s appearance,

often beginning in adolescence, should not be treated as a footnote to the “real” physical condition. It is, in a very real sense, part of the condition itself. This is returned to explicitly in Chapter 8 when meditation and Yoga Nidra are discussed as potential techniques for psychological as well as physiological assistance.

4.8 Complications

PCOS is now known to have important long-term health risks in addition to its effects on reproduction and dermatology. Cross sectional and longitudinal studies suggest an increased risk of type 2 diabetes, hypertension and dyslipidaemia in women with PCOS and recent data confirm translation into an elevated risk of cardiovascular events irrespective of obesity. Obstructive sleep apnoea, non-alcoholic fatty liver disease and endometrial cancer are also more common, whereas anxiety and depression are still common but hitherto under-recognised correlations (Allen et al., 2022). Specifically, the risk of endometrial cancer has a fairly simple mechanistic pathway. Chronic anovulation means that the uterine lining is not regularly shed by a normal period, and so the lining is subjected to years of prolonged, unopposed estrogen stimulation – a known risk factor for endometrial hyperplasia and eventual cancer. None of this is meant to scare you, as most of these hazards are changeable, and the lifestyle changes that improve PCOS symptoms in the short term (weight management, increased insulin sensitivity, stress reduction) are the same interventions that are associated with reduced long-term risk. But it is the most compelling reason for why PCOS should be treated proactively and not just when fertility is an issue.

4.9 Diagnosis

PCOS is a clinical diagnosis based on the Rotterdam criteria as described in Section 4.2. A woman is diagnosed with PCOS if she has at least two of the three criteria, and other conditions that could explain the same symptoms (such as thyroid dysfunction, hyperprolactinemia or non-classic congenital adrenal hyperplasia) have been ruled out:

1. Oligo- or anovulation (infrequent or missing ovulation)
2. Clinical or biochemical hyperandrogenism (e.g. apparent symptoms such as hirsutism and acne, or raised androgens on a blood test)
3. Ultrasound appearance of polycystic ovaries

The presence or absence of these three criteria define four different phenotypes: phenotype A (all three criteria present), phenotype B (hyperandrogenism and ovulatory dysfunction but normal ovarian morphology), phenotype C (hyperandrogenism and polycystic ovarian morphology but normal ovulation) and phenotype D (ovulatory dysfunction and polycystic ovarian morphology but no hyperandrogenism) (Mancini et al., 2022). This is of clinical significance as the androgenic phenotypes (A, B and C) have been associated with more severe metabolic alterations than phenotype D (Mancini et al., 2022). A PCOS diagnosis alone does not tell the whole story; the specific phenotype determines both the symptom picture and the long-term risk profile.

Diagnosis in adolescents requires particular caution, because physiological insulin resistance in puberty and menstrual irregularity in the first few years after menarche can mimic PCOS, leading to both over- and under-diagnosis in this age group (Bruni et al., 2025), explaining why many clinicians prefer to wait, where clinically appropriate, before applying a formal PCOS label to very young patients.

4.10 Management

There is no cure for PCOS at present, management is on treating symptoms and minimizing long-term risk and, when relevant, restoring fertility rather than removing the underlying tendency itself. Modern management usually has two parallel tracks.
Current worldwide recommendations increasingly place lifestyle management as the cornerstone of care rather than an add-on. As discussed in Chapter 1, the 2023 international evidence-based guideline for PCOS places supported healthy lifestyle and weight management at the centre of long-term care (Teede et al., 2023) precisely because of the insulin-androgen feedback loop detailed in Section 4.4 — addressing insulin sensitivity through diet, activity, sleep and stress reduction intervenes directly on the mechanism driving nearly every downstream symptom, rather than masking one symptom at a time. PubMed Central Pharmacologic management is usually directed to the woman’s particular concern. Combined oral contraceptives continue to be the mainstay of initial therapy for control of monthly irregularities and androgen-mediated signs (eg, acne and hirsutism) through inhibition of ovarian androgen production and increased SHBG. Metformin is an insulin-sensitising drug originally created for type 2 diabetes, and is often used to treat the insulin resistance component directly, especially in overweight women with obvious metabolic indicators. In women wanting to conceive, ovulation induction with letrozole or clomiphene

citrate continues to be the normal strategy, with assisted reproductive technology reserved for recalcitrant situations.

It is important to emphasize, as we move on with the remainder of this dissertation, that these two tracks are not in competition. The existing therapy for PCOS involves lifestyle adjustments and medications, and treatments are individualized for each patient (Mancini et al., 2022). Yogic practices are recommended as an intervention under lifestyle modifications aside from diet and traditional exercise.

5. YOGA – CONCEPT AND PHILOSOPHY

5.1 Meaning of Yoga

The word Yoga comes from the Sanskrit root Yuj, which meaning “to join”, “to unite” or “to yoke together”. In its most literal sense, this refers to the union of the individual self with a greater universal consciousness — but in practical terms it is most often interpreted as the integration of body, breath, mind and awareness into one synchronized state of being. This root is essential etymologically because it instantly reveals that yoga was never designed as just a regimen of physical practice. Historically speaking, the postures that dominate popular understanding of yoga today are only one limb of a much larger discipline aimed at uniting the fragmented aspects of human experience — the restless mind, the distracted senses, the undisciplined breath, the physical body — into a coherent, stilled whole.

The act of "joining" occurs on numerous levels simultaneously. At the psychological level, yoga tries to connect the conscious mind with the subconscious patterns that generally control behavior without consciousness. Physiologically, it tries to integrate voluntary control (via breath and posture) with automatic bodily functions that usually run on autopilot, such as heart rate and the stress reaction. In philosophical terms, classical yoga aimed at the union of the individual self (jivatman) with universal consciousness (paramatman), removing the feeling of separateness that classical Indian philosophy identified as the foundation of human suffering. This layered meaning is significant because it changes yoga from a fitness craze into what it was originally designed to be: a comprehensive, internally coherent system for altering consciousness, of which physical postures are just the most visible and most accessible entry point.

5.2 Definitions of Yoga

In the lengthy history of texts about yoga, the word yoga has been defined in many ways. Each meaning tells us something different about how the tradition regarded its own purpose. The most quoted classical definition is the first chapter of the Yoga Sutras where yoga is defined simply as chitta vritti nirodhah - the cessation, or stilling, of the fluctuations of the mind (Patanjali, trans. (Iyengar, 1993). This is an intentionally psychological definition: it places yoga not in the body, but in the nature of mental activity, implying that a person may be physically motionless and mentally agitated, and that real yoga has not yet occurred until that inner agitation resolves.

This is supplemented by two other definitions provided in the Bhagavad Gita. In one verse Krishna describes yoga as samatvam – even-mindedness, an even-tempered steadiness which does not oscillate between success and failure, pleasure and suffering (Bhagavad Gita, trans. Easwaran, 2007). Another calls yoga karmasu kaushalam — skill in action, the ability to act with full participation and perfection while staying internally unattached to the outcome. Later commentators and modern yoga teachers have added extra layers. B. K. S. Iyengar, for instance, described yoga as a methodical effort towards perfection, accomplished via control of the diverse elements of human nature – physical, mental and spiritual (Iyengar, 1979). So, these definitions all mean the same thing – that yoga is not so much about what the body performs but about the character of steadiness, balance and undistracted concentration with which any action – physical, mental or moral – is done.

5.3 Yoga in the Patanjali Yoga Sutras

It is regarded as the most important systematic text of classical yoga philosophy. The Yoga Sutras are attributed to the philosopher Patanjali, and are typically dated to anywhere between the second century BCE and the fourth century CE. It consists of some 196 short aphorisms (sutras), grouped into four chapters called padas: the Samadhi Pada, concerned with the nature and goal of meditative absorption; the Sadhana Pada, concerned with practice and discipline, including the eight-limbed path; the Vibhuti Pada, concerned with the extraordinary powers said to arise from advanced practice; and the Kaivalya Pada, concerned with final liberation (Patanjali, trans. Iyengar, 1993).

What separates the Yoga Sutras from many other spiritual works is their almost clinical,

systematic tone. Patanjali does not rely solely on devotional language or mythology but instead addresses the mind as a careful diagnostician treating a patient, describing its typical patterns of disturbance (the vrittis, or fluctuations), the causes of suffering (the kleshas), and a structured, sequential method for working through them. The text argues that mental disturbance results from five sorts of fluctuation: proper knowledge, misperception, imagination, sleep, and memory. Yoga practice, it argues, is fundamentally a way of gradually quieting these five. It is this systematic structure that has made the Yoga Sutras the primary philosophical reference point for almost every later school of yoga, including the physically-oriented Hatha tradition. Even the most body-focussed traditions still derive their ultimate purpose from Patanjali's stated aim of a stilled, undistracted mind.

5.4 Yoga in the Bhagavad Gita

The Bhagavad Gita, a section of the great Indian epic, the Mahabharata, offers yoga in a significantly different tone than the Yoga Sutras. Where Patanjali provides a technical manual, the Gita provides yoga set in a dramatic, narrative dialogue: the warrior Arjuna, paralyzed by moral doubt on the eve of battle, is counseled by Krishna through eighteen chapters that lay out several distinct, complementary paths to the same ultimate goal (Bhagavad Gita, trans. Easwaran, 2007.

Three of these routes are very important. Karma Yoga, the yoga of action, is the teaching that duty should be done with all sincerity and skill, but being separated from personal reward – action without the anxious grasping for outcome. Jnana Yoga is the yoga of knowledge. It stresses the need to discriminate between the eternal self and the temporal, ever-changing world of matter. This discrimination is developed by study and reflection. Bhakti Yoga, the yoga of devotion, employs love and surrender to the divine as the principal vehicle for transformation. The next chapter is titled Dhyana Yoga and is all about meditation practice. It describes the seated posture, the steady gaze and controlled breath that would set the mind up for continuous interior focus. The Gita’s account of yoga is significant because it insists that these paths are not mutually exclusive but are suited to different temperaments – a more psychologically flexible vision of yoga than is often supposed, in which the underlying aim of inner steadiness can be achieved through action, intellect, devotion or meditation, as is genuinely appropriate for the individual.

5.5 Yoga in Hatha Yoga

Hatha Yoga is a later and more body-centred development in the wider yogic tradition, systematised most influentially in the Hatha Yoga Pradipika, composed by the sage Svatmarama about the fifteenth century CE. Hatha is typically described as a mix of ha (sun) and tha (moon) to represent the balance of opposing forces, solar and lunar, active and receptive, heating and cooling, inside the body and energy system (Svatmarama, trans. Muktibodhananda, 1998).

The Hatha Yoga Pradipika is divided into four chapters dealing with asana (physical posture), pranayama and shatkarma (breath control and internal cleansing practices), mudra and bandha (energetic locks and seals), and samadhi (the ultimate meditation state). While the Yoga Sutras mention posture only in passing, as one of eight limbs, the Hatha tradition elevates the physical body to the status of primary instrument, proceeding from the assumption that a body undisciplined and full of obstruction cannot support a stable, meditative mind, and that physical purification is therefore a necessary foundation rather than a peripheral concern. The text explicitly states that Hatha Yoga should be practised for the sake of attaining Raja Yoga -- the "royal" path of meditative absorption that Patanjali describes -- and so the physical techniques are not an end in themselves, but preparatory groundwork that steadies the body and channels its energy so that deeper meditative states are actually accessible, not just theoretically.

5.6 The Eight Limbs of Yoga (Ashtanga Yoga)

Patanjali describes the eight limbs of yoga or Ashtanga Yoga in chapter two of the Yoga Sutras as a progression, a cumulative route, where each limb forms the basis for the next, going from outer ethical behavior towards inner absorption (Patanjali, trans. Iyengar (1993).

The first limb is called Yama . Yama consists of five moral restrictions on behavior towards others : non-violence , truthfulness , non-stealing , moderation , and non-possessiveness . These are portrayed as universal moral disciplines in order to purify the practitioner's relation to the outer world before any internal practice can have any relevance. The second limb, Niyama, directs this same ethical concern inward. It is made up of five personal observances—cleanliness, contentment, disciplined effort, self-study, and devotion to a higher ideal.

The third limb, Asana, means physical posture – however in Patanjali’s original formulation, it is characterized merely as a steady and comfortable seat, designed largely to support lengthy periods of sat meditation rather than to create a fitness regimen in itself. The fourth

limb is pranayama, the intentional management of breath, which is used to steady and direct the body's life force, or prana. Pratyahara, the fifth limb, is the withdrawal of the sense from outward stimulus, an intentional and disciplined technique of shifting focus inward.

The last three limbs are frequently called the core of the path pointing inward. Dharana is concentration, the steady focussing of attention onto one point. Dhyana is genuine meditation – a deepened, easy extension of that concentration, in which awareness flows steadily without strain of conscious focusing. The eighth and last limb is Samadhi . This is a state of complete absorption , in which the difference between the meditator , the act of meditation , and the object of meditation is completely lost . This eight-limbed structure is important because it shows that the physical postures and breathing exercises were not intended to be in isolation – they are deliberately placed as the middle stages of a much larger progression that starts in ethics and ends in a radically altered state of consciousness.

5.7 Importance of Asana

In the eight-limbed form, asana holds a deceptively humble place. Patanjali devotes only a small number of sutras to it, defining it simply as a posture that is steady and agreeable (sthira sukham asanam). But this brevity should not be confused with a lack of relevance. The main classical role of asana is preliminary. A restless, unpleasant, or painful body cannot sustain the long, unbroken stretches of seated stillness necessary for the later limbs of focus and meditation. Asana, then, is best understood as the physical basis for the rest of the yogic path: without a body that can sit steadily and, without distraction, the inward-facing limbs are mostly inaccessible.

Over time (especially with the development of the Hatha Yoga tradition) the scope of asana has expanded greatly from the lone seated position described by Patanjali to a wide variety of postures designed to increase flexibility, strength, stimulation of internal organs and energetic balance throughout the body. This growth suggests a heightened awareness: that the body is not a passive vessel to be simply tolerated during meditation, but an active partner in mental and energetic states, capable of being purposefully conditioned to support steadiness, vibrancy, and inner harmony. A body that is chronically tense, misaligned or sluggish in its circulation tends to produce a correspondingly restless or dull mind, while a body that is open, balanced and energised tends to support clarity and calm. Which is precisely why asana retains its central, non-negotiable place in any complete yogic practice, classical or contemporary.

5.8 Importance of Pranayama

Of the eight limbs, pranayama, the voluntary control of the breath, is uniquely important, for the breath is at the junction of the voluntary and involuntary neural systems as are few other body functions. Breathing is an automatic function that does not require conscious effort, but may also be slowed, extended, held or redirected at will. Classical yogic philosophy intuitively recognised this bridge long before it could be described in physiological terms, and built a whole discipline on the premise that by mastering the breath, a practitioner gains indirect mastery over the otherwise involuntary fluctuations of the mind.
This is shown in the very meaning of the phrase. Prana is the vital life-force or energy which animates the body and ayama is extension, expansion or control. Hence, pranayama is not a "breathing exercise" as common usage of the term could suggest but a technology of the conscious manipulation and expansion of the subtle energy of the body through the controlled inhalation, retention and exhale. Pranayama is found in the eight-limbed sequence immediately following asana, and immediately preceding pratyahara (the retreat of the senses). This is no accident. Classical writings relate breath and mind to each other as being inseparably tied: that a mind cannot be steady while the breath is irregular, and that a consciously steadied breath naturally begins to draw the mind inward. In effect, pranayama is the actual technique by which the broad discipline of posture is transformed into the subtler discipline of attention.

5.9 Importance of Dharana

The sixth limb of the yogic path, sometimes translated as concentration, symbolizes the formal shift from outward-facing discipline to truly inward-facing practice, known as dharana. It is described as the continuous attention to a single point, object or idea – be that the breath, a sound, an image or a specific spot in the body – to the conscious exclusion of any competing thoughts. What sets dharana apart from regular attention is its ongoing, continuous nature. regular attention tends to wander naturally and often, while dharana demands the conscious, repeated effort to redirect the focus to the designated location each time it deviates.

Philosophical value of dharana: Dharana is the practice to be followed to teach the normally fragmented mind to keep a single concentration for longer and longer periods of time, gradually. The classical view of the untrained mind is that it is always restless, leaping from one sensory impression to another, from one memory to another, from one anticipation to

another. This, it was thought, is the cause of much human dissatisfaction, for the attention divided among many objects can never settle deeply into any one of them. Dharana utilizes repeated practice to assist with this restlessness . It does not attempt to suppress the restlessness . The mind is not pushed into stillness , but rather slowly and consistently redirected until sustained focus becomes increasingly natural . This also accounts for the presentation of dharana as a separate limb, rather than as the same thing as meditation: it is the effortful, yet somewhat strained stage of concentration that has to be developed before the simpler, self-sustaining absorption of meditation proper can arise.

5.10 Importance of Dhyana

Dhyana, meditation, is the seventh limb and represents a qualitative deepening of dharana rather than an entirely separate skill. Where dharana involves the effortful, repeated act of returning a wandering attention to its chosen point, dhyana is what emerges once that effort is no longer needed — a state in which awareness rests on its object steadily, smoothly, and without strain, sustained almost effortlessly rather than through continuous correction. Classical texts describe this transition as analogous to the slow, steady flow of oil being poured from one vessel to another, in contrast to the interrupted, drop-by-drop quality of ordinary, scattered attention.

Dhyana's importance within the broader yogic path lies in its function as the direct gateway to samadhi, the eighth and culminating limb. It is in the sustained, unbroken quality of meditative awareness that the usual sense of separation between the observer and the observed begins to soften, setting the stage for the complete absorption that samadhi describes. Beyond its position within this final sequence, dhyana also carries a more immediate, practical significance: it is the limb most directly responsible for cultivating the inner steadiness, clarity, and equanimity that earlier definitions of yoga — equanimity itself, recall, being one of the *Bhagavad Gita's* own definitions of the term — describe as yoga's defining quality. In this sense, dhyana is not simply one stage among eight, but in many respects the practical heart of the entire tradition: the point at which technique falls away and the stilled, undistracted awareness that yoga has been pointing toward all along is, finally, directly experienced.

6. YOGIC PRACTICES FOR HORMONAL BALANCE

Seven asanas form the core practical recommendations of this chapter. Each one is presented with its technique, its general physical benefits, and — where current research allows — its specific relevance to the endocrine and reproductive systems most affected by hormonal imbalance.

6.1 Baddha Konasana (Bound Angle Pose)

Technique: The practitioner sits on the floor with an erect spine, bending both knees and drawing the heels toward the pelvis so the soles of the feet contact. Then the knees are unlocked outward and lowered toward the floor, the hands grasping the feet or ankles. The pose is usually held for one to three minutes, keeping the spine long and the respiration slow and even throughout the pose.

Benefits: Baddha Konasana opens the hip joints and inner thighs, and enhances the flexibility of the groin and gently stretches the muscles of the inner knee. The pose also improves posture and relieves mild fatigue, and is historically considered to be one of the most essential seated poses for women's reproductive health because the legs are held wide in a position that stimulates blood flow to the pelvic floor.

Effects on the Endocrine System: This position has some of the more direct research support of the poses mentioned in this chapter. The intervention was based on Baddha Konasana and Bhujangasana, plus some pranayama and relaxation techniques, in women with PCOS. The intervention was tested in a 12-week pilot experiment at a yoga research facility in Haridwar. Intervention resulted in improvements in monthly regularity, acne and hirsutism (Singh et al., 2025) and changes in hormonal markers, including testosterone, LH and FSH, in the patients. While the finding is representative of a practice sequence and not the isolated effect of this posture, the focus of the pose on opening the pelvic region and increasing local circulation is consistent with the fact that this pose has been included as a foundational posture in almost every protocol published for yoga for PCOS till date.

6.2 Malasana (Garland Pose)

Technique The practitioner stands with feet slightly wider than hips, toes turned out slightly, and lowers the body into a deep squat, hips moving toward heels. The elbows press into the inner knees to help the chest open, and the palms come together at the centre of the chest in a

prayer stance. The spine is kept as long as possible, heels down wherever flexibility allows.
Advantages. Opens the hips, groin and inner thighs deeply, stretches the ankles and lower back. The squatting action also softly compresses and massages the abdominal organs, which is thought to promote digestion and elimination in traditional yoga. The pose is extensively used to strengthen the hip and ankle mobility needed for many seated and standing poses.
Effect on the Endocrine System. The relevance of Malasana to hormonal balance is more mechanical and circulatory than directly researched in isolation: the deep hip-opening posture promotes blood flow to the pelvic floor and lower abdomen, an area that commonly experiences poor circulation due to sitting for long periods in everyday life. It is well known that lifestyle interventions that enhance circulation and reduce sedentary time bolster metabolic and reproductive health in women with hormonal disturbances. For this reason, the squatting action of Malasana is often incorporated into structured PCOS-focused yoga sequences to offset the effects of prolonged sitting on pelvic blood flow and hip mobility, complementing the more directly studied postures discussed elsewhere in this chapter.

6.3 Bhujangasana (Cobra Pose)

Technique. The practitioner lies face down with legs stretched and together, tops of feet touching the floor, palms flat on the floor under the shoulders. On an inhale, slowly straighten the arms lifting the chest away from the floor, keeping the lower ribs, pelvis and legs anchored. The shoulders are pulled down and back, the eyes are looking forward or slightly up, and the stance is often held for fifteen to thirty seconds before releasing.
Advantages. Bhujangasana expands the chest and shoulders, gently stretches the abdominal muscles and strengthens the muscles of the upper back and spine. It is also stated that the backward extension of the spine stimulates the abdominal organs through mild compression and release and the position is often employed to offset the rounded, forward-leaning posture common from extended sitting.
Influence on Endocrine System. In this chapter you were exposed to a 12-week experiment of PCOS yoga that directly used two postures, Baddha Konasana and Bhujangasana. Another randomised controlled trial of yoga in women with PCOS undergoing infertility treatment reported a significant reduction in hirsutism, abdominal and hip circumference scores in the intervention group versus the control group, with a programme that also incorporated this pose. (Mohseni et al., 2021) The gentle compression and release of the abdomen that happens in the backbend is thought to help circulation to the pelvic and abdominal area, and the opening of the chest that happens is widely accepted in yoga therapy to counteract the

shallow, stress-pattern breathing that goes with chronically high levels of stress hormones—though this particular mechanism is more easily supported by traditional reasoning than by isolated clinical measurement of this single pose.

6.4 Setu Bandhasana (Bridge Pose)

Technique. The practitioner is in supine position with knees bent, feet flat on the floor, at hip-width apart and close to the hips, and arms resting along the sides of the body. The feet, shoulders and back of the head stay on the ground, with the hips coming up off the floor on an inhale creating a nice soft arch across the spine. The hands may be clasped behind the back for support, and the pose is usually held for thirty seconds to one minute before lowering with control.

Advantages. Setu Bandhasana develops the muscles of the back, glutes and hamstrings, while gently stretching the front of the chest, neck and spine. It is frequently utilized as a light, approachable backbend for most practitioners. Even a short time of raising the hips above the level of the heart in yoga practice is related with a soothing effect on the nervous system when the breath is kept steady and even.

Effects on the Endocrine System. PCOS-focused yoga flows generally contain Setu Bandhasana because it works the abdomen and pelvis and is often partnered with Paschimottanasana because of the complementary action of the two poses on the front and back of the body. Raising the hips to a mild inversion is traditionally believed to help venous return from the pelvic area and ease the sensation of heaviness that some women experience around menstruation, as supported physical activity and improved circulation are acknowledged elements of effective lifestyle management for PCOS. Like many of the poses in this chapter, the throat and chest opening that comes with the mild backbend is also traditionally associated with stimulation of the thyroid gland, though this particular claim is more based on long-held yoga teaching than on specific clinical measurements of thyroid hormone levels after practicing this pose by itself.

6.5 Paschimottanasana (Seated Forward Bend)

Technique. The practitioner sits with his legs straight out in front of him, the feet together and the toes pointing up. As you exhale, bend forward at the hips, lengthening your spine before you fold, and reach your hands out toward your feet, shins or ankles wherever they can

reach comfortably without straining the stretch. The head and neck are relaxed. Usually the pose is kept for one to three minutes while breathing slowly and evenly.

Advantages. Paschimottanasana stretches the entire back of the body, including the hamstrings, calves and spine, and calms the nervous system with its forward-folding, inward-turning quality. Traditionally, the mild compression of the abdomen against the thighs is believed to help digestion, and the position is widely utilized as a counterbalance to backbends within a single practice session.

Effects on the Endocrine System. This forward fold compresses the belly and is often mentioned in yoga treatment as being good for healthy digestion and metabolism, both of which are intimately related to the insulin sensitivity that is at the heart of hormonal imbalance. Yoga courses which include this type of soothing seated posture have been shown to reduce belly circumference in women with PCOS receiving organized yoga intervention (Mohseni et al., 2021). The posture's effect on the nervous system is equally important: its forward folding, inward directed quality is generally thought to stimulate the parasympathetic, "rest and digest" response, theorised to decrease circulating stress hormones over time – a mechanism with potential relevance to the chronic stress activation often linked to hormonal disruption, even where direct hormonal measurement of this one posture is limited.

6.6 Marjariasana (Cat Stretch)

Methodology. The practitioner starts off on all fours with the wrists in line with the shoulders and the knees in line with the hips. Exhale, and round the spine up toward the ceiling, drawing the chin toward the chest and tucking the tailbone under, creating a smooth arch through the entire back. The position is sometimes done as one half of a flowing pair with its counter-movement, when the spine arches the opposite way on the next inhalation, the two phases repeated slowly and rhythmically with the breath.

Advantages. This pose helps to increase flexibility and mobility across the spine, softly massages the abdominal organs with the rhythmic rounding motion and is a very common warm-up pose to get the back ready for deeper stretches. The synchronisation of breath with movement also makes it a good technique to enhance fundamental body awareness and breath control in beginner practitioners.

Impact on the Endocrine System. The gentle, rhythmic movement of the spine in Marjariasana is traditionally thought to promote the flow of circulation along the length of the

spine and to the abdominal organs, through the repeated compression and release, in a similar way to the mechanism proposed for other gently compressive postures in this chapter. In the published literature, the broader impact of yoga on PCOS has been associated with positive changes in endocrine parameters, glucose metabolism and overall quality of life (Thakur et al., 2021). The slow, breath-associated quality of movements such as this one is consistent with the parasympathetic, stress-reducing mechanism believed to underlie much of yoga's broader hormonal benefit. It is a calming effect on the nervous system achieved through movement paced deliberately to the breath, rather than by any single posture's isolated physiological action.

6.7 Supta Baddha Konasana (Reclining Bound Angle Pose)

Technique The practitioner rests on the back, bends both knees, bringing the soles of the feet together, and lets the knees fall open to either side, similar to the seated version of this position, but with the torso fully reclined. Arms are resting alongside the body with palms facing upward or extended upward. This position is usually held the longest of any pose in a sequence — generally three to five minutes or more — with slow, deep breathing throughout, sometimes with cushions or blocks under the outer knees.

Advantages. Supta Baddha Konasana expands the hips and inner thighs without muscular exertion to hold the pose and is one of the more restorative and accessible postures in this chapter. It is a popular closing or relaxation posture because the body is completely supported by the floor, letting the nervous system to settle down after the more energetic practice.

Effect on the Endocrine System. One of the most suggested poses in any published PCOS yoga guide is this reclining, fully supported variation, because it offers both pelvic opening and deep physical relaxation. The larger research literature surrounding yoga and PCOS suggests that combining postures of this nature with any extended, regular practice has positive effects on hormonal parameters (Thakur et al., 2021), and the very restorative quality of this specific pose – held longer and with less muscular effort than almost every other posture – is widely considered to be one of the easier ways to bring down physiological activity in the sympathetic nervous system during a practice session. It is understood that chronic activation of the stress response interferes with the hormonal signaling that governs the reproductive cycle. Postures capable of reliably downshifting that activation, even briefly, are considered a meaningful component of a hormonally supportive practice, even where the specific contribution of this single pose has not been isolated and measured on its own.

7. ROLE OF PRANAYAMA IN HORMONAL REGULATION

Pranayama — the deliberate regulation of breath — is examined in this chapter for its specific physiological relevance to hormonal balance. Breath sits at a unique junction in the body: it is the one major bodily function under both automatic and voluntary control, which is precisely why it offers such direct access to the otherwise involuntary stress response that drives so much hormonal disruption.

7.1 Nadi Shodhana (Alternate Nostril Breathing)

Method. The practitioner sits with a comfortable straight spine, seals the right nostril with the thumb and slowly breathes in through the left nostril. The right nostril is then released, and the left is closed with the ring finger and the breath evacuated via the right. This cycle continues, swapping sides with each breath, typically with a little retention retained at the top of the inhale in its fullest classical form. It takes five to 10 minutes to complete the whole exercise.

Advantages. Traditionally, Nadi Shodhana is characterized as purifying and balancing the body's subtle energy channels (nadis) that are supposed to run down either side of the spine. It is frequently reported to sharpen concentrate, settle an anxious or scattered mind and provide a calm, alert mental state, distinct from the lethargy sometimes associated with basic relaxation treatments.

Impact on Hormonal Control. This is one of the most investigated pranayama techniques. A systematic evaluation of forty-four randomized controlled trials on alternate nostril breathing indicated high-level evidence of improved results on autonomic nervous system and cardiovascular parameters (Ghiya, 2017). The autonomic nervous system directly controls the release of stress hormones such as cortisol and adrenaline, so a technique with this amount of evidence for shifting autonomic balance toward parasympathetic dominance has plausible relevance for any hormonal condition where chronic stress activation is a contributing factor. Separate clinical research on this technique has shown decreases in systolic and diastolic blood pressure and heart rate, attributed to its stress-reducing effects and activation of the vagus nerve – mechanisms that act upstream of, and directly influence, the same hypothalamic-pituitary signaling pathways that regulate reproductive hormones.

7.2 Bhramari Pranayama (Humming Bee Breath)

The technique . The person sits comfortably with their eyes closed and their middle fingers lightly placed on the cartilage of each ear or around the aperture of the ear canal. He takes slow, deep breaths through both nostrils. He makes a low, continuous humming sound (like a bee buzzing) as he exhales, with his mouth slightly closed. And this is done five to 10 rounds.
Advantages Many people utilize Bhramari to relax their mind rapidly. This is because the internal vibration of the hum, with the fingers faintly shutting off outside sound, pulls the mind sharply inward. A lot of people suggest it for helping with headaches, minor anxiety and getting ready for meditation because the vibration itself tends to quiet a restless mind practically right away.
Effect upon the Control of Hormones. Bhramari has collected a lot of extremely strong data about the functioning of the autonomic and vagal systems. In a detailed evaluation of 46 experimental trials, Chetry et al. (2024) demonstrated that Bhramari practice consistently decreases sympathetic activity and increases parasympathetic and vagal activity. This shows up in measures of heart rate variability. A short study looking at humming versus other states showed something quite interesting: humming resulted in a lower physical stress index than was observed even during sleep. The humming sound is thought to increase heart rate variability and improve autonomic function (Trivedi et al., 2023). The vibration directly stimulates the vagus nerve through the vocal folds and the tissue surrounding them, providing a more direct route to parasympathetic activation than slow breathing alone. This mechanism is very different from the nostril-based strategies discussed earlier in this chapter, as these strategies work through sound and vibration, not airflow pattern.

7.3 Ujjayi Pranayama (Victorious Breath)

Method. Practitioner inhales slowly through the nose, softly tightening the back of the throat, as if whispering the sound "haaa" silently with the mouth closed. The constriction provides a quiet, audible “oceanic” sound on both the inhale and the exhale. The resistance of the airway will automatically slow down and deepen the breath without the need to count consciously.
Benefits Ujjayi is often employed as the main breathing technique throughout the physical postures itself, as its audible character provides a continual aural anchor for attention, helping to keep the mind present during physically taxing sequences. It is also said to induce a feeling of inside heat and a continuous, prolonged energy, as opposed to the more purely relaxing impact of some other pranayama techniques.
Effects on Hormonal Regulation The Ujjayi throat constriction stimulates vagal afferent nerve fibers in the larynx and pharynx directly, enhancing the parasympathetic activation that

slow breathing alone would induce. This is exclusive to the unique throat constriction of this technique. A recent randomized study of this technique in a high stress student population found that short term practice of Ujjayi pranayama led to significant improvement in emotional intelligence, further supporting its potential as a low resource intervention for stress management in demanding environments (Abazari et al., 2025). Given the close association between emotional regulation and the physiological stress response via shared neural and hormonal pathways, any technique that can measurably improve the former is plausibly relevant to the management of the latter – relevant wherever chronic stress reactivity is seen to be feeding into hormonal disruption.

7.4 Anulom Vilom

Method. Anulom Vilom is similar to Nadi Shodhana and is sometimes used interchangeably with it in casual practice, but it is typically taught as the simpler of the two: a continuous, even alternation between nostrils — inhale through one side, exhale through the other, then reverse — performed without the breath retention sometimes found in more complete classical Nadi Shodhana practice. The hand position is the same, the thumb and ring finger alternately sealing each nostril. A session normally lasts between five and fifteen minutes.

Advantages. Anulom Vilom is a more easily accessible pranayama for beginners because it does not include breath retention. It is often taught as an entrance level into pranayama practice. It is relaxing and balanced like Nadi Shodhana but more moderate and may be maintained for extended durations without strain.

Influence on Hormonal Control. Specialized research with this method has examined cardiac output, systemic peripheral resistance in prehypertensive young adults, and more generally cardiopulmonary parameters, and has consistently shown that structured training enhances cardiovascular and autonomic function (Ghiya, 2017). Another meta-analysis of data from several randomized controlled trials found that alternate nostril breathing produced significant reductions in both systolic and diastolic blood pressure, whether practiced alone or as part of a broader yoga programme — supporting the broader principle that simple, sustained breath regulation, even without advanced retention techniques, is sufficient to produce a measurable downshift in sympathetic nervous system activity, the same activation pattern implicated in chronic, stress-driven hormonal disruption.

7.5 Deep Breathing (Diaphragmatic Breathing)

Method The practitioner is laid or seated comfortably, one hand on the chest and the other on the belly, and breaths slowly and deeply through the nose, concentrating on expanding the abdomen and not the chest with each inhale. The exhale is allowed to be a little longer than the inhalation, and the breath is kept leisurely, smooth and unforced throughout—usually four to six breaths per minute, far slower than the resting respiratory rate of most adults.

Advantages. Most other pranayama practices are based on deep, diaphragmatic breathing and this is usually the first skill taught to new practitioners. It's a direct antidote to the shallow, quick, chest breathing pattern that tends to accompany chronic stress. There are no special hand postures or sounds required, so it is one of the most widely teachable and immediately accessible relaxation strategies available.

Influence on Hormonal Regulation. The basic mechanism for almost all the techniques in this chapter was described in a highly cited theoretical paper which suggests that slow, deep breathing has been shown to result in decreased oxygen consumption, decreased heart rate, and decreased blood pressure, along with increased parasympathetic activity (Jerath et al., 2006). The same paper proposed that voluntary slow deep breathing functionally resets the autonomic nervous system through stretch-induced inhibitory signals transmitted via neural and non-neural pathways (Jerath et al., 2006) – providing a plausible physiological rationale for why something as simple as slowing down the breath might have a measurable, system-wide calming effect, beyond just a subjective experience of relaxation.

7.6 Stress Reduction

The most immediate and reliably observable consequence of practically every pranayama technique covered above is stress reduction, no matter what the specific mechanical variations between them – nostril alternation, humming vibration, throat constriction, or basic slow breathing. They all have in common that they target the rate, depth and rhythm of the breath, which the brain constantly monitors as one of its major cues for whether the body is in safety or threat. Such breathing techniques have been shown to reduce systolic blood pressure, diastolic blood pressure and heart rate due to their stress-reducing effects via vagus nerve stimulation and subsequent parasympathetic predominance. What makes this especially crucial for hormonal health is the directness of the mechanism involved. The stress reduction that comes from pranayama is not a vague, general sense of feeling better. It is measurable through specific changes in heart rate variability, blood pressure and vagal tone, all of which reflect a real shift in the balance of the nervous system between the sympathetic and parasympathetic branches. The same nervous system branches that control the stress response

also directly influence the hypothalamus, the structure that starts the hormonal cascades that regulate both the stress response and the reproductive cycle. Thus, a reliable, repeatable method for reducing sympathetic activation has genuine physiological significance, independent of any subjective feeling of calm a practitioner might report.

7.7 Cortisol Regulation

The body's major stress hormone, cortisol, is released via a feedback loop that begins in the brain and concludes in the adrenal glands. These types of breathwork techniques work by triggering the parasympathetic nerve system, which slows down the heart rate, reduces cortisol levels and lowers blood pressure, bringing the body into a state of physiological calm without creating drowsiness. This is rather a different effect than just relaxing or sleeping: it seems that pranayama can induce a real, measurable decrease in the activity of stress hormones in the blood stream, while the practitioner is still wide awake and conscious.
The relevance of this, for hormonal balance more broadly, is in how interlinked the body’s hormonal cascades are. Chronically increased cortisol is not limited to the stress response; it interferes with insulin sensitivity, inhibits normal pulsatile release of reproductive hormones from the hypothalamus, and over time can alter thyroid function. Thus, a technique that can reliably reduce cortisol output, even modestly and transiently, has a plausible route of influence far beyond that of stress relief in the narrow sense, influencing metabolic and reproductive hormonal balance via the far-reaching downstream effects of cortisol on other endocrine systems.

7.8 Autonomic Nervous System

The autonomic nervous system is the center of every mechanism mentioned in this chapter. It has two branches, sympathetic (“fight or flight”) and parasympathetic (“rest and digest”). Pranayama has been shown to positively affect heart rate variability by increasing parasympathetic activity, reducing the synthesis of stress hormones, and improving the inhibitory signaling from the prefrontal cortex to the amygdala, thereby reducing the psychological and physical effects of stress. This last point is worth dwelling on. The effect of pranayama is not limited to the body in isolation – it appears to affect the very brain regions responsible for regulating emotional reactivity to begin with. This suggests a genuinely bidirectional relationship between breath, brain and hormonal output; rather than breath being a passive bystander to whatever the brain decides to do.
The vagus nerve linking solitary nucleus, thalamus, limbic areas and prefrontal cortex is

regarded to be the major psychobiological mechanism for these effects of pranayama. Because the vagus nerve also carries signals to and from the gut, heart, and many other organs, vagal tone has become one of the most studied physiological proxies for overall autonomic health—and pranayama's consistent ability to improve it across the techniques discussed in this chapter is one of the clearest, most reproducible findings in the entire research literature on yogic breathing.

7.9 Mind-Body Connection

The mind-body link discussed in this chapter is not a loose metaphor — it is a particular, bi-directional physiological interaction in which mental state affects breathing pattern and breathing pattern affects mental and hormonal condition. Anxious or stressed mental states reliably produce shallow, rapid, chest-dominant breathing . Consciously reversing that breathing pattern, by any of the techniques described abve, also seems to be able to reverse the mental state to a meaningful degree, rather than just temporarily masking it.
It is this bidirectionality that gives pranayama its unique value as a tool for hormonal regulation. It provides a point of conscious, voluntary access to a system – the autonomic nervous system, and by extension the hormonal cascades it controls – that is otherwise completely beyond conscious control. There's no way to will your cortisol level down, or tell your hypothalamus to release GnRH more steadily. But by practicing they can deliberately slow and deepen their breathing – and by that single, available lever impose a genuine and measurable effect upon the otherwise unavailable hormonal machinery that operates below the level of conscious awareness. This is the practical heart of the matter as to why pranayama holds such a key place in any serious discussion about non-pharmacological hormonal support.

8. MEDITATION, RELAXATION AND LIFESTYLE PRACTICES

8.1 Meditation

Meditation, in its many forms, cultivates continuous non-reactive attention, the ability to notice a thought, sensation or emotion arise without being immediately caught up into it. Meditation taught in a wellness or therapeutic context is often less structured than concentration techniques used as preparatory tools, and is generally taught in a more simple manner. This usually involves sitting quietly and attending to the breath or chosen point of

focus, then gently bringing the attention back each time the mind wanders, for a period of between ten and thirty minutes.

A comprehensive scoping review focusing on meditation and mindfulness therapies in women with PCOS found a significant and rising evidence base . The review comprised fourteen trials, with seventeen citations and 723 individuals of different age groups, nine of which were randomized controlled trials, considering outcomes in psychological, anthropometric, metabolic and quality of life domains (Rao et al., 2024). Crucially, improvements were not limited to mood: two trials revealed increased frequency of menstrual cycles after a meditation-based intervention, and two trials reported a decrease in biochemical hyperandrogenism including reductions in total and free testosterone (Rao et al., 2024). This is an important finding, suggesting that the effects of meditation on PCOS are not limited to subjective stress relief, but extend to measurable hormonal markers, likely via the same stress-axis pathways by which chronic psychological stress is known to disrupt reproductive hormone signaling in the first place.

8.2 Yoga Nidra

Yoga Nidra, often translated as “yogic sleep”, is a form of systematic, guided relaxation practiced lying down where the practitioner is led through a series of body awareness, breath observation and visualisation, remaining consciously aware throughout – clearly distinguishing it from sleep, despite the deep physical stillness that is involved. A session typically lasts between eleven to forty-five minutes and involves no physical exertion other than keeping still and obeying vocal instructions.

In recent years, the research evidence supporting this technique has risen dramatically, and some of it speaks directly to the concerns of this dissertation. In a randomized controlled trial, a 30-minute session of an online Yoga Nidra programme was found to significantly reduce stress, anxiety, depression, rumination and sleep disturbance compared to a waitlist control, and to produce a measurable biological change: a flatter, healthier cortisol awakening response (Moszeik et al., 2025). More relevantly, a dedicated clinical trial specifically looked at this practice in women with menstrual disturbance: research has demonstrated that Yoga Nidra had a measurable effect on menstrual abnormalities in females of reproductive age, following previous findings that the practice could be used as a complementary treatment for anxiety and depressive symptoms in patients with menstrual disorder (Rani et al., 2013). A recent large meta-analysis lends additional credibility to the overall credibility of the practice. Yoga Nidra is among the most studied relaxation techniques in the current mind-body

literature. It was rigorously evaluated in a systematic review and meta-analysis of seventy-three studies and 5,201 participants (Ghai, 2026).

8.3 Mindfulness

Mindfulness is the purposeful, non-judgmental awareness of one's experience in the moment – thoughts, bodily sensations and emotions noticed as they arise, not analyzed, suppressed or automatically acted upon. This ability is usually taught in structured programmes of eight weeks of guided sessions such as Mindfulness-Based Stress Reduction (MBSR) involving sitting meditation, body awareness and gentle exercise.

Mindfulness has been investigated specifically in populations with PCOS and with encouraging consistency. A quasi-experimental study on sixty women with PCOS examined the effect of an eight-session mindfulness-based stress reduction programme on PCOS-related worries in mental, interpersonal, physical, and sexual domains (Imani et al., 2023). Another randomized controlled trial found that an eight-week mindfulness stress management programme resulted in statistically significant reductions in stress, depressive symptoms, and anxiety, as well as reductions in salivary cortisol, among reproductive-age women with PCOS . What is striking across this work is the consistency between subjective psychological improvement and an objective biological marker (salivary cortisol) moving in the same direction, which adds considerably more weight to the claim that mindfulness training has a genuine physiological effect on the stress axis, rather than just changing how participants choose to describe their symptoms.

8.4 Yogic Diet

The yogic approach to eating is based on the concept of the three gunas, qualities that are supposed to characterize both food and state of mind. Sattvic foods are pure, light and energy-giving. Rajasic foods are exciting, spicy or highly processed. Tamasic foods are heavy, stale or dulling to both body and mind. Yogic diet suggests to consume fresh fruits, vegetables, whole grains and legumes, cooked in a simple way and in moderation, avoiding processed and fried foods and those that are very stimulating. PubMed Central The notion of mitahara or modest eating is the cornerstone of this method. Classical guidance on this principle suggests that one should eat only when genuinely hungry, avoid overeating, and leave a portion of the stomach's capacity empty rather than filling it completely—favouring fresh, vital, sattvic food over excessive amounts of sour, salty, oily, or fermented fare (Svatmarama, trans. Muktibodhananda, 1998). What makes this classical guidance especially

compatible with modern metabolic science is its focus on whole, minimally processed, fibre-rich food and moderation in portions, principles that are close to dietary patterns shown to support healthy insulin sensitivity, whether one approaches the question from a yogic or a biomedical perspective. Hence, the yogic diet should be best understood not as an alternative or counter-nutritional system, but as a values-based dietary philosophy that aligns with modern metabolic advice on a number of crucial issues.

8.5 Dinacharya

Dinacharya is the Ayurvedic concept of an ideal daily routine — a schedule of when to wake up, eat, work and rest that is designed to bring a practitioner's daily rhythm into harmony with the natural cycles of light, temperature and biological tendency that shift predictably over a twenty-four hour period. The traditional dinacharya generally suggests waking before sunrise, engaging in some light movement or yoga practice in the early morning, eating meals at the same times each day with the largest meal at midday, and having a relaxing wind-down period before an equally constant bedtime.

Dinacharya, as a traditional system, has not been studied as a single intervention in current clinical studies, but its constituent components map closely onto habits that contemporary circadian research independently recognizes as protective. A large population-based study examined sleep and circadian hygiene practices and found that morning physical exercise reduced the odds of self-reported poor sleep quality and was associated with reduced sleep latency and fewer nocturnal awakenings, whilst practices such as a heavy evening meal, late caffeine consumption and evening screen exposure were all associated with poorer sleep outcomes (Castro-Santos et al., 2023). In essence, it's a modern empirical echo of the key precepts of dinacharya: walk early in the day, eat your biggest meal earlier rather than later, and keep the hours before sleep free of stimulus, all reached not through the traditional texts, but through population survey data. This convergence is a valuable reminder that "ancient" and "evidence-based" are not opposites; in this case, they seem to be describing substantially the same underlying pattern of circadian synchronization.

8.6 Sleep Hygiene

Sleep hygiene is the sum of behaviours and environmental factors that help you sleep regularly and well – not just sleeping a certain amount of time. Two people might sleep the same number of hours, but the quality of their sleep can vary widely depending on their sleep hygiene. Basic sleep hygiene measures: go to bed and wake up at regular times, reduce screen

time before sleep, do not consume big meals or caffeine in the evening, and sleep in a cool, dark, quiet area.

The evidence supporting these specific activities at the population level is far stronger than is typically supposed. A large population-based study in Brazil found that evening use of electronic devices with illuminated screens had a negative impact on every sleep parameter assessed. Reporting dinner as the largest meal of the day and evening caffeine consumption were both associated with shorter sleep duration and longer sleep latency (Castro-Santos et al., 2023). The hormonal significance of this is far greater than just feeling tired: sleep deprivation boosts stress by activating the HPA axis and misregulating cortisol production, and increased stress leads to more sleep deprivation – a self-reinforcing cycle of poor sleep and raised stress hormones constantly feeding each other. So, in the context of hormonal health, breaking this cycle with intentional sleep hygiene is not a minor, peripheral recommendation; it is one of the more direct, evidence-supported levers available for interrupting a cycle that, if left unaddressed, actively perpetuates the same hormonal disruption this dissertation is concerned with throughout.

8.7 Stress Management

Stress management, as a category, unites all the practices discussed in this chapter – meditation, Yoga Nidra, mindfulness, mindful eating, a structured daily routine and protected sleep – in one coherent objective: to decrease the frequency, intensity and duration of the body's stress response in ordinary daily life, rather than employing any single technique in isolation.

What the research discussed throughout this chapter implies, in total, is that this kind of layered, multi-practice approach to stress management has a more legitimate claim to affecting hormonal results than any single isolated relaxation technique may suggest on its own. In some trials, meditation changed menstrual frequency and androgen markers; Yoga Nidra directly altered diurnal cortisol rhythm; mindfulness lowered salivary cortisol and psychological symptoms; and sleep hygiene practices addressed a self-reinforcing loop between sleep disruption and HPA axis activation. None of these data independently are enough to say stress management will fix hormonal imbalance outright. Together, however, they paint a coherent, repeatable picture: methods that reliably calm the nervous system and regularize daily routine appear, from multiple, separate research streams, to imprint the body’s hormonal output in a measurable way – not just how someone feels, but what can be measured in their blood and spit. It is this confluence of subjective and biological data that

lends stress management its credibility as a real part of hormonal therapy, rather than a comfortable but ultimately cosmetic adjunct to it.

9. CONCLUSION

This dissertation was designed to investigate the role of yogic practices in the management of the hormonal imbalance associated with Polycystic Ovary Syndrome, approached as a review-based study, synthesizing the physiology, classical yogic philosophy, specific practical techniques and the available scientific literature. Having traversed each of these links in turn, it is now able to synthesize what the body of work, taken as a whole, actually supports.

This dissertation started from a simple observation: PCOS is the most common endocrine disorder among reproductive age women affecting an estimated 8% to 13% of women globally, with the numbers in India often being considerably higher and it comes with a whole lot of metabolic, reproductive, dermatological and psychological consequences that go far beyond the menstrual irregularity through which it is most often first noticed. At the same time, supported lifestyle management is now central to PCOS care in international clinical guidelines, acknowledging that pharmacological treatment alone manages symptoms without necessarily addressing the chronic stress, sedentary behaviour and metabolic disruption that drives the condition in the first place. This is the gap in which yoga has been placed throughout this study – not as a replacement for medical therapy, but as an organized, low-cost, side-effect-free practice able to intervene directly on numerous of the pathways believed to underlie hormonal imbalance.

The physiological argument is not based on a stunning single finding, but on a chain of facts. The endocrine system is a series of interconnected feedback loops. For example, the hypothalamic-pituitary-ovarian axis regulates the menstrual cycle, and the hypothalamic-pituitary-adrenal axis regulates the stress response. PCOS mainly affects the endocrine system through the reinforcing loop of insulin resistance and androgen excess. This is the very mechanism by which yoga is relevant: postures, breathing exercises, and meditative practices each provide a unique route to dampening an overactive stress response, and it is understood that a more quiescent stress response reduces the downstream pressure that chronic cortisol elevation places on both insulin sensitivity and reproductive hormone signaling.

There is real, although still growing, support in the research reviewed throughout this dissertation for this mechanism. Systematic review of published literature has associated yoga

practice with favorable changes in endocrine parameters, glucose metabolism, and quality of life in women with PCOS. Some trials utilizing postures such as Baddha Konasana and Bhujangasana have demonstrated measurable improvement in menstrual regularity, acne, and hirsutism, as well as alterations in testosterone, LH, and FSH. Some of the most robust and reproducible findings across the entire body of yoga research are in the individual techniques of pranayama – alternate nostril breathing alone has been evaluated in forty-four randomised controlled trials, with high-level evidence for genuine autonomic and cardiopulmonary benefit. Both meditation and Yoga Nidra expanded that findings to directly measurable biological indicators, including the diurnal cortisol cycle and, in dedicated experiments, menstrual regularity itself. The most direct hormonal evidence for any single practice category studied here was identified in a scoping review of meditation and mindfulness in PCOS, which found two trials reporting increased menstrual frequency and two with reduced biochemical hyperandrogenism after structured intervention.

But intellectual honesty demands that we acknowledge the limits of what this data now suggests. Most of the studies is still tiny, short-term, and variable in the specific protocols utilized, so while the direction of the evidence is generally beneficial, the strength of any given conclusion should not be overestimated. The mental health toll women with PCOS are paying – depression at more than two and a half times the rate of unaffected peers, anxiety at almost five times the rate – is itself a powerful argument that any truly complete management approach must address mental and emotional wellbeing along with hormonal and metabolic markers, and this is precisely the area where yoga's evidence base, across meditation, mindfulness and relaxation practice, is currently most robust and consistent. Oxford Academic Collectively, the evidence presented throughout this dissertation supports a measured, yet real, conclusion: yogic practice – comprising asana, pranayama, and meditative technique – is a credible, evidence-informed adjunct to conventional PCOS management, operating predominantly through its demonstrated effects on stress physiology, autonomic balance, and psychological wellbeing, with increasing, if not yet conclusive, support for measurable hormonal benefit. It is not a cure and should never be presented as a substitute for proper medical care. Rather, it is precisely what the lifestyle-first approach advocated by current clinical guidelines calls for: an accessible, sustainable and increasingly well-evidenced practice that women with PCOS can reasonably incorporate into their long-term care, in tandem with – not in place of – the medical support their condition may also require.

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